



**INSTALLATION/USER MANUAL**  
**COMPLETE SOLUTION WITH FORTRESS POWER BATTERIES**

# FP-ENVY 12K



**\*Batteries are not Included**



# FORTRESS POWER

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# Safety

## Safety Instruction

### General Safety Instructions

Safety regulations have been strictly observed in the design and testing of the inverter. Prior to any work, carefully read all safety instructions and always observe them when working on or with the inverter. The installation must adhere to all applicable national or international standards or regulations.

Incorrect operation or work may cause:

- injury or death to the operator or a third party
- damage to the inverter and other properties belonging to the operator or a third party.

### Important Safety Notifications

There are various safety issues that must be carefully conveyed prior to during and after the installation, as well as during future operation and maintenance. The following are important safety notifications for the operator, owner, and user of this product under normal conditions of use.



### Dangers of High Voltages and Large Current

- Beware of high PV voltage. Please turn-off the DC switch of PV Panel output before and during the installation to avoid electric shock.
- Beware of high grid voltage. Please turn-off the AC switch at the grid connection before and during the installation to avoid electric shock.
- Beware of large current of the battery output. Please turn-off the battery module before and during the installation to avoid electric shock.
- Do not open the inverter when it's working to avoid electric shock and damage from live voltage and current from the system.
- Do not operate the inverter when it's working, only the LCD and buttons can be touched in limited cases by qualified personnel,
- Other parts of the inverter can be touched when the inverter is in a safe state (e.g., fully shutdown).
- Do not connect or disconnect any connections (PV, battery, grid, communication etc.) of the inverter when it's working.
- Make sure the inverter is well grounded. An operator should make sure he is well protected by reasonable and professional insulation measurements (e.g. personal protective equipment (PPE)).
- Inspect relevant existing wiring on-site of the installation is in good condition before installation, operation, or maintenance.
- Inspect that connections are good between the inverter and PV, battery, and grid during installation to prevent damages or injuries caused by bad connections.



## WARNING

### **Avoid Misoperation and Inappropriate Usage**

- All the work of this product (system design, installation, operation, setting, configuration, and maintenance must be carried out by qualified personnel as required.
- All connections must be in accordance with local and national regulations and standards.
- The inverter and system can inter-connected with the utility grid only if the utility grid permits it.
- All the warning labels or nameplates on the inverter must be clearly visible and must not be removed, covered, or pasted.
- The installation should consider the safety of future users when choosing the right position and location as specified in this manual.
- Please keep the children away from touching or misusing the inverter and relevant systems.
- Beware of burning hurt, the inverter and some parts of the system could be hot when working, please do not touch the inverter surface or most of the parts when they are working. During inverter working states, only the LCD and buttons could be touched.

## Notice

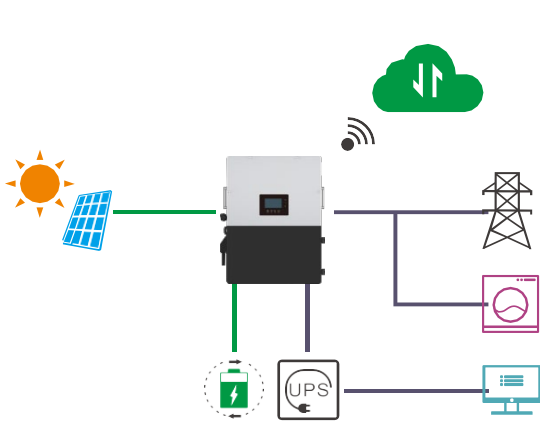
- Please carefully read this manual before any work is carried out on this inverter, the installation, please keep this manual carefully stored and easy to access at any time.
- The qualified personnel should have had training in the installation and commissioning of the electrical system as well as dealing with hazards, also they should have the knowledge of the manual and other related documents. As the installer or operator, they are required to be familiar with local regulations and directives.

# Brief Introduction

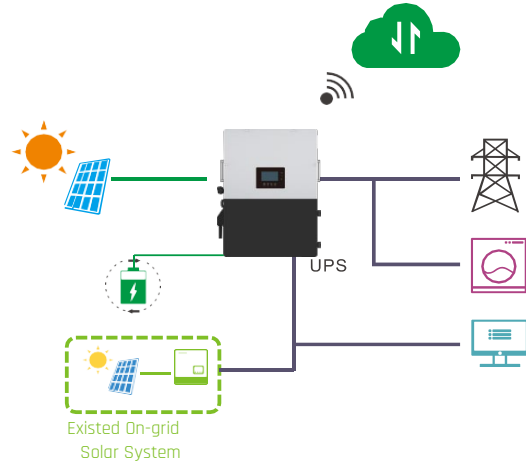
## System Solution

This product and its associated system are suitable for the following system applications (system diagram):

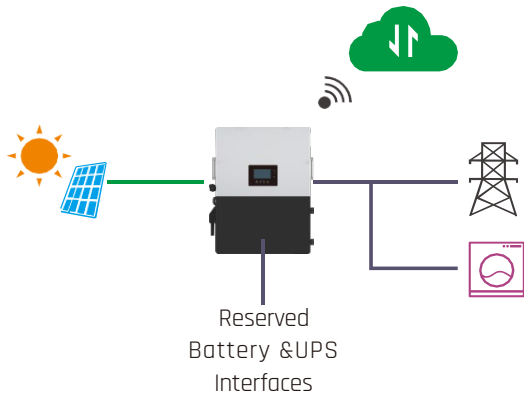
**A. Solar and battery storage system**



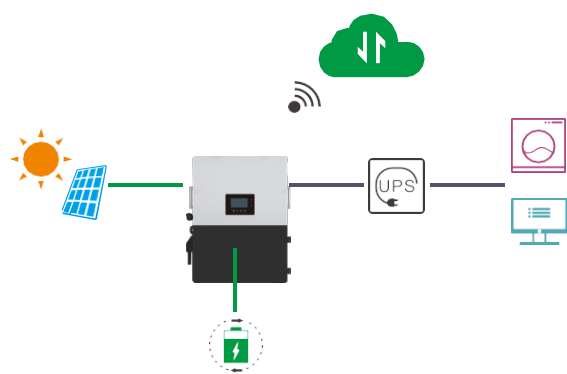
**B. AC Coupling with existed solar system**



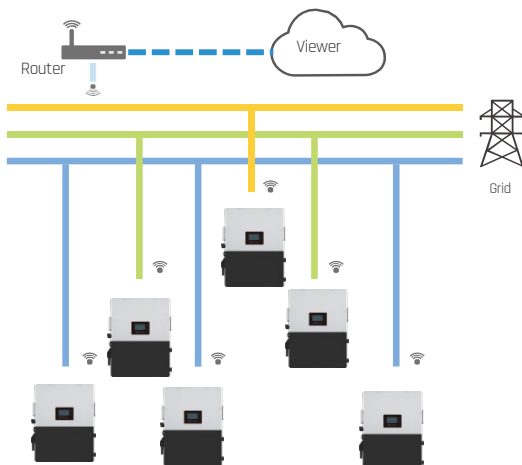
**C. On-grid solar system without battery (Support EPS Load even without battery)**



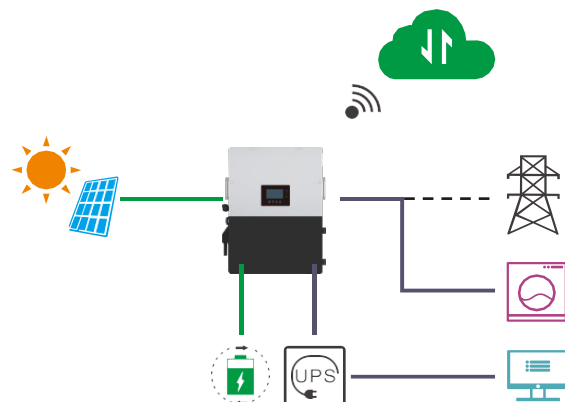
**D. Off-grid and back-up applications**



**E. Single and three phase paralleling system**



**F. Energy storage system with peak shaving Function**



# Installation

## Packaging List & Storing

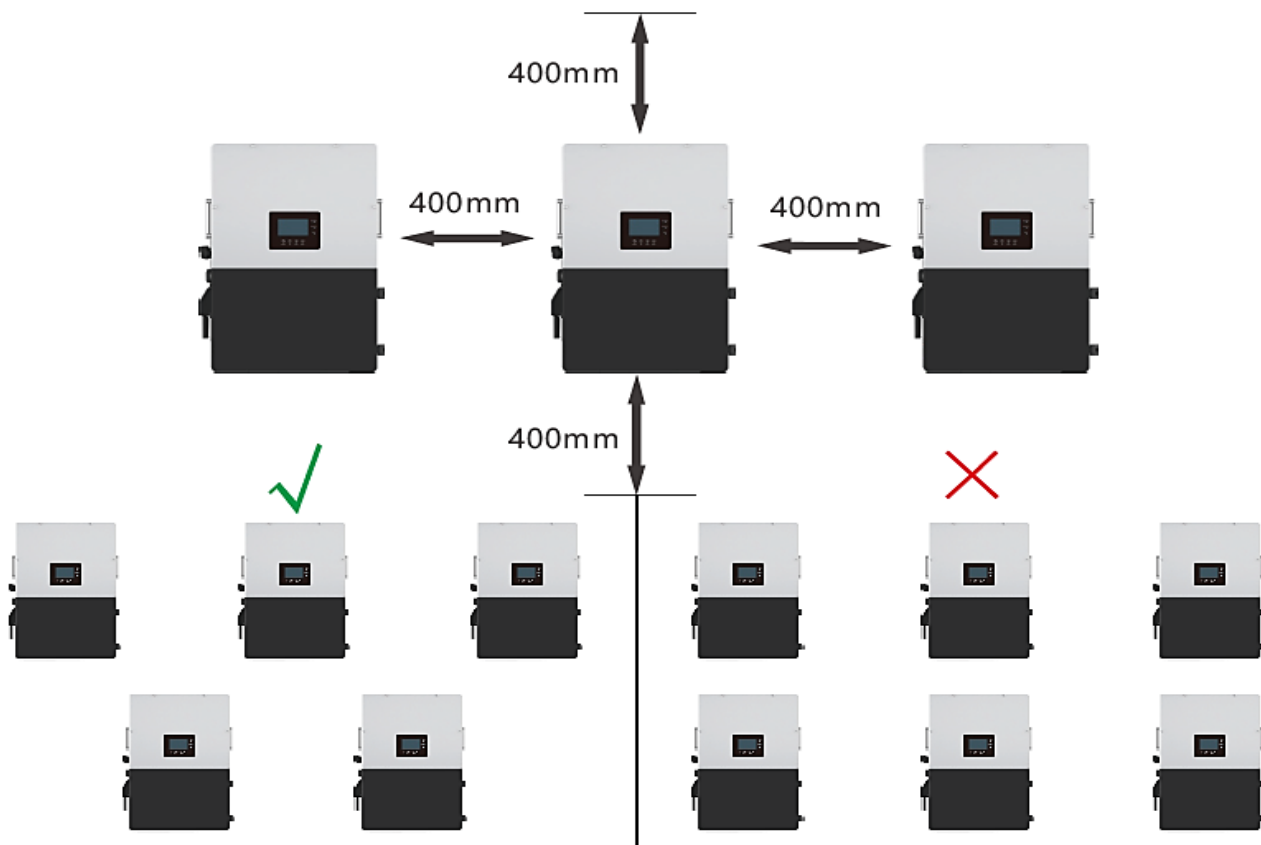
When the packaging is unpacked, the inner components should match those listed in the list below.



## Location Selection and Installation

### Requirements for installation location

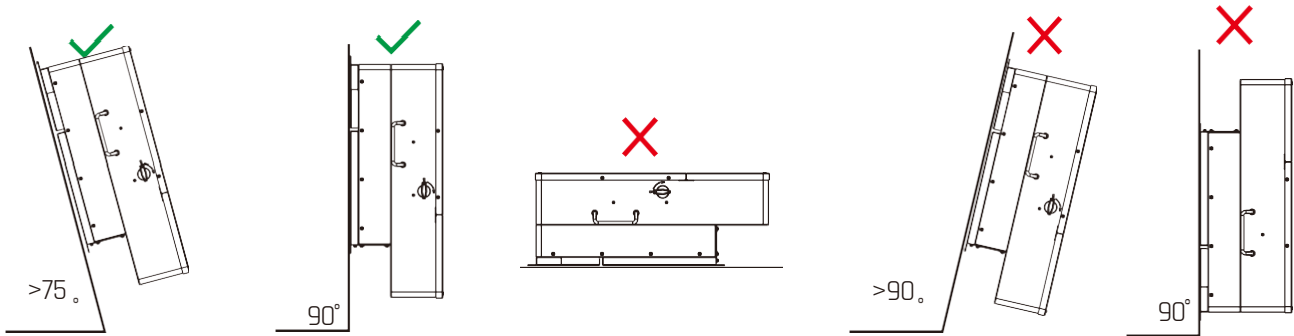
- a) The mounting wall should be strong enough to bear the weight of the inverter. Please maintain the minimum clearances when using multiple inverters in parallel as presented below for adequate heat dissipation. Other electrical accessories such as the ENVY distribution Panel may be mounted with a minimum 2-inch clearance on either side of the inverter. If mounted below the inverter fans the minimum clearance shall be 16 inches.



- a) Never position the inverter in continuous sunlight, rain, or snow when installed in the south side orientation of the property (in reference to the sun) as this might damage the LCD screen due to excessive UV exposure. If installed in the south side orientation, choose a well shaded site or a shed to protect the inverter from direct sunlight, rain, and snow etc. Otherwise install in the correct property side orientation as described in the figure below.

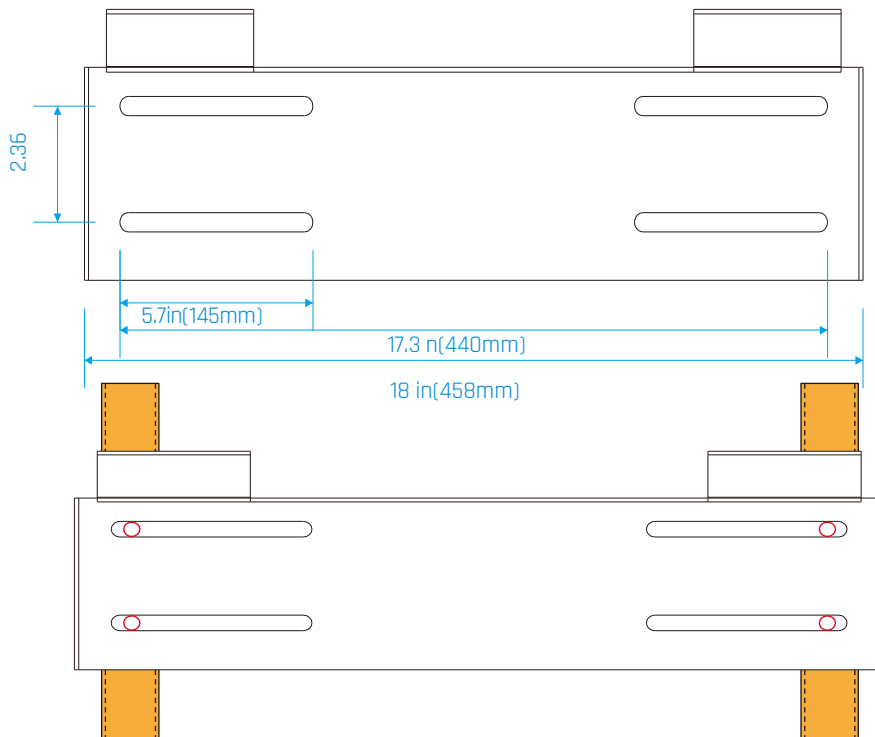


- b) The inverter should be installed upright on a vertical surface.



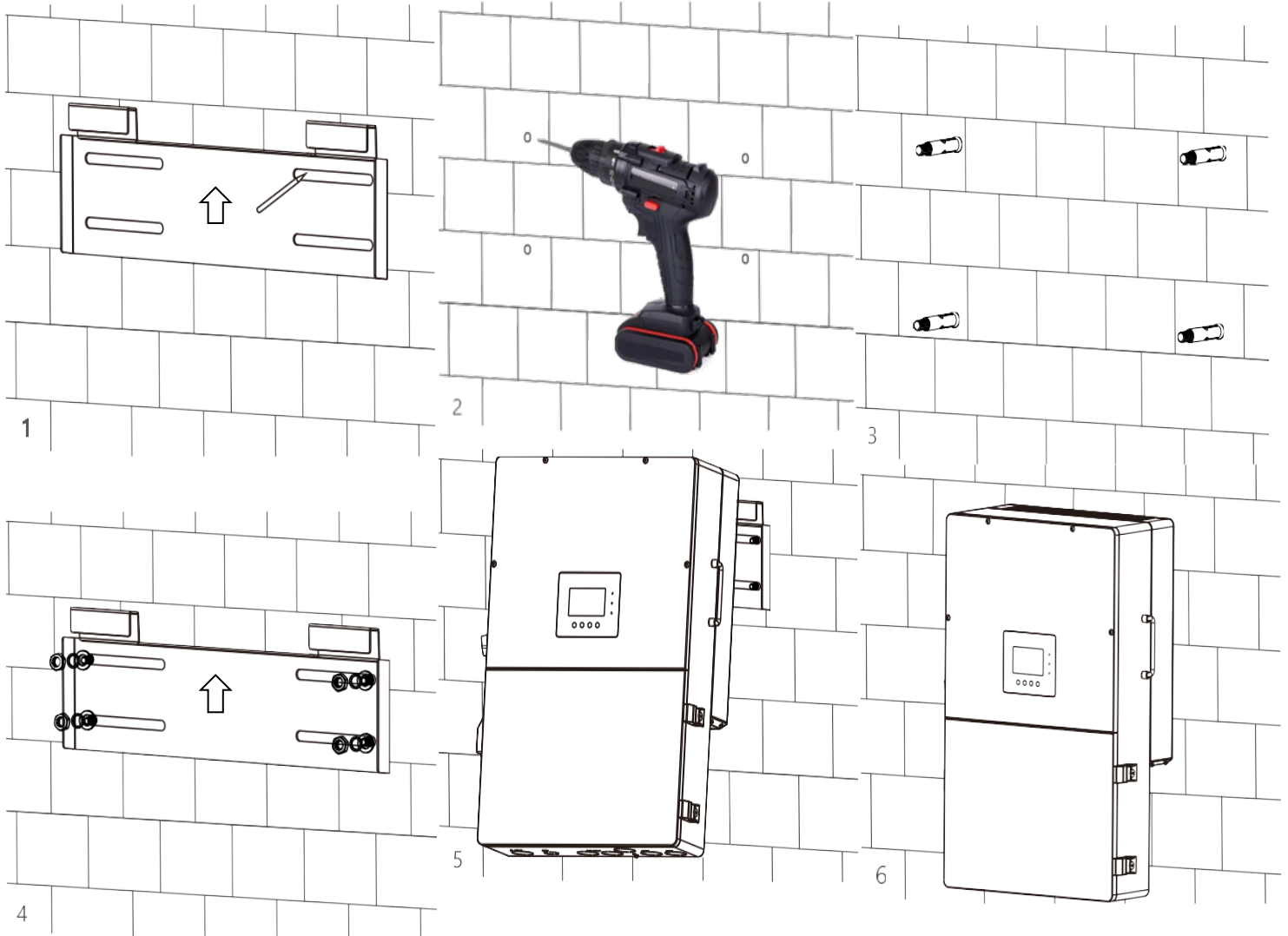
### Installing the inverter

The inverter is wall-mounted type and, should be installed on a vertical, solid mounting surface, such as wood studs, brick, or concrete wall. Two or more persons may be needed to install the inverter due to its weight. The slots on the mounting bracket can accommodate various stud spacings from 12inches(305mm) to 16inches(406mm).





The mounting steps are as below: (Use brick wall as example)



1. Mark the drill holes positions with the mounting bracket,
2. Drill four 48mm(5/16inch) diameter holes, making sure the depth of the holes is deeper than 50mm(2inches).
3. Install and tighten the expansion bolts into the holes.
4. Then use the corresponding nuts and washers (packaged together with the expansion bolts) to install and fix the wall-mounting bracket on the wall.
5. Hang the inverter onto the wall-mounting bracket and lock the inverter on the wall using 2 self-tapping screws on the top of the inverter.

