

USER GUIDE

IVGM60KHP3G2-480-US

IVGM50KHP3G2-480-US

IVGM40KHP3G2-480-US

IVGM30KHP3G2-208-US

IVGM20KHP3G2-208-US



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ABOUT THIS MANUAL

This manual provides installation, operation, maintenance, and troubleshooting instructions for the Felicity Solar IVGM20-60KHP3G2-480-US Split-Phase Hybrid Inverter.

This document is intended for qualified personnel only.



Read this manual carefully before installing, operating, or servicing the equipment. Failure to follow the instructions and safety precautions in this document may result in equipment damage, serious injury, or death.

APPLICABLE PRODUCT MODELS

This manual applies to the following models:

- IVGM60KHP3G2-480-US
- IVGM50KHP3G2-480-US
- IVGM40KHP3G2-480-US
- IVGM30KHP3G2-208-US
- IVGM20KHP3G2-208-US

IMPORTANT NOTICE

Verify the inverter grid configuration before connecting the system to the utility grid.

Grid frequency and operating parameters may vary depending on the destination country or utility requirements.

Information included in this Installation Guide speaks only as of the Effective Date and is qualified, in its entirety, by the Disclaimer referred to below and by the terms of any applicable Limited Warranty.

DISCLAIMER

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For the latest product documentation, firmware, and technical information, visit:

<https://www.felicitysolar.com>

Technical Support:

felicitysupport@felicitysolar.com

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1. Important Safety Instructions

1.1 General Safety

This manual contains important safety instructions that must be followed during installation, operation, and maintenance of the inverter system.

Only qualified personnel are permitted to install, commission, service, or troubleshoot this equipment.

Qualified personnel must:

- Be trained in electrical safety procedures
- Understand the operation of photovoltaic and energy storage systems
- Be familiar with applicable electrical codes and regulations
- Use appropriate personal protective equipment (PPE)

Improper installation or operation may result in:

- Electric shock
- Arc flash
- Fire hazard
- Equipment damage

1.2 Safety Symbols

Symbols	Name	Instruction
	Danger	Indicates a hazardous situation that will result in serious injury or death if not avoided.
	Warning	Indicates a situation that may result in equipment damage if not avoided.
	Electrostatic sensitive	Indicates that damage may occur if not follow the relative requirements.
	Hot surface	Indicates a hot surface hazard. Do not touch the sides of the device during operation.
	Earth terminal	Indicates that the inverter must be reliably grounded before operation.
	Caution	Indicates that DC and AC circuit breakers must be disconnected, and at least 5 minutes must elapse before wiring or inspection.
NOTE	Note	Indicates procedures or actions required to ensure proper operation.
	FCC mark	Indicates the inverter meets US electromagnetic interference standards, mandatory for US market sales.
	ETL C/US mark	Indicates the inverter meets US & Canadian electrical safety standards certified by Intertek, eligible for market access in US and Canada.
	EU WEEE mark	Indicates that the product must not be disposed of as household waste.

1.3 Notices

ATTENTION

Read all instructions and cautionary markings in this document and on the equipment before installing this inverter. Failing to follow any of these instructions may also void the limited warranty provided by Felicity Solar.

All installations must conform to the laws, regulations, codes and standards applicable in the jurisdiction of installation.

Before starting an installation, consult a local building or electrical inspector for current requirements. Local codes may vary but are adopted and enforced to promote safe electrical installations. A permit may be needed to do electrical work, and some codes may require an inspection of the electrical work. Felicity Solar is not responsible for system design or installation and makes no representations regarding system performance, reliability or compliance with local or other codes or requirements.

GENERAL

WARNING: Risk of electric shock or fire. Installation, service, and replacement must be performed by qualified personnel only.

WARNING: Disconnect all power sources before installation or service. Verify power is off using a properly rated voltage tester and ensure no residual charge remains. Reinstall all covers and doors before energizing the equipment.

WARNING: Do not install damaged equipment or insert foreign objects into the equipment.

WARNING: Do not expose the equipment to open flame.

WARNING: Do not disassemble, modify, or repair the equipment except as specified in this manual. There are no user-serviceable parts inside. Contact the installer for service.

WARNING: Do not use this equipment for life-support systems, medical equipment, or other applications where failure could result in injury or loss of life.

CAUTION: Do not use solvents or expose the equipment to flammable or corrosive chemicals or vapors. Prevent petroleum-based substances from contacting nonmetallic parts.

CAUTION: Use only approved parts and accessories.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

INSTALLATION AND USE

WARNING: Risk of electric shock or fire. Use only components approved for dry locations.

WARNING: Ensure all wiring is correct, secure, and free from damage before energizing the equipment.

WARNING: Verify all DC disconnects are OFF before making connections. Check all wiring before applying power.

WARNING: Disconnect and de-energize all wiring before maintenance or cleaning.

WARNING: Use the equipment only as specified by the manufacturer. Improper use may result in injury, death, or equipment damage.

CAUTION: Do not connect the grid to the LOAD output terminal.

CAUTION: Do not exceed 1000 Voc on any MPPT input.

CAUTION: Connect only one conductor to each inverter input terminal.

ENVIRONMENTAL CONDITIONS

WARNING: Operate the equipment only within an ambient temperature range of -40 to 60 °C (> 45 °C derating)

WARNING: Install the equipment in a dry location protected from flooding and water exposure, including sprinklers, downspouts, and faucets.

TRANSPORTATION AND HANDLING

WARNING: Handle the equipment carefully during transport and keep it in the original packaging until installation.

WARNING: Risk of injury or death. Use proper lifting methods and equipment when moving battery modules and components.

REQUIREMENTS FOR INSTALLATION PERSONNEL

All work MUST comply with local code, regulations, and industry standards. The installation of this inverter can only be completed by qualified people with appropriate qualifications as determined by the local AHJ.



DO NOT exceed 1000 Voc on any MPPT on this inverter.

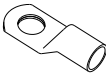
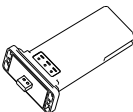
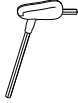
2. Felicity Solar: At First Glance

2.1 Inspect Shipment

The box should include all items shown in the component guide. If there is damage or missing parts, immediately contact Felicity Solar Technical Support at: **felicitysupport@felicitysolar.com**.

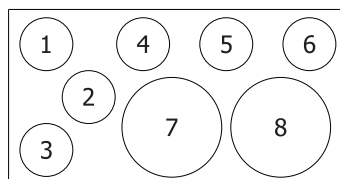
2.2 Components

This system includes the following components:

1  Inverter×1	2  User manual×1	3  Warranty card×1	4  Quick installation guide×1
5  SC-shaped terminal (SC25-6)×4	6  WiFi module×1	7  RJ45 terminal×6	8  Meter(optional)×1
9  Expansion screw×4	10  M5 combination screw×2	11  M10 T-wrench×1	12  M5 T-wrench×1
13  Ring×2	14  CT×3	15  ring 1,2,3 Magnetic ring for communication cable of BMS and Meter×3 (23x33x15 mm)	16  ring 4,5,6 Magnetic ring for CT x3 (31x29x19 mm)
17  ring 7,8 Magnetic ring for AC wires x2(50x65x25 mm)	18  Parallel cable×2		

NO.	Name	Description	Quantity
1	Inverter	Inverter	1
2	User manual	User manual	1
3	Warranty card	Warranty card	1
4	Quick installation guide	Quick installation guide	1
5	SC-shaped terminals	Used for battery connection(SC25-6)	4
6	WiFi module	For installing the WIFI module	1
7	RJ45 terminal	Used for creating custom communication cables	6
8	Meter	Meter(Optional)	1
9	Expansion screw	Used for securing the product's wall mount	4
10	M5 combination screw	Fixed wall mounts and inverter	2
11	M10 T-wrench	Used for internal connection of the wiring bin	1
12	M5 T-wrench	Used for cover disassembly or internal ground connection	1
13	Ring	Used to connect wall hooks	2
14	CT	Anti backflow	3
15	Magnetic ring	For communication cable of BMS and Meter(23x33x15 mm)	3
16	Magnetic ring	Magnetic ring for CT(31x29x19 mm)	3
17	Magnetic ring	Magnetic ring for AC wires(50x65x25 mm)	2
18	Parallel cable	Used for parallel wiring	2

Packing box of magnetic ring



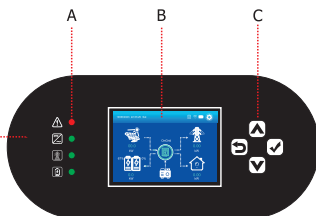
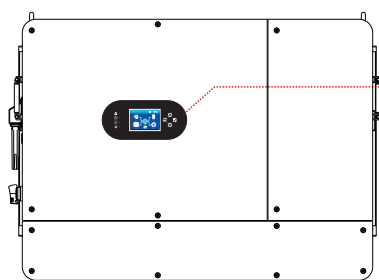
1,2,3: 23x33x15 mm

4,5,6: 31x29x19mm

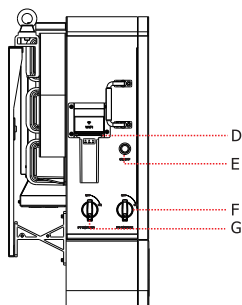
7,8: 50x65x25 mm

2.3 Inverter Components and Inputs

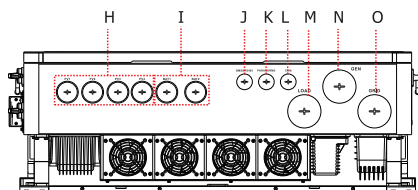
This system includes the following components:



