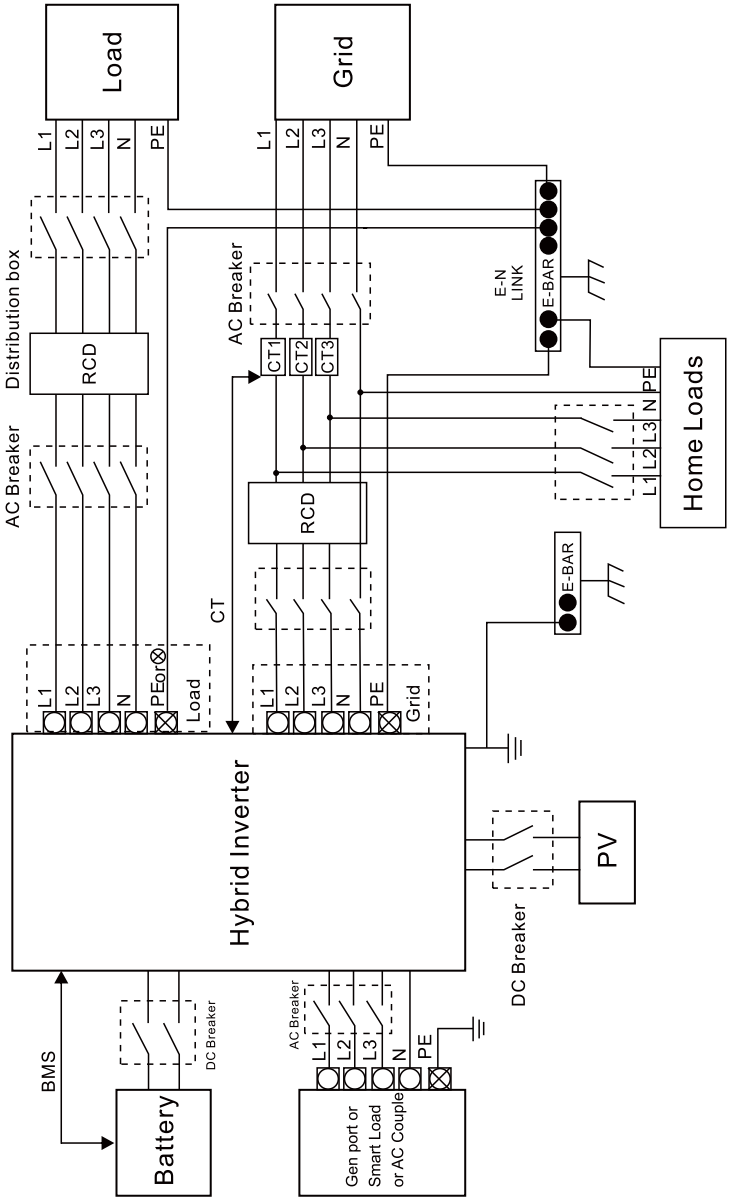
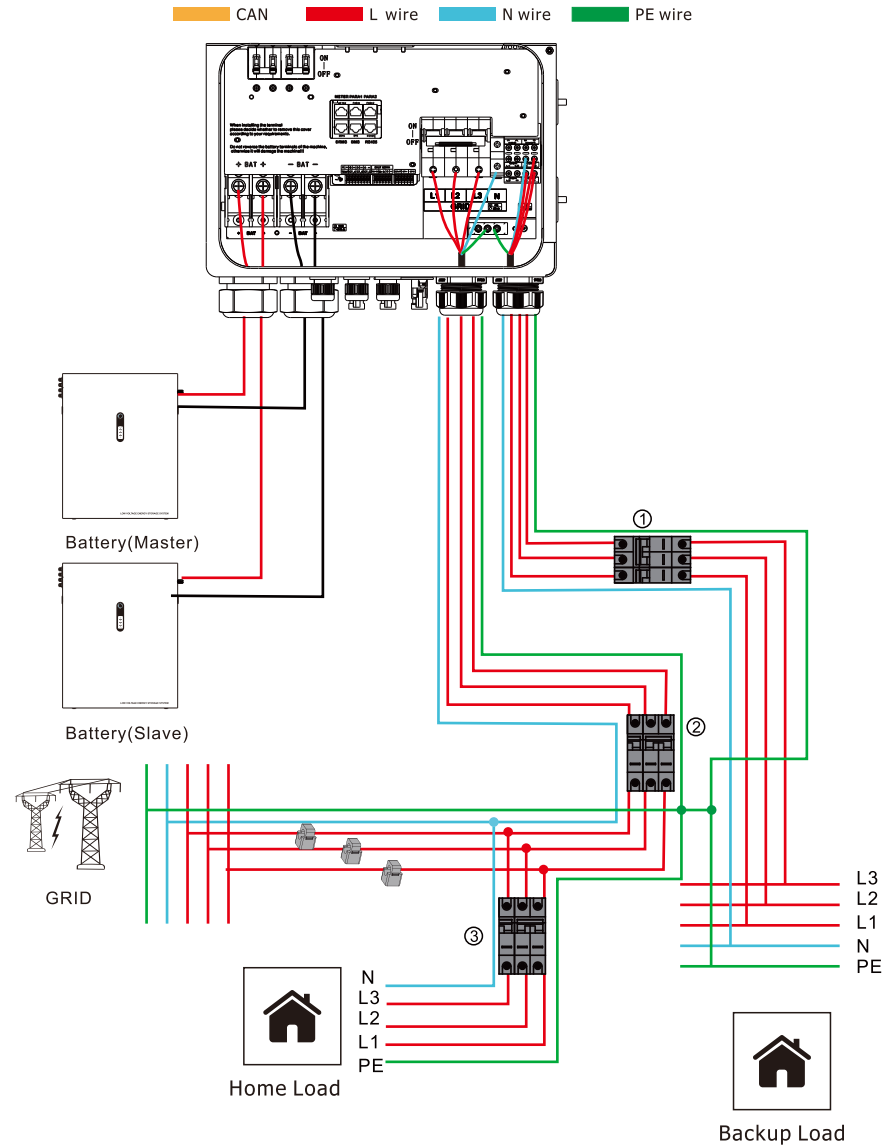
4.11 Wire System For Inverter



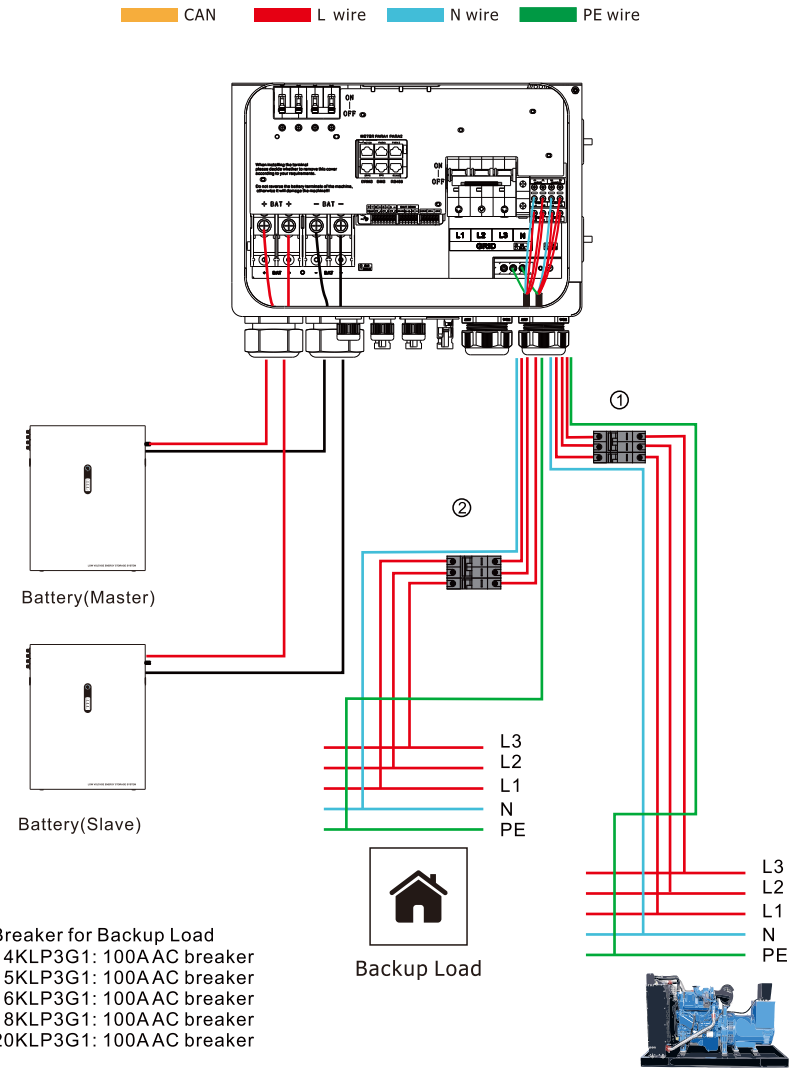


①AC Breaker for Backup Load
IVGM14KLP3G1: 100A AC breaker
IVGM15KLP3G1: 100A AC breaker
IVGM16KLP3G1: 100A AC breaker
IVGM18KLP3G1: 100A AC breaker
IVGM20KLP3G1: 100A AC breaker