#### **For installation on wood studs**

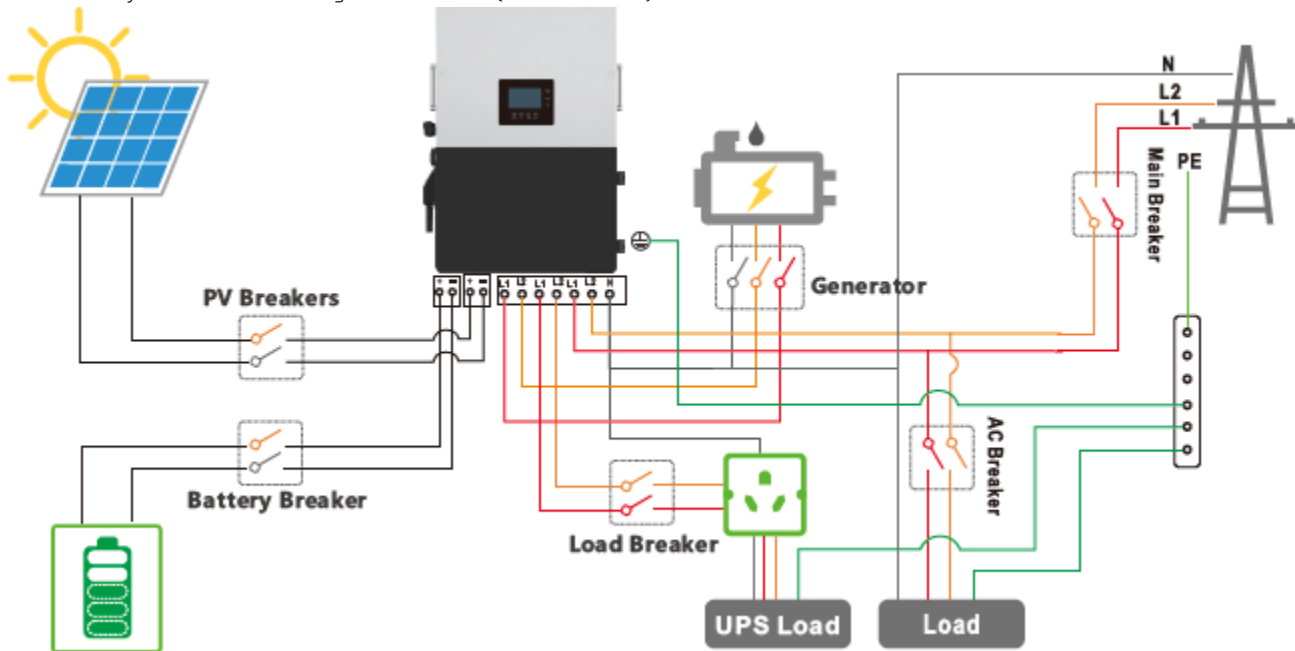
Fasten the mounting bracket on the studs with 4 wood screws, then hang the inverter onto the bracket and lock the inverter on the wall with 2 self-tapping screws.

Please note that the wood screws and self-tapping screws are not provided with the inverter. Installers need to prepare the screws before installation.

## Connection Overview

### System Connection

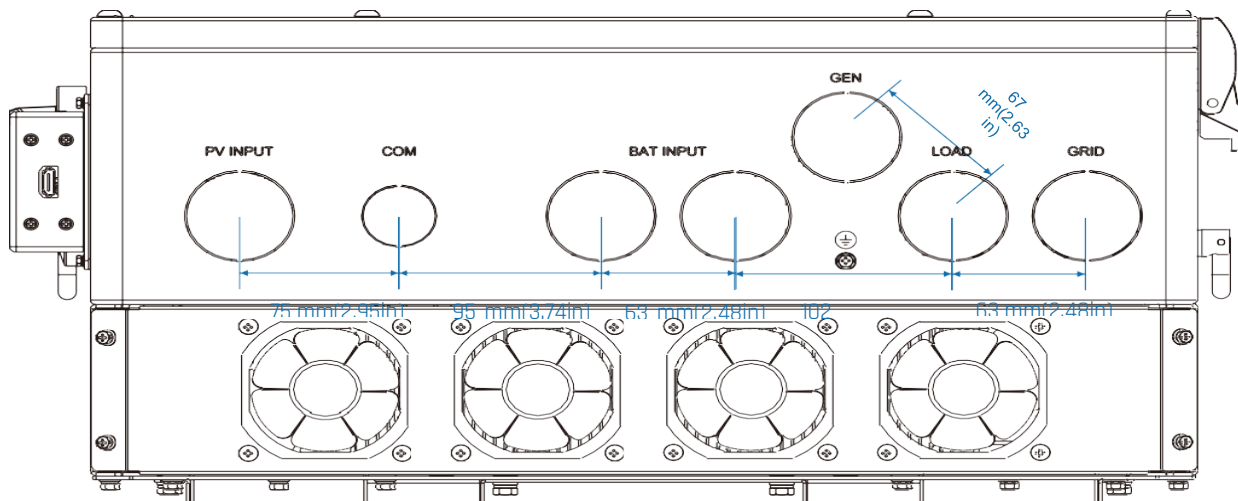
The system connection diagram is as below( for US version):

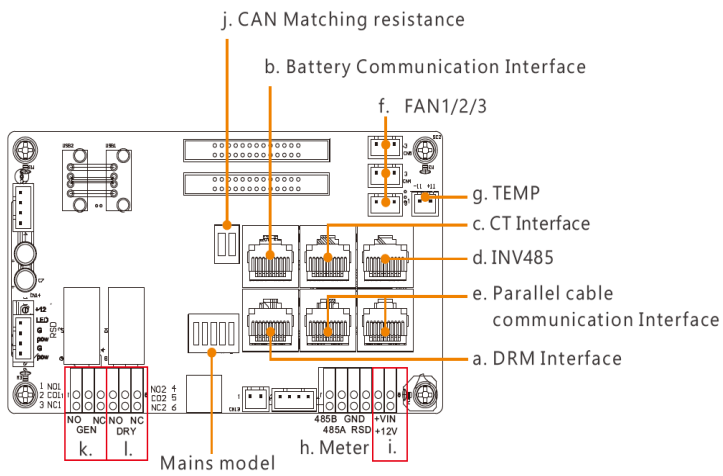
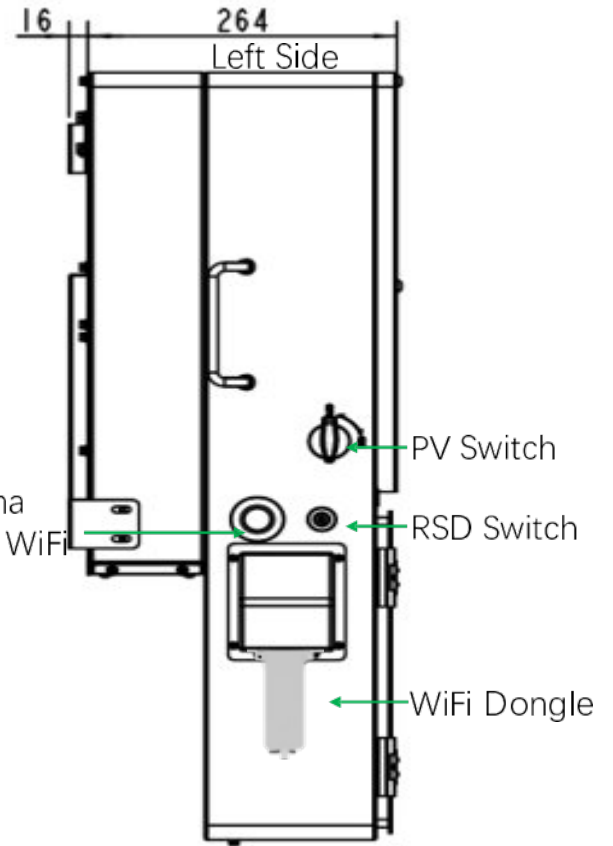
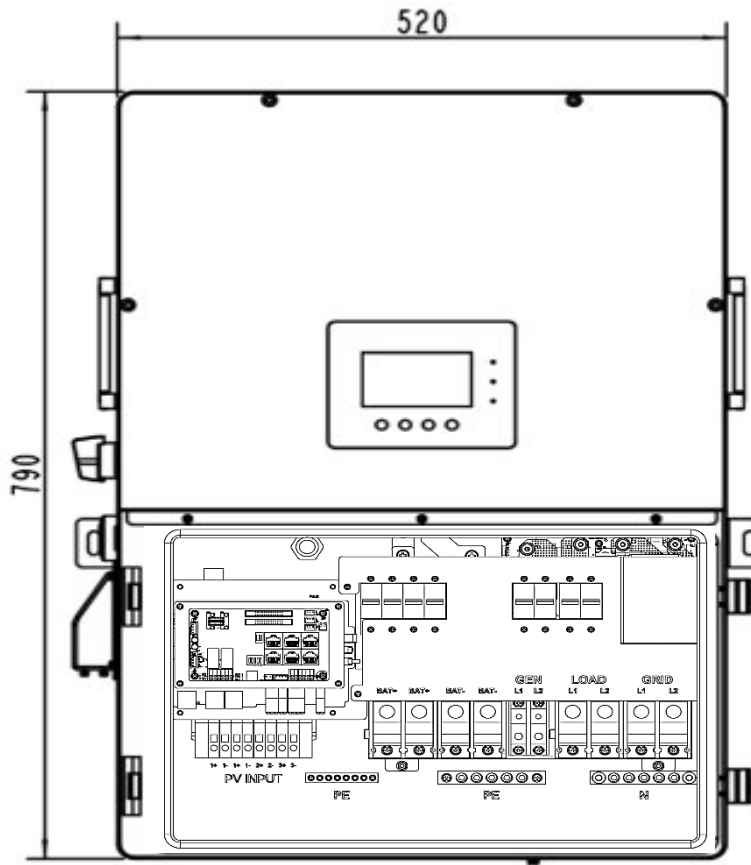


Please prepare the breakers before connecting, breakers selection recommendation for both DC and AC

Inverter model	12K
PV Breakers(2Px4)	MPPT1 string 1 : 600V/20A MPPT1 string 2 : 600V/20A MPPT2: 600V/20A MPPT3: 600V/20A
Main Breaker(2P)	200A/240Vac when ups is used for whole home backup 100A/240Vac when ups is used for partial load backup
Generator breaker	100A/240Vac

### Overview of Connection Ports





- a). DRM port
- b). Battery communication port (CAN&RS485) please check Chapter 3.5.2 for Pin definition
- c). CT Interface: please check Chapter 3.6.4 for CT connection
- d). INV 485: Debugging port
- e). Parallel communication port please check Chapter 3.9 for Parallel connection
- f). FAN1/2/3
- g). TEMP: Connection for temperature sensor of lead-acid battery
- h). Meter 485B&485A: For Meter communication
- i). VIN/+12V: Connect a outside emergency switch on these 2 terminals
- j). CAN Matching resistance: Set DIP switch when use inverters in parallel
- k). GEN (NO, NC): Connection for generator auto-start function
- l). DRY(NO,NC): reserved

## PV Connection

The PV connection of this hybrid inverter is the same as that of a traditional on-grid solar inverter (string inverter).



### WARNING

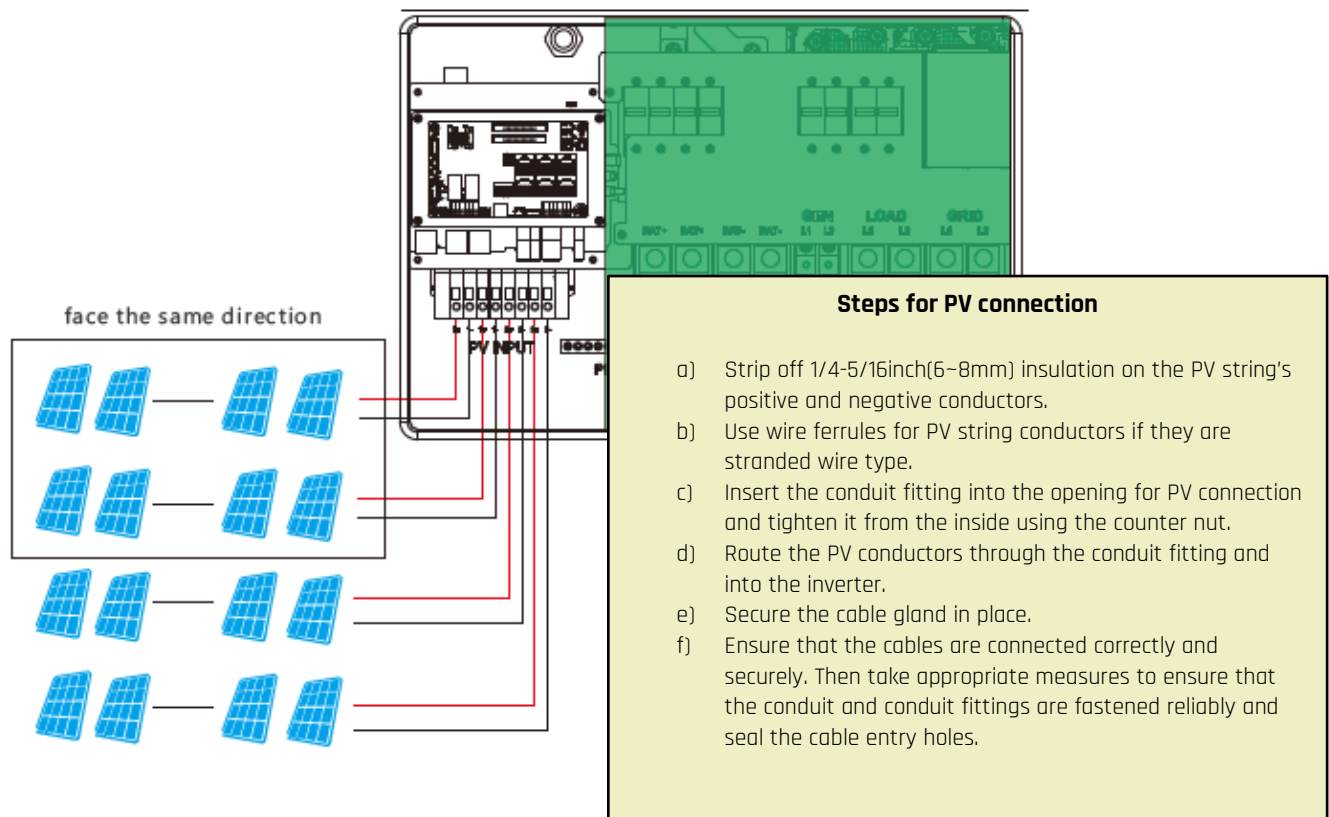
\* Please double check the lowest ambient temperature of the installation location. The rated  $V_{oc}$  on solar panel nameplate is obtained at 25°C. As the ambient temperature drops, the Solar panel  $V_{oc}$  increases. Please ensure the Maximum solar string voltage corrected at the lowest temperature does not exceed the inverter's maximum input voltage of 550V.

### Cable Requirement:

Cable Size	Minimum Voltage
10-8AWG (5-8mm <sup>2</sup> )	600V

### NOTICE

1. The inverters have three MPPTs. For MPPT1, users can connect two strings. For MPPT2 and MPPT3, users can connect one string.
2. When users connect 2 strings to MPPT1, make sure the two strings have same quantity of solar panels. The inverter will limit the total MPPT1/MPPT2/MPPT3 input current to 25A/15A/15A automatically.
3. The inverter will limit the max solar input power to 18kW totally.

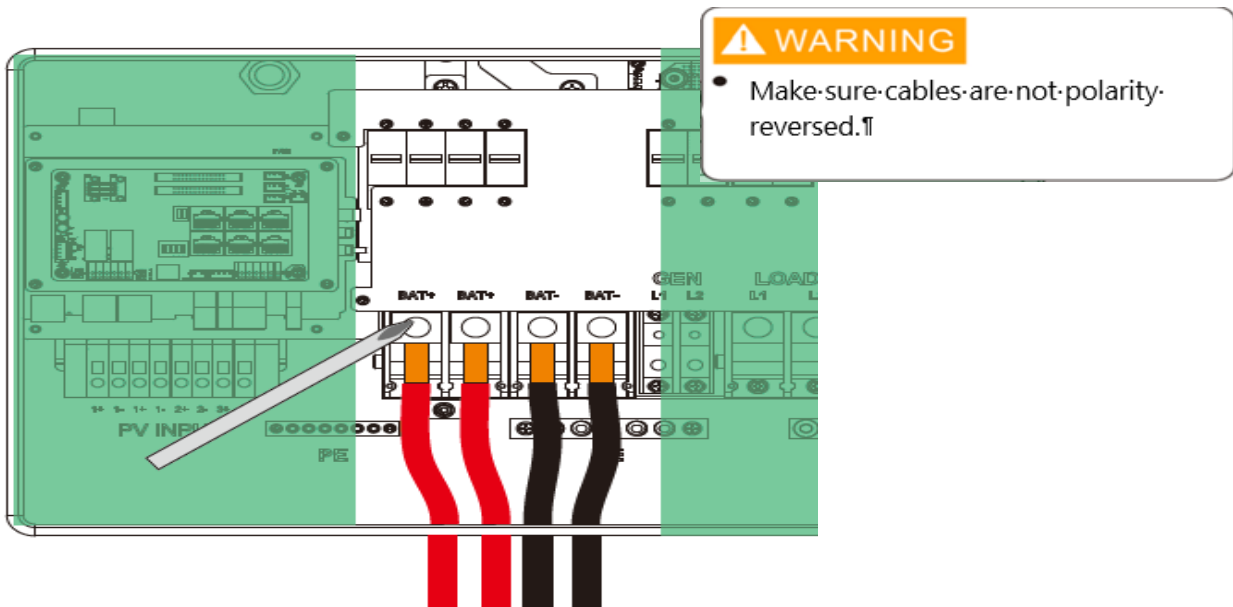


## Battery Connection

### Battery power cable connection

#### Cable Requirement:

1. Strip 1/4-5/16inch(6-8mm) insulation from the cable end and crimp Ferrule for the cable ends.
2. Route the battery power cable, connect positive to BAT, negative to BAT-.
3. Secure the conduit fitting to the enclosure using the counter nut.
4. Fasten the DT rings of battery positive and negative cables to the lugs according to the markings.
5. Fix the cable gland in place.



### Battery communication cable connection

Correct battery communication cable must be used to connect the battery to the inverter when users choose lithium-ion battery type. Please select 'Lead-acid' type if the lithium battery cannot communicate with the inverter. The battery communication port on inverter is an RJ45 socket, Pin for the RJ45 plug of the communication cable is as below. Make the communication cable according to the below inverter Pin and the correct pinout of communication port on battery. The inverter supports both CAN and RS485 communication

Pin	Description
1	NC
2	GND
3	NC
4	BAT CAN H
5	BAT CAN L
6	NC
7	BAT RS485 A
8	BAT RS485 B

After battery power cable and communication cable connection, users need to enter Advanced settings and choose Battery type and brand on the inverter LCD.

The screenshot displays the 'Advanced' settings menu on the inverter LCD. The left sidebar contains navigation buttons: Basic, Charge, Discharge, **Advanced**, Debug, and Device info. The main display area is divided into sections:

- Grid type:** Set to 240V/120V. A callout box explains: "Select Grid Voltage 240V/120V, 208V/120V. Select Frequency".
- Grid regulation:** A dropdown menu. A callout box explains: "Select Grid Regulation According to Region".
- Reconnect time(S):** A numeric input field.
- Battery type:** Set to Lithium. A callout box explains: "Select Lithium and Lithium 0 for Closed Loop Communication with Fortress Power eFlex, eVault MAX".
- Lithium brand:** Set to Lithium 0. A callout box explains: "Select Lithium and Lithium 0 for Closed Loop Communication with Fortress Power eFlex, eVault MAX".
- Lead capacity(Ah):** A numeric input field.

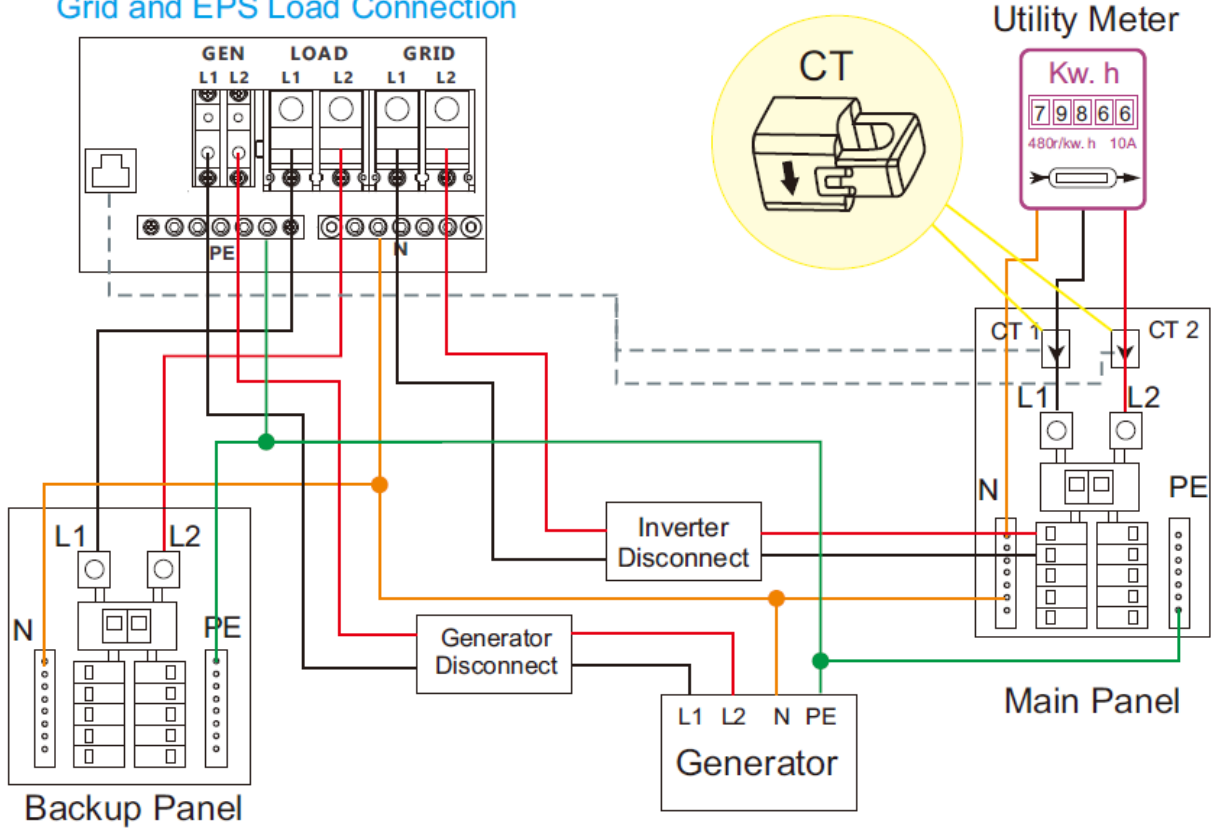
Below this, the 'Charge' section is visible, with 'Charge first(PV)' checked. Under the 'Lead-acid' section, 'Absorb voltage(V)' is 54.8, 'Float voltage(V)' is 54, and 'Start derate Volt(V)' is 48. A callout box explains: "Select Lead Acid for Open Loop Settings and manually configure charging parameters. The Inverter will use three stage charging.".