Component	Name
A	Inverter Indicators
B	LCD Display
C	Function Buttons

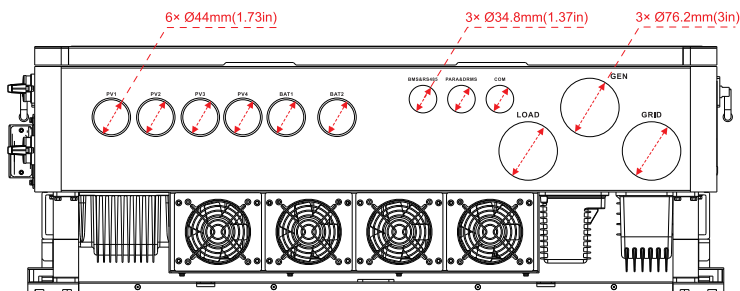
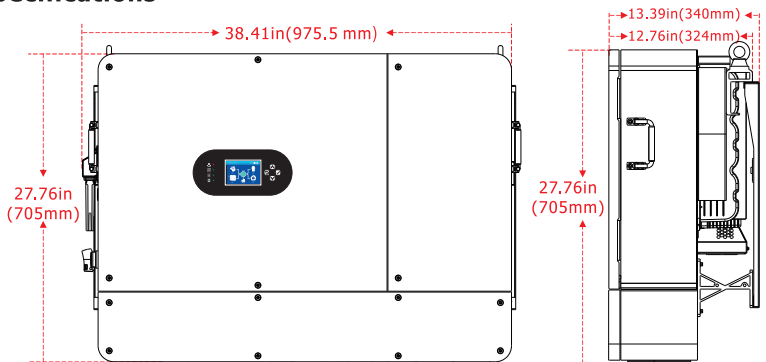


Component	Name
D	WIFI Communication Port
E	Power on/off
F	PV Switch 1
G	PV Switch 2

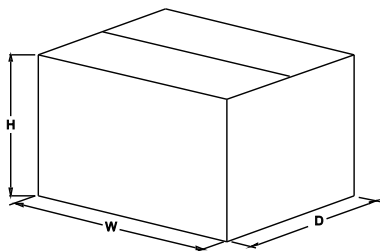


Component	Name
H	PV Input Connection Port
I	Battery Connection Port
J	BMS & Rs485 Port
K	PARA & DRMS Port
L	COM Port
M	LOAD Connection Port
N	GEN Connection Port
O	GRID Connection Port

2.4 Specifications



Hole Dimension(unit:inch)



Paper packages dimension

Packages dimension and gross weight

Model	H (mm/in)	W (mm/in)	D (mm/in)	Net Weight (KG)	Gross Weight (KG)
IVGM60KHP3G2-480-US IVGM50KHP3G2-480-US IVGM40KHP3G2-480-US IVGM30KHP3G2-208-US IVGM20KHP3G2-208-US	470mm (18.50 in)	1118mm (44.02 in)	855mm (33.66 in)	93.5	115.5

2.4.1 Datasheet

Model	IVGM60KHP3G2 ~480-US	IVGM50KHP3G2 ~480-US	IVGM40KHP3G2 ~480-US	IVGM30KHP3G2 ~208-US	IVGM20KHP3G2 ~208-US
Battery Input Data					
Battery Type	LFP (LiFePO4)				
Battery Voltage Range	160~800Vd.c.				
Max. Charging/Discharging Current	50+50(A)				
Number of battery input	2				
Charge Controller Type	BMS Adaptive Controlled				
BMS Communication	CAN/RS485				
PV String Input Data					
Max. PV Input Power	80 kW				
Max. PV Input Voltage	1000Vdc				
Min. PV Input Voltage	150Vdc				
Start-up Voltage	180Vdc				
Rated PV Input Voltage	600Vd.c.				
MPPT Range	150~850Vd.c.				
Full Load PV Voltage Range	555~850Vd.c.	555~850Vd.c.	555~850Vd.c.	555~850Vd.c.	555~850Vd.c.
PV Input Current	36+36+36+36 (A)				
Max. PV Isc	55+55+55+55 (A)				
No.of MPP Trackers	4				
No.of Strings per MPP Tracker	2				
AC Input/Output Data					
Max. AC Input/Output Apparent Power	60 kVA	50 kVA	40 kVA	30 kVA	20 kVA
Max. AC Input/Output Current	72.2 A	60.2 A	48.1 A	83.3 A	55.5 A
Max. AC Coupled Input	60 kVA			30 kVA	
Rated AC Voltage	277/480 Vac (-20%~+15%)			120/208 Vac(-20%~+15%)	
AC Wiring Mode	3L+N+PE				
Rated AC Frequency	50 /60 Hz (45~55Hz/55~65Hz)				
Power Factor	0.8(leading) to 0.8(lagging)				
Peak Power (off-grid)(W)	1.5 time of rated power, 10S				
Backup Transfer Time	10ms(adjustable)				
Max. AC Passthrough Current (grid to load)(A)	200(A)				
Synchronization	35A				
Trip Limit and Trip Time Accuracy	Voltage:1%; Frequency:0.01Hz; Time:1% of measured duration, but not less than 50ms; Active power: 5% Srated, Reactive power:+ 5% Srated				
Design (DC to AC)	Transformerless DC				
Parallel Compatible	Up to 12 in parallel				

Efficiency	
CEC Efficiency	96.5%
Max Efficiency	97.6%
MPPT Efficiency	99.9%
Protection	
PV Input Lightning Protection	Integrated
PV String Input Reverse Polarity Protection	Integrated
PV DC Disconnect Switch-NEC 240.15	Integrated
PV Rapid Shutdown Control-NEC 690.12	Integrated
PV Arc Fault Detection-NEC 690.11	Integrated
Battery Input Lightning Protection	Integrated
Battery Input Reverse Polarity Protection	Integrated
Ground Fault Detection-NEC 690.41	Integrated
Residual Current Monitoring Unit	Integrated
Output Over Current Protection	Integrated
Output Shorted Protection	Integrated
Output Over Voltage Protection	Integrated
Anti-islanding Protection	Integrated
AC Output Lightning Protection	Integrated
Safety and Standards	
Surge Protection Level	TYPE II(DC), TYPE III(AC)
Over Voltage Category	OVC II(DC), OVC III(AC)
Certification Standard	UL 1741-2021 (UL1741SB), CSA C22.2 No 107.1-16, IEEE 1547-2018 & 1547a-2020 & 1547.1-2020 (SRD V2.0), UL 1741 CRD-PCS, UL1699B, CEC, SGIP, CSIP
General Data	
Net Weight	93.5 KG
Gross Weight	115.5 KG
Product Dimension	975.5*705*324mm
Package Dimension	1118*855*470mm
Protection Degree	NEMA 4X/IP65
Operating Temperature Range	-40 to 60 °C (> 45 °C derating)
Humidity	0 ~ 95% (No condensation)
Cooling	Smart cooling
Altitude	3000 m (> 2000 m derating)
Monitor module	WIFI/Bluetooth
Installation Style	Wall-mounted
Warranty	10 years

2.5 Connection Requirements

2.5.1 Inverter Torque Values for Terminals



Do not use impact drivers to tighten any fasteners on the Felicity Solar.



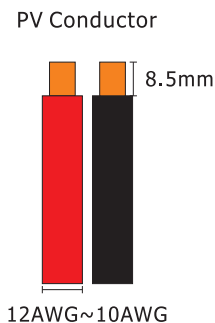
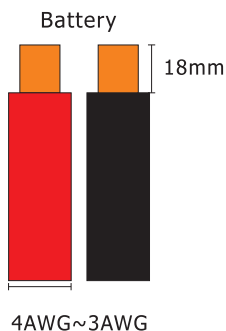
All wire runs should be sized to be at or below a 2.5% current drop at full load. Wire size must comply with your local electrical code.

Field Wiring

GRID Port			LOAD Port			GEN Port			Battery Port			Grounding Port		
Wire Size (AWG)	Cable (mm ²)	Torque (max N.M)	Wire Size (AWG)	Cable (mm ²)	Torque (max N.M)	Wire Size (AWG)	Cable (mm ²)	Torque (max N.M)	Wire Size (AWG)	Cable (mm ²)	Torque (max N.M)	Wire Size (AWG)	Cable (mm ²)	Torque (max N.M)
0~1	50	17	3~4	20~25	17	0~1	50	17	4	16	4.8	10	16	2.0

2.5.2 Sensors and Communications Requirements

Component	Wire Size Range (AWG/mm ²)	Max Distance
BMS Communications	CAT.5E 24AWG/ 0.205 mm ²	2m extendable
Smartmeter Communication	CAT.5E or better	1000(theoretical length)
RJ45 Parallel Communication	CAT.5E 24AWG/ 0.205 mm ²	2m extendable

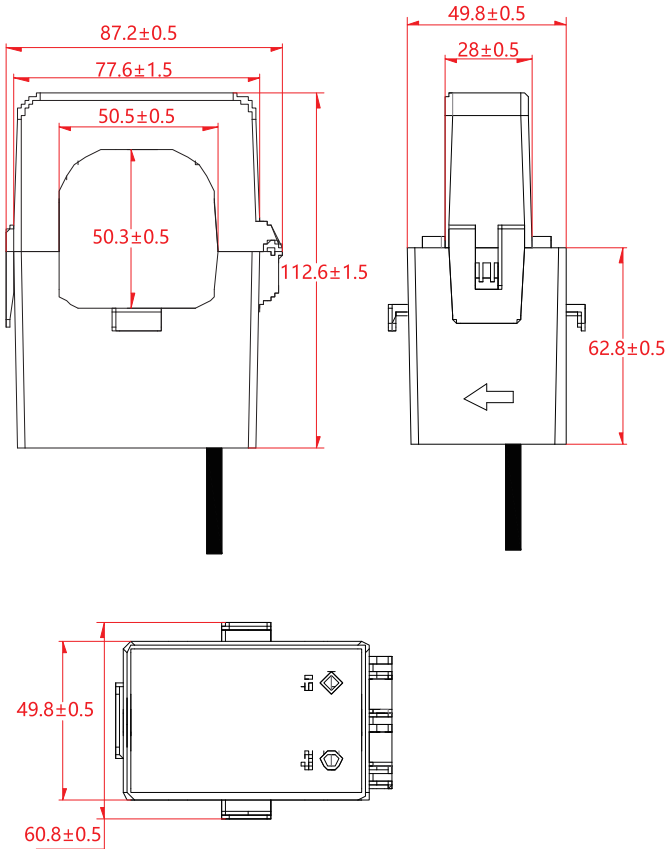


2.5.3 CT Sensors (Included)

1. Standard cable length is 4m;
2. The default transformation ratio for CT is 6000 : 1;
3. The default range of CT is 300A;

The external CT has a ratio of 300A : 5A, providing the first-stage ratio of 60 : 1.

The internal circuit of terminals 1-6 provides conversion ratio of 5A:50mA, providing the second-stage ratio of 100 : 1. Therefore, the total CT Ratio is 6000 : 1.