②AC Breaker for Gen port
IVGM14KLP3G1: 100A AC breaker
IVGM15KLP3G1: 100A AC breaker
IVGM16KLP3G1: 100A AC breaker
IVGM18KLP3G1: 100A AC breaker
IVGM20KLP3G1: 100A AC breaker

③AC Breaker for Home load
Depends on household loads

4.12 Typical Application Diagram of Diesel Generator



①AC Breaker for Backup Load
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IVGM20KLP3G1: 100A AC breaker

②AC Breaker for Gen port
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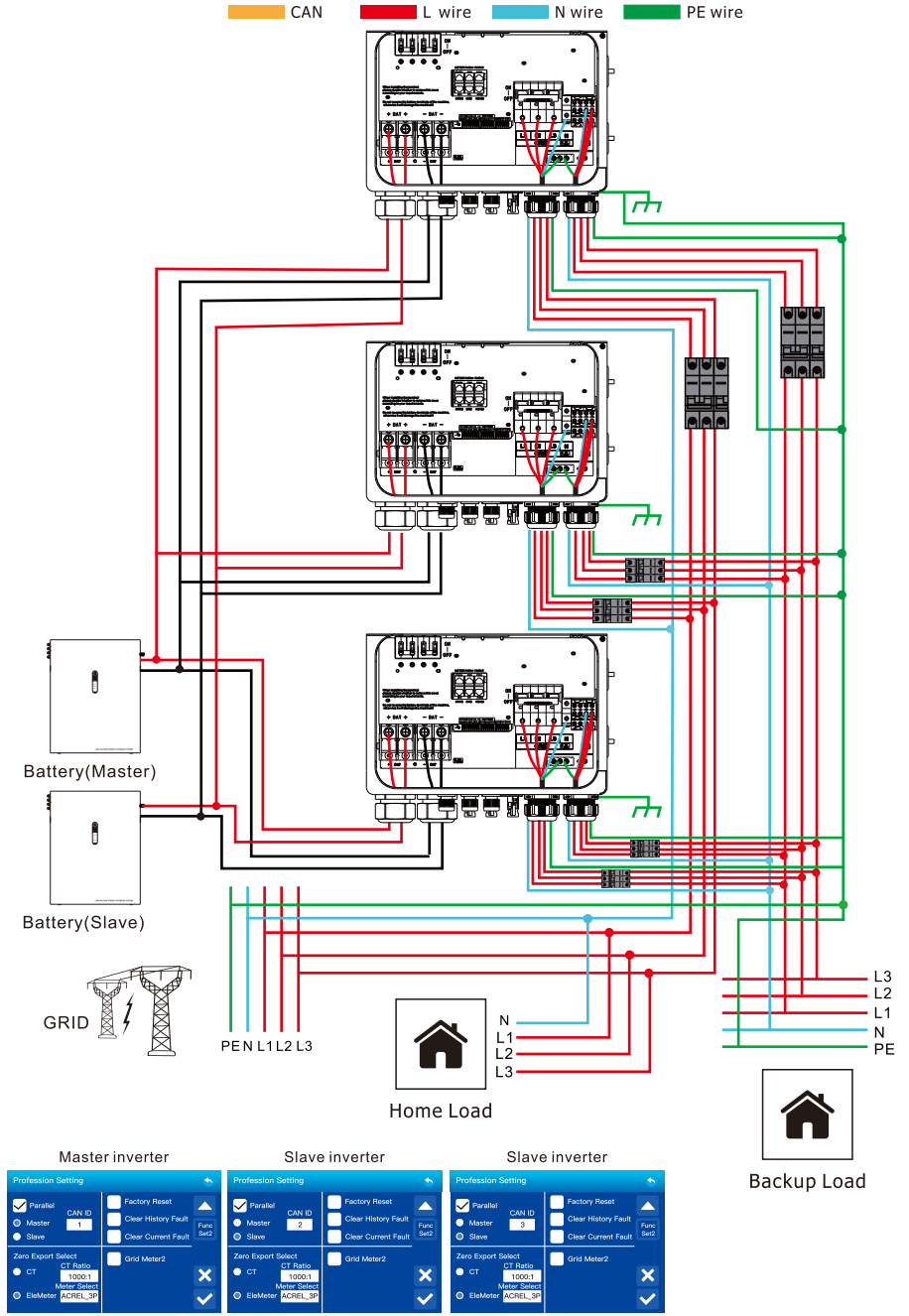
IVGM15KLP3G1: 100A AC breaker
IVGM16KLP3G1: 100A AC breaker
IVGM18KLP3G1: 100A AC breaker
IVGM20KLP3G1: 100A AC breaker

4.13 Three Phase Parallel Inverter



5. Display and Operation

This chapter describes the panel displaying and how to operate on the panel, which involves the LCD display, LED indicators and operation panel.

5.1 Inverter Power ON/OFF

TURN ON the inverter with at least one of the following power sources:
1 Battery, 2 PV, 3 Grid/Generator.

5.1.1 Pre-Commissioning

- Make sure that no high voltage conductors are energized.
- Check all conduit and cable connection points ensure they are tight.
- Verify that all system components have adequate space for ventilation.
- Follow each cable to ensure that they are all terminated in the proper places.
- Verify that the inverter is secured to the wall and is not loose or wobbly.

5.1.2 Inverter Power ON

Step 1: With the DC switch off, energize the PV strings and then measure DC voltage of the PV strings to verify that the voltage and polarity are correct. Turn on the battery and check the battery voltage and polarity as well.
Step 2: Turn on the AC breaker for the system and then measure the AC voltages line to line and line to neutral. The backup side of the system will be off until commissioning is complete.Turn the AC breaker back off for now.
Step 3: Turn the battery breaker on, the DC switch and then the AC breaker for the system, **press the Power ON/OFF button to turn on the unit.**
This inverter can be powered on by PV only, battery only and Grid only.

5.1.3 Inverter Power OFF

Step 1: Press the Power ON/OFF button to turn off.
Step 2: Turn off the AC breaker to disable AC power to the inverter.
Step 3: Turn off the DC switch of the inverter.
Step 4: Turn off the battery breaker.
Step 5: Use a multimeter to verify that the battery and AC voltages are 0V.

5.2 Operation and Display Panel

Once the unit has been properly installed and the batteries are connected well, simply press ON/OFF button (located on the left side of the case) to turn on the unit. When system without battery connected, but connect with either PV or grid, and ON/OFF button is switched off, LCD will still light up (Display will show Standby), In this condition, when switch on ON/OFF button and select NO battery, system can still working.

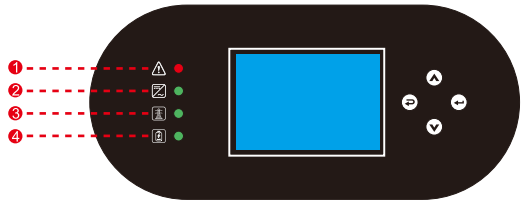


Table 5.2-1 LED indicators

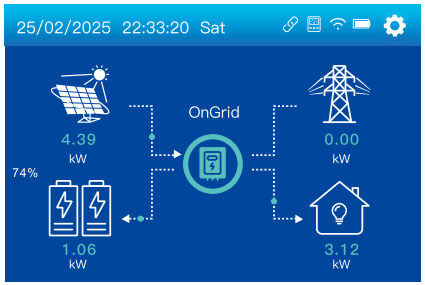
Numeber	LED Indicator		Messages
1	Fault	Red led solid light	Fault
2	DC/AC	Green led solid light	Inverter operation normal
3	GRID	Green led solid light	Grid connection normal
4	BATTERY	Green led solid light	Battery connection normal

Table5.2-2 Function Buttons

Function Key	Description
Esc	To exit setting mode
Up	To go to previous selection
Down	To go to next selection
Enter	To confirm the selection

5.3 LCD Display Icons

The LCD is touchscreen, below screen shows the overall information of the inverter.



1.The icon in the center of the home screen indicates that the system is Normal operation. If it turns into red and shows "fault", it means the inverter has errors .If it turns into yellow, it means the inverter has warning.And the error or warning message will display under this icon(detail info can be viewed in the System Alarms menu).

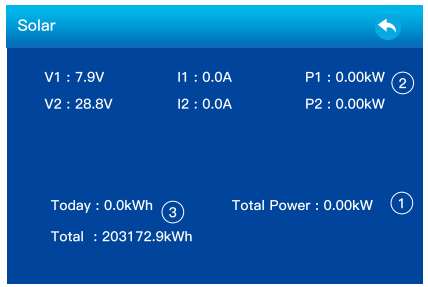
2.At the top of the screen is the time (day/month/year,time).

3. System Setup Icon, Press this set button, you can enter into the system setup screen which including Basic Setting, Battery Setting, Grid Setting, Work Mode Setting, Gen setting, Profession Setting and Alarm Info.