## Grid & EPS Load Connection

### Grid type and regulation selection

The inverter can be used with 120/240V split phase. The inverter has passed the main grid-connection regulations in the US. Users can choose different Grid Type and regulation in advanced program as below:

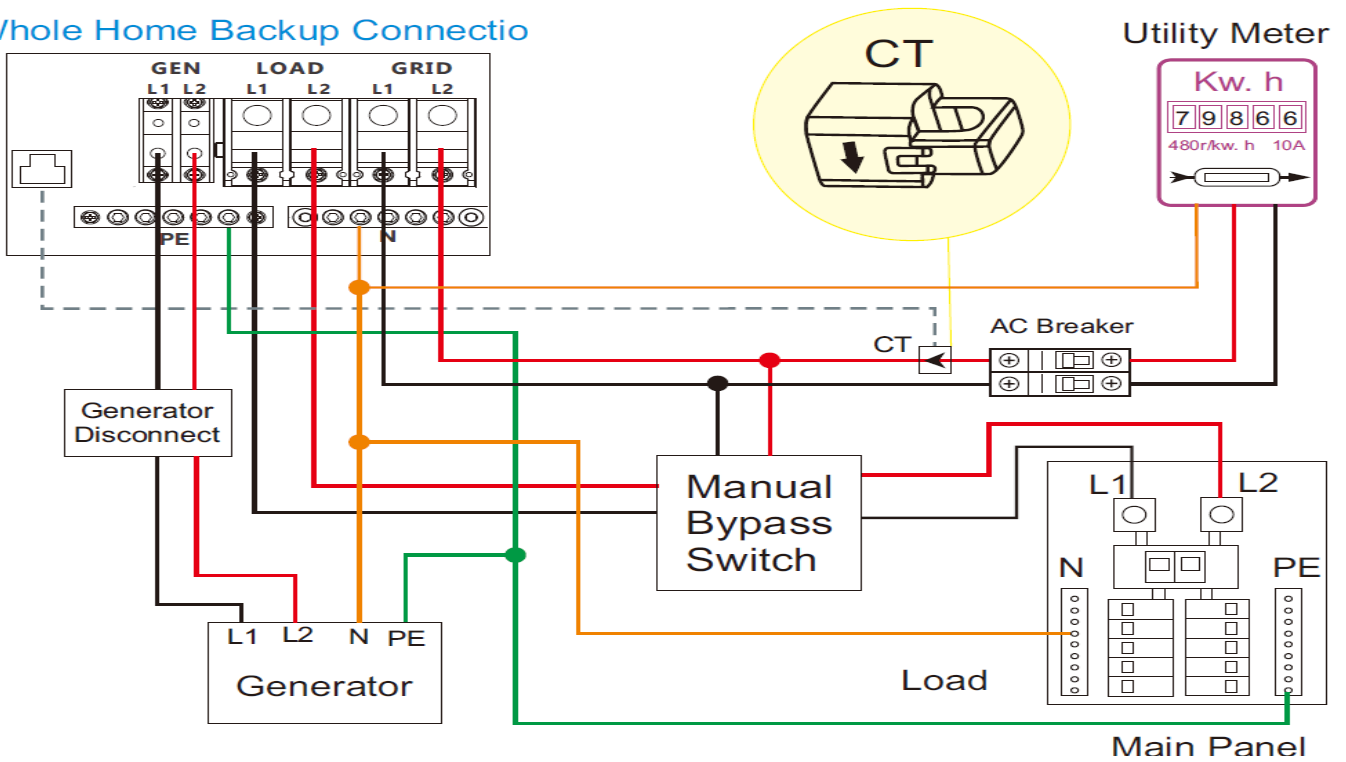
### Grid and EPS Load Connection



### Grid and EPS load connection for split-phase service

Connection diagram for 120/240V is as below. The inverter can be connected to the load side of the service disconnecting means if the busbar rating in the main panel can meet the NEC705.12(B)(3) requirements. Otherwise, a Line side connection can be made to avoid an expensive main panel upgrade.

### Whole Home Backup Connectio

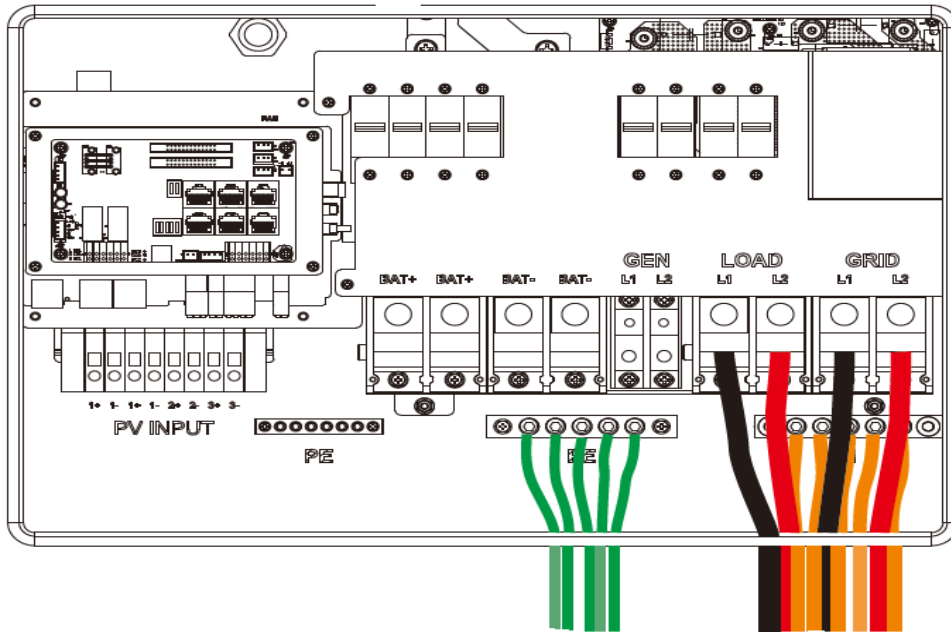


## AC cable connection

Cable Requirement:

Current	Cross-section	Cable Diameter	Minimum Voltage	Torque for cable connection
100A	3-2AWG(25-35mm <sup>2</sup> )	6-7mm	600V	7(N.M)
200A	1/0-2/0AWG(55-70mm <sup>2</sup> )	8-9mm	600V	33(N.M)

- Strip off 5/16-3/8inch(8-10mm) insulation sleeve on the cables.
- Use wire ferrules if the cables are made of fine stranded wires.
- Secure the conduit fitting to the enclosure using the counter nut of the fitting.
- Fasten the grid and EPS load cables to the terminal block in accordance with the markings.
- Secure conduit to the conduit fitting.
- Check that the cables are connected correctly and securely, then take appropriate measures to ensure that the conduit and conduit fitting are secured reliably and seal the cable entry holes.



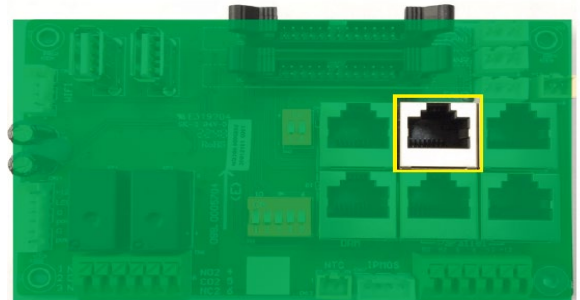
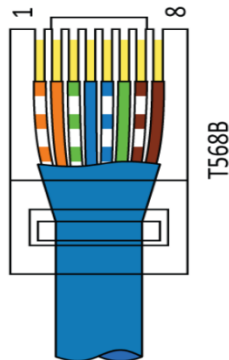
## CT/Meter Connection

To measure the power imported from and exported to the grid, a pair of CTs or one triphase meter must be installed at the service entry point in or near the main service panel. We standardly supply 2 CT for one inverter.

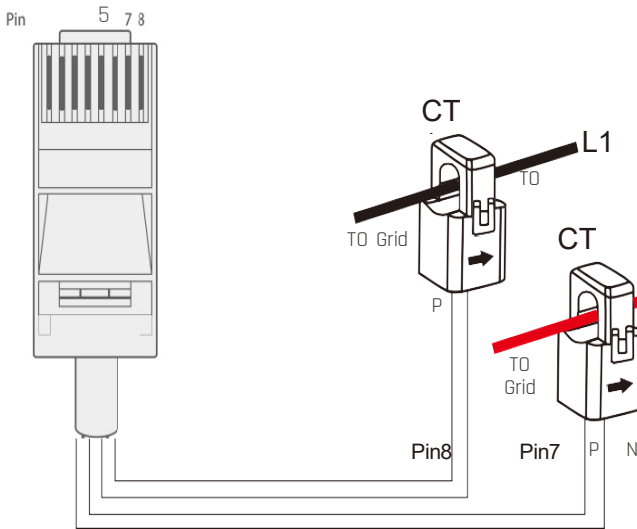
### CT Port Pin definition

The CT interface for 2 CTs connection is a RJ45 port, We have made a RJ45 plug on those 2 CTs in advance, so you can connect it to the port directly.

Pin	Description
1-4	Reserved
5	CT2N
6	CT2P
7	CT1N
8	CT1P







Please refer to the above connection diagram for the correct positions of CTs. Please clamp the 2 CTs on the L1 and L2 wires at the service entry point in the main service panel. The arrows on the CTs must point to inverter side.

#### CT Clamp Ratio

The Fortress Power inverters support two ratios of CT clamp- 1000:1 and 3000:1. The CT ratio of the CTs in the accessory bag is 3000:1. If you are using a 3rd party CT, please ensure the CT ratio is either 1000:1 or 3000:1, and then select the correct CT ratio setting in the inverter monitor page or on the inverter LCD.

#### Extend CT clamp cable.

The CT wires can be extended with a common ethernet cable if the length is not enough. An RJ45 adapter is needed for the extension. The CT wires can be extended up to 300ft (around 100m)

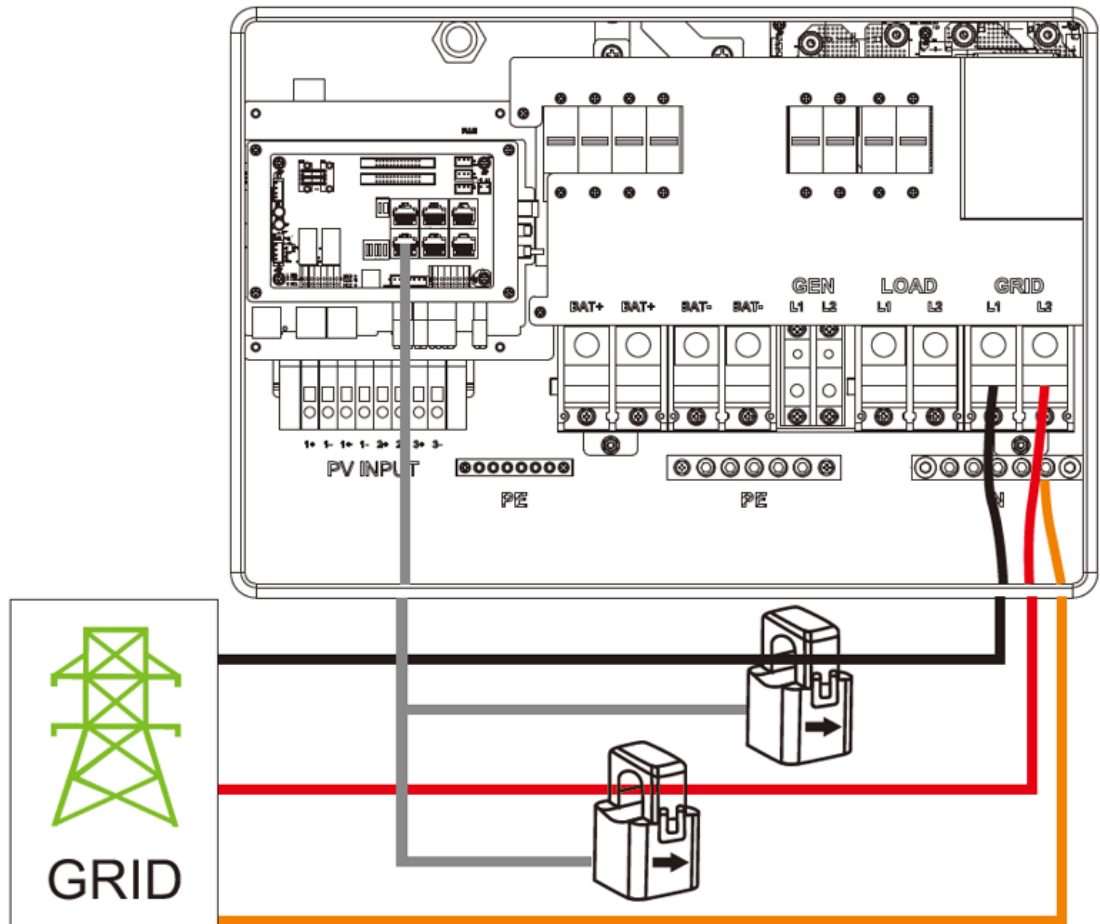


#### Alternative Meter Connection

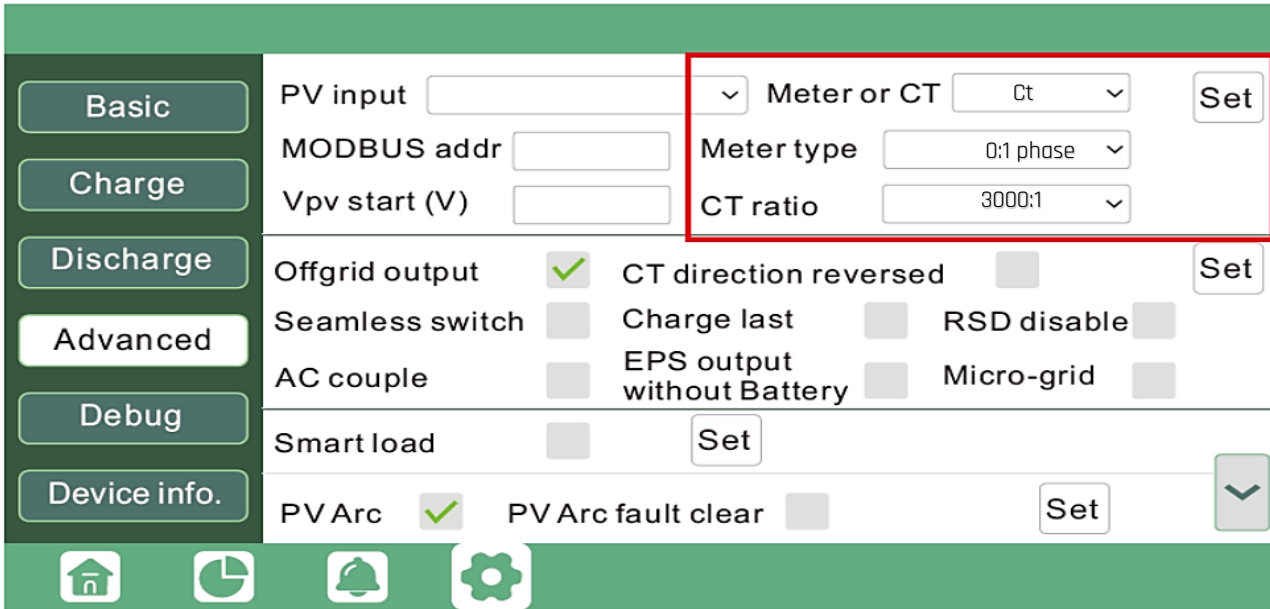
Currently only EASTRON SDM630-Modbus meters can be used. If you need to use a meter for import/export detection instead of CTs, you need to connect it to the Meter 485A and 485B terminals on the inverter.

#### Fast Zero Export

For Fast Zero Export applications, CT's must be connected between the Utility Meter and Main Panel Connection.



## Inverter CT Programming

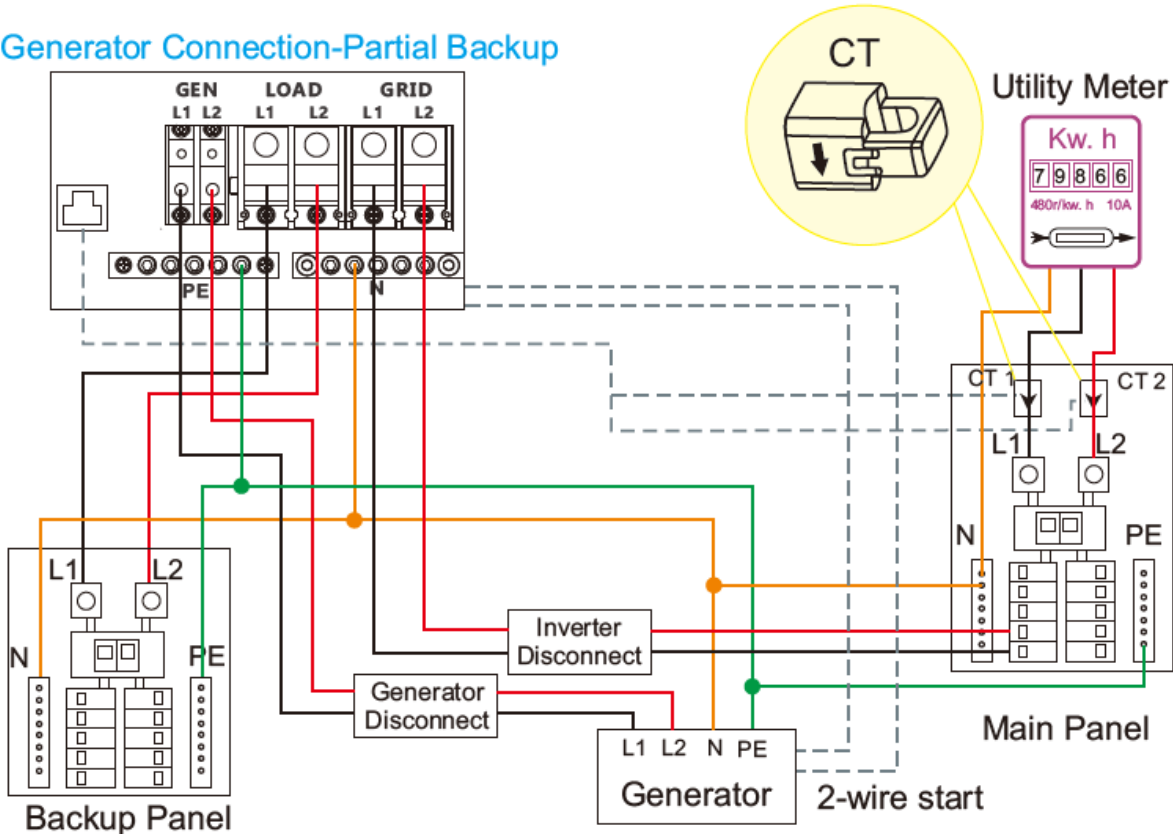


## Working with Generator

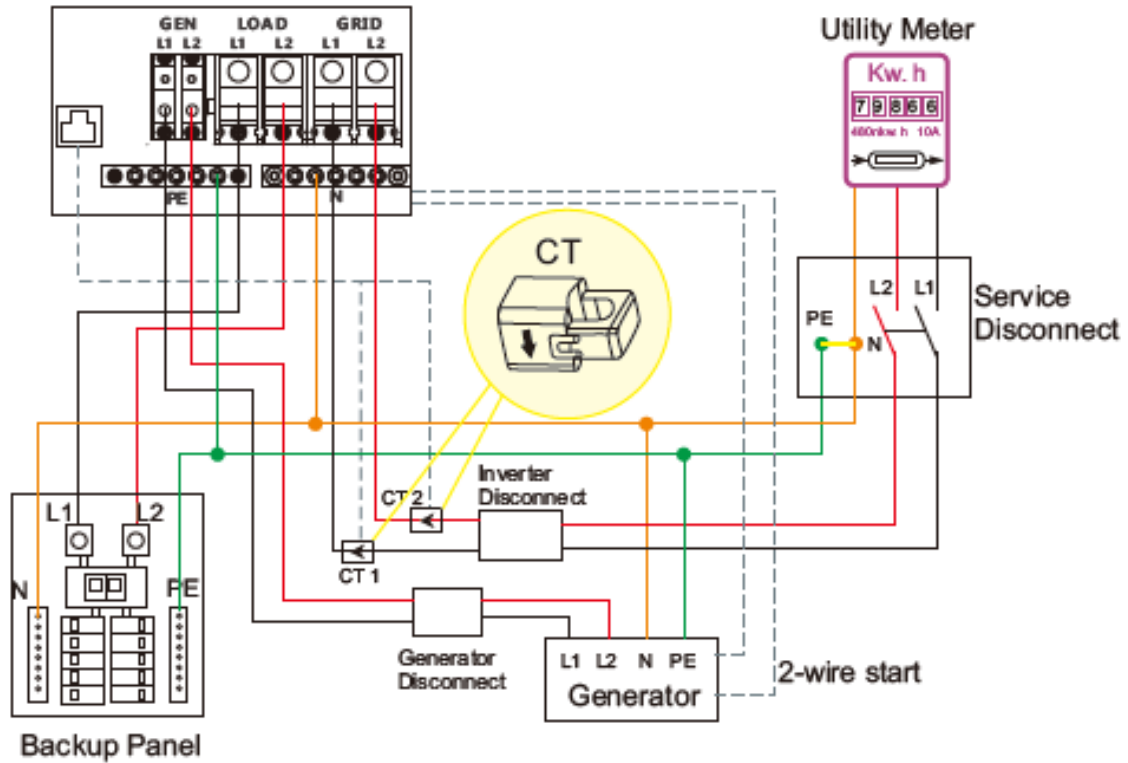
### Generator system connection

This hybrid inverter can work with generator. There are Gen ports on the inverter for generator connection.