3. Mechanical Installation

3.1 Installation Requirement

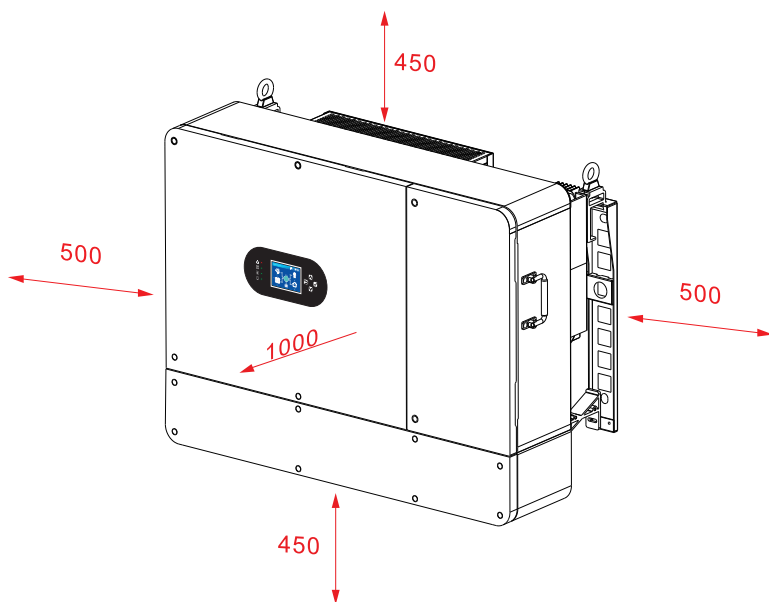
Install the inverter in a clean, dry, and well-ventilated location.

The installation area must:

- Be protected from direct sunlight
- Be free from corrosive gases
- Allow sufficient airflow
- Prevent unauthorized access
- Provide adequate maintenance clearance

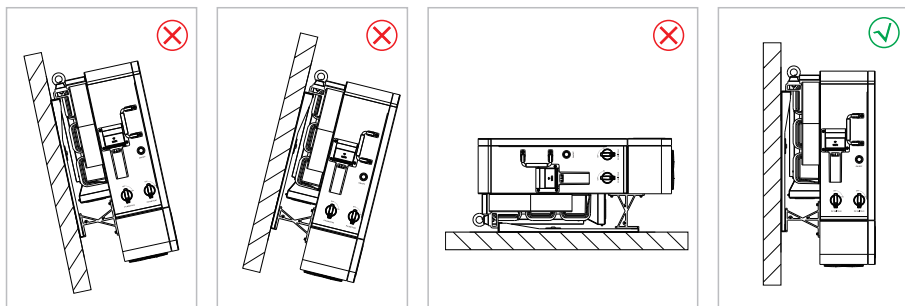
3.2 Mounting Clearances

Considering the dimensions of the inverter, find a suitable location for the system. There must be at least 450mm of vertical clearance and 500mm of side clearance for proper heat dissipation.



Unauthorized modifications are strictly prohibited. Any damage to the equipment caused by failure to install according to this instruction manual will not be covered under warranty. PROTECT THE LCD SCREEN from direct exposure to UV light.

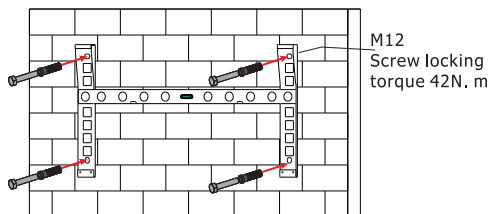
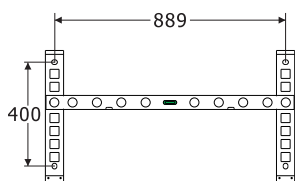
Mount the inverter in the optimal orientation as shown on below.



Unauthorized modifications are strictly prohibited. Any damage to the equipment caused by failure to install according to this instruction manual will not be covered under warranty. Damage to the LCD Screen due to direct sunlight exposure will not be covered by warranty.

3.3 Mounting Procedure

- ✧ Use the Wall Mounting Bracket to mark the drilling positions.
- ✧ Drill four holes at the marked positions using an appropriate drill bit , to a depth of 55–60 mm and a diameter of 16 mm.
- ✧ Align the wall mounting bracket with the 4 holes on the wall and secure it to the wall with 4 expansion screws (included).

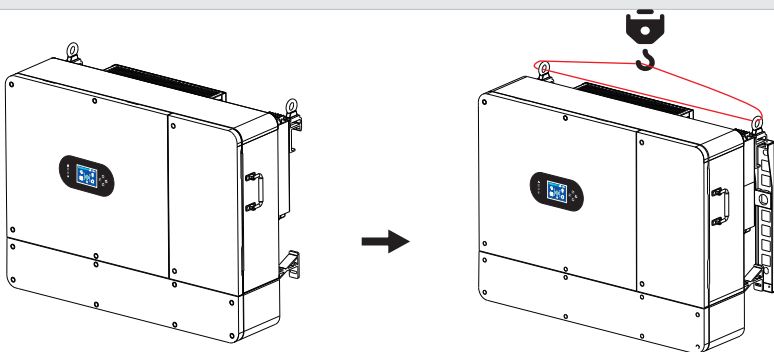


Note: During installation, the bubbles of the level can be aligned with the middle grid to ensure the level of the wall hanging

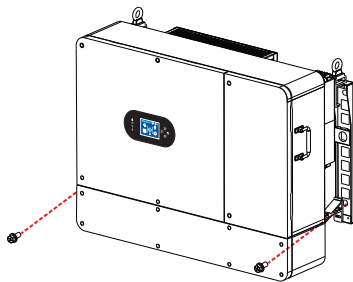
Lift the inverter to suspend it on the installation bracket, We can prevent theft by locking.



- Remember that this inverter is heavy so users must be careful in handling the unit during installation especially when mounting or removing it from a wall.



Adjust the inverter position until the lower holes of the mounting bracket align with the side holes of the inverter. Secure the inverter to the bracket using the supplied M5 combination screws.



Ensure the inverter is firmly supported during installation to prevent dropping. Damage to the inverter caused by improper installation is not covered under warranty.

4. Electrical Connections

4.1 General Requirements

All electrical work must be performed by qualified personnel.

Before making electrical connections:

- Turn OFF all external disconnect devices.
- Verify that all circuits are de-energized.
- Confirm conductor sizing and breaker ratings.
- Ensure compliance with local electrical codes.

4.2 Backup Circuits

The LOAD connected service panel is called the Essential Loads Panel.

You must keep the Essential Loads Panel within the limitations of the unit:

Please refer to section 2.4.1 Datasheet on page 8 for specific values.

Verify that every load circuit power ($P=V \times I$) does not surpass the limits.

Single System Install

A. FOR PARTIAL BACKUP: Connect the output of the back-feed breaker or line side tap (depending on the point of interconnection) to the GRID terminal.
 An external disconnect must be installed between the interconnection and the Felicity Solar. Size the disconnect according to code.

Connect the LOAD output to the Essential Loads Panel. Follow electric code to select proper wire gauge.

B. FOR WHOLE-BUSINESS BACKUP: Connect the utility grid directly to the GRID terminal.
 An external disconnect must be installed between the grid and the Felicity Solar. Size the disconnect according to code.

Connect the LOAD output to the Main Service Panel. Follow electric code to select proper wire gauge.

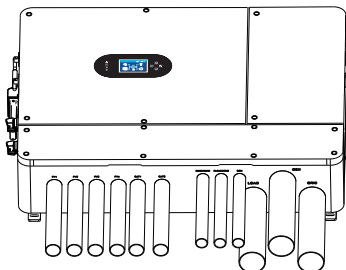
It's possible to connect a generator or an AC coupled source, such as string or micro inverters, to the GEN terminal of the inverter. Only one AC source can be connected to the GEN terminal at a time.

Please refer to section **2.4.1 Datasheet on page 8** for specific specifications

4.3 Conduit Installation Instructions

Before running cables through conduits for wiring, remove the sealing plugs at the corresponding cable ports on the unit. Use the same procedure to fit conduit connectors to all other unused cable hole plugs on the device.

1. Unscrew the sealing plugs pre-installed on the reserved cable knock-out holes at the PV input side of the inverter.
2. Select compliant conduit fittings per local codes.
3. Mount the conduit connector onto the cable hole after removing the plug, then feed cables through to complete subsequent wiring procedures.

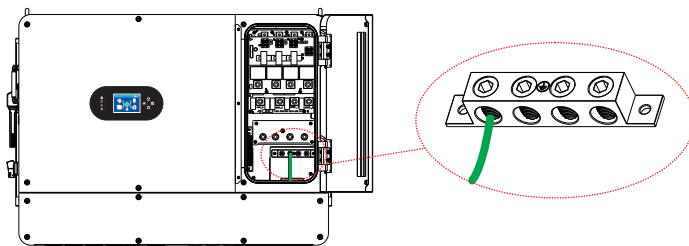


4.4 Grounding Requirements

The inverter must be permanently connected to the protective earth (PE) system.

Improper grounding may result in:

- Electric shock hazard
- Equipment malfunction
- Communication interference
- Fire hazard



The conductor should be made of the same metal as the phase conductors.



Inverter has built-in leakage current detection circuit. The type A RCD can be connected to the inverter for protection according to the local laws and regulations. If an external leakage current protection device is connected, its operating current must be equal to 10mA/KVA or higher, for this series of inverter it should be 500mA or higher, otherwise inverter may not work properly. Inverter caused by improper installation is not covered under warranty.

4.5 Integrating Batteries

 It's best practice to not mix battery banks of different make, model, age, or chemistry. This can have an adverse effect on performance, and in some cases could be hazardous.

1.  Inverter must be OFF while you connect the batteries.
2. Depending on the battery voltage & current limits on section **2.4.1 Datasheet on page 8**, wire up the battery bank in the possible configurations
3. Battery breakers must be OFF when wiring. If your battery bank does not have internal breakers, maintain the necessary safety measures when handling.



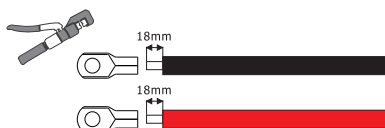
Do not reverse polarity. The system will be damaged, and warranty voided!