4. The main screen showing the info including Solar, Grid, Load and Battery. Its also displaying the energy flow direction by arrow.

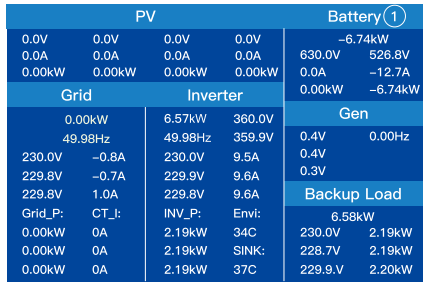
- PV power and Load power always keep positive.
- Grid power negative means sell to grid, positive means get from grid.
- Battery power positive means charge, negative means discharge.

5.4 Power Curve



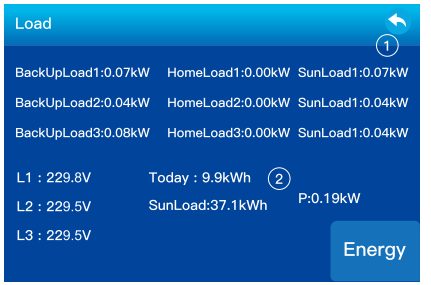
This is Solar Panel detail page.
Press the "Energy "button will enter into the power curve page.

① Solar Panel Generation.
② Voltage, Current, Power for each MPPT.
③ Daily and total PV production.



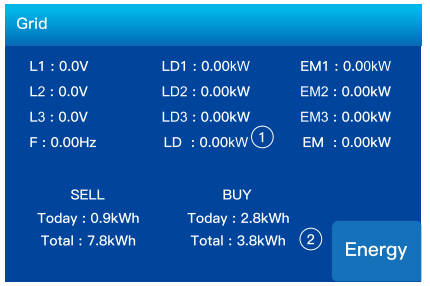
This is Inverter detail page.

① DC/AC inverter module
Voltage, Current, Power for each Phase.
SINK: mean Heat-sink temperature.



This is Load detail page.
Press the "Energy " button will enter into the power curve page.

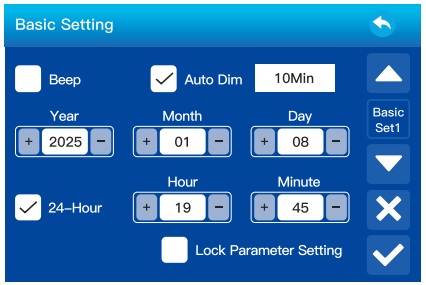
① Voltage,Back-up Power, homeload power, total load Power for each Phase.
② Daily and total backup consumption.



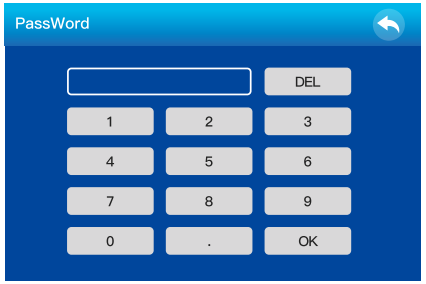
This is Grid detail page.

① L: Voltage for each Phase
CT: Power detected by the external current sensors.
P: Power detected using internal sensors on AC grid in/out breaker.
② BUY: Energy from Grid to Inverter.
SELL: Energy from Inverter to grid.

5.5 Basic Setting

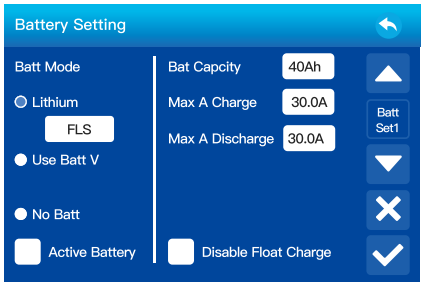


Beep: Used to turn on or off the beep sound in inverter's alarm status.
Lock Parameter Setting: All setting parameters cannot be set up when it is active.

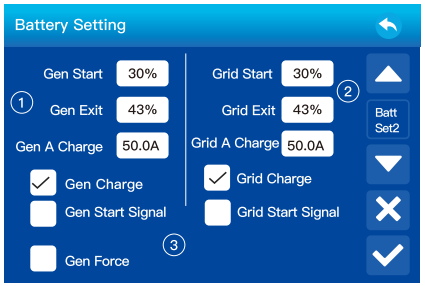


Lock Parameter Setting Password: 123456
Auto Dim: The backlight of LCD will power off after the set time.

5.6 Battery Setting



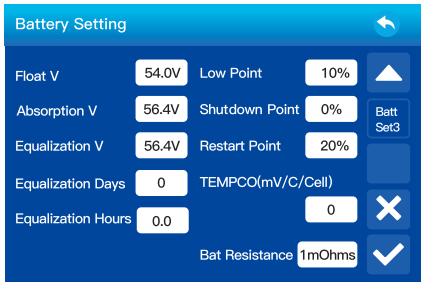
Batt Capacity: Reserved.
Lithium: Use SOC for all battery related settings.
Lithium Mode: This is the BMS communication protocol code which can be confirmed on the "Felicity Solar Approved Battery list " base on the battery model you are using.
Use Batt V: Use battery voltage for all battery related settings.
No Batt: tick this item if no battery is connected to the system.
Max A Charge/Discharge: Max battery charge/dischargecurrent(0-240A for 14kW model,0-280A for 15kW model,0-300A for 16kW model,0-330A for 18kW model,0-350A for 20kW model)
· For AGM and Flooded, we recommend Ah battery size x20%=Charge/Discharge amps.
· For Lithium, we recommend Ah battery size x 50%=Charge/Discharge amps.
· For Gel, follow manufacturer' s instructions.
Active Battery: This feature will help recover a battery that is over discharged by slowly charging from the solar array or grid.
Disable Float Charge: For the lithium battery with BMS communication, the inverter will keep the charging voltage at the current voltage when the BMS charging current requested is 0. It is used to help prevent battery from being overcharged.



This is Battery Setup page. ①③
Gen Start : Percent SOC below 30% system will Auto Start a connected generator to charge the battery bank.
Gen Exit: When the battery SOC or voltage reaches a preset Gen exit point, the inverter will disconnect the generator.
Gen A Charge: The maximum charging current that the generator can support.
Gen Charge: Use the power of diesel generator to charge the battery.

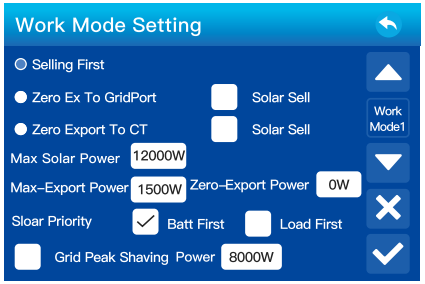
Gen Start Signal: The normally open relay will close when the battery SOC or voltage drop to the set value of "Start"
Gen Force: When the generator is connected, it is forced to start the generator without meeting other conditions.

This is Grid Charge, you need select. ②
Grid Start : When battery SOC or voltage drop to this set value, inverter will start the generator connected to the grid port automatically to charge the battery.
Grid Exit: Reserve
Grid A Charge: maximum charging current when only use the power fed from the grid port of inverter as the power source, which means using the power of grid or the power of generator connected to the grid port.
Grid Charge: It's allowed to use power fed from the grid port, which includes grid or generator connected to the grid port, to charge the battery.
Grid Start Signal: When a generator is connected to the grid port of hybrid inverter, this 'Grid signal' can be used to control the dry contact to start or stop the generator.

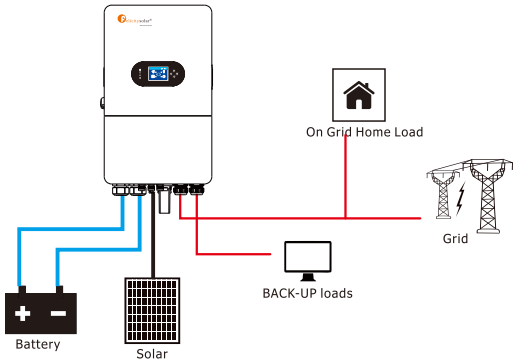


Float V: Battery full charge voltage.
Absorption V: Battery constant charge voltage.
Equalization V: Reserve
Equalization Days: Reserve
Equalization Hours: Reserve
Low Point : The inverter will alarm if the SOC below this value.
Shutdown Point: The inverter will be shut down if the SOC below this value and the solar power can only be used to charge the battery.
Restart Point: The inverter will power the load with battery if the SOC upto this value.
TEMPCO: Reserve
Bat Resistance: Reserve

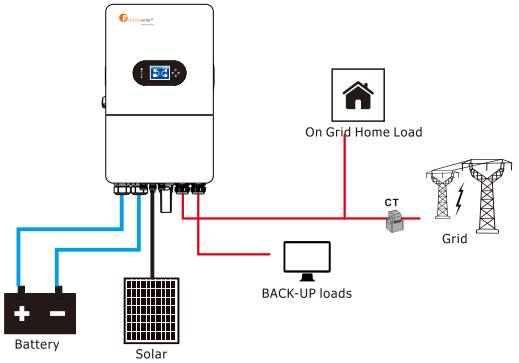
5.7 Work Mode Setting



Selling First: This Mode allows hybrid inverter to sell back any excess power produced by the solar panels to the grid. If Time Of Use is active, the battery energy also can be sold into grid.
The PV energy will be used to power the load and charge the battery and then excess energy will flow to grid.
Power source priority for the load is as follows:
1. Solar Panels.
2. Grid. when Energy Pattern tick Batt First.
Battery (until programable SOC discharge is reached). when Energy Pattern tick Load First and disable Grid charge.
Max Solar Power: the maximum DC input power allowed.
Zero Ex To GridPort: Hybrid inverter will only provide power to the backup load connected. The hybrid inverter will neither provide power to the home load nor sell power to grid. The built-in CT will detect power flowing back to the grid and will reduce the power of the inverter only to supply the backup load and charge the battery.