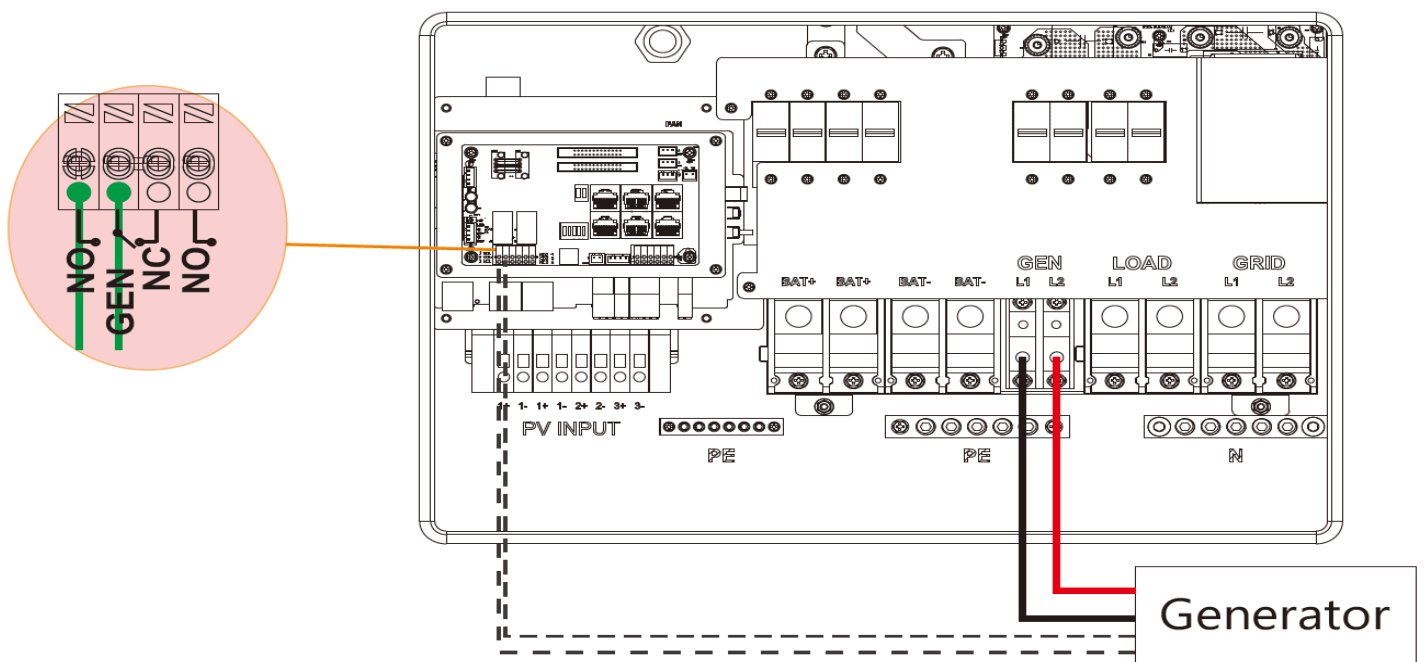
### Generator Connection-Partial Backup



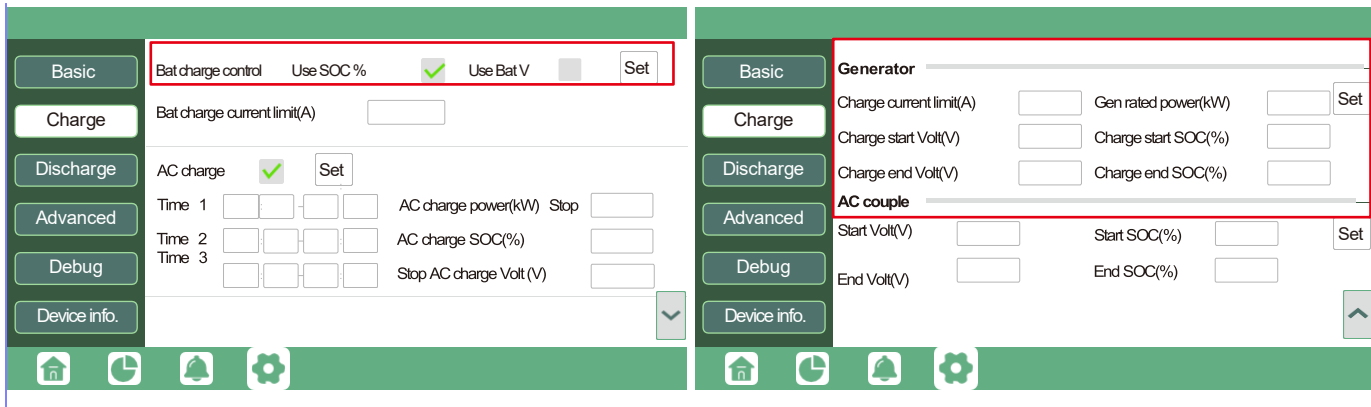
## Generator Connection-Whole Home Backup



When the generator is started, all the loads connected to EPS will be supplied by the generator. Meanwhile the battery will be charged. The pass-through relay on the generator port is 90A. When the generator is on, please ensure the total load and charge current will not exceed 90A. The generator start signal shall be connected to the COM board GEN (NO, NC port) if users want to start



## Generator Startup and Stop settings.



Note: Always Make sure you select Set for every change made, otherwise the inverter will not save input parameters.

It depends on the Bat charge control setting; The system will use either battery SOC or battery voltage to determine whether the system needs to start or stop the generator.

### Generator Start Conditions

When utility fails and  
 -When battery is discharged to cut-off settings  
 or there is force charge request from battery,  
 or when the battery voltage or SOC is lower than the Generator Charge start Volt/SOC settings,

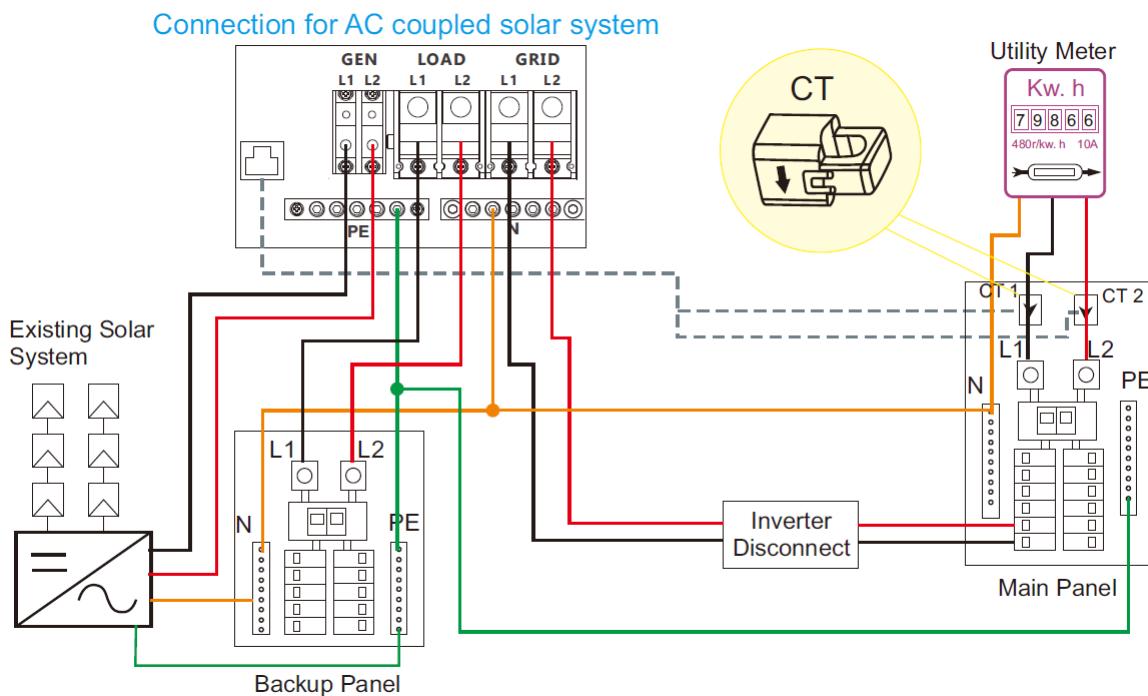
### Generator Stop Conditions

When battery voltage or SOC is higher than Charge end Volt/SOC settings value.

## AC Coupling Installation Connection

The inverter supports AC coupling connection with the existing grid-interactive solar system. The existing solar system is connected to the inverter's GEN port.

### Connection for AC coupled solar system



**After AC couple function enabled:**

When the Grid is on, the GEN terminal is connected to the grid terminal inside the inverter. In this case the hybrid inverter will bypass the interactive inverter AC to the grid and EPS Load.

When grid is off, The GEN terminal is connected to the EPS Load terminal inside the inverter. In this case, the hybrid inverter will work as a power source for the grid interactive inverter to synchronize and feed power to the micro-grid. The loads will be first supplied by solar power. If solar panels are generating more power than load consumption, the excess solar power will be stored to the battery. When solar power exceeds the sum of load power and max battery charging power, e.g., when battery is nearly full, the inverter will signal the grid interactive inverter to reduce power via the frequency shifting power reduction mechanism, thus, to maintain the balance of generation and consumption of the micro grid system.

**What is frequency shifting power reduction?**

All UL1741SA compliant grid-interactive inverter has the Frequency-Watt feature, which requires the grid-interactive inverter to reduce power with the increasing of grid frequency. The power will drop to zero before the over frequency trip threshold is reached.

When the Fortress Power hybrid inverter requires the grid interactive inverter to reduce power, it simply shift the output frequency up a bit, the grid-interactive inverter will limit its output power accordingly after sensing this frequency shift.

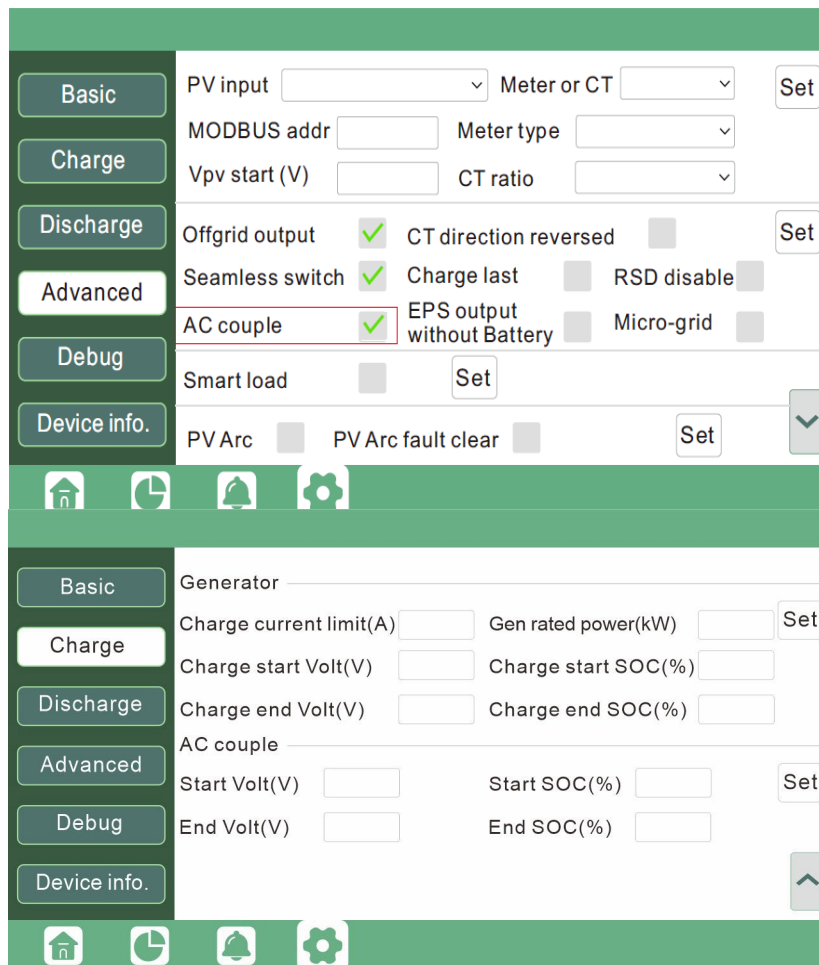
**AC Coupling Settings**

Users need to enable AC coupling function when they connect existing on grid system to GEN terminal.

Start SOC (%): The SOC at which the AC coupled inverters are turned on when in off-grid mode. 50%-70% recommended

End SOC (%): The SOC at which the AC coupled inverters are shut down when in off-grid mode. 90% recommended.

When On-Grid and Feed-in grid enabled, the AC-coupled inverter will always be on, and it will sell any extra power back to the grid. Ensure you are allowed to sell power to your utility provider when using AC Coupled PV Arrays on-grid.

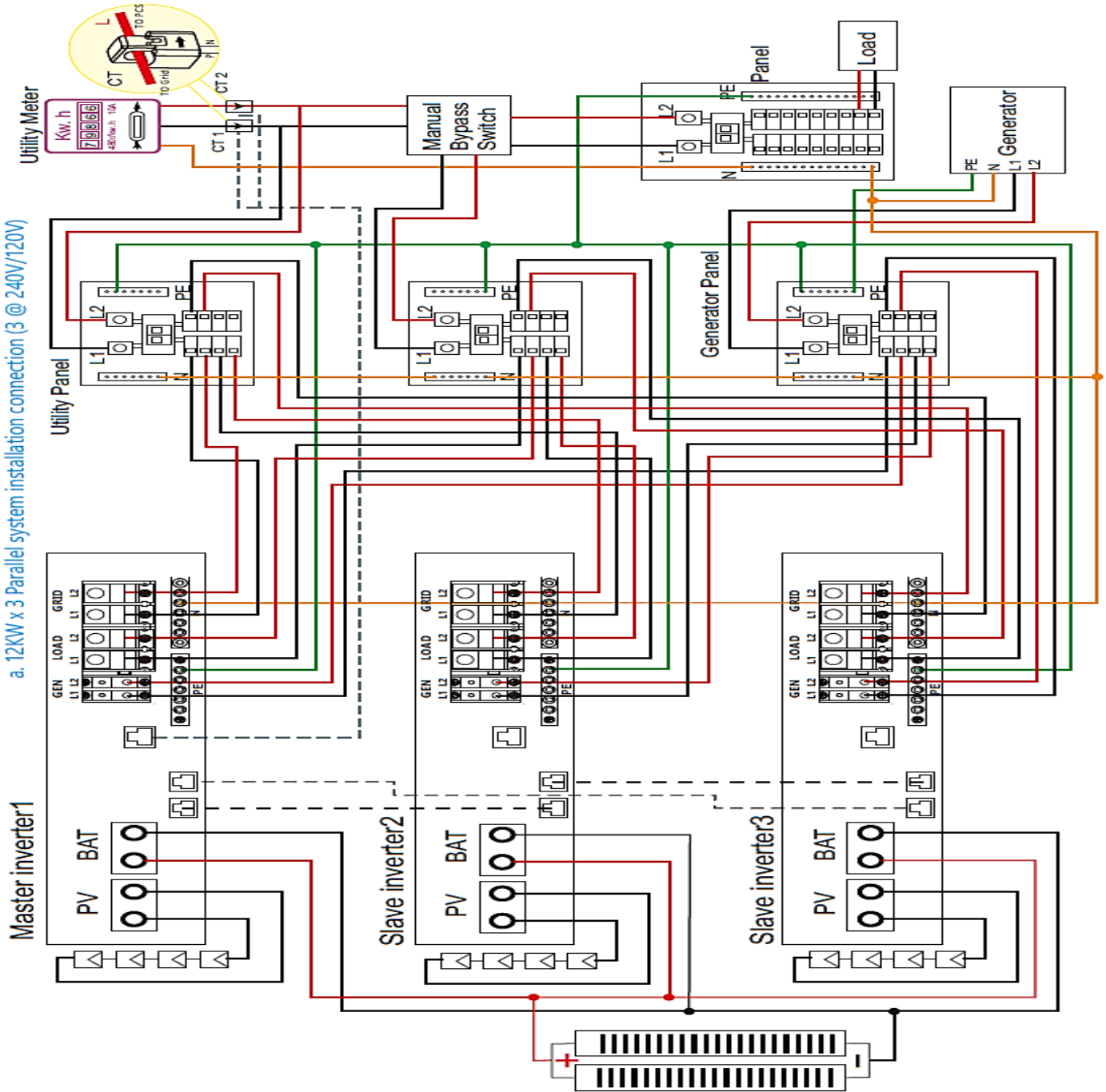


# Parallel System Connection

## Connection for paralleling system

The hybrid inverter supports parallel connection to expand power and energy capacity to suit different using scenarios. Up to 5 units can be paralleled to reach a capacity of 60kW. Wiring diagram is as below, The manual bypass switch connect loads to EPS Load panel for default.

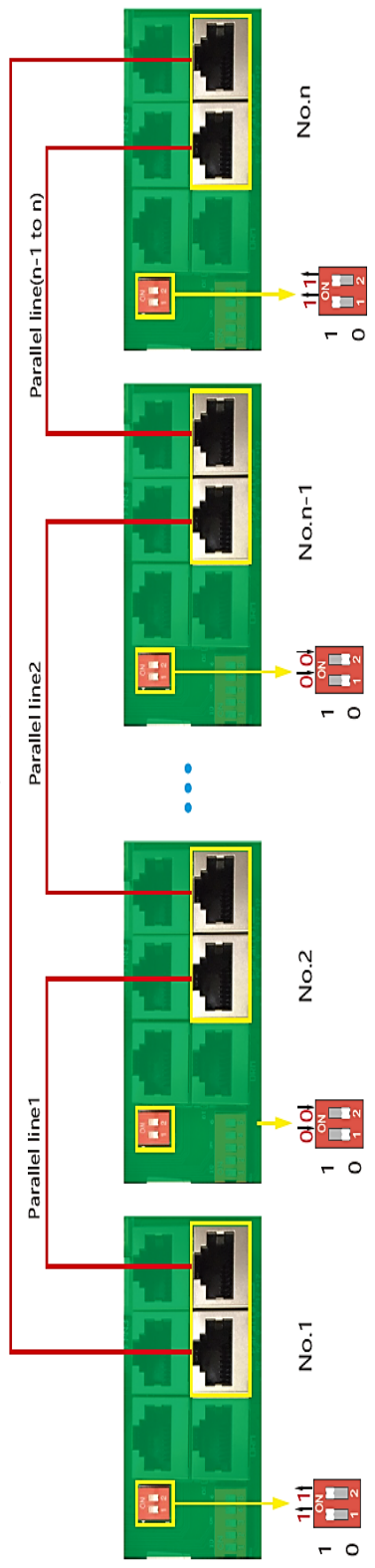
a. 12KW x 3 Parallel system installation connection (3 @ 240V/120V)



Please put the 2-bit CAN balancing resistor switch to ON status for the first and end inverter of the daisy chain loop.

The max parallel quantity is 5, so  $2 < n < 5$

Parallel line(n to 1)



Parallel line (n to 1)

The max parallel quantity is 5 so  $2 < n < 5$ .

### Grid type setting for each inverter

Basic Charge Discharge Advanced Debug Device info.

Grid type: 240V/120V | Grid Freq: 60 | Reconnect time(S): | Set

Grid regulation: UL1741&IEEE1547~

HV1: V S HV2: V S HV3: V S | LV1: V S LV2: V S LV3: V S | HF1: Hz S HF2: Hz S HF3: Hz S | LF1: Hz S LF2: Hz S LF3: Hz S

Battery type: Lithium | Lithium brand: Lithium 0 | Lead capacity(Ah): | Set

### Inv1 setting

Basic Charge Discharge Advanced Debug Device info.