4.5.1 Wiring Steps

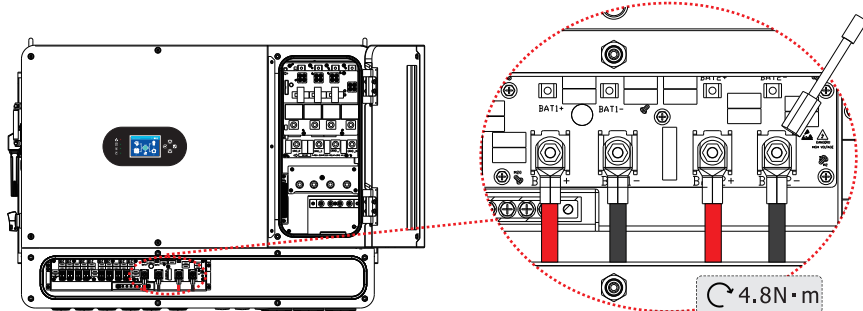
Step 1: Prepare a suitable battery cable according to below table

Inverter Model	Wire Size(AWG)	Cable(mm ²)
IVGM60KHP3G2-480-US IVGM50KHP3G2-480-US IVGM40KHP3G2-480-US IVGM30KHP3G2-208-US IVGM20KHP3G2-208-US	4	16

Step 2: Make battery terminals. Strip cable coat, revealing 18mm length of metal core. Use special crimper to compress battery terminal tightly.

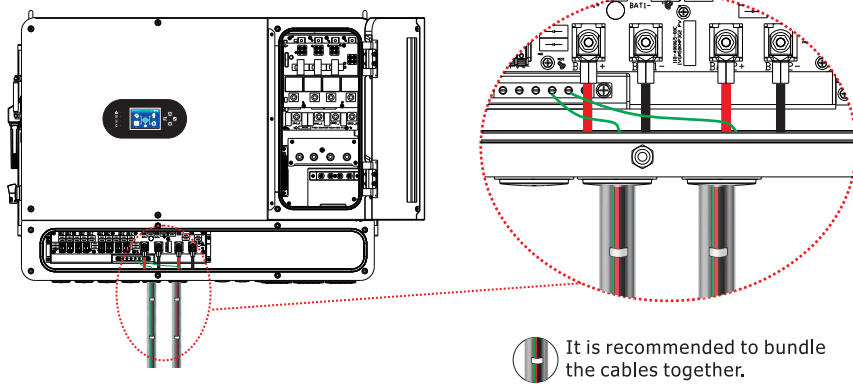


Step 3: Connect the battery terminal to the inverter. Ensure that the battery polarity is connected correctly.



Step 4: Battery Grounding

Bundle one grounding conductor with the battery cable harness for a length of at least **1 m**. Connect one end to the inverter's PE terminal and ground the other end at the nearest suitable grounding point.



It is recommended to bundle the cables together.

4.6 Battery Communication

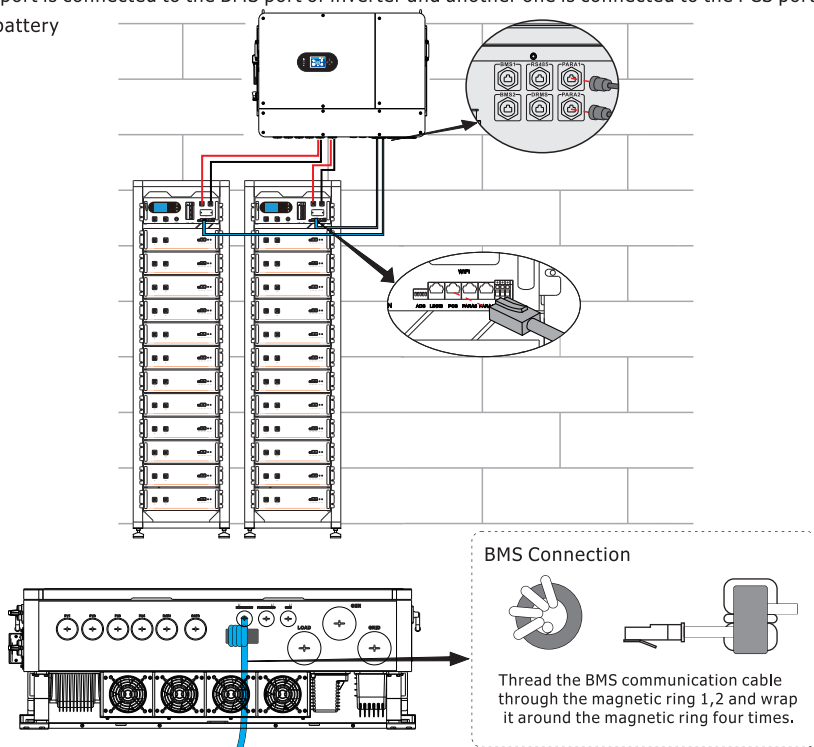
RJ-45 Configurations

This inverter achieves battery communications through a single RJ-45 port labeled “BMS” .

This port combines the RS-485 and CANBus pin configurations shown below.

The communication cable is included in the battery pack accessories, both sides are RJ45 port.

One port is connected to the BMS port of inverter and another one is connected to the PCS port of the battery



Position	Function	
1	/	
2	/	
3	/	
4	BMS/CANH	
5	BMS/CANL	
6	GND	
7	BMS/485A	
8	BMS/485B	



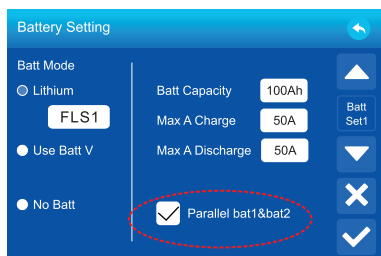
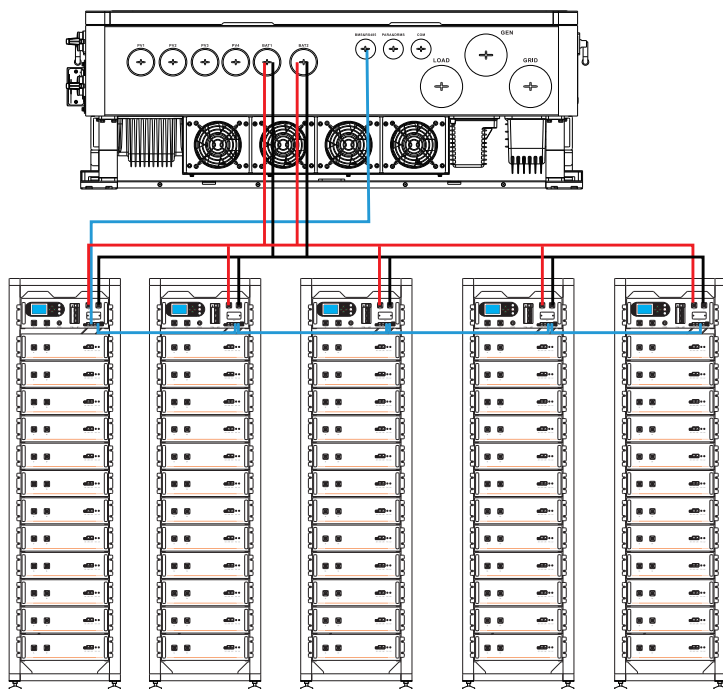
Any damage caused by the improper use of the communication protocols will not be covered by warranty.

4.6.1 Single battery Bank communication

Configure and connect HV batteries, establishing a single communication source from a battery pack. Establish communication by connecting the communication cable to the "BMS1" port of the IVGM inverter.

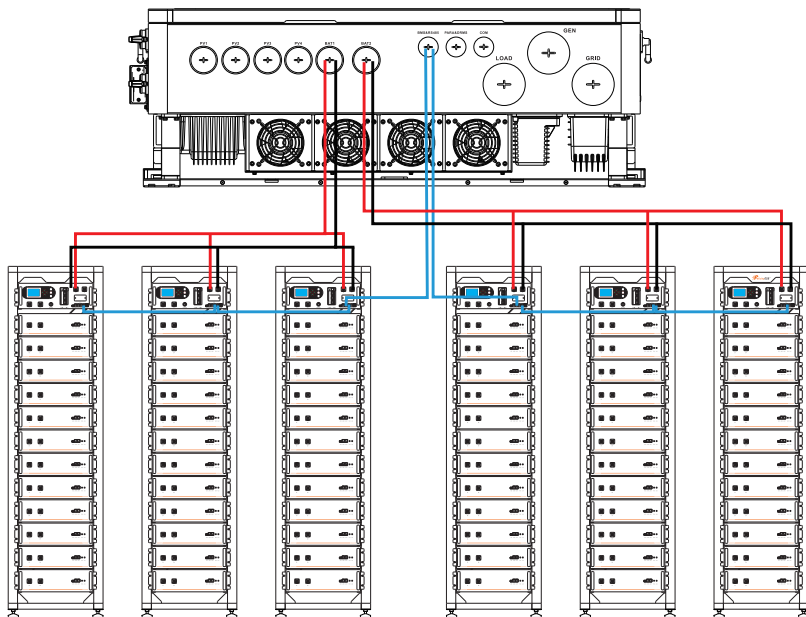


- The **"Parallel bat1 & bat2"** option in the battery settings menu must be enabled, and the batteries must be connected in parallel on the battery ports.
- Parallel bat1 & bat2: When using two battery inputs from the same battery bank, a check must be performed. After activation, the inverter will communicate using a single battery.



4.6.2 Separate Battery Banks Communications

Configure and connect the high-voltage battery to have two battery packs, each with a separate communication source. Establish communication by connecting each communication cable to the BMS ports ("BMS1" and "BMS2") of the IVGM INVERTER.



Battery Setting
⬅

Batt Mode

☐ Lithium

FLS1

☒ Use Batt V

☐ No Batt

Batt Capacity 100Ah

Max A Charge 50A

Max A Discharge 50A

☐ Parallel bat1&bat2

⬆

Batt Set1

⬇

✕

✓

4.7 Connecting PV Modules



Please refer to section on page 8 to configure the appropriate number of PV panels according to different models.