Zero Export To CT: Hybrid inverter will not only provide power to the backup load connected but also give power to the home load connected. If PV power and battery power is insufficient, it will take grid energy as supplement. The hybrid inverter will not sell power to grid. In this mode, a CT is needed. The installation method of the CT please refer to Table 4.7 CT Connection. The external CT will detect power flowing back to the grid and will reduce the power of the inverter only to supply the backup load, charge battery and home load.



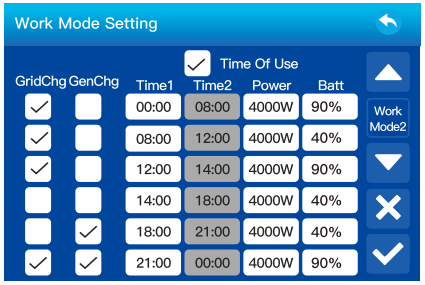
Solar Sell: "Solar sell" is supplement for Zero Ex To GridPort or Zero Export To CT: when this item is active, the surplus PV energy can be sold back to grid too. When it is active, PV Power source priority usage is as follows: load consumption and charge battery and feed into grid.

Max-Export Power: Allowed the maximum output power to flow to grid.
Zero-Export Power: forZero Ex To GridPort or Zero Export To CT, and the "Solar sell" is not active. It tells the grid output power threshold to ensure the hybrid inverter won' t feed power to grid. Recommend to set it as 20-100W to ensure the hybrid inverter won' t feed power to grid.

Solar Priority: Priority of PV power usage.
Batt First: PV power is firstly used to charge the battery and then used to power the load. If PV power is insufficient, grid will make supplement for battery and load simultaneously.

Load First: PV power is firstly used to power the load and then used to charge the battery. If PV power is insufficient, Grid will provide power to load, but neither the battery power to load nor the Grid charge to battery.

Grid Peak Shaving:
1. To use Peak-Shaving on a generator, the equipment MUST be connected to the "GRID" terminal of the inverter.
2. Peak-Shaving helps reduce grid consumption during peak demand by utilizing battery backup power. It can also be used to prevent generator overload above a specified power threshold.
3. Install the CT sensors on grid / generator lines L1, L2,L3 The arrows on the CTs must point toward the GRID.
4. The IVGM INVERTER supplies power from the batteries whenever the "Power" threshold is met.
5. This mode will automatically adjust the "Grid Charge" amperage (A) to avoid generator overloads during battery charging.
6. Grid Peak-Shaving will automatically enable "Time of Use" and must be configured.



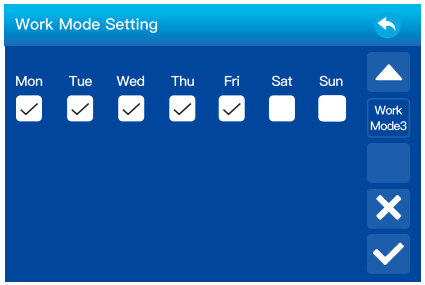
Time Of Use: it is used to program when to use grid or generator to charge the battery, and when to discharge the battery to power the load. Only tick "Time Of Use" then the follow items (Grid, charge, time, power etc.) will take effect.
Note: when tick Selling First and click Time Of Use, the battery power can be sold into grid.
Charge Source: select grid or diesel generator to charge the battery.

GridChg: Use grid to charge the battery in a time period.
GenChg: Use diesel generator to charge the battery in a time period.
Note: If tick Grid and Gen at the same time, Grid is priority. and only the Gen Charge Enable or Grid Charge Enable is tick in Battery Setting, can the corresponding Gen or Grid tick take effect.
Time1: real time, range of 00:00-24:00.

Power: Max.discharge power of battery allowed.
Batt(V or SOC %): Battery SOC % or voltage at when the action is to happen.
During the current time period, If the actual SOC or voltage of the battery is lower than the target value, the battery needs to be charged by the ticked source. If the actual SOC or voltage of the battery is higher than the target value, the battery can discharge, and when the solar power is not enough to power the load or the "Selling First "is enabled, the battery will discharge to feed to grid.

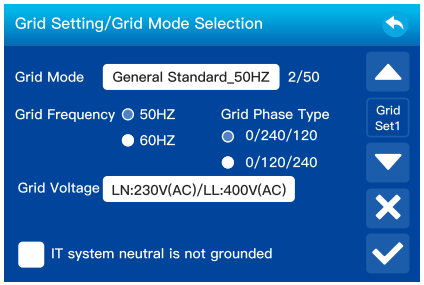
For example:
During 00:00-08:00,
if battery SOC is lower than 90%, it will use grid to charge the battery until battery SOC reaches 90%.
During 08:00-12:00,
if battery SOC is higher than 40%, hybrid inverter will discharge the battery until the SOC reaches 40%. At the same time, if battery SOC is lower than 40%, then grid will charge the battery SOC to 40%.
During 12:00-14:00,
if battery SOC is lower than 90%, it will use grid to charge the battery until battery SOC reaches 90%.
During 14:00-18:00,
when battery SOC is higher than 40%, hybrid inverter will discharge the battery until the SOC reaches 40%.if battery SOC is lower than 40%, neither the diesel generator nor the grid will charge the battery.

During 18:00-21:00,
when battery SOC is higher than 40%, hybrid inverter will discharge the battery until the SOC reaches 40%. At the same time, if battery SOC is lower than 40%, then diesel generator will charge the battery SOC to 40%.
During 21:00-00:00,
if battery SOC is lower than 90%, it will use grid or diesel generator to charge the battery until battery SOC reaches 90%.



It allows users to choose which day to execute the setting of "Time Of Use".
For example, the inverter will execute the time of use page on Mon/Tue/Wed/Thu/Fri only.

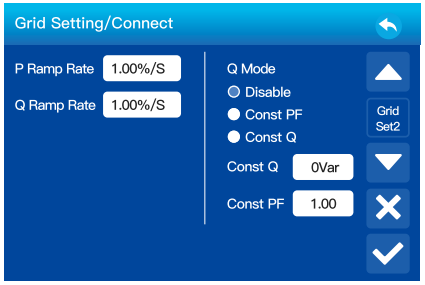
5.8 Grid Setting



Unlock Grid Settng: Before changing the grid parameters, please enable this with password of 123456. Then it is allowed to change the grid parameters.
Grid Code:

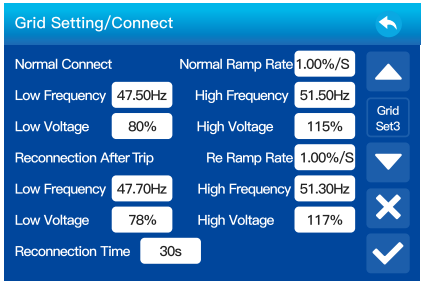
0: Germany_VDE4105,	7: NewZealand_AS4777,	13: Czech_CSN 50549-1,
2: General Standard_50Hz,	8: SouthAfrican_NRS097,	14: Austria_R25:2020-03,
3: General Standard_60Hz,	9: Netherland_EN 50549-1,	15: Austria_OVE-directive_R25,
4: Italy_CEI_021_2019,	10: Brazil,	16: Spain_NTS_2021,
5: Britain_G99,	11: En50549,	17: Spain_UNE217001,
6: Australia_A,	12: Poland_NC_RFG,	18: cNetherland.

Grid Type: The output type of the inverter in off-grid mode.

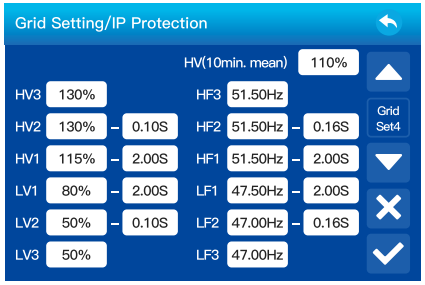


P Ramp Rate: It is the power ramp response to the active power reference in normal running.
Q Ramp Rate: It is the power ramp response to the Reactive power reference in normal running.

Const Q: Setting the reactive power value. Const Q >0 means Inverter output capacitive reactive power, Const Q <0 means Inverter output Inductive reactive power.
Const PF: Setting the power factor(cos φ)value. Const PF>0 means Inverter output Inductive reactive power(or inverter will absorb capacitive reactive power from the power grid),Const PF<0 means Inverter output capacitive reactive power.