Parallel system: Role: 1 phase master | Phase: R Phase | Set

Parallel battery: Share battery:  | Set

Auto Detect Phase: | Reset

### Inv2 setting

Basic Charge Discharge Advanced Debug Device info.

Parallel system: Role: Slaver | Phase: R Phase | Set

Parallel battery: Share battery:  | Set

Auto Detect Phase: | Reset

### Inv3 setting

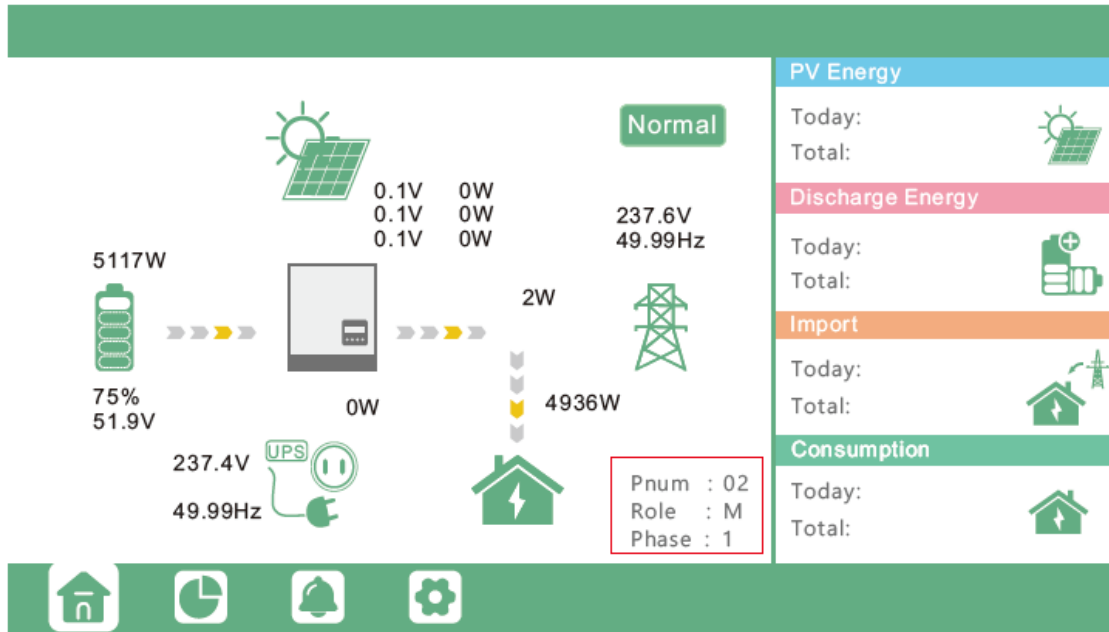
Basic Charge Discharge Advanced Debug Device info.

Parallel system: Role: Slaver | Phase: R Phase | Set

Parallel battery: Share battery:  | Set

Auto Detect Phase: | Reset

## Parallel information display



The information in the red box shows the parallel information:

Pnum: 01-5, display number of parallel units.

Role: M or S, M means Master and S means Slave

Phase: 1-3, 1: R Phase, 2: S Phase, 3: T Phase

## Notice

### Notices for parallel system:

- Ensure the Generator is connected to all systems in parallel (if applicable).
- If you cannot divide the number of PV panels connected to each inverter, it is recommended to have more PV panels in the master inverter.
- The values shown on the LCD of each inverter represent the inverter's contribution, not the system's total.

Settings for paralleling function in monitor system

- Set up monitoring for the system, add all dongles to one station. Users can login to visit the monitoring system, Configuration->Station->Plant Management->Add a dongle to add dongles.

	Plant name	Installer	End User	Country	Timezone	Daylight saving time	Create date	Action
1	Genesis		Aspergo Install	SouthAfrica	GMT+2	No	2019-03-14	Plant Management
2	Butler Home	Elangeni	johnbutler	SouthAfrica	GMT+2	No	2019-03-25	Plant Management
3	Office			SouthAfrica	GMT+2	No	2019-06-03	Plant Management
4	Cronje Home	Broomhead	cronje	SouthAfrica	GMT+2	No	2019-07-16	Plant Management

- If the system shares a single battery bank, enable the shared battery function otherwise, disable the shared battery function.
- Set the system as a parallel group in the monitor system



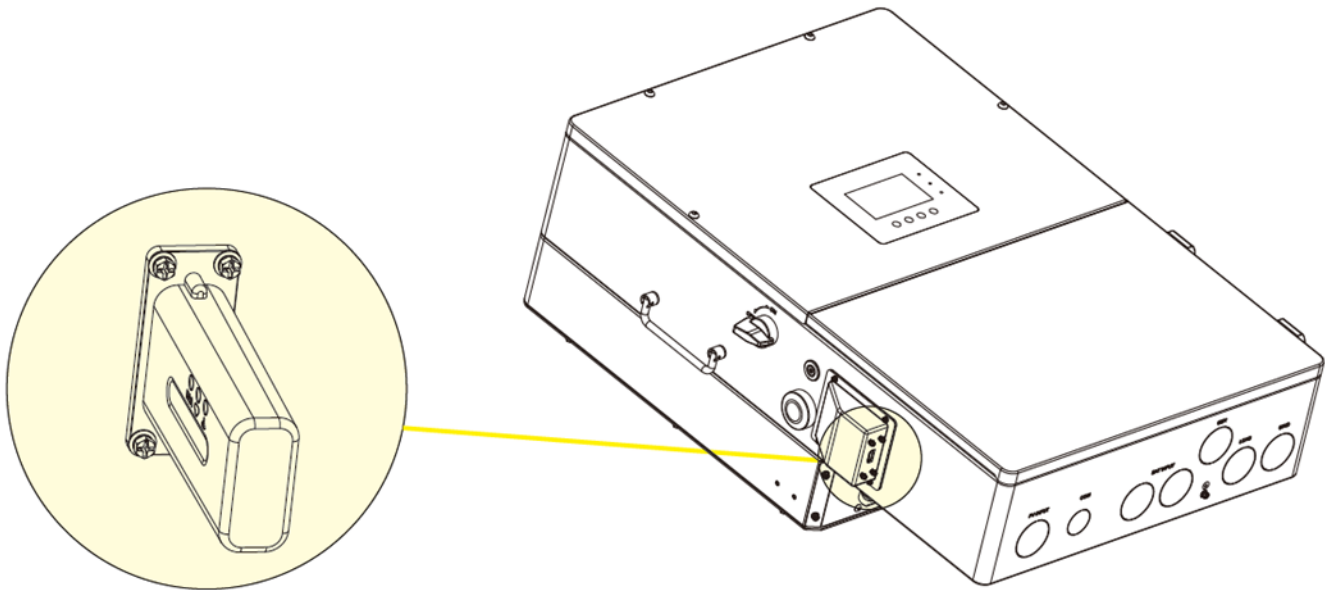
Monitor   Data   Configuration   Overview   Maintain   Aspergo   User Center													
Stations Overview	Station Name	Search by inverter SN <input type="text"/>											
Device Overview	Serial number	Status	Solar Power	Charge Power	Discharge Pow	Load	Solar Yielding	Battery Dischar	Feed Energy	Consumption E	Plant name	Parallel	Action
1	<a href="#">0272011008</a>	Normal	228 W	42 W	0 W	182 W	215.3 kWh	39.6 kWh	0 kWh	551.2 kWh	Dragonview	A-1	Parallel
2	<a href="#">0272011011</a>		35 W	32 W	0 W	0 W	158.7 kWh	21.1 kWh	0 kWh	160.5 kWh	Dragonview	A-2	Parallel
3	<a href="#">0272011012</a>		1 kW	129 W	0 W	1 kW	170.3 kWh	49.9 kWh	0 kWh	434.5 kWh	Dragonview	A-3	Parallel
4	<a href="#">0272011017</a>		79 W	48 W	0 W	106 W	99 kWh	85.6 kWh	0 kWh	257.1 kWh	Dragonview	A-4	Parallel

Please contact your inverter supplier for more detailed guidance for paralleling system

## Monitor System Setup

### Wifi/GPRS/4G/WLAN dongle connection

Users can use a WiFi/ WLAN /4G /2G dongle to monitor their inverter and view the monitoring data on a computer or smart phone remotely. To view data on s smart phone, please download the Fortress Power APP from the **Google Play** or **Apple APP store**, then login with their user account.

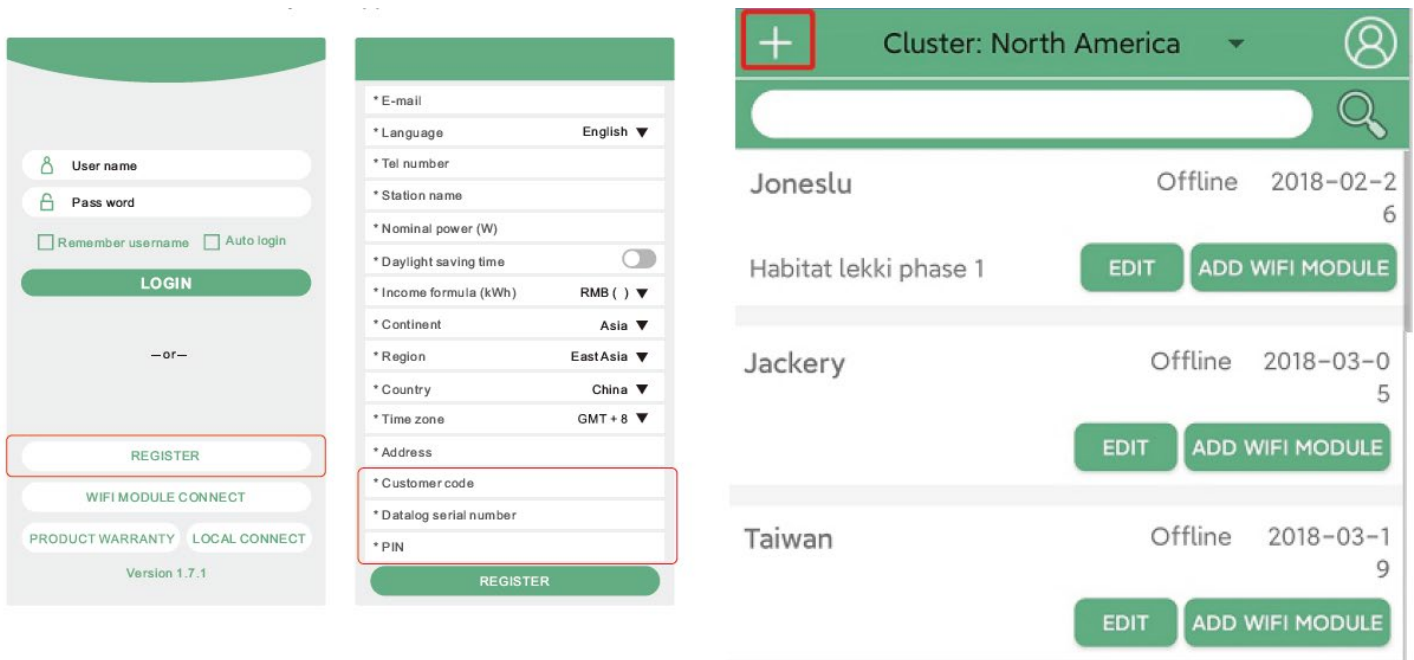


## Setup the monitor system

1. Sign up an account on the mobile phone APP available in Android Playstore/ Apple IOS App store as Envy Fortress Power or Website: [www.envy.fortresspower.io](http://www.envy.fortresspower.io)

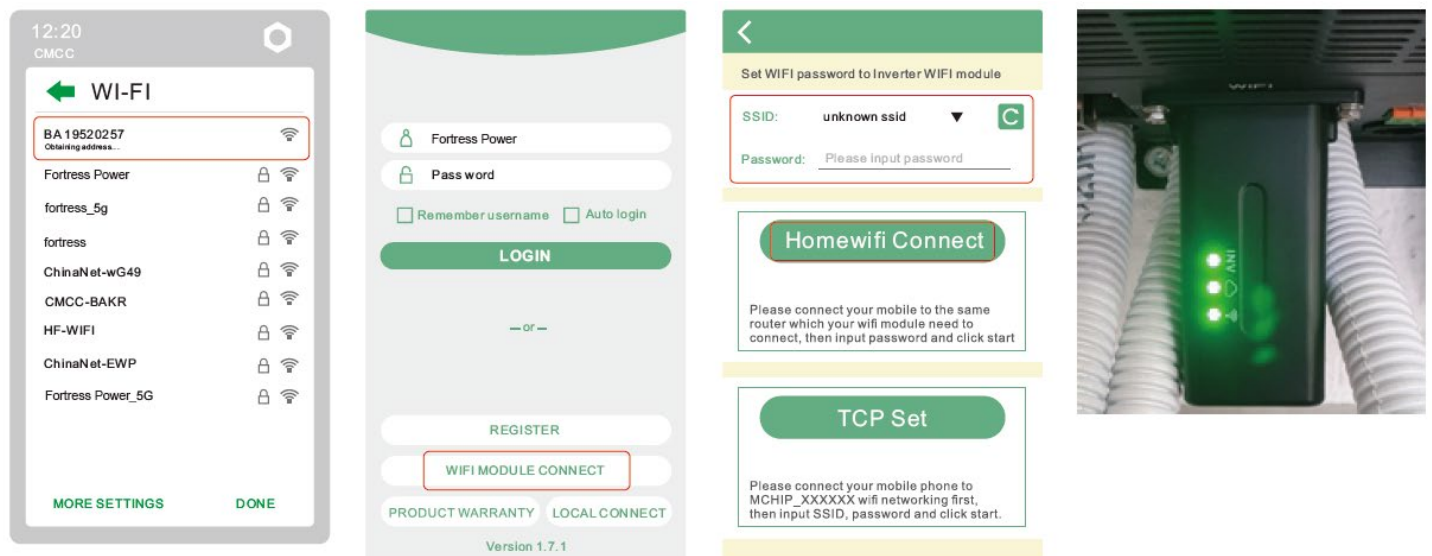
The "customer code" is a code we assign to your distributor or installer. You can contact your supplier for their code.

2. Create station and add dongle for the station



## Set Homewifi password to dongle

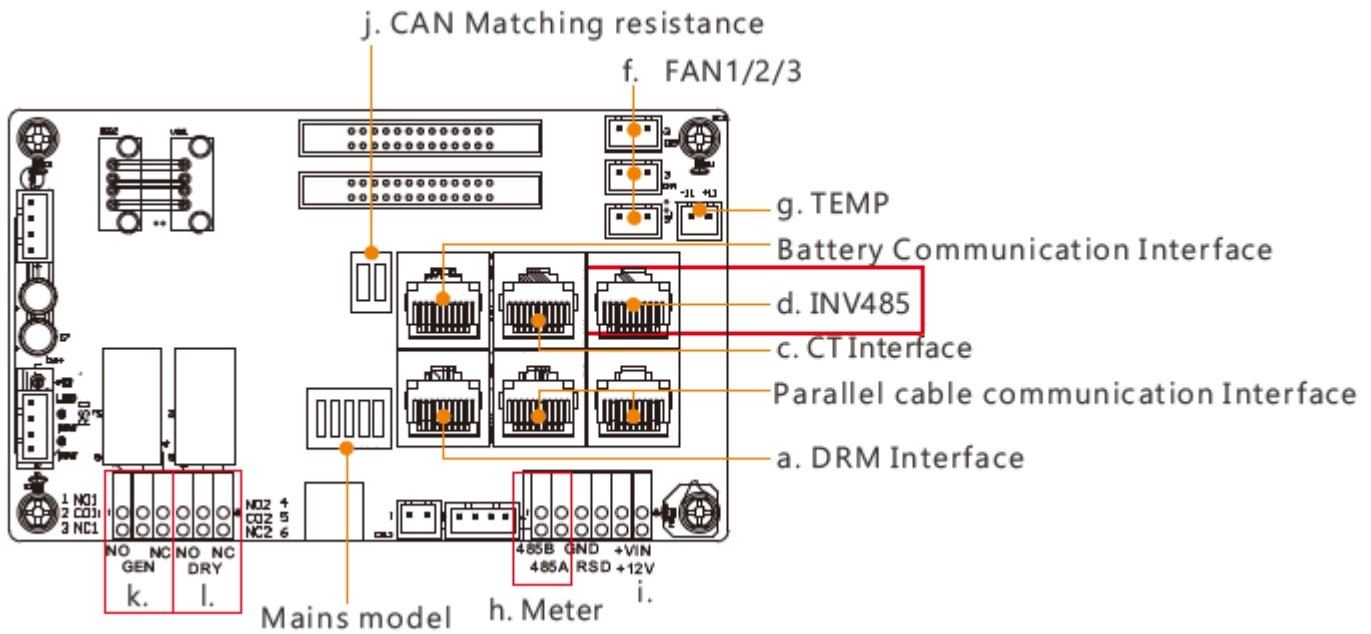
1. Connect your mobile phone to the "BAXxxxxxx" wireless network where "BAXxxxxxx" is the serial number of the WiFi dongle.
2. Click the "WIFI MODULE CONNECT" button on the APP
3. Select the home WiFi that the WiFi dongle is to be connected to, and enter the WiFi's password. And then click "HomeWifi Connect". The WiFi dongle will restart and try to connect to our server automatically.
4. Check the LEDs' status on the WiFi dongle. The middle light should be solidly lit when the WiFi dongle connects to our server successfully.



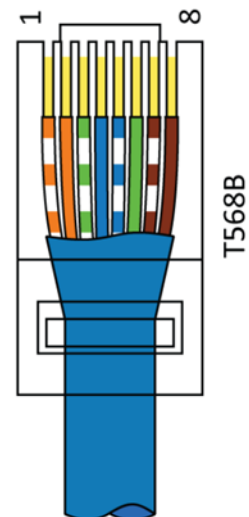
5. Now you can disconnect your mobile phone from the "BAXxxxxxx" wireless network. Login on the APP with your account, you'll find the inverter information already appears. Now you'll be able to monitor and control the inverter remotely on any smart phone or computer that has an Internet connection.

## Third party RS485 communication

Meter 485B&485A: are used when the Meter is not connected. These two pins can be used to communicate with the inverter using our Rs485 Modbus protocol. INV485: This interface is shared with the WIFI module. If the WIFI module is not in use, users can use this interface to communicate with the inverter. Please contact your distributor to get the protocol for third party APP development.



Pin	Description
1	485B
2	485A
3-8	



# Operation Guide

## Operation Mode and Function

### Self-usage Mode (Default)

In this mode, the priority order of load supply sources is Solar>Battery>Grid. The priority order of solar power usage is: **Load>Battery>Grid.**

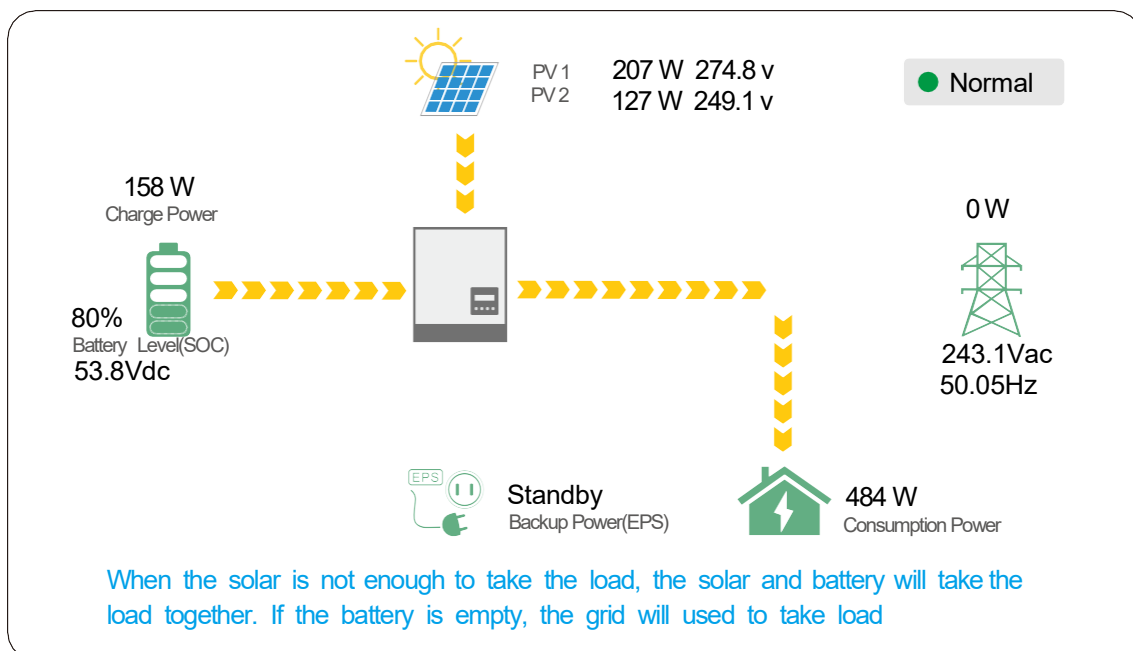
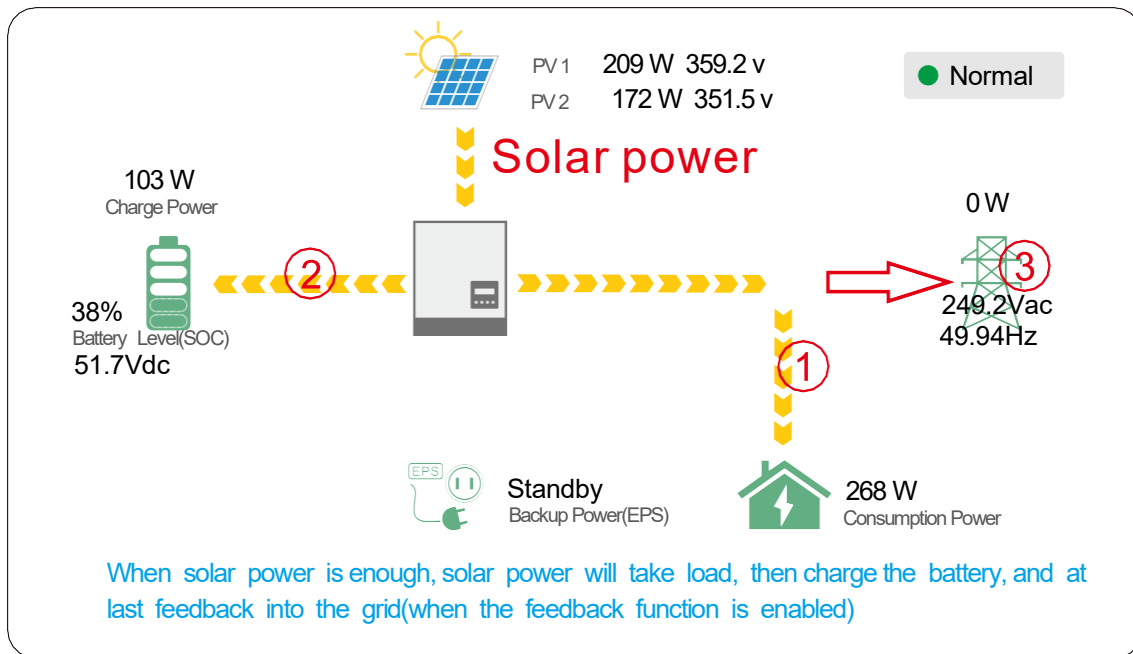
### Application Scenarios

Self-consumption mode will increase the self-consumption rate of solar power and reduce the energy bill significantly.