When selecting proper PV modules, please be sure to consider below parameters:

1. Open circuit Voltage (Voc) of PV modules can not exceed Max.PV Input Voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than Min.PV Input Voltage of inverter.

Inverter Model	IVGM60KHP3G2 -480-US	IVGM50KHP3G2 -480-US	IVGM40KHP3G2 -480-US	IVGM30KHP3G2 -208-US	IVGM20KHP3G2 -208-US
PV input Voltage	600V(150V~1000V)				
MPPT Range	150V~850V				
No. of MPP Trackers	4				
No. of Strings MPP Tracker	2				

NOTE:According to NEC Art. 690.43, exposed non-current-carrying metal parts of PV module frames, electrical equipment, and conductor enclosures of PV systems must be connected to an equipment grounding conductor. All grounding conductors and grounding electrodes should be installed according to NEC Art. 690.47 or as required by the AHJ.

For ground-mounted arrays, Felicity Solar recommends installing an auxiliary grounding electrode placed near the array to ensure optimal earth-to-ground resistance of the grounding system. This auxiliary electrode must follow the requirements of NEC Art 250.54.

4.7.1. Pre-connection Steps

- ✧ Turn OFF the grid supply main switch (AC).
- ✧ Turn OFF the DC isolator.
- ✧ Ensure all PV cables are properly prepared.



Safety Instructions

PV modules exposed to sunlight generate voltage. Series-connected modules can produce hazardous high voltage.

Before connecting DC inputs, ensure:

- ✧ The inverter is powered OFF
- ✧ The PV array is covered or isolated



Failure to do so may result in electric shock.



Warning

Do not disconnect PV under load.

Do not turn off the DC isolator while current is flowing.

Electrical Limits

Verify that the PV string open-circuit voltage (Voc) does not exceed the inverter's maximum PV input voltage.

Ensure Correct Polarity:

PV+ (positive)

PV- (negative)

4.7.2. Cable Requirements

To reduce the risk of overheating or injury, use the recommended cable size:

Inverter Model	Wire Size	Cable(mm ²)
IVGM60KHP3G2-480-US IVGM50KHP3G2-480-US IVGM40KHP3G2-480-US IVGM30KHP3G2-208-US IVGM20KHP3G2-208-US	10~12AWG	7mm ² (10AWG)



Cable selection shall comply with local electrical regulations.

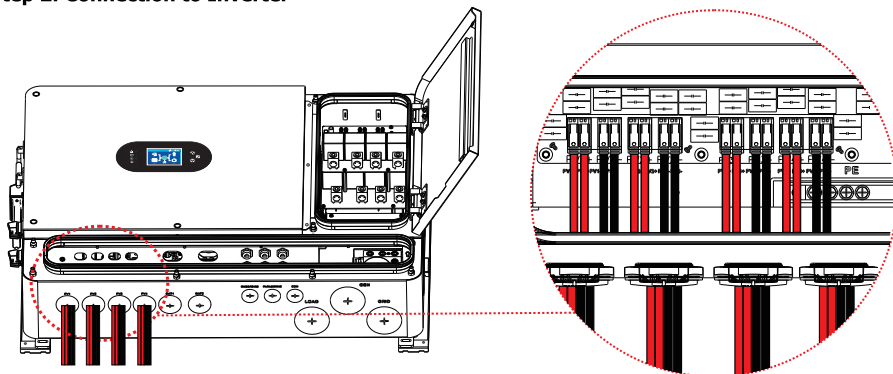
4.7.3. PV Cable Installation

Step 1: Cable Preparation

Strip insulation: 8.5mm



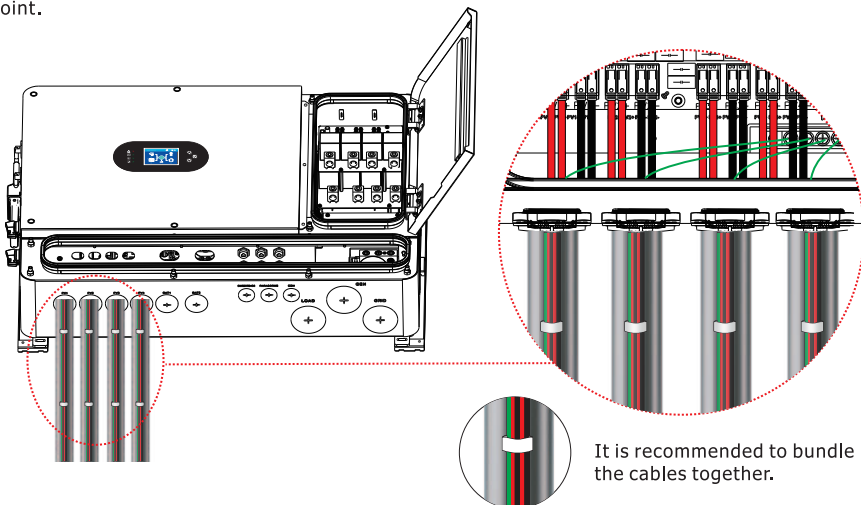
Step 2: Connection to Inverter



Sunlight hits the panels to create voltage, and high voltages in series can be life-threatening. Therefore, before connecting the DC input line, it is necessary to shield the solar panel with opaque material and put the PV switch in the "OFF" state, otherwise, the high voltage of the inverter may lead to a life-threatening situation.

Step 3: PV Grounding

Bundle one grounding conductor with the PV cable harness for a length of at least **1 m**. Connect one end to the inverter's PE terminal and ground the other end at the nearest suitable grounding point.



4.8 Grid, Load and Gen Port Connection

4.8.1. Pre-Installation Requirements



Before connecting the system, dedicated AC circuit breakers must be installed:

- Between the inverter and the grid.
- Between the backup load and the inverter.

This ensures:

Safe disconnection during maintenance.

Protection against overcurrent.

Breaker selection must comply with local regulations.

The recommended ratings are based on the inverter's maximum continuous AC passthrough current, you can refer to section **2.4.1 Datasheet on page 8** for specific value.

The backup-side breaker may be selected according to the actual total load current.



Safety Warning

- All wiring must be carried out by qualified personnel only.
- Use appropriate AC cables that meet local standards.
-  **Using recommended cable specifications reduces the risk of injury and equipment damage.**

4.8.2. Circuit Breaker Selection

Inverter Model	Recommended Breaker
IVGM60KHP3G2-480-US IVGM50KHP3G2-480-US IVGM40KHP3G2-480-US IVGM30KHP3G2-208-US IVGM20KHP3G2-208-US	240A for both LOAD and GRID

4.8.3. Port Definitions

The inverter includes three terminal sections:

Label	Description
Grid	Grid connection (bi-directional input/output, similar to a grid-tied inverter).
Load	Connection for essential loads (lighting, security systems, internet, etc.).
Gen	Generator connection.



Ensure that input and output terminals are not misconnected.

4.8.4. Cable Specifications (Bypass Mode)

Inverter Model	GRID Port			LOAD Port			GEN Port		
	Wire Size (AWG)	Cable (mm ²)	Torque (max) N·m	Wire Size (AWG)	Cable (mm ²)	Torque (max) N·m	Wire Size (AWG)	Cable (mm ²)	Torque (max) N·m
IVGM60KHP3G2-480-US IVGM50KHP3G2-480-US IVGM40KHP3G2-480-US IVGM30KHP3G2-208-US IVGM20KHP3G2-208-US	0~1	50	17	3~4	20~25	17	0~1	50	17

Please follow below steps to implement Grid, Load and Gen port connection:

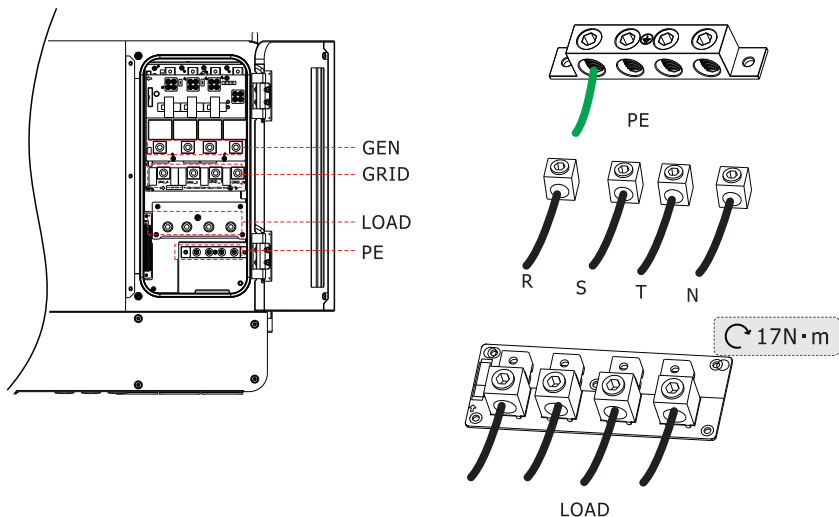
- Before making GRID, LOAD and GEN port connection, be sure to turn off AC breaker or disconnect first.
- Then, prioritize the connection of the PE lines corresponding to GEN, GRID and LOAD to ensure the safety of subsequent power usage.
- Strip the insulation of AC wires by about 10mm, insert AC wires according to polarities indicated on the terminal block and tighten the terminals. Be sure to connect corresponding N wires and PE wires to related terminals as well.
- Make sure all the wires are securely and completely connected.
- Some appliances, such as air conditioners and refrigerators, may need a time delay before reconnecting them after a power outage. This delay allows the refrigerant gas to stabilize and prevents potential damage. Check if your appliance has a built-in time-delay function before connecting it to our inverter. Examples of appliances that may require a delay include:
 - Air conditioners: Balancing refrigerant gas.
 - Refrigerators: Stabilizing the compressor.
 - Freezers: Allowing the cooling system to balance.
 - Heat pumps: Protecting against power fluctuations.

This inverter will protect your appliances by triggering an overload fault if no time delay is present. However, internal damage may still occur. Refer to the manufacturer's documentation for specific time-delay requirements.