Normal Connect: The allowed grid voltage/frequency range when the inverter operates normally.
Normal Ramp Rate: It is the startup power ramp.
Low Frequency: If the grid frequency is lower than the set point, the inverter disconnects the grid.
High Frequency: If the grid frequency is higher than the set point, the inverter disconnects the grid.
Low Voltage: If the grid voltage is lower than the set point, the inverter will disconnect the grid.
High Voltage: If the grid voltage is higher than the set point, the inverter will disconnect the grid.
Reconnect After Trip: The allowed grid voltage/frequency range for the inverter connects the grid after the inverter trip from the grid.
Re Ramp Rate: It is the reconnection power ramp.
Reconnection Time: The waiting time for the inverter connects the grid again after tripping.

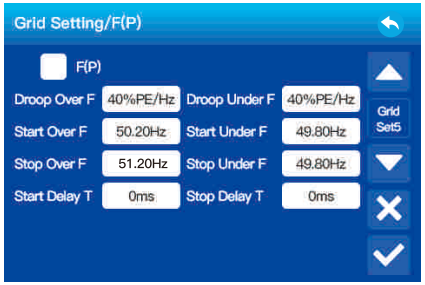


HV1: Level 1 overvoltage protection point;,
HV2: Level 2 overvoltage protection point;
HV3: Level 3 overvoltage protection point.

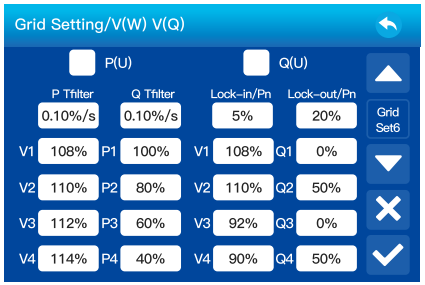
LV1: Level 1 undervoltage protection point;
LV2: Level 2 undervoltage protection point;
LV3: Level 3 undervoltage protection point.

HF1: Level l over frequency protection point;
HF2: Level2 over frequency protection point;
HF3: Level 3 over frequency protection point.

LF1: Level l under frequency protection point;
LF2: Level2 under frequency protection point;
LF3: Level 3 under frequency protection point.

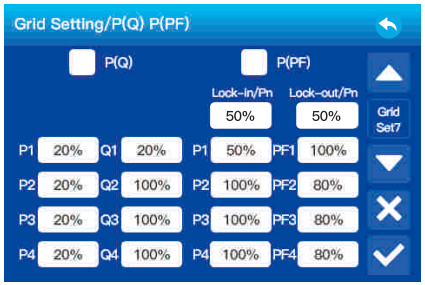


F(P): It's used to adjust the output active power of inverter according to grid frequency.
Droop Over F: percentage of nominal power per Hz
For example, "Start freq F=50.2Hz, Stop freq F=51.2Hz.
Droop F=40%PE/Hz" when the grid frequency reaches51.2Hz, the inverter will decrease its active power at Droop F of 40%. And then when grid system frequency is less than 50.2Hz, the inverter will stop decreasing output power. For the detailed setup values, please follow the local grid code.
Start Over F: Indicates the start of mains overfrequency derating.
Stop Over F: Indicates the end point of the mains over frequency derating.
Start Delay T: delay time of mains frequency response.
Droop Under F: Percentage of under frequency power rise per Hz.
Start Under F: Indicates the start of the mains under frequency rise.
Stop Under F: Indicates the end point of the mains under frequency rise.
Stop Delay T: Delay time for stopping mains frequency response.



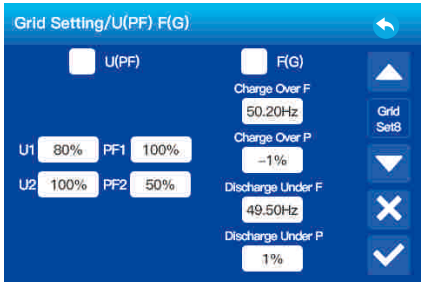
P(U): It is used to adjust the inverter's active power according to the set grid voltage
Q(U): It is used to adjust the inverter's reactive power according to the set grid voltage.These two functions are used to adjust inverter's output power (active power and reactive power) when grid voltage changes.
Lock-in/Pn 5%: When the inverter active power is less than 5% rated power, the V(Q) mode will not take effect.
Lock-out/Pn 20%: If the inverter active power is increasing from 5% to 20% rated power, the V(Q) modewill take effect again.

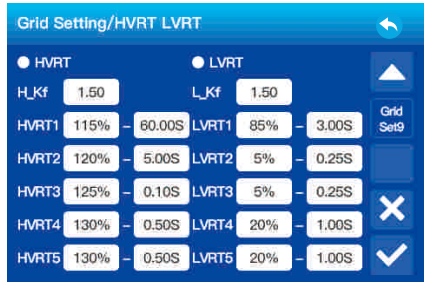
For example: V2=110%, P2=80%. When the grid voltage reaches 110% of the rated grid voltage, inverter will reduce its active power output to 80% of the rated power.
For example: V1=108%, Q1=0%. When the grid voltage reaches 108% of the rated grid voltage inverter will output reactive power that accounts for 0% of the rated power. For the detailed setup values, please follow the local grid code.



P(Q): it is used to adjust the output reactive power of inverter according to the set active power.
P(PF): It is used to adjust the PF of inverter according to the set active power.For the detailed setup values, please follow the loca!grid code.
Lock-in/Pn 50%: When the output active power of inverter is less than 50% of inverter's rated power, it won't enter the P(PF) mode.
Lock-out/Pn 50%: When the output active power of inverter is higher than 50% of inverter's rated power,itwill enter the P(PF) mode.

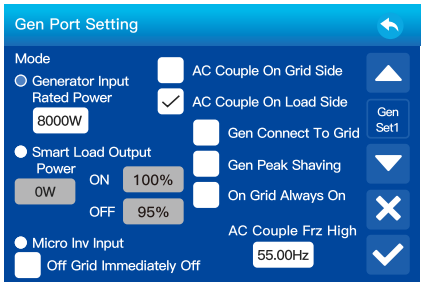
Note : only when the grid voltage is equal to or higher than 1.05 times of the rated grid voltage, then the P(PF)mode will take effect.



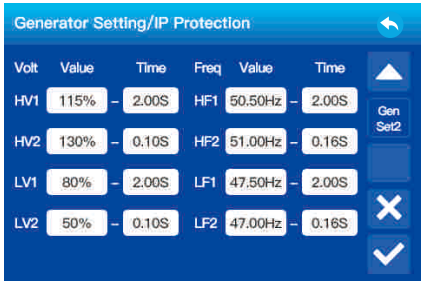


Reserved: This function is reserved.It is not recommended.

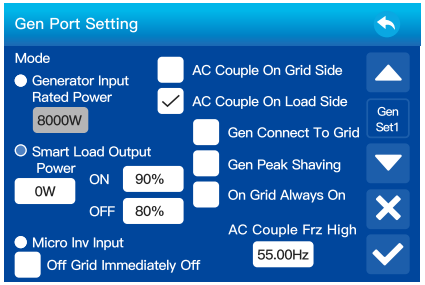
5.9 Gen Port Setting



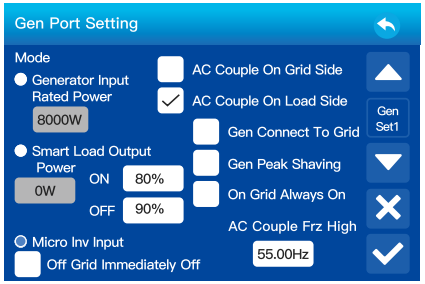
Generator Input Rated Power: allowed Max. power from diesel generator.
AC Couple On Grid Side: Reserved
AC Couple On Load Side: Use the Load port as an AC couple input port, which can be connected with micro-inverter or other Grid-Tied inverter.
Gen Connect To Grid: connect the diesel generator to the grid input port.
Gen Peak Shaving: Limit the maximum output power of the generator to the set rated power , the rest of power consumption will be provided by inverter to ensure that the generator will not overload.
On Grid Always On: When click "on Grid always on" the smart load will switch on when the grid Is present.
AC Couple Frz High: If choosing "Micro Inv Input", as the battery SOC reaches gradually setting value (OFF), During the process, the microinverter output power will decrease linear. When the battery SOC equals to the setting value (OFF) the system freguency will become the setting value (AC Couple Fre H) and the Microinverter will stop working. Stop exporting power produced by the microinverter to the grid.
Smart Load Output Power: Use the GEN port as an AC output port, and the load connected to this port can be controlled on/off by the hybrid inverter.
e.g.ON: 100%,OFF: 95%: When the battery bank SOC reaches 100%, Smart Load Port will switch on automatically and power the load connected. when the battery bank SOC < 95% , the Smart Load Port will switch off automatically.