### Related Settings

Effective when Charge Priority, AC Charge, and Forced discharge are disabled.

### Example



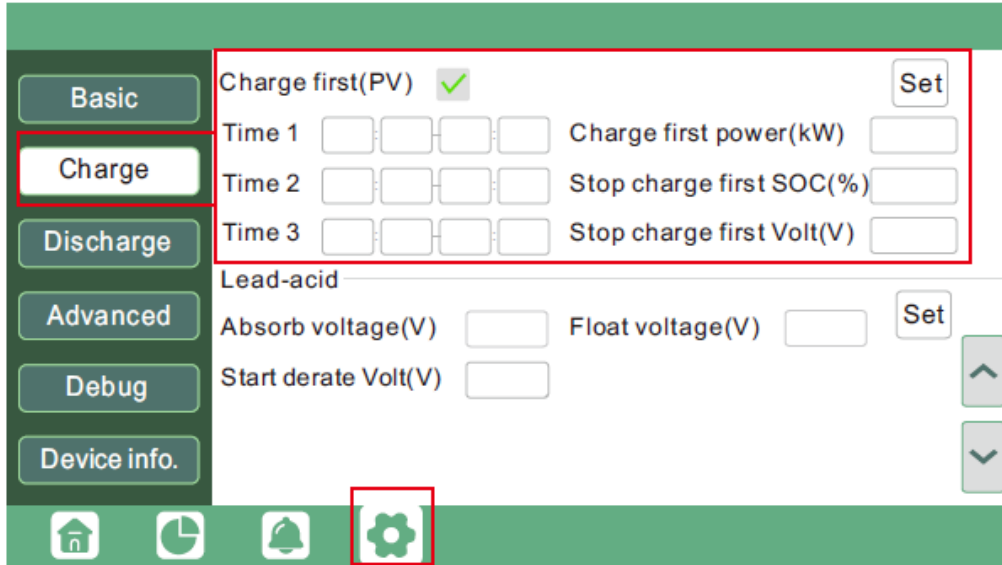
## Charge First Mode

The priority order of solar power usage will be Battery >Load >Grid. During the Charge Priority time period, load is first supplied with grid power. If there is excess solar power after battery charging, the excess solar power will take load together with grid power.

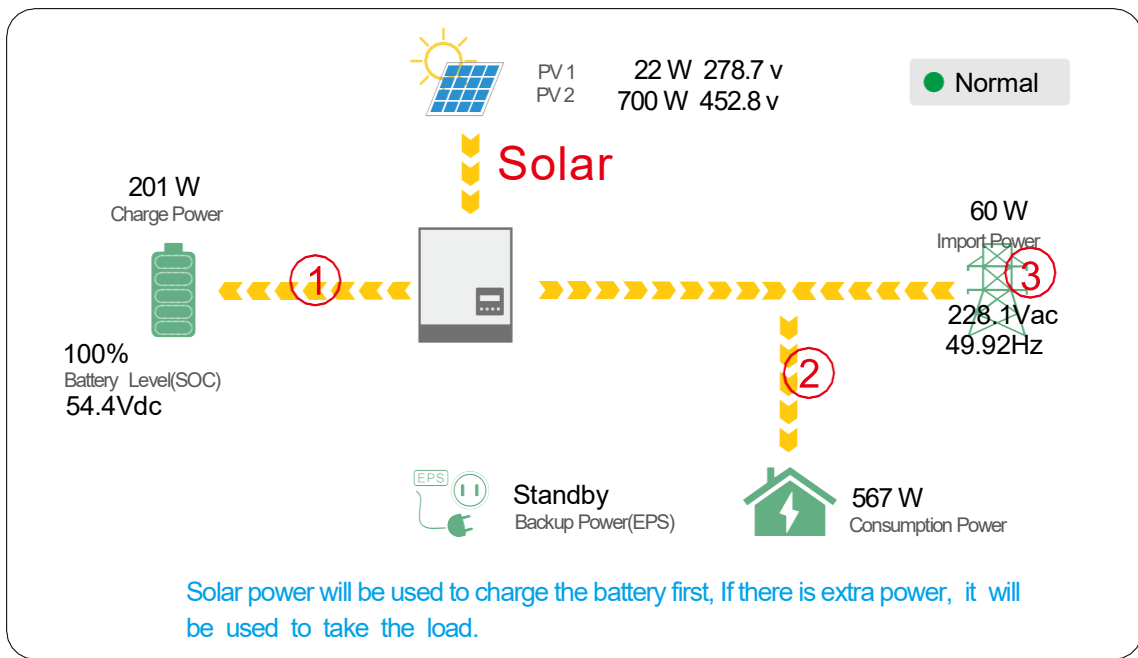
### Application Scenarios

When users want to use solar power to charge batteries, grid power is used to supply loads.

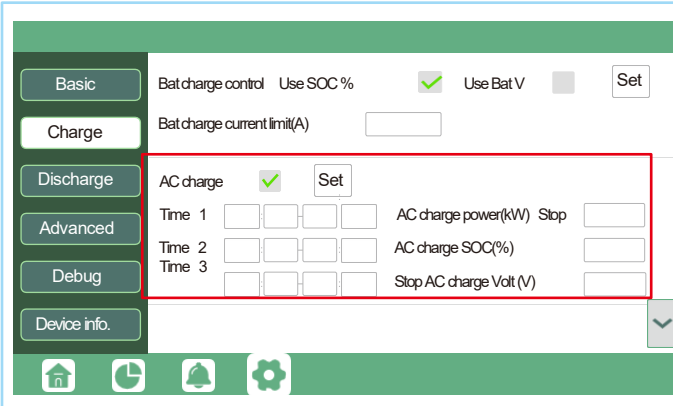
### Related Settings



### Example



## AC Charge Mode



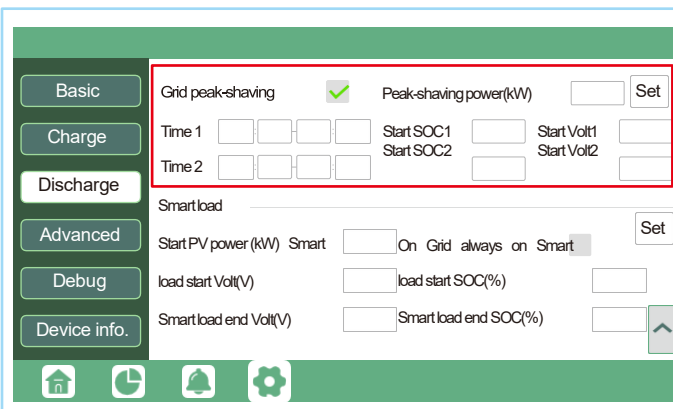
Users can charge batteries with grid power when electricity prices are cheap, and discharge battery power to supply load or export to the grid when electricity prices are high.

### Application Scenarios

When users have a Time of Use (TOU) rate plan.

### Related Settings

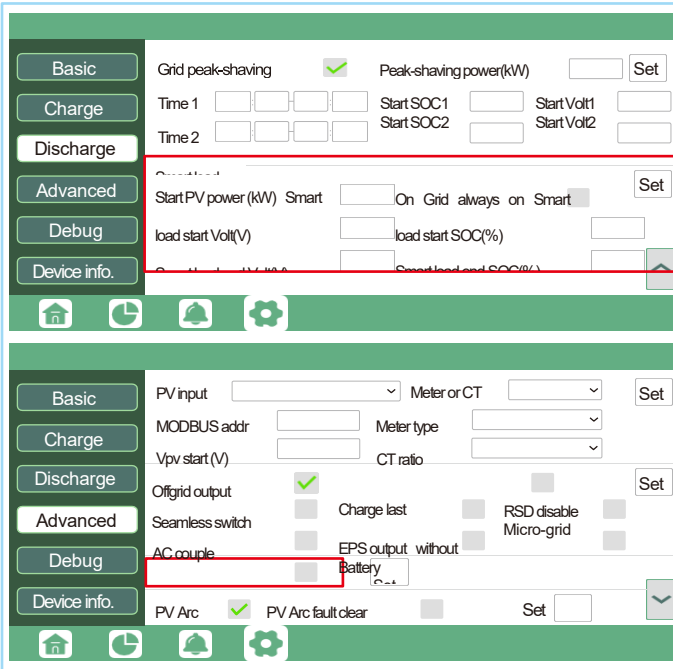
## Grid peak-shaving Function



### Grid peak-shaving & Grid peak-shaving power(kW):

Is used to set the maximum power that the inverter will draw from its grid power.

## Smart load Function



- Smart Load:** This function is to make the Gen input connection point as a load connection point, if you enable it, inverter will supply power to this load when the battery SOC and PV power is above a user setup value. e.g., Smart load start SOC=90%, Smart load end SOC=85%, Start PV power=300W, it means: When the PV power exceeds 300W, and the battery system SOC gets to 90%, the Smart Load Port will switch on automatically to supply the load which is connected on this side. When the battery reaches SOC<85% or PV power<300w, the Smart Load Port switch off automatically.

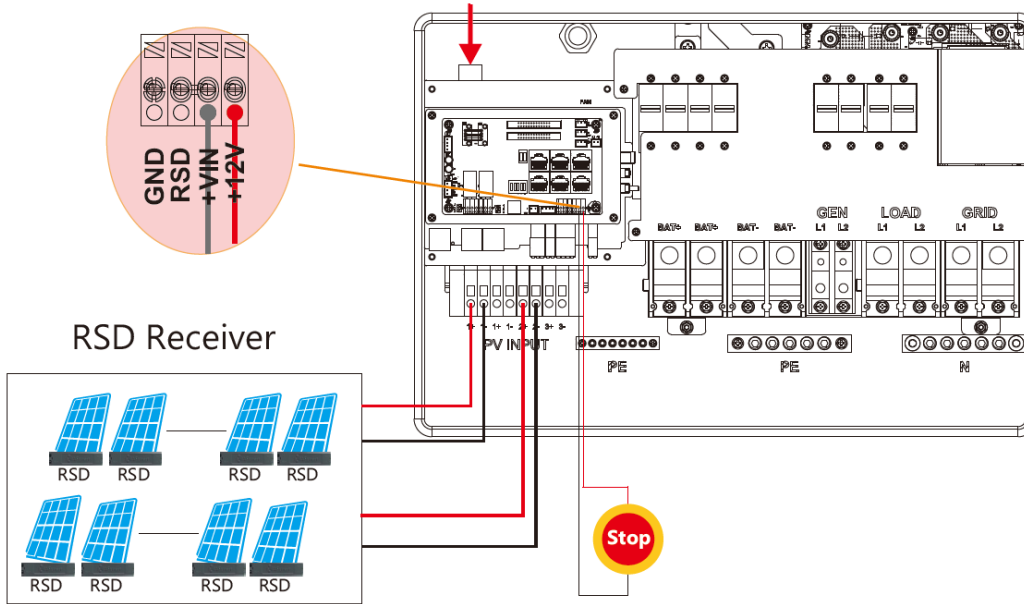
### Note:

If you enable the Smart load function, it's forbidden to connect the generator at the same time, otherwise the device will be damaged!

## Rapid shutdown

The inverter includes a rapid shutdown system that complies with 2017 and 2020 NEC 690.12 requirements. A rapid shut switch should be connected to the terminals x and x on the inverter and mounted on a readily accessible place out of the property.

### RSD Transmitter



The Rapid shut down switch should be connected to VIN and 12V.

In case of emergency, press the rapid shutdown switch. The PV conductor's voltage will be reduced to less than 30V within 30 seconds.

## LCD Display

Users can view inverter running status, real time power, daily and accumulated energy information conveniently on inverter. LCD. In addition to the above information, users can also check alarm and fault record on the display for troubleshooting.

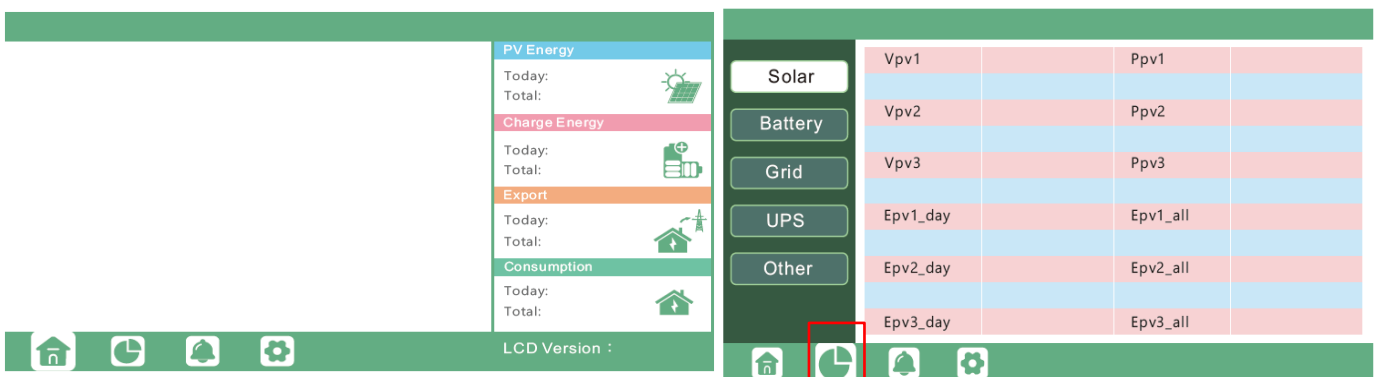
### Viewing information and alarm/fault record

#### Home Page

Touch the screen to light it up if it's in sleep mode. The Home page will appear on the display. Users will see a system overview diagram along with the real time information of each component, such as battery SOC, battery charging/discharging power, grid import/export power, load power, etc. On the right part of the screen, users can check daily and accumulated solar energy, battery charged/discharged energy, grid imported/exported energy, as well as load consumption.

#### Detailed System Information

Click on the pie icon at the bottom of the screen and, you'll be able to view the detailed real time solar information, battery information, grid information and EPS output information



Solar	Vbat	Ibat
Battery	Pchg	Pdischg
Grid	Vbat_Inv	BatState
UPS	SOC/SOH	CycleCnt
Other	Vchgrf	VcutVolt
	I maxchg	I maxdischg
	Vcellmax	Vcellmin
	Tcellmax(°C)	Tcellmin(°C)
	BMSEvent1	BMSEvent2
	Echg_day	Edischg_day
	Echg_all	Edischg_all

Solar	Vgrid	Fgrid
Battery	VgridL1N	VgridL2N
Grid	Vgen	Fgen
UPS	Pimport	Pexport
Other	Pinv	Prec
	Pload	
	Eimport_day	Eexport_day
	Eimport_all	Eexport_all
	Einvs_day	Erec_day
	Einvs_all	Erec_all
	Eload_day	Eload_all

Solar	Vups	Fups
Battery	VupsL1N	VupsL2N
Grid	Pups	Sups
UPS	PupsL1N	SupsL1N
Other	PupsL2N	SupsL2N
	Eups_day	Eups_all
	EupsL1N_day	EupsL1N_all
	EupsL2N_day	EupsL2N_all

Solar	Status	StatusPre
Battery	SubStatus	SubStatusPre
Grid	FaultCode	AlarmCode
UPS	Vbus1/Vbus2	VbusP/VbusN
Other	T0/T1(°C)	T2/T3(°C)
	OC/PG/OnOff Cnt	ExitReason1/2
	InnerFlag/Run Trace	NoDis/chgReason
	Dis/chg LimitReason	Dis/chg CurrLimit
	Inv/Rec LimitReason	Inv/Rec CurrLimit
	Para status	

### Fault/Alarm Information

Touching the bell icon at the bottom of the screen, you'll see all the current and historical fault & warning information on this page.

<b>Fault status</b>	● M3 Rx failure	● Model fault	● Eps short circuit
<b>Alarm status</b>	● Eps power reversed	● Bus short circuit	● Relay fault
<b>Fault record</b>	● M8 Tx failure	● M3 Tx failure	● Vbus over range
<b>Alarm record</b>	● Eps connect fault	● PV volt high	● Hard over Curr
	● Neutral fault	● PV short circuit	● Temperature fault
	● Bus sample fault	● Inconsistent	● v8 Rx fault
	● Para Comm error	● Para master loss	● Para rating Diff
	● Para Spec Diff	● ParaPhase set error	● Para Gen unAccord
	● Para Sync loss	● Fault A	● Fault B
	● Fault C	● Fault D	● Fault E

<b>Fault status</b>	● Bat Com failure	● AFCI Com failure	● AFCI high
<b>Alarm status</b>	● Meter Com failure	● Bat fault	● Auto test failure
<b>Fault record</b>	● Lcd Com failure	● Fw mismatch	● Fan stuck
<b>Alarm record</b>	● Bat reversed	● Trip by no AC	● Trip by Vac abnormal
	● Trip by Fac abnormal	● Trip by iso low	● Trip by gfci high
	● Trip by dci high	● PV short circuit	● GFCI module fault
	● Bat volt high	● Bat volt low	● Bat open
	● Offgrid overload	● Offgrid overvolt	● Meter reversed
	● Offgrid dcV high	● RSD Active	● Alarm A
	● Para Phase loss	● Para no BM set	● Para multi BM set

	Error code	Error time
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

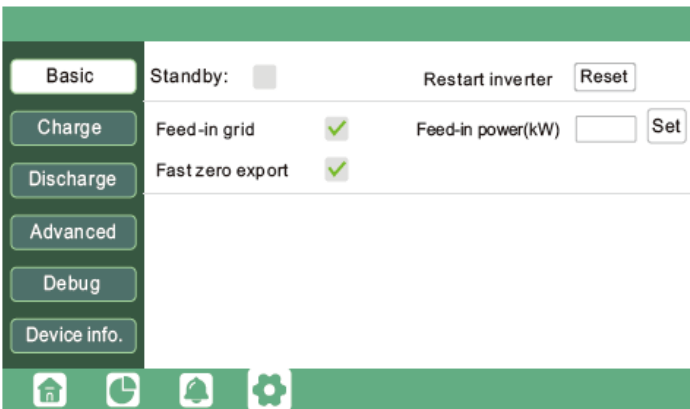
	Alarm code	Alarm time
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		



## Setting Parameters

Clicking on the gear icon at the bottom of the screen, you'll get into the parameter setting page of the inverter.

### a. Basic settings

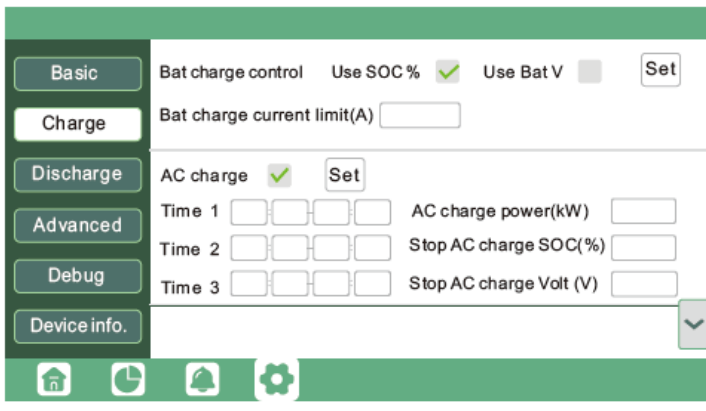


**Restart inverter:** Restart the system, please note the power maybe interrupted when restarted.

**Feed-in Grid:** Is for users to set a zero export function. If exporting solar power is not allowed, users need to disable the "Feed-in Grid" option. If users' utility meter is tripped with even a little solar export, "Fast zero export" can be enabled Thus the export detection and adjustment will take place every 20mS, which will effectively avoid any solar power being exported. If export is allowed, users can enable "Feed-in Grid" and set a maximum allowable export limit in "Feed-in Power(kw)".