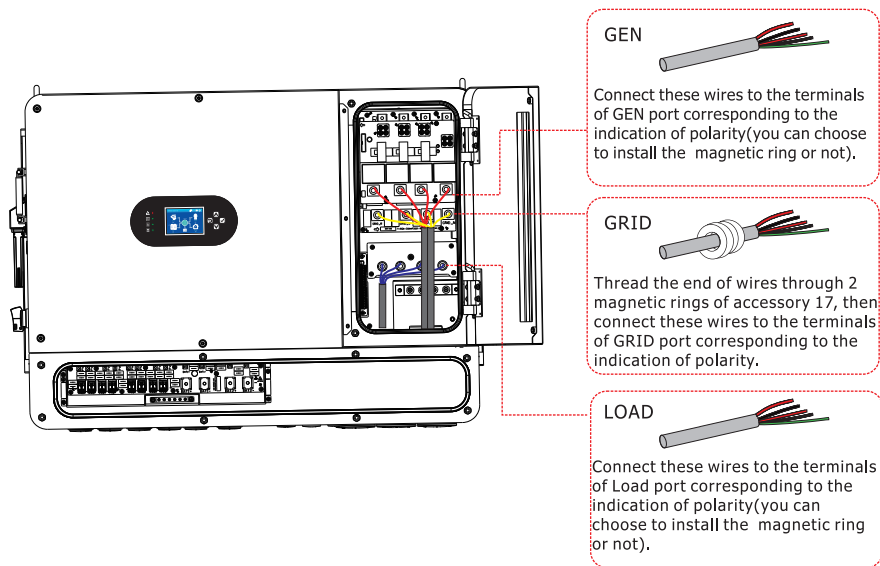


- The power grid, oil engine and load cannot be directly connected to the split-phase power grid, oil engine or equipment. An additional three-phase transformer for split-phase conversion needs to be added

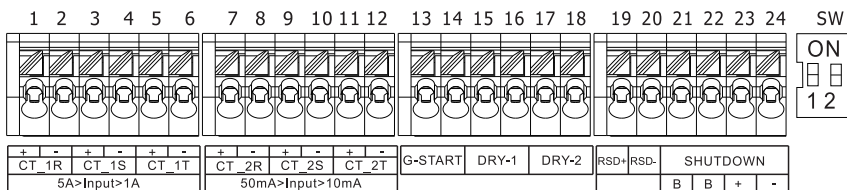
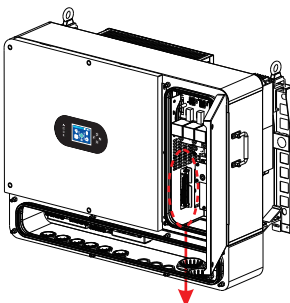
GEN, GRID, LOAD and PE port



GRID, LOAD and GEN port connection with magnetic ring



4.9 Function Port Definition



CT-R (1,2,7,8): current transformer (CT-R) for "zero export to CT" mode clamps on L1 when in three phase system. Polarity sensitive.

CT-S (3,4,9,10): current transformer (CT-S) for "zero export to CT" mode clamps on L2 when in three phase system. Polarity sensitive.

CT-T (5,6,11,12): current transformer (CT-T) for "zero export to CT" mode clamps on L3 when in three phase system. Polarity sensitive.

If the secondary current of CT is within the range of 1A-5A, use terminals 1-6. If the secondary current of CT is within the range of 10mA-50mA, use terminals 7-12.

G-start (13,14): dry contact signal for startup the diesel generator. When the "GEN signal" is active, the open contact (GS) will switch on (no voltage output).

DRY-1 (15,16): dry contact output. When the inverter is in off-grid mode and the "Neutral-Ground Relay" is active, the dry contact will switch on.

DRY-2 (17,18): reserved.

RSD+, RSD- (19,20): when battery is connected and the inverter is in "ON" status, it will provide 12Vdc.

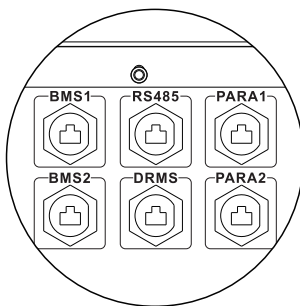
SHUT DOWN (21,22,23,24): if the terminal "B" & "B" (21&22) is short-circuited with wire connection, or there's 12Vdc input at the terminal "+" & "-" (23&24), then the 12Vdc of RSD+ & RSD- will disappear immediately, and the inverter will shutdown immediately.



SW: DIP Switch for communication setting of parallel system.

SW is ON when any of PIN1 or PIN2 is ON, and OFF only when both PIN1 and PIN2 are OFF. In parallel system, set the "SW" according to the following table.

Inv1 (master)	Inv2	Inv3	Inv4	Inv5	Inv6	Inv7	Inv8	Inv9	Inv10	Inv11	Inv12
OFF											
ON	ON										
ON	OFF	ON									
ON	OFF	OFF	ON								
ON	OFF	OFF	OFF	ON							
ON	OFF	OFF	OFF	OFF	ON						
ON	OFF	OFF	OFF	OFF	OFF	ON					
ON	OFF	OFF	OFF	OFF	OFF	OFF	ON				
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON			
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON		
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON



BMS1: BMS port for battery communication port 1.

BMS2: BMS port for battery communication port 2.

RS485: RS-485 port for Meter communication.

DRMS: Logic interface for AS/NZS 4777.2:2020.

PARA1: Parallel communication port 1.

PARA2: Parallel communication port 2. (PARA 1 and 2 are same and have no particular orders)

4.10 DRMS Connection

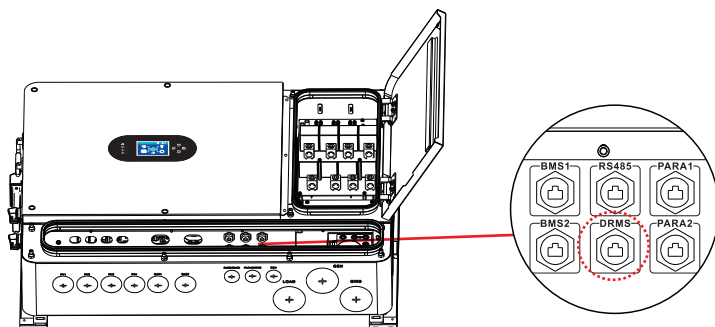
The DRMS (Demand Response Mode System) interface is designed to meet grid compliance requirements in:

- Australia / New Zealand (AS/NZS 4777 – DRED).
- Europe (Remote Shutdown function).
- A factory-installed resistor plug is inserted by default.



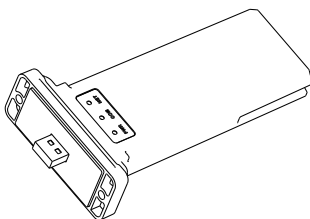
Do not remove the resistor plug unless an external control cable is connected. Improper removal may lead to abnormal inverter operation.

Position	Function	
1	DRM1/5	
2	DRM2/6	
3	DRM3/7	
4	DRM4/8	
5	REF	
6	COM	
7	/	
8	/	

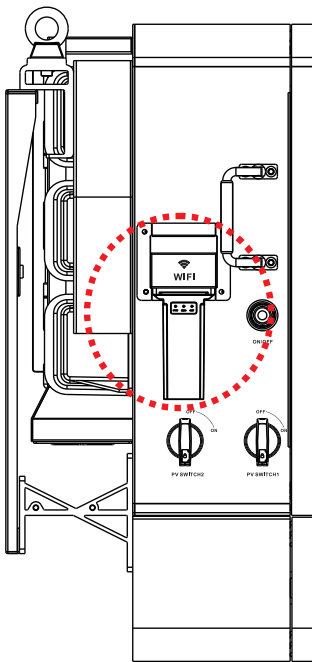


4.10.1. WiFi module

Remote monitoring and software updates require an internet connection through the WI-FI/Bluetooth
Compatible with Wi-Fi & Bluetooth .



For detailed WiFi configuration steps, please refer to the WiFi module manual.



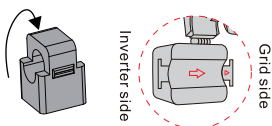
4.11 Only CT Connection(Recommend)

The CT sensors (or limit sensors) enhance system capabilities by enabling the use of the system work modes known as "Zero Export To CT" (Meter Zero) and "Grid Peak Shaving". The CTs will measure and calculate total load demand which the inverter will then use to accurately supply and offset all existing loads (Meter Zero).

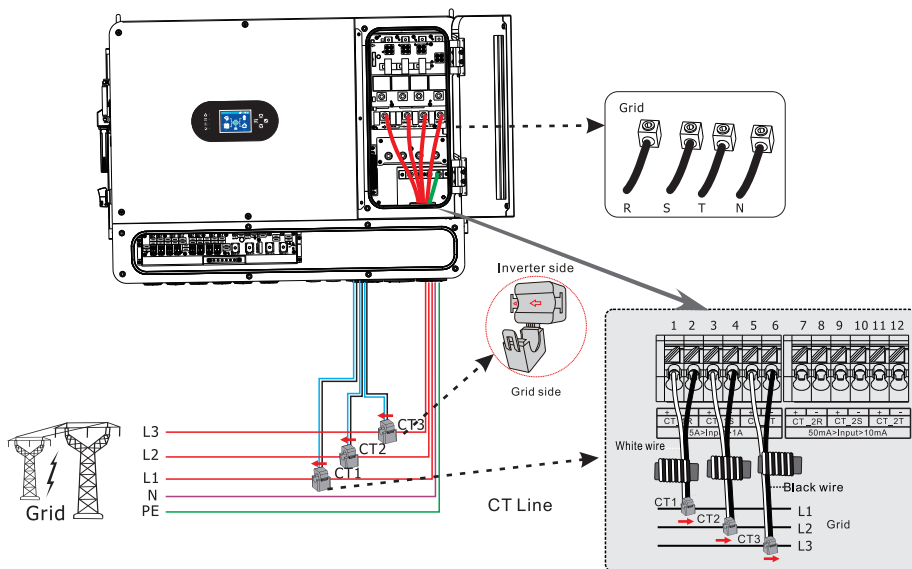
When the distance between the AC distribution box and the hybrid inverter exceeds 10 meters, which means that the wire length of the CT needs to exceed 10 meters, it is recommended to use a smart meter instead of three CTs. If the current to be measured is greater than 300 A, the default three CTs also need to be replaced with smart meters or larger CTs. Please contact the support team to confirm which specification of CT or smart meter to use.