HV1: Level 1 overvoltage protection point and protection time;
HV2: Level 2 overvoltage protection point and protection time;
LV1: Level 1 undervoltage protection point and protection time;
LV2: Level 2 undervoltage protection point and protection time;
HF1: Level 1 over frequency protection point and protection time;
HF2: Level 2 over frequency protection point and protection time;
LF1: Level 1 under frequency protection point and protection time;
LF2: Level 2 under frequency protection point and protection time.



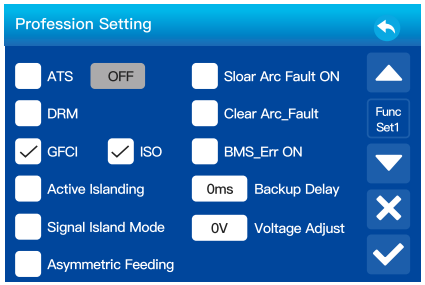
Smart Load OFF Batt
• Battery SOC or voltage at which the Smart load will switch off.
Smart Load ON Batt
• Battery SOC or voltage at which the Smart load will switch on.



Micro Inv Input: Use the GEN port as an AC couple input port which can be connected with micro-inverter or other Grid-Tied inverter.
***Micro Inv Input ON:** When the hybrid inverter operates in off-grid mode and the SOC or voltage of battery drops to this set value,the relays on GEN port of hybrid inverter will turn to normally closed(ON), then the Grid-Tied inverter will generate solar power and feed into hybrid inverter. When the hybrid inverter operates in on-grid mode, this parameter will be invalid, the relays on GEN port of hybrid inverter will always be normally colsed(ON),Grid-Tied inverter can operate normally.
***Micro Inv Input OFF:** When the hybrid inverter operates in off-grid mode and the SOC or voltage of battery upto this set value,the relays on GEN port of hybrid inverter will turn to normally open (OFF), then the Grid-Tied inverter will Stop to work. When the hybrid inverter operates in on-grid mode, this parameter will be invalid, the relays on GEN port of hybrid inverter will always be normally colsed(ON),Grid-Tied inverter can operate normally.

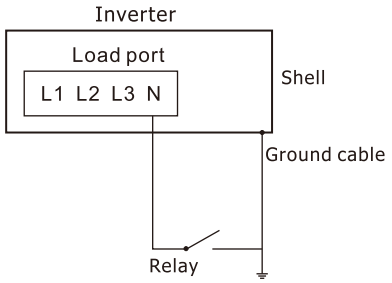
AC Couple Frz H: If choosing"Micro Inv input", as the battery SOC reaches gradually setting value (OFF), during the process, the microinverter output power will decrease linear. When the batterySOC equals to the setting value (OFF), the system frequency will become the setting value (AC couple Frz H) and the Microinverter will stop working.
***Note:** Micro Inv Input OFF and On is valid for some certain FW version only.

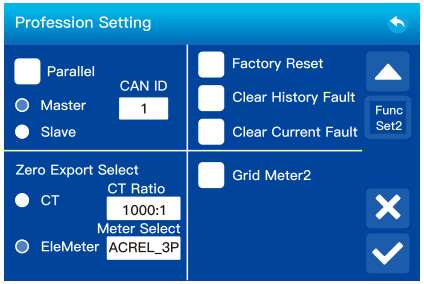
5.10 Profession Setting



ATS: It is related with ATS port voltage. it is better in "uncheck" position.
DRM: Only for AS4777 standard.
GFCI: the ground-fault circuit interrupter function.
ISO: the PV and the battery wiring terminals Positive to ground and negative to ground insulation impedance detection.
Active Islanding: Active islanding detection enable or not.
Asymmetric Feeding: Reserved
Sloar Arc Fault ON: This is only for US.
Clear Arc_Fault: Clear Arc_Fault.
BMS_Err ON: When it is active, if the battery BMS failed to communicate with inverter, the inverter will stop working and report fault.
Backup Delay: When the grid cuts off, the inverter will output powerafter the set time.
For example, backup delay: 600s. the inverter will give output powerafter 600s when the grid cuts off.
CT Ratio: The CT ratio of the zero-export to CT mode.
Voltage Adjust: if the inverter is working at off grid, we can adjust the output voltage by Voltage Adjust.

Signal Island Mode:when "signal island mode" is checked and the inverter connects the grid, the ATS port voltage will be 0. When "signal island mode" is checked and the inverter disconnected from the grid, the ATS port voltage will output 240Vac voltage. With this feature and outside NO type relay, it can realize N and PE disconnection or bond.

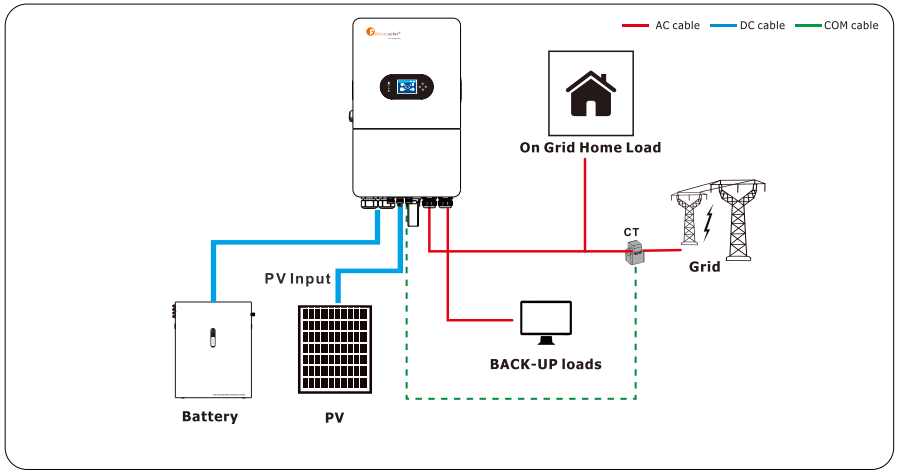




Parallel: To expand system capacity, click the parallel. In a parallel system, there can only be one Master for one phase, and the others must be set as Slaver, set a unique CAN ID to each inverter, the CAN ID is from 1 to 10.
Master: Select any hybrid inverter in the parallel system as the master inverter, and the master inverter needs to manage the working mode of the parallel system.
Slave: Set the other inverters managed by the master inverter as slave inverter
CAN ID: The Modbus address of each inverter, should be different.
EleMeter For CT: when using zero-export to CT mode,the hybrid inverter can select EX Meter For CT function and use the different meters,e.g.Acrel and CHINT.
Meter Select: Select the corresponding meter type according to the meter installed in the system.
Zero Export Way: To CT mode can be used to select anti-reverse current mode for inverter, either CT or electric meter.
Factory Reset:If selected, enter the password first(Password:123456); Deselect it, you do not need to enter a password.
Fault Clear: When it is active, the inverter will restart.
Grid Meter2: When there's a string inverter AC couple at the grid or load side of hybrid inverter and there's a meter installed for the string inverter, then the hybrid inverter LCD will show the string inverter output power on its PV icon. Please make sure the meter can communicate with thehybrid inverter successfully.

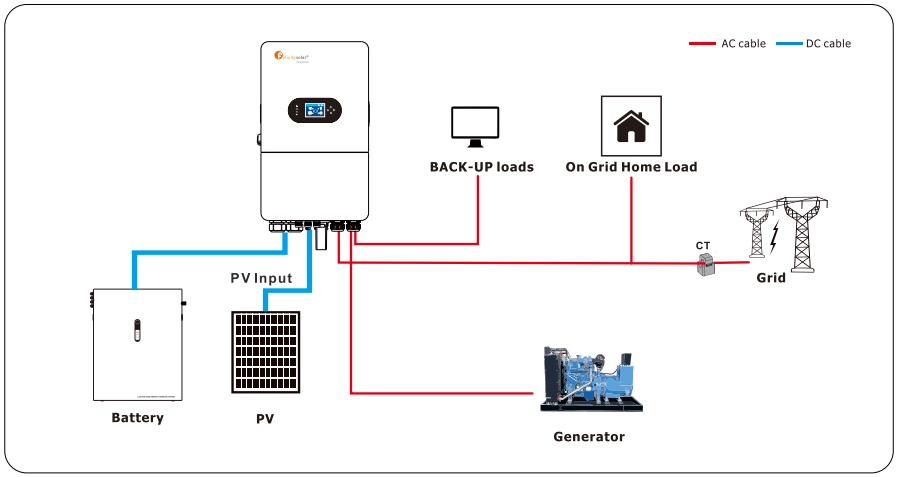
6. System Application

Mode I:Basic



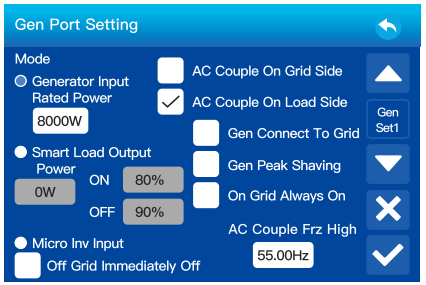
With Export to CT mode,the hybrid inverter can provide power not only to the home load on the main side, but also to the critical load on the backup side.And excess energy feeds to Grid.