**Standby:** Is for users to set the inverter to normal status or to standby status. In standby status, the inverter will stop any charging or discharging operations, as well as solar-feed-in.

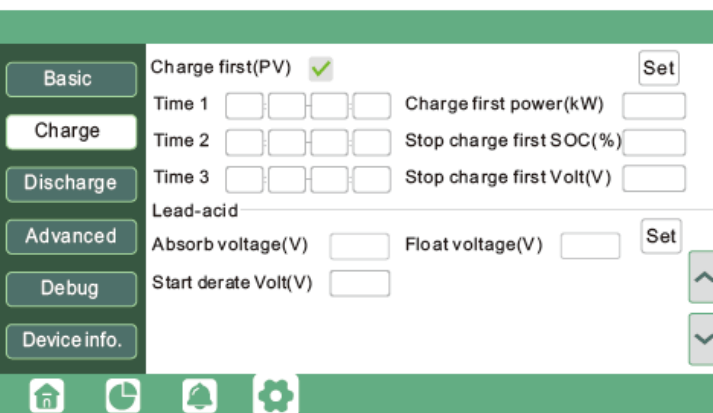
### b. Charge setting



**Bat charge control:** Users can decide to use SOC or BatV to control charge and discharge logic depending on battery type.

**Bat charge current limit(A):** Users can set Max charge current.

**AC Charge:** Utility charge.configuration If users want to use grid power to charge their battery, then they can enable "AC Charge", set time periods when AC charging can happen, AC Charge power(kW) to limit utility charging power, and "Stop AC Charge SOC(%)" as the target SOC for utility charging. "Stop AC Volt(V)" as the target battery voltage for utility charging



**Charge first:** PV charge configuration. When using enable Charge first, PV will charge the battery as a priority, set time periods when PV charge can happen, charge first power(kW) to limit PV charge power, and "Charge first SOC (%)" as the target SOC for PV charge first. "Charge first Volt(V)" as the target battery voltage for PV Charge first.

**Lead acid (Open Loop):** When using Lead-acid battery, you need to set parameters in these programs, Follow the battery manufacturer's recommendation.

### Generator

**Bat charge current limit(A):** Set the Max. battery charge current from the Generator. The Generator will start charging according to the Charge start Volt/SOC, and stop charging when the battery voltage or SOC reaches the Charge end Volt/SOC value.

**Gen rated power:** Inverter has the peak-shaving function, when you need you can enable it and setup the Gen peak-shaving power(W)

### c. Discharge setting

**Discharge current limit(A):** The Max. discharge current from battery

**Discharge start power(W):** The Min. value can be set to 50. When the inverter detects the import power is higher than this value, battery start discharging, otherwise battery will keep standby.

**On-grid EOD(%) and Off-grid EOD(%) /On-grid Cut-off(V) and Off-grid Cut off(V):** End of discharge SOC/Cut off voltage in on-grid and off-grid condition respectively.

**Forced discharge:** Settings for battery force discharge within certain time period. In the preset time period, the inverter will discharge battery at the power set by "discharge power", until battery

SOC or voltage reaches "Stop discharge" value.

### Bat discharge control

You can choose "Use SOC %" or "Use Bat V" to control the battery discharge state.

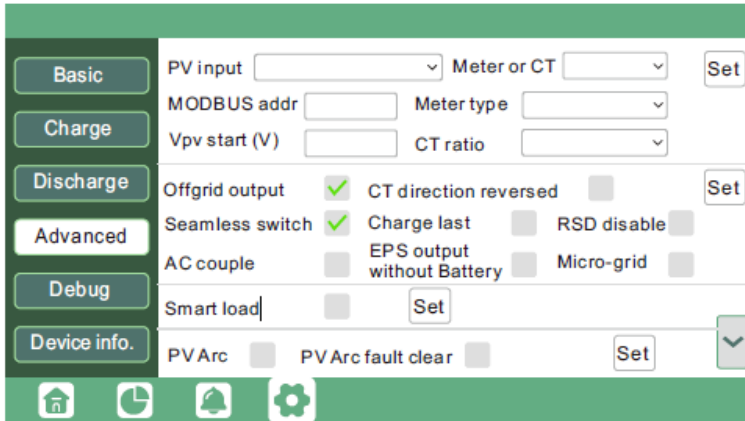
### d. Advanced setting

Advanced setting is mainly by installer after installation.

**Grid type:** You can choose by yourself, 240/120V, 208/120V,

**Battery type:** No battery, lead-acid, or lithium-ion. If lead-acid battery is selected, please input correct battery capacity. If lithium-ion battery is selected, please choose the battery brand in the Lithium brand drop down list

**Meter type:** Please select it according to the meter.



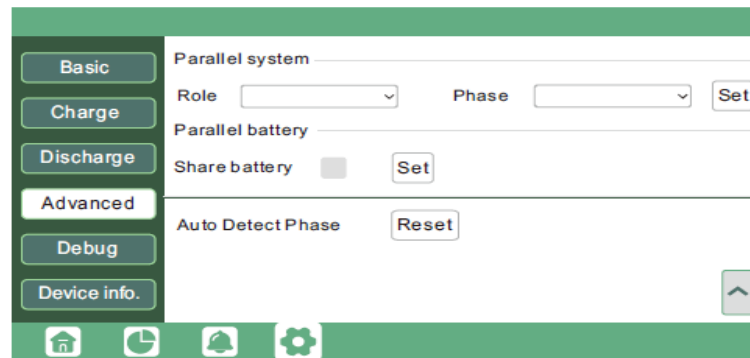
only needs to be set when the generator is connected. to the inverter's grid port. With this option enabled, the inverter will use AC power to charge the battery and won't export any power through the grid port if AC power is present at the inverter's grid port. **Charge last:** When users want to use solar power in the order of loads -- grid export -- battery charging.

that's to be installed.

**CT direction reversed:** When the CT is installed in the wrong direction, the installer can modify it by selecting it. There is no need to reconnect. in the order of loads--grid export -- battery charging. The supported CT ratio is 1000:1 and 3000:1. Default CT ratio is 3000:1. If 3rd party CT is to be used, please. ensure its CT ratio is either 1000:1 or 3000:1 and set it accordingly. the battery brand in the Lithium brand drops down list.

**Off grid output:** It is for users to set if the inverter provides backup power or not when the grid is lost. If users want the load to be seamlessly transferred to the inverter backup power, "**Seamless switch**" must be enabled. If customers don't have a battery installed yet, but still wish to have inverter backup power with only solar panels connected, "**EPS output without battery**" can be enabled to use solar power to supply load when the grid fails, or load-shedding happens.

**Microgrid:**



**Phase:** This is the phase code setting of the EPS Load output. The system will automatically detect the phase sequence of the inverter (consistent with the phase sequence of the connected Grid mains) and display on the inverter after it is connected to the grid.

**Share battery:** When the inverter is connected as a parallel system, all inverters need to share the battery, and set the "**Share Battery**" to "Enable" at the same time.

**Role:** The Role setting of the parallel system. It is set to 1 phase master by default. In a parallel system, only one inverter is allowed to be set as Master, and the others are all Slaves.

## NOTICE

1. All settings of parallel inverters have to be done in Standby or Fault Mode
2. If the system is connected to a lithium battery, the host of the lithium battery needs to communicate with the inverter which is set as Master in the parallel system. For More Information Refer to the Integration Guide.
3. Please keep all the setting are same for each inverter in the parallel system on the LCD or Web monitor

## Start-up and shut down the inverter

### Start up the inverter

Step1. Turn on the battery system firstly, then turn on the DC breaker between battery and inverter.

Step2. Make sure the PV voltage of the strings are higher than 120V ,and check if the inverter works in PV charge or PV charge back-up mode.

Step3. Make sure step1and 2 above work properly before turning on the grid power or generator breaker and check if the inverter can go to bypass mode and on-grid mode normally.

### Shut down the inverter

Danger: Do not disconnect the battery, PV and AC input power under load. If there is emergency issue, and you have to shut down the inverter, please follow the steps as below.

Step1. Turn off the Grid breaker of the inverter.

Step2. Switch off the load breaker.

Step3. Turn off PV breaker and then battery breaker, waiting for the LCD to go off.

## Troubleshooting & Maintenance

### Regular Maintenance





#### Inverter Maintenance

- Check the inverter every 6 months or 1 year to verify if there are damages on cables, accessories, terminals, and the inverter itself.
- Check the inverter every 6 months to verify if the operating parameter is normal and there is no abnormal heating or noise from the inverter.
- Check the inverter every 6 months to confirm there is nothing that covers the inverter heat sink, if there is, shut-down the inverter and clear the heat sink.

#### Battery Maintenance

Follow the manufacturer's requirements on maintenance. When you carry out these works on batteries, please make sure to fully shut-down the inverter for safety consideration.

### LED Displays

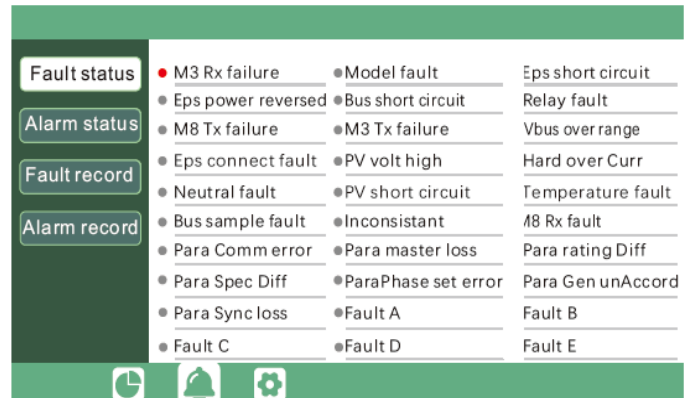
LED	Display	Description	Suggestion
Green LED	Solid lit 	Working normally	
	Flashing 	Firmware upgrading	Wait till upgrading complete
Yellow LED	Solid lit 	Alarm, inverter is working but needs checked.	Wait for it to be clear up, If Alarm, remains it might need troubleshooting
Red LED	Solid lit 	Fault, inverter stopped working	Need troubleshooting

### Troubleshooting Based On LCD Displays

Once there is any warning or fault occurring, users can troubleshoot according to the LED status and the warning/fault information on the LCD.

#### 1. Fault on the LCD

If the dot on the left of fault item is red, it means the fault is active. When it is grey, it means the fault is inactive.



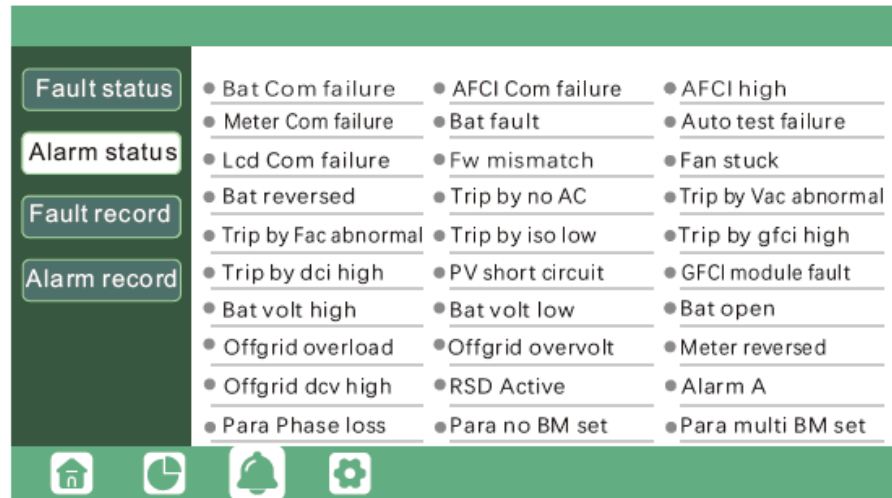
Fault	Meaning	Troubleshooting
M3 Rx failure	M3 microprocessor fails to receive data from DSP	Restart inverter, if the error still exists, contact Fortress Power service or your inverter supplier.
Model fault	Incorrect model value	
Eps short circuit	Inverter detected short-circuit on EPS Load output terminals	<ol style="list-style-type: none"> <li>Check if the L1, L2 and N wires are connected correctly at inverter EPS Load output port.</li> <li>Disconnect the EPS Load breaker to see if fault remains. If fault persists, contact Fortress Power service or your inverter supplier.</li> </ol>

EPS power reversed	Inverter detected power flowing into EPS Load port	Restart inverter, if the error still exists, contact Fortress Power service or your inverter supplier.
Bus short circuit	DC Bus is short circuited	
Relay fault	Relay abnormal	
M8 Tx failure	DSP fails to receive data from M8 microprocessor	
M3 Tx failure	DSP fails to receive data from M3 microprocessor	
Vbus over range	DC Bus voltage too high	Please check if the PV string voltage is within the inverter specification. If string voltage is within range, and this fault still appears, contact Fortress Power service or your inverter supplier.
EPS connect fault	EPS Load port and grid port are connected mixed up	Check if the wires on EPS Load port and grid port are connected correctly. If the error exists, contact Fortress Power service or your inverter supplier.
PV volt high	PV voltage is too high	Please check if the PV string voltage is within the inverter specification. If string voltage is within range, and this fault still appears, contact Fortress Power service or your inverter supplier.
Hard over curr	Hardware level over current protection triggered	Restart inverter, if the error still exists, contact Fortress Power service or your inverter supplier.
Neutral fault	Voltage between N and PE is greater than 30V	Check if the neutral wire is connected correctly.
PV short circuit	Short circuit detected on PV input	Disconnect all PV strings from the inverter. If the error persists, contact Fortress Power service or your inverter supplier.
Temperature fault	Heat sink temperature too high	Install the inverter in a place with good ventilation and having no direct sunlight. If the installation site is okay, please check if the NTC connector inside the inverter is loose.
Bus sample fault	Inverter detected DC bus voltage lower than PV input voltage	Restart inverter, if the error still exists, contact Fortress Power service or your inverter supplier.
Inconsistent	Sampled grid voltage values of DSP and M8 microprocessor are inconsistent	
M8 Rx fault	M8 microprocessor fails to receive data from DSP	
Para Comm error	Parallel communication abnormal	1. Please check whether the connection of the parallel cable is loose, please connect the parallel cable correctly. Please check and make sure the PIN status of CAN communication cable from the first to the end inverter is correctly inserted.
Para master loss	No master in the Parallel system	a. If a master has been configured in the system, the fault will be automatically removed after the master works. If so, you can ignore it. b. If a master has not been configured in the system, and there are only slaves in the system, please set the master first. Note: For single unit running system, the role of the inverter should be set as "1 phase master"

Para rating Diff	Rated power of parallel inverters are inconsistent	Please confirm that the rated power of all inverters are the same, or you can contact Fortress Power service to confirm
Para Phase set error	Incorrect setting of phase in parallel	Please confirm that the wiring of the parallel system is correct first. In this case, then connect each inverter to the grid, the system will automatically detect the phase sequence, and the fault will be automatically resolved after the phase sequence is detected.
Para Gen un-Accord	Inconsistent generator connect in parallel	Some inverters are connected to generators, some are not. please confirm that all inverters in parallel are connected to generators together or none of them are connected to generators
Para sync loss	Parallel inverter fault	Restart inverters, if the error still exists, contact Fortress Power service or your inverter supplier

## 2. Alarm on the LCD

If the dot on the left of fault item is yellow, it means the fault is active. When it is grey, it means the fault is cleared



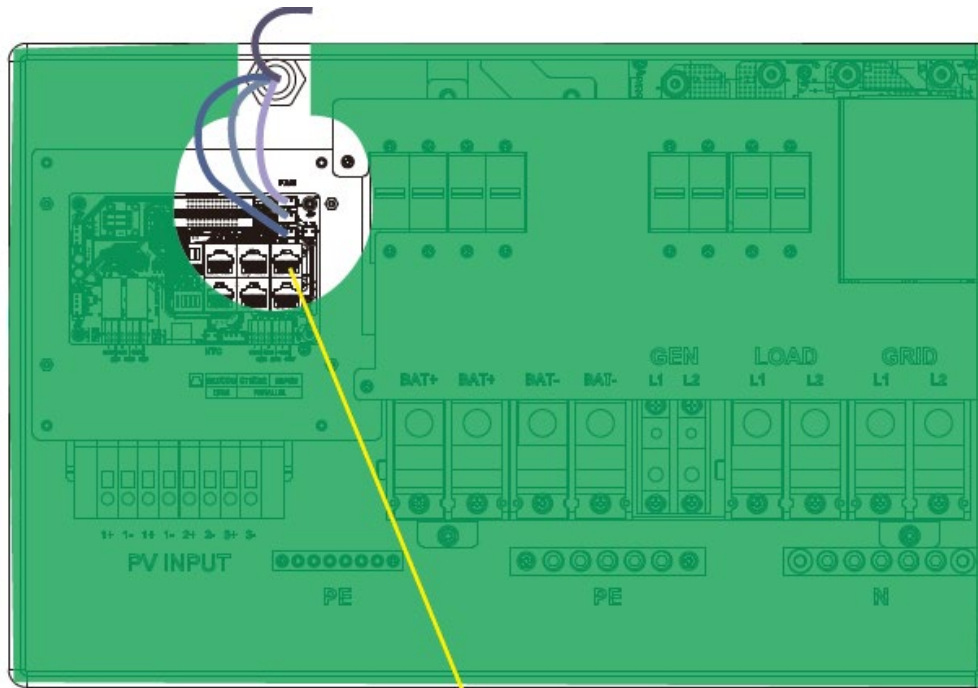
Alarm	Meaning	Troubleshooting
Bat com failure	Inverter fails to communicate with battery	Check if communication cable is correct, and if you have chosen the correct battery brand on inverter L. If all is correct but this error persists, please contact Fortress Power service or your inverter supplier.
AFCI com failure	Inverter fails to communicate with AFCI module	Restart inverter, if the error persists, contact Fortress Power service or your inverter supplier.
AFCI high	PV arc fault is detected	Check each PV string for correct open circuit voltage and short circuit current. If the PV strings are in good condition, please clear the fault on inverter LCD.
Meter com failure	Inverter fails to communicate with the meter	<ol style="list-style-type: none"> <li>1. Check if the communication cable is connected correctly and in good condition.</li> <li>2. Restart inverter. If the fault persists, contact Fortress Power service or your inverter supplier.</li> </ol>
Bat Fault	Battery cannot charge or discharge	<ol style="list-style-type: none"> <li>1. Check the battery communication cable for correct pinout on both inverter and battery end;</li> <li>2. Check if you have chosen an incorrect battery brand;</li> <li>3. Check if there is fault on battery's indicator. If there is fault, please contact your battery supplier.</li> </ol>

Auto test failure	Auto test failed	Only applied to Italy model
Lcd com failure	LCD fails to communicate with M3 microprocessor	Restart inverter. If fault still exists, contact Fortress Power service or your inverter supplier.
Fwm mismatch	Firmware version mismatch between the microprocessors	
Fan stuck	Cooling fan(s) are stuck	
Trip by gfcI high	Inverter detected leakage current on AC side	2.Check if there is ground fault on grid and load side; 3.Restart inverter. If the fault remains, contact Fortress Power service or your inverter supplier.
Trip by dci high	Inverter detected high DC injection current on grid port	Restart inverter. If the fault remains, contact Fortress Power service or your inverter supplier.
PV short circuit	Inverter detected short circuited PV input	c. Check if each PV string is connected correctly; d.Restart inverter. If the fault remains, contact Fortress Power service or your inverter supplier.
GFCI module fault	GFCI module is abnormal	Restart inverter. If fault still exists, contact Fortress Power service or your inverter supplier.
Bat volt high	Battery voltage too high	Check if battery voltage exceeds 59.9V, battery voltage should be within inverter specification.
Bat volt low	Battery voltage too low	Check if battery voltage is under 40V, battery voltage should be within inverter specification.
Bat open	Battery is disconnected from inverter	Check battery breaker or battery fuse.
Offgrid overload	Overload on EPS port	Check if load power on inverter EPS port is within inverter specification.
Offgrid overvolt	EPS voltage is too high	Restart inverter. If fault still exists, contact Fortress Power service or your inverter supplier.
Meter reversed	Meter is connected reversely	Check if meter communication cable is connected correctly on inverter and meter side.
Offgrid dcv high	High DC voltage component on EPS output when running off-grid	Restart inverter. If fault still exists, contact Fortress Power service or your inverter supplier.
RSD Active	Rapid shutdown activated	Check if the RSD switch is pressed.
Para phase loss	Phase losing in parallel system	Please confirm that the wiring of the inverter is correct. If the master is set to 3 Phase master, the number of parallel inverters needs to be $\geq 3$ . (And the grid input of each inverter should be connected with Grid L1,L2,L3 rightly). If the master is set to 2x 208master, the number of parallel inverters needs to be $\geq 2$ . (And the grid input of each inverter should be connected with Grid L1,L2,L3 rightly)
Para no BM set	Master isn't set in the parallel system	Please set one of the inverters in the parallel system as the master
Para multi-BM set	Multiple Masters have been set in the parallel system	There are at least two inverters set as Master in the parallel system, please keep one Master and the other set as Slave

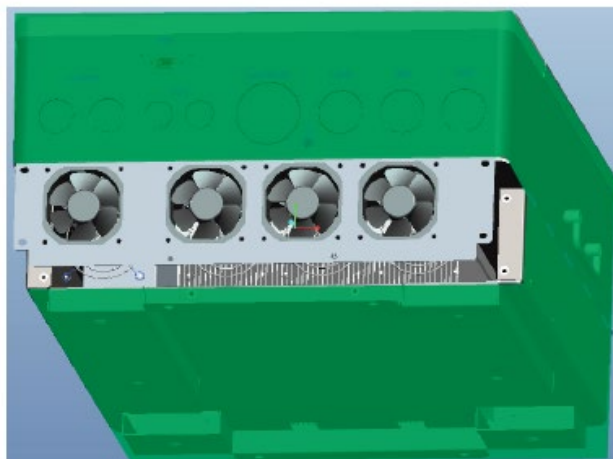
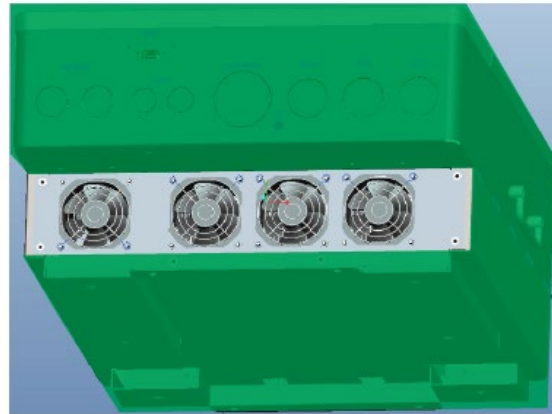
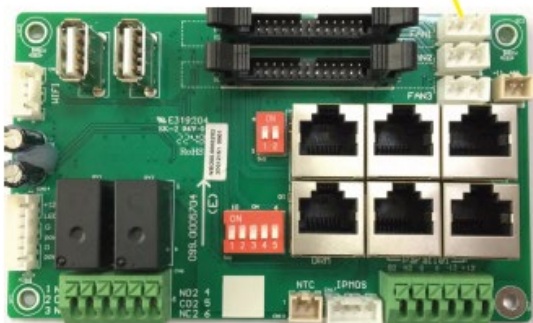
## Fan replacement

Please check and clean the fans regularly. The recommended period is 6 months.