Please use the standard length CT cable; do not extend it yourself, otherwise it will affect the accuracy of the detected data.



Wiring the CT sensor

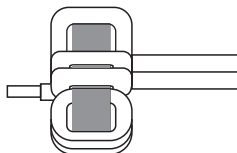
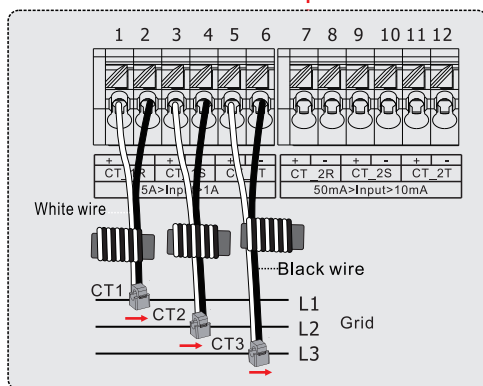
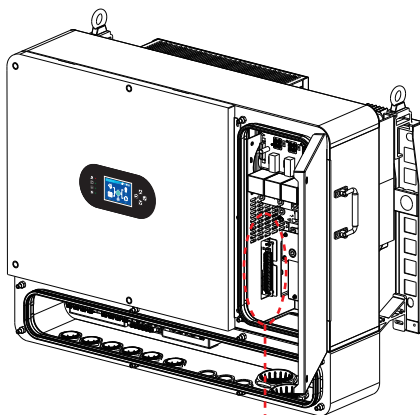


Note: CT Description

1. The default transformation ratio for CT is 6000:1;
2. The default range of CT is 300A;

The CT has a ratio of 300A:5A, and the internal circuit of terminals 1-6 provides an additional conversion ratio of 5A:50mA. Therefore, the total transformation ratio is 6000:1.

CT Connection with magnetic ring



Thread the end of the CT's wires through the magnetic ring 4, wrap the wires around it five lap. Fix the magnetic ring near the wiring terminals, as shown in the above diagram. Repeat this operation on the other two CTs using ring 5 and ring 6.

4.12 Smart Meter Connection (Optional)

4.12.1 Only Meter Connection

There are two kinds of smart meter, one is passthrough smart meter, and the other is Mutual inductance smart meter with Cts., The smart meter brands that inverters have been matched with include Eastron and CHINT. The recommended models here are not all compatible models. It is recommended to purchase smart meter from authorized distributors of Felicitysolar, otherwise it may not be able to be used due communication mismatch.

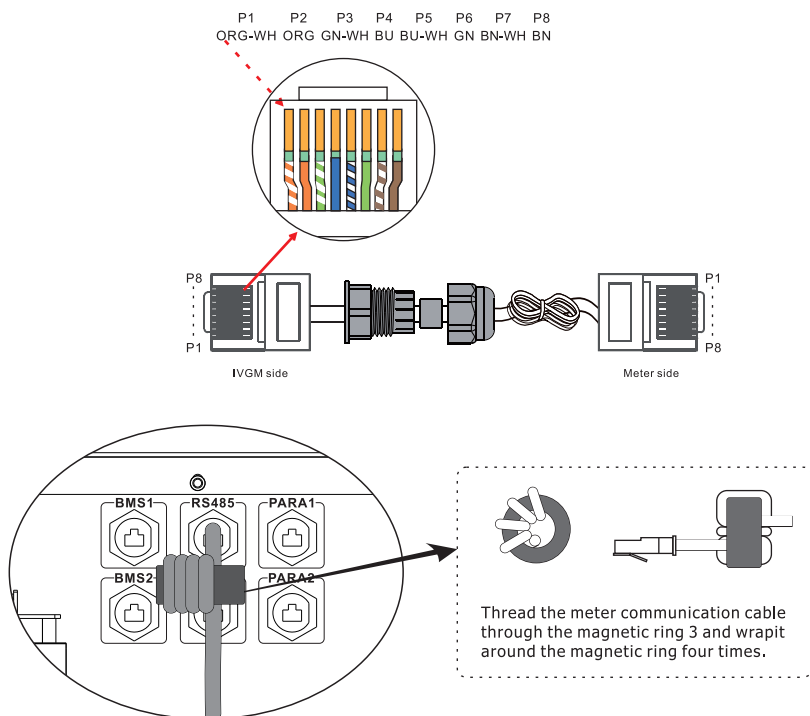
The baud rate of these smart meters remains at 9600, with their ID addresses retaining the default value of 1.

NOTE: The default range of the smart meter(Eastron and CHINT) is 100A.

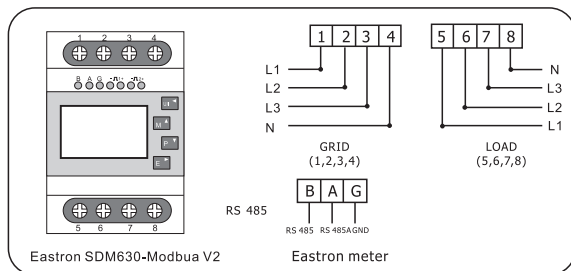
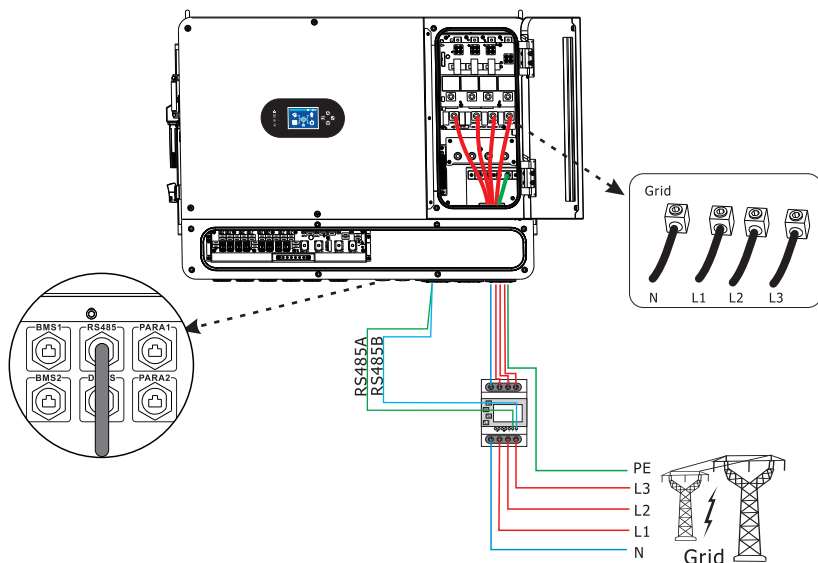
Table:4.4-1:RS485 interface

NO.	P1	P2	P3	P4	P5	P6	P7	P8
Function	/	/	RS_485_B	RS_485_A	/	/	Meter_485B	Meter_485A

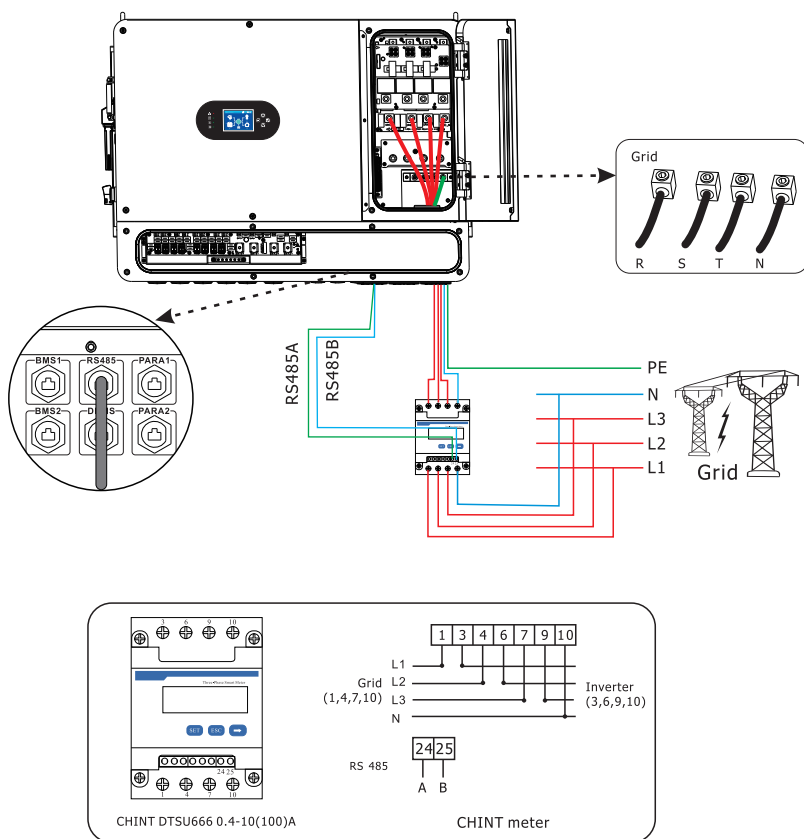
The Smart Meter with CT in product box is compulsory for IVGM system installation, used to detect grid voltage and current direction and magnitude, further to instruct the operationcondition of IVGM inverter via RS485 communication.See Table 4.4-1.



Meter Connection with Eastron meter



Meter Connection with CHINT meter



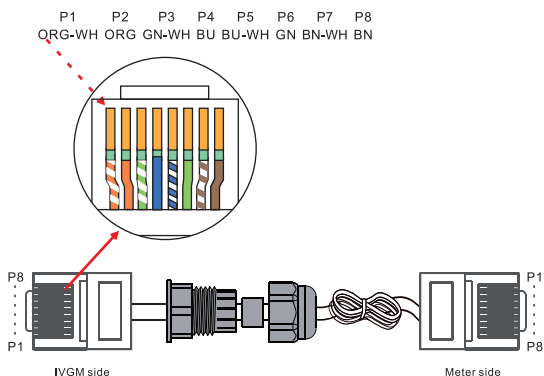
4.12.2 Meter Connection with CTs

NO.	P1	P2	P3	P4	P5	P6	P7	P8
Function	/	/	RS_485_B	RS_485_A	/	/	Meter_485B	Meter_485A

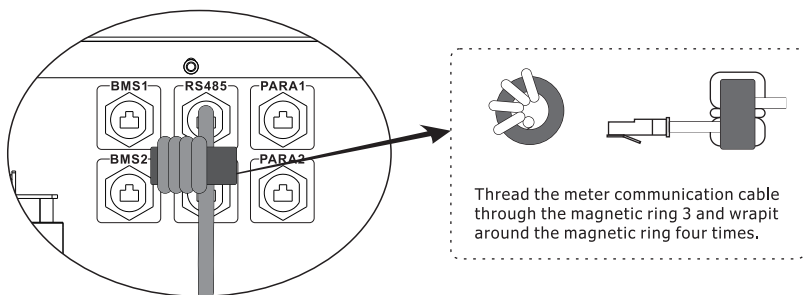
The Smart Meter with CT in product box is compulsory for IVGM system installation, used to detect grid voltage and current direction and magnitude, further to instruct the operation condition of IVGM inverter via RS485 communication. See Table 4.4-2.

NOTE: The meter (Eastron and CHINT) must not be connected to CTs with secondary current exceeding 6A to prevent risk of damage.

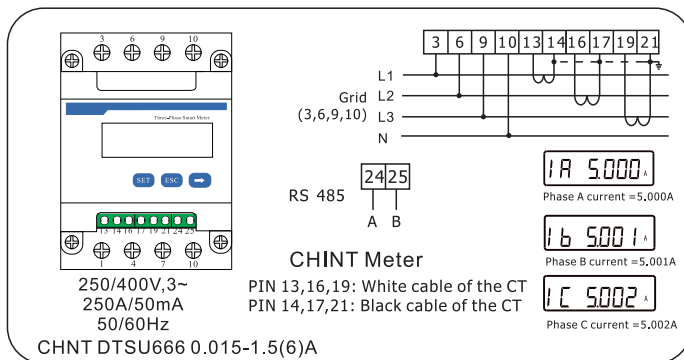
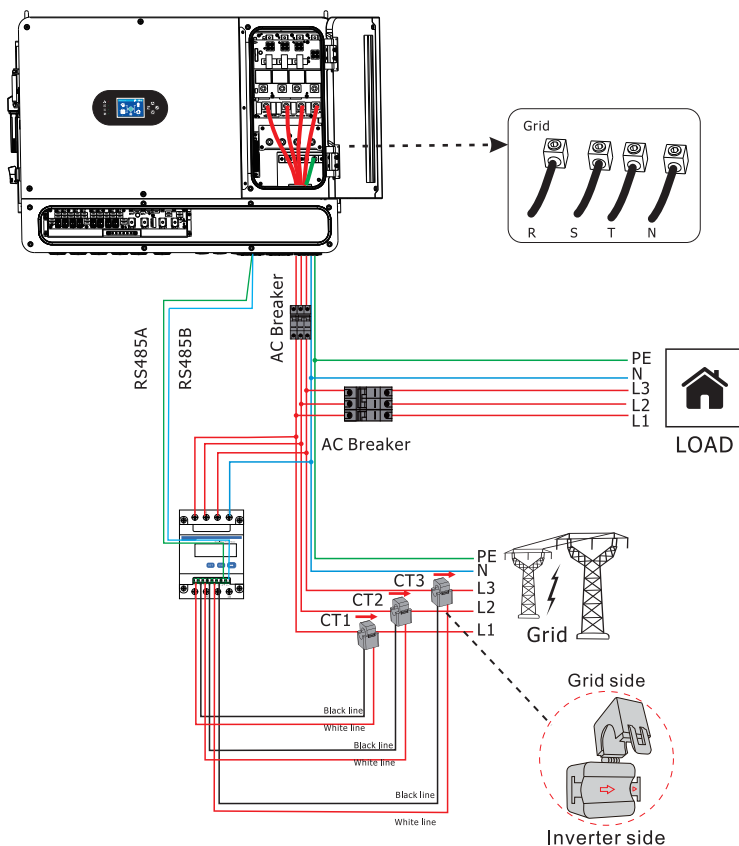
Rs485 interface



Meter connection with magnetic ring



Smart Meter&CT Connection with CHINT meter



5. Commissioning



NOTE: TURN ON the inverter with at least one power source: Battery, PV, or Grid.

5.1 Pre-Startup Inspection

1. Check the voltage of the battery bank

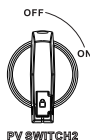
- A.  Voltage of the battery must be between 160VDC-800VDC.
- B. **Turn ON** battery modules and ensure appropriate voltage on each battery. Verify nominal voltage of battery bank according to the battery installation manual.
- C. **Turn ON** the external battery disconnect. Verify that the voltage at the IVGM INVERTER terminals is within 2% of the voltage measured at the battery bank output.
- D. **DO NOT** reverse polarity. **DO NOT Turn OFF** battery disconnect if any current is flowing in or out



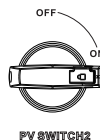
NOTE: TURN ON the inverter with at least one power source: Battery, PV, or Grid. DO NOT reverse polarity. DO NOT turn OFF battery disconnect if any current is flowing into or out of the battery.

2. Check the voltage of each PV input circuit

- A.  Voc must not exceed 1000 VDC.
- B. Input voltage must be above the startup voltage of 150 VDC.
- C.  Do not ground PV+ or PV-.
- D.  Verify polarity in each PV string. Backward polarity will measure 0Vdc by the Inverter and will cause long-term damage.
- E. **NOTE:** PV alone turns LCD screen only. Inverter requires grid and/or batteries to operate, otherwise an "NO BAT" message will appear.
- F. PV DC disconnect switch on the side of the inverter will turn the PV ON or OFF.



PV SWITCH2



PV SWITCH2

3. Check GRID input voltage

- A. Verify that voltage between Neutral and Ground is 0VAC.
- B. Verify that voltage between "GRID" L1 and "LOAD" L1 is 0V. Do the same for L2 and L3.
- C. Verify the AC voltage on the "GRID" terminals using digital multimeter.

5.2 Power ON the Inverter | Single Inverter Systems

Follow the instructions below for your power source.

5.2.1 Powering up from a Battery bank. (Off-Grid/On-Grid)

A. Turn ON the external battery breaker(s). Until inverter LCD and battery LED lights up and displays battery data.

B. PROGRAM the settings on the inverter according to your Battery and GRID type.

Battery Setting

Batt Mode

☐ Lithium

FLS1

☒ Use Batt V

☐ No Batt

Batt Capacity 100Ah

Max A Charge 50A

Max A Discharge 50A

☐ Parallel bat1&bat2

Batt Set1

⬆

⬇

✕

✓

Grid Setting/Grid Mode selection

Grid Code Germany_VDE4105 0/48

Grid Frequency ☐ 50HZ ☒ 60HZ

Grid Phase Type ☐ 0/120/240 ☒ 0/240/120

Grid Voltage LN:230V/LL:400V(AC)

☐ IT system—neutral is not grounded

Grid Set1

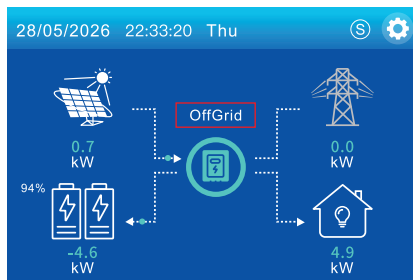
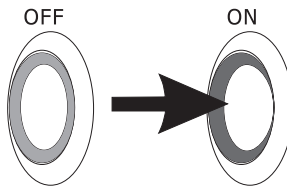
⬆

⬇

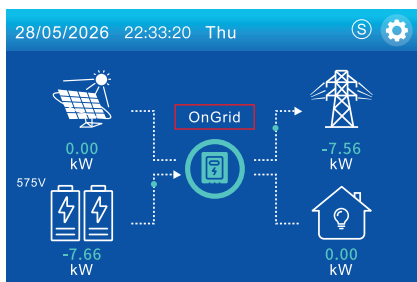
✕

✓

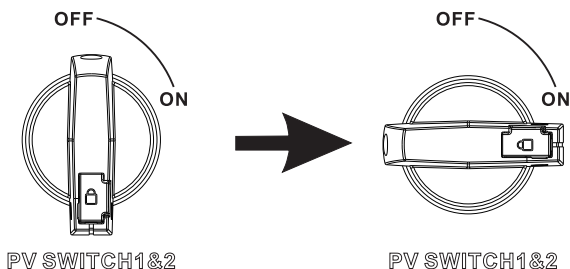
C. Turn on the ON/OFF button of inverter, wait until inverter LCD displays“Off Grid”.



D. Turn ON the external GRID disconnect. Wait for GRID LED indicator to turn on and inverter LCD displays "On Grid"



E. Turn ON the PV DC disconnect switch. Wait for the PV icon appear on LCD.

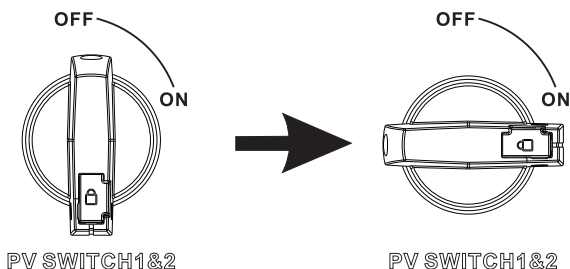


F. Turn ON the external GEN breakers.

H. Turn ON the external LOAD breakers

5.2.2 Powering up from PV. (On-Grid)

A. Turn ON the PV DC disconnect switch. Wait for the PV icon appear on LCD.



- B. Turn ON the external GRID disconnect. Wait for GRID LED indicator to turn on
 C. PROGRAM the settings on the inverter according to your GRID type, and set the "Battery Type" as "No Batt"

Grid Setting/Grid Mode selection

Grid Code 0/48

Grid Frequency ☐ 50HZ ☒ 60HZ

Grid Phase Type ☐ 0/120/240 ☒ 0/240/120

Grid Voltage

☐ IT system-neutral is not grounded

Grid Set1

Grid Set1

Grid Set1

Grid Set1

Battery Setting

Batt Mode ☒ Lithium ☐ FLS1 ☐ Use Batt V ☒ No Batt

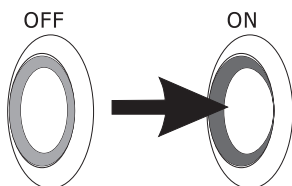
Batt Capacity

Max A Charge