Mode II:With Generator

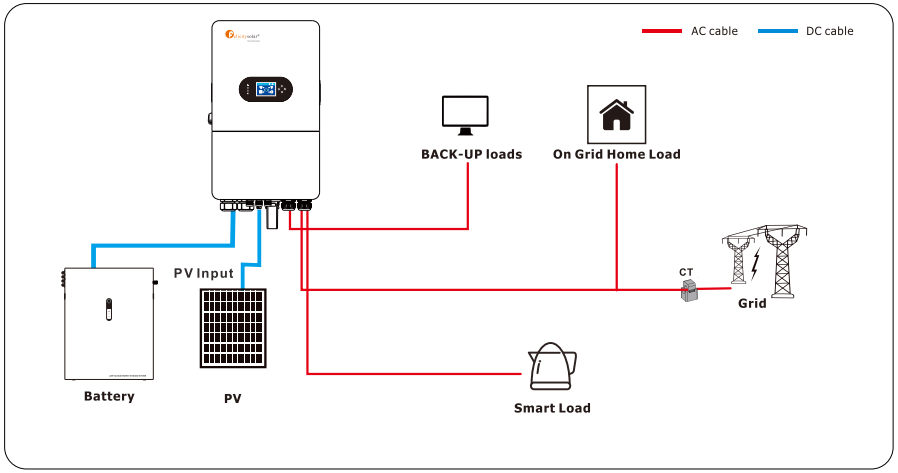


Generators Smaller than 20kW(On"GEN"Input)
1.ONLY supports three-phase 400Vac generators.
2.55A rated "GEN"terminal.31.9A continuous.
3.A THD(Total Harmonic Distortion)of less than 15%is required for stable operation.
Generators Greater than 20kW(On "GRID"Input)
1.ONLY supports three-phase 400Vac generators.
2.Optimal way to integrate generators for Off-Grid or Grid-Tied systems with automatic or manual transfer switches.

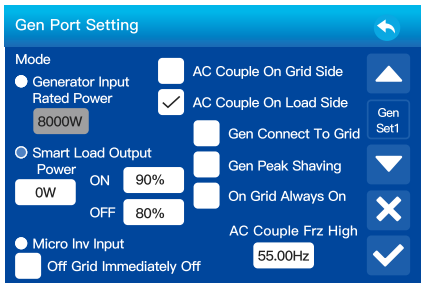
3.Programming "GEN Connect to Grid Input"and generator connected to grid port.
4.DO NOT use "Sell to Grid"when generatoris connected to the GRID input,can cause potential damage the generator Installation of CT sensors on generator lines is only required if"Peak Shaving"is intended to be used.



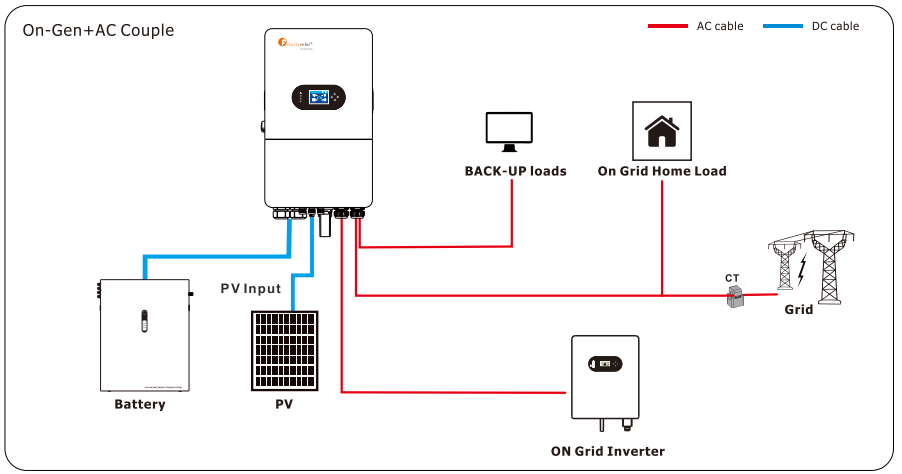
Mode III:With Smart-Load



1. This mode uses the **"Generator"** input as a load output that delivers power when the battery exceeds a user programmable threshold or when the IVGM INVERTER is connected to the grid.
2. When **"Smart Load Output"** is enabled, the "GEN" input turns into an output to power high power loads such as a water heater, irrigation pump, AC unit, pool pump, or any other load.
3. When **"On Grid Always On"** is enabled, the "GEN" terminal will always output power as long as the grid is connected, regardless of battery charge.



Mode IV: AC Couple



The IVGM INVERTER supports the addition of grid-tied solar inverters, this allows the systems total solar power input to be expanded by coupling micro or string inverters into the "GEN" terminals of the inverter.

An entirely AC-coupled solar system is not recommended as power control and monitoring is limited but is supported. Having DC-coupled modules, or a combination of DC-coupled modules and AC-coupled inverters is always preferred. AC-coupled inverters used in this application need to be either EN 50549 or VDE 4105 certified. This certification confirms the inverters' ability to disconnect from the grid based on frequency and ensures that the IVGM INVERTER will safely be able to frequency shift to control the AC coupled production.
In off-grid systems or during grid-forming operation, the IVGM INVERTER uses frequency shifting to curtail and shutdown AC-coupled inverters when the battery is full, allowing AC-coupled solar to produce power in an outage scenario. When the IVGM INVERTER is connected to the grid any AC-coupled inverters connected will always sell all excess solar power back to the grid. Selecting "Limited to Load" will NOT limit production when AC coupled.

AC Coupling on the GRID Side
Installing AC coupled inverters upstream of the GRID port of the IVGM INVERTER, such as with a load or supply side connection, is supported for grid connected systems but has some notable limitations when using the inverter for backup or grid-forming mode:
- Does NOT allow the usage of grid-tied inverter production during grid outages to charge batteries or power loads.
- Does NOT allow monitoring of PV production in inverter and Fsolar monitoring.

AC Coupling on the GEN Terminal
AC Coupling via the GEN Terminal is the preferred method for integrating AC-coupled solar on the IVGM INVERTER. This method offers several key advantages:
- Allows the usage of grid-tied inverter production during grid outages.
- Allows the integration of grid-tie inverters in off-grid systems.
Using the GEN terminal also allows for comprehensive monitoring of solar production, giving users valuable insights into the system's performance.

7. Warranty

As to Warranty terms, please refer to <General Warranty Agreement>.
Under the guidance of our company, customers return our products so that our company can provide service of maintenance or replacement of products of the same value. Customers need to pay the necessary freight and other related costs. Any replacement or repair of the product will cover the remaining warranty period of the product. If any part of the product or product is replaced by the company itself during the warranty period, all rights and interests of there placement product or component belong to the company.

Factory warranty does not include damage due to the following reasons:

- Damage during transportation of equipment;
- Damage caused by incorrect installation or commissioning;
- Damage caused by failure to comply with operation instructions, installation instructions or maintenance instructions;
- Damage caused by attempts to modify, alter or repair products;
- Damage caused by incorrect use or operation;
- Damage caused by insufficient ventilation of equipment;
- Damage caused by failure to comply with applicable safety standards or regulations;
- Damage caused by natural disasters or force majeure (e.g. floods, lightning, over voltage, storms, fires, etc.)

In addition, normal wear or any other failure will not affect the basic operation of the product. Any external scratches, stains or natural mechanical wear does not represent a defect in the product.

8. Troubleshooting

Perform troubleshooting according to the solutions in the table below. Contact the after-sales service if these methods do not work.
Collect the information below before contacting the after-sales service, so that the problem scan be solved quickly.

- Inverter information like serial number, firmware version, installation date, fault time, fault freguency,etc.
- Installation environment, including weather conditions, whether the PV modules are sheltered or shadowed, etc. It is recommended to provide some photos and videos to assist in analyzing the problem.
- Utility grid situation.

9. APP Download the APP

Method 1: Access https://download.felicitysolar.com using the mobile phone browser and download the latest installation package.
Method 2: Scan the following QR code and download the latest installation package.

Please refer the Fsolar End user manual, register the installer and create a plant and owner (skip this step if the account has been created). You can obtain the Fsolar End user manual by scanning the following QR code.

10. Warning Code

When fault event happens, the fault LED is flashing. At the same time, warning code, icon ⚠ is shown on the LCD screen.

Warning Code	Warning Information	Trouble shooting
2	Battery Under Voltage Alarm	Battery voltage is too low,the battery should be charged
3	Battery SOC Low Alarm	Battery voltage is too low or Battery SOC is too low, the batteryshould be charged
15	Heat Sink Overtemperature Derating Alarm	Reduce the ambient temperature of the device
16	Internal Environment Overtemperature Derating Alarm	Reduce the ambient temperature of the device
17	AFCI Communication Alarm	The AFCI communication is abnormal,check AFCI wiring
18	External Fan Alarm	External fan malfunction,check fan for proper functioning
22	Internal Fan Alarm	Internal malfunction,check fan for proper functioning
23	Meter Communication Alarm	The Meter communication is abnormal,check AFCI wiring
24	External CT Sensor Reverse	Check the connection of CT is correctly
26	Software and Hardware Versions Do Not Match	The inverter will halve the power,Seek help from us.

11. Fault Code

This chapter describes the fault alarm and fault code for quick troubleshooting.

Warning Code	Warning Information	Trouble shooting
01	PV Overvoltage Fault	The voltage of the PV is too high, check the voltage of the string
05	PV Overcurrent Fault	The current of the PV is too large, check the string current
09	PV Reverse Connection Fault	PV string positive and negative connection, check the string wiring
13	PV Arc Fault	Reserved
17	Battery Overvoltage Fault	Battery voltage is too high,the battery should be discharged
19	Battery Undervoltage Fault	Battery voltage is too low,the battery should be charged
20	Battery Over Current Fault	Battery current is too high,shutdown and restart
26	Battery SOC Low Fault	Battery SOC is too low,the battery should be charged
38	Bus Overvoltage Fault	Bus voltage is too high,shutdown and restart
40	Bus Undervoltage Fault	Bus voltage is too low,shutdown and restart
41	Positive and Negative Bus Imbalance Fault	Positive bus voltage does not match negative bus voltage, shutdown and restar
42	Bus Soft Start Fault	Bus voltage fails to rise normally at startup,shutdown and restart
44	Balanced Bridge Overcurrent Fault	Balanced bridge current is too high,shutdown and restart

49	Inverter Self Check Fault	Reserved
50	Inverter Soft Start Fault	Inverter voltage fails to rise normally at startup,shutdown and restart
51	Inverter Voltage Fault	Inverter voltage is too high,shutdown and restart
52	Inverter Overcurrent Fault	Inverter current is too high,check the given power and load size
54	Inverter Short Circuit Fault	Short circuit at inverter,shutdown and restart
55	Inverter Voltage DC Component Fault	Inverter voltage DC component is too high,shutdown and restart
56	Inverter Current DC Component Fault	Inverter current DC component is too high,shutdown and restart
57	Grid Overvoltage Fault	The grid voltage is too high,check whether the grid voltage is within the normal range
58	Grid Undervoltage Fault	The grid voltage is too low,check whether the grid voltage is within the normal range
59	Grid Over-frequency Fault	The grid frequency is too high,check whether the grid frequency is within the normal range
60	Grid Underfrequency Fault	The grid frequency is too low,check whether the grid frequency is within the normal range
61	Grid Reverse Sequence Fault	The grid phase sequence is reversed,check the grid phase sequence wiring
62	Grid Overload Fault	The load of the grid access is too large,and the load should be reduced
65	Load Overload Fault	The load exceeds ,the load should be reduced
70	IGBT Over-temperature Fault	Inverter device temperature is too high

71	Ambient Overtemperature	The ambient temperature of the inverter is too high
72	Fan Fault	Fan is faulty,check whether the fan is normal
77	EEPROM Fault	There was an error with the EEPROM write
78	12V Auxiliary Power Supply Fault	Failure of 12V auxiliary power supply
79	CT or Hall Open Circuit Fault	current sensing device is faulty,check CT or Hall element connections
80	Main and Auxiliary DSP CommunicationFault	There is an error in the DSP communication,try to upgrade the software
81	MCU Communication Fault	There is an error in the MCU communication, try to upgrade the software
83	Leakage Current Fault	The leakage current of the inverter is too large,check the wiring of the inverter
84	BUS Insulation Impedance Fault	The insulation of the BUS string is abnormal
88	GEN Relay Fault	Gen relay not closing properly causing open circuit,or Gen relay not properly disconnected causing short circuit,shutdown and restart
89	Grid Relay Fault	Grid relay not closing properly causing open circuit,or Grid relay not properly disconnected causing short circuit,shutdown and restart
90	Inv Relay Fault	Inv relay not closing properly causing open circuit,or Inv relay not properly disconnected causing short circuit,shutdown and restart
93	PWM SYNC Fault	The inverter is connected to abnormal parallel communication
94	Parallel CAN Communication	The inverter is connected to abnormal parallel communication
95	Parallel Host loss Fault	Parallel host disconnects from the system,check whether the hosts is normal

96	Zero SYNC Fault	The inverter is connected to abnormal parallel communication
97	Master Clash Fault	There is more than two Parallel host , check whether the hosts is normal
98	GEN Overvoltage Fault	The generator voltage is too high,check whether the generatord voltage is within the normal range
99	Grid Undervoltage Fault	The generator voltage is too low,check whether the generator voltage is within the normal range
100	Grid Over-frequency Fault	The generator frequency is too high,check whether the generator frequency is within the normal range
101	Grid Underfrequency Fault	The generator frequency is too low,check whether the generator frequency is within the normal range
102	Grid Reverse Sequence Fault	The generator phase sequence is reversed,check the generator phase sequence wiring
103	GEN Overload Fault	The generator exceeds ,the generator should be reduced
104	BMS Com Circuit Fault	BMS fails to communicate normally,check the BMS communication cable
106	Remote Off	Remotely shutdown It means the inverter is remotely controlled
107	Mode Change	1 When the grid type and frequency have changed it will eport F65. 2. When the battery mode has been changed to "No battery" mode,it will report F65.
108	Flash Data Missing	Remotely shutdown It means the inverter is remotely controlled

12 Appendix

Model	IVGM 20KLP3G1	IVGM 18KLP3G1	IVGM 16KLP3G1	IVGM 15KLP3G1	IVGM 14KLP3G1
Battery Input Data					
Battery type	Li-Ion/Lead-acid				
Battery Voltage Range	40~60V				
Max.charging current	350 A	330 A	300 A	280 A	260 A
Max. discharging current	350 A	330 A	300 A	280 A	260 A
Charging Curve	3 Stages/Equalization				
Charging Strategy for Li-Ion Battery	Self-adaption to BMS				
PV String Input Data					
Max. PV Input Power	32 kW	28.8 kW	25.6 kW	24 kW	22.4 kW
Max. PV Input Voltage	800V				
Start-up Voltage	160V				
MPPT Voltage Rang	160~650V				
Rated DC Input Voltage	550V				
Full Load DC Voltage Range	550~800V	500~800V	445~800V	416~800V	389~800V
Max. Operating PV Input Current	36+36(A)				
Max. Input Short-Circuit Current	54+54(A)				
No. of MPP Trackers /No. of Strings MPP Tracker	2/2+2				
Max, Inverter Backfeed Current to The Array	0				
AC Input/Output Data					
Rated AC Input/Output Active Power	20 kW	18 kW	16 kW	15 kW	14 kW
Max. AC Input/Output Apparent Power	22 kVA	19.8 kVA	17.6 kVA	16.5 kVA	15.4 kVA
Peak Power (off-grid)	2 times of rated power, 10s				
Rated AC Input/Output Current	28.9 A	26.1 A	23.2 A	21.8 A	20.3 A
Max.AC Input/Output Current	31.9 A	28.7 A	25.5 A	23.9 A	22.3 A
Max. Continuous AC Passthrough (grid to load)	70A				
Max. Output Overcurrent Protection	92A				
Rated Input/Output Voltage/Range	220/380,230/400Vac(-20%~+15%)				
AC Wiring Mode	3L+N+PE				
Rated Input/Output Grid Frequency /Range	50 /60 Hz(45~55Hz/55~65Hz)				
Power Factor Adjustment Range	<3%(of nominal power)				
Total Current Harmonic Distortion THDi	0.8(leading) to 0.8(lagging)				
DC Injection Current	<0.5% In				

Efficiency	
Max. efficiency	98%
Euro efficiency	97.1%
MPPT efficiency	>99%
Equipment Protection	
DC Polarity Reverse Connection Protection	YES
AC Output Overcurrent Protection	YES
AC Output Overvoltage Protection	YES
AC Output Short Circuit Protection	YES
Thermal Protection	YES
DC Terminal Insulation Impedance Monitoring	YES
DC Component Monitoring	YES
Ground Fault Current Monitoring	YES
Arc fault circuit interrupter (AFCI)	YES
power Network Monitoring	YES
Island Protection Monitoring	YES
Earth Fault Detection	YES
DC input Switch	YES
Overvoltage Load Drop Protection	YES
Residual Current (RCD) Detection	YES
Surge Protection Level	TYPE II(DC), TYPE II(AC)
Certification and Standards	
Grid Regulation	NRS 097-2-1,VDE4105,EN50549-1,AS 4777.2,GB /T 34120,GB/T 34133,GB/T 34129
Safety EMC / Standard	IEC/EN 61000-6-1/2/3/4,IEC/EN 62109-1,IEC/EN 62109-2
General Date	
Net Weight	49.5kg
Gross Weight	61.5kg
Product Dimension	750x450x268mm
Package Dimension	895x594x401mm
Protection Degree	IP65
Operating Temperature Range	-40 to 60 ℃ (>45 ℃ derating)
Humidity	0 ~ 95 % (No condensation)
Cooling	Smart cooling
Communication with BMS	RS485, CAN
Monitor module	WiFi/4G
Installation Style	Wall-mounted
Warranty	5 Years/10 Years the Warranty Period Depends the Final Installation Site of Inverter More Info Please Refer to Warranty Policy