Please replace the fan following up the below diagram if there is problem with the fans. Turn off the system and wait for more than 5 minutes before disassembling the machine.



- a. Open the wiring cover.
- b. Unplug the fan cable.
- b. Loosen the screws and remove them.
- c. Remove the fan fixing.
- e. Loosen the waterproof connector.
- f. Remove the fan and replace it
- g. After the fan is installed, follow the steps just now to push back and assemble it back.





## Annex: Technical Data

### Parameter setting according to Rule21

#### Enter Service Setting

Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
Permit service	Enable	N/A	N/A
Applicable voltage low	91.7%Vnom	91.7%Vnom	91.7%Vnom
Applicable voltage high	105%Vnom	105%Vnom	106%Vnom
Applicable frequency low	59.5Hz	59.0Hz	59.9Hz
Applicable frequency high	60.1Hz	60.1Hz	61.0Hz
Connection delay time	300s	1s	600s
Reconnection delay time	300s	1s	600s
Ramp rate	20%Pn/min	6000%Pn/min	6%Pn/min

Ramp rate: When normal startup, the output power rise is 1%~100%, the maximum output current/section is adjustable.

- High Voltage and Low Voltage Trip

Required settings in accordance with UL 1741 SA	Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
High voltage 2 HV2	Grid Volt Limit2 High(V)	120%Vnom	Fixed at 120%Vnom	Fixed at 120%Vnom
	Grid Volt Limit2 High Time	160ms	Fixed at 160ms	Fixed at 160ms
High voltage 1 HV1	Grid Volt Limit1 High(V)	110%Vnom	110%Vnom	120%Vnom
	Grid Volt Limit1 High Time	13s	1s	13s
Low voltage 1 LV1	Grid Volt Limit1 Low(V)	88%Vnom	0%Vnom	88%Vnom
	Grid Volt Limit1 Low Time	21s	2s	50s
Low voltage 2 LV2	Grid Volt Limit2 Low(V)	50%Vnom	0%Vnom	50%Vnom
	Grid Volt Limit2 Low Time	2s	160ms	21s

Note: When setting the protection time, it needs to be converted into the number of cycles of the corresponding frequency.

#### High Frequency and Low Frequency Trip

Required settings in accordance with UL 1741 SA	Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
High Frequency 2 HF2	Grid Freq Limit2 High(V)	62.0Hz	61.8Hz	66.0Hz
	Grid Freq Limit2 High Time	160ms	160ms	1000s
High Frequency 1 HF1	Grid Freq Limit1 High(V)	61.2Hz	61.0Hz	66.0Hz
	Grid Freq Limit1 High Time	300s	180s	1000s
Low Frequency 1 LF1	Grid Freq Limit1 Low(V)	58.5Hz	50.0Hz	59.0Hz
	Grid Freq Limit1 Low Time	300s	180	1000s

Low Frequency 2 LF2	Grid Freq Limit2 Low(V)	56.5Hz	50.0Hz	57.0Hz
	Grid Freq Limit2 Low Time	160ms	160ms	1000s

Note: When setting the protection time, it needs to be converted into the number of cycles of the corresponding frequency.

- Specified Power factor (SPF)

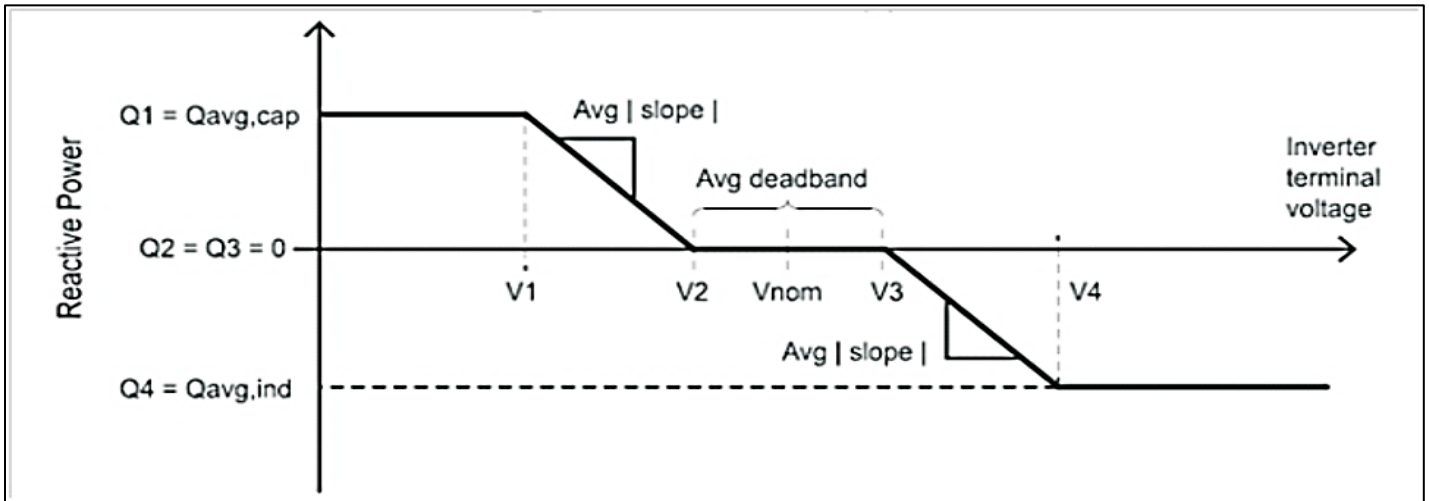
The reactive power is controlled as a function if a specified power factor cos

Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
Constant Power Factor Mode	Disable	N/A	N/A
Under-excited/Over-excited	Under-excited	Under-excited	Over-excited
Constant Power Factor	1	0.8	1

Note: Use the selected method to set Under-excited/Over-excited

### Voltage / Var Mode (Q(V))

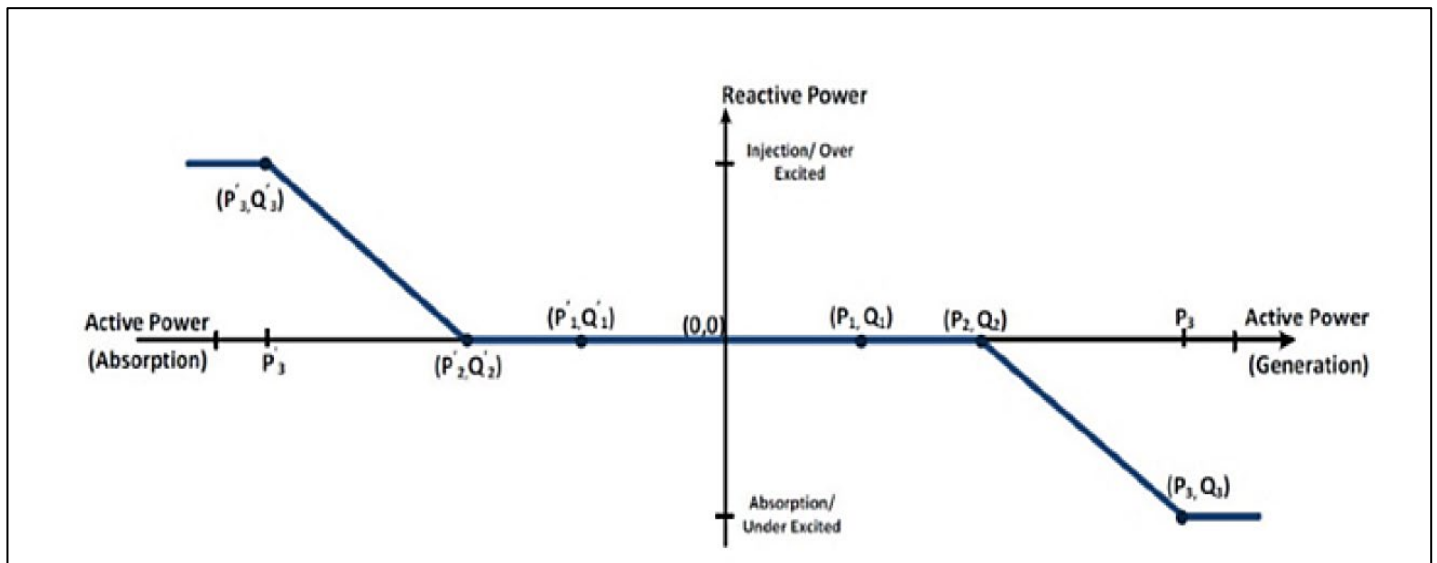
The reactive power is controlled as a function of the grid voltage. The parameterize-action is carried out by means of a reactive power/voltage characteristic curve. The absolute value of Q1 and Q4 are the same.



Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
Voltage-Reactive Power Mode	Disable	N/A	N/A
Vref	100%Vnom	95%Vnom	105%Vnom
Autonomous VRef adjustment Enable	Disable	N/A	N/A
Vref adjustment time constant	300s	300s	5000s
V2	Vref-2%Vnom	Vref-3%Vnom	100%Vnom
Q2	0	-60% of nameplate apparent power	60% of nameplate apparent power
V3	Vref+2%Vnom	100%Vnom	Vref+3%Vnom
Q3	0	-60% of nameplate apparent power	60% of nameplate apparent power
V1	Vref-8%Vnom	Vref-18%Vnom	V2-2%Vnom

Q1	44% of nameplate apparent power	-60% of nameplate apparent power	60% of nameplate apparent power
V4	Vref+8%Vnom	Vref+18%Vnom	V3+2%Vnom
Q4	44% of nameplate apparent power	-60% of nameplate apparent power	60% of nameplate apparent power
Open Loop Response Time	5s	1s	90s

### Active Power-Reactive Power Mode ( Q(P))



Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
Active Power-Reactive Power Mode	Disable	N/A	N/A
P3	100%Pn	P2+10%Pn	100%Pn
P2	50%Pn	40%Pn	80%Pn
P1	0%Pn	0%Pn	P2-10%Pn
Q1	0	-60% of nameplate apparent power	60% of nameplate apparent power
Q2	0		
Q3	44% of nameplate apparent power		

Note: P1, P2, P3 and P1', P1', P1' are Y-axis symmetrical relationship, Q1, Q2, Q3 and Q1', Q2', Q3' are X-axis symmetrical relationship, no need to set P1', P1', P1', Q1', Q2', Q3';

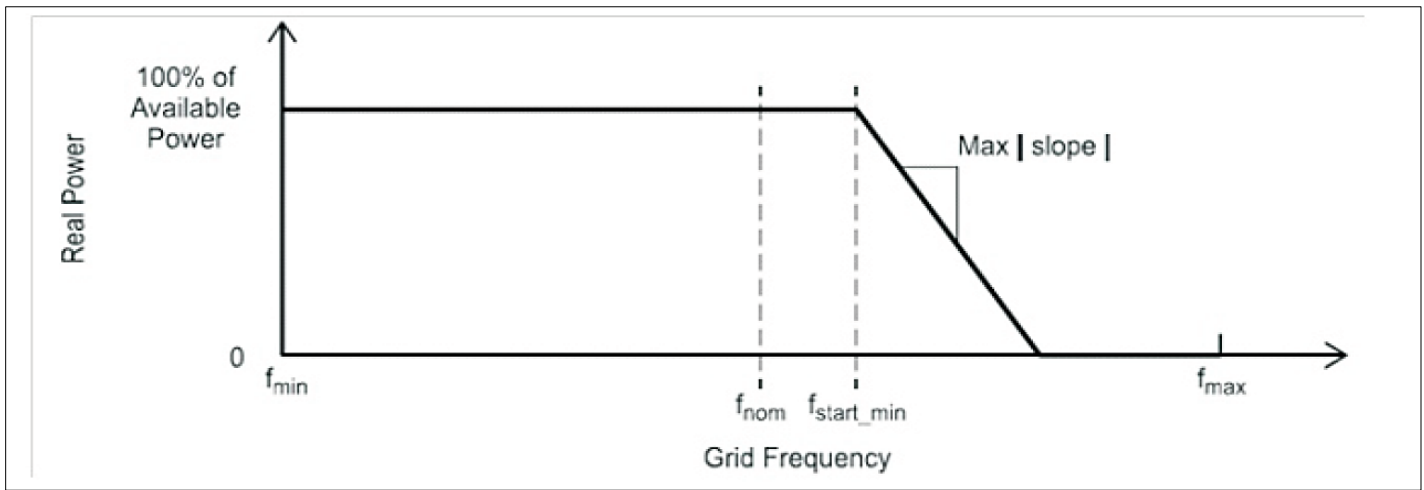
### Constant Reactive Power Mode

Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
Constant Reactive Power Mode	Disable	N/A	N/A
Under-excited/ Over-excited	Under-excited	Under-excited	Over-excited

Constant Reactive Power	44% of nameplate apparent power	0	60% of nameplate apparent power
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Note: Use the selected method to set Under-excited/Over-excited

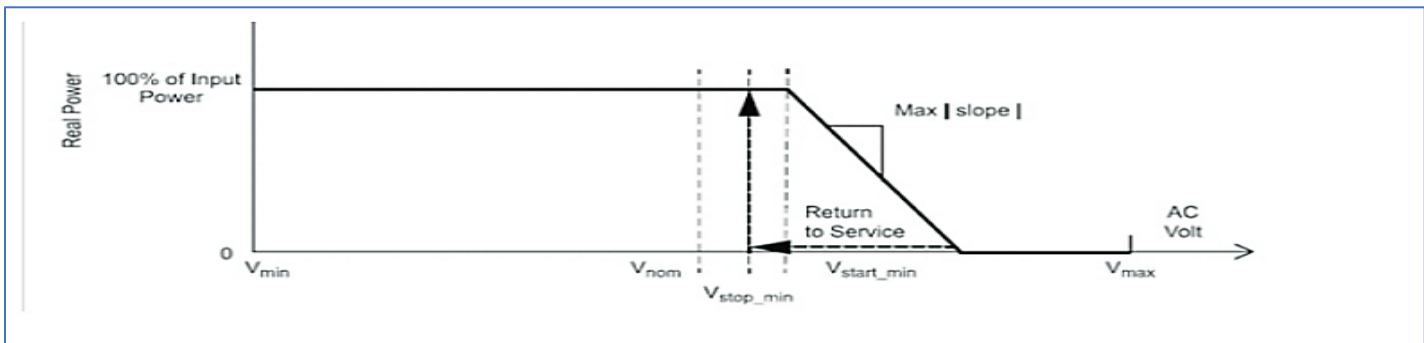
### Frequency-Watt (FW)



Note: When setting the protection time, it needs to be converted into the number of cycles of the corresponding frequency.

Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
Frequency-Active Power Mode	Disable	N/A	N/A
Overfrequency Droop dbOF	0.036Hz	0.017Hz	1Hz
Underfrequency Droop dbUF	0.036Hz	0.017Hz	1Hz
Overfrequency Droop kOF	0.05	0.02	0.07(for HECO)
Underfrequency Droop kUF	0.05	0.02	0.07(for HECO)
Open Loop Response Time	0	200ms	10s

### Voltage-Watt (VW)



When the grid voltage exceeds  $V_1$ , the output active power varies with the grid voltage.

Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
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Voltage-Active Power Mode	Disable	N/A	N/A
V1	106%Vnom	105%Vnom	109%Vnom
P1	Ppre-disturbance (for active power output at the time voltage exceeds V1 in p.u. of Prated)	N/A	N/A
V2	1.1*Un	1.04*Vn	1.10*Vn
P2	Pmin (for Advanced Inverters that can only inject active power, Pmin should approach 0)	N/A	N/A
Open Loop Response Time	10S	0.5S	60S

### Active power limit mode

Parameter name	Default Value	Minimum Adjustable Range	Maximum Adjustable Range
Active power limit mode	Enable	N/A	N/A
Maximum Active Power (%)	100	0	100

### Test parameter tolerances

Parameter	Units	Default Tolerance of Measurement
Voltage	Volts	±1%Urated
Current	Amps	±1%Urated
Power	Watts	±1%Urated
Reactive Power	VA	±5%Srated
Power Factor	Displacement power factor	±0.01
Frequency	Hz	±0.05
Response Time	Seconds	1
Time accuracy	Total time	0.1%

Note: When setting the protection time, it needs to be converted into the number of cycles of the corresponding frequency.

## Data Sheet

FP-ENVY-12K	
Max. usable input current(A)	25/15/15
Max. short circuit input current(A)	34/17/17
Start input voltage(V)	100
Startup voltage(V)	140
Full power MPPT voltage range(V)	230-500
DC nominal voltage(V) MPPT tracker	360
DC voltage range(V)	100-600
MPP operating voltage range(V)	120-500
Max. power(W)	18000
Number of MPPT	3
Inputs per MPPT	2/1/1
AC Grid output data	
Nominal Output Current(A)	50
Max. Output Current(A)	50
Rated voltage(V)	120/240V
Operating voltage range(V)	180-270
Continuous power output(W)	@240V 12000
Operating frequency (Hz)	50/60
Operating frequency range (Hz)	55-65
Phase shift	0.99@full load
Reactive power adjust range	-0.8~+0.8 leading Adjustable
THDI	<3%
Sync inrush current(A)	35
UPS AC output data	
Nominal output current(A)	50
Nominal output voltage(V)	120/240V
Continuous output power (VA)	@240 12000
Operating frequency (Hz)	60
Peak power (VA)	2xPn, 0.5s
THDV	<3%
Switching Time (ms)	<20
Efficiency	
Max. Efficiency @ PV to grid	97.5%
Max. Efficiency @ battery to grid	94%
CEC Efficiency	96.9%

Battery data	
Type	Lead-acid battery/Lithium battery
Max. charge current(A)	250
Max. discharge current(A)	250
Nominal voltage(V)	48
Voltage range(V)	48-56
Min-Max. voltage(V)	40-60
General Data	
Integrated disconnect	DC switch
Reverse polarity protection	Yes
DC switch rating for each MPPT	Yes
Output over-voltage protection varistor	Yes
Output over current protection	Yes
Ground fault monitoring	Yes
Grid monitoring	Yes
Pole sensitive leakage current Monitoring unit	Yes
AFCI	Yes
RSD	Yes
Dimensions(mm)	790*520*280mm (31.1*20.5*11.2inch)
Weight(kg)	55kg (121.25 lbs)
Degree of protection	NEMA4X / IP 65
Cooling concept	FAN
Topology	Transformer-less
Relative humidity	0-100%
Altitude(m)	<2000m
Operating Temperature Range (°C)	-25~60°C, >45°C Derating
Noise emission(dB)	<50dB
Internal consumption(W)	<15W
Display	Touch color screen
Communication interface	Rs485/ Wi-Fi/ CAN
Standard warranty	10 Years

## Contact Information



# FORTRESS POWER

### For Technical Support Please Contact us at Tech-Support Contact Information

Useful Links

- Phone: (877) 497-6937
- Support Tickets: <https://www.fortresspower.com/support/>
- Warranty Submittal: <https://www.fortresspower.com/warranty/>

FP-ENVY-MV.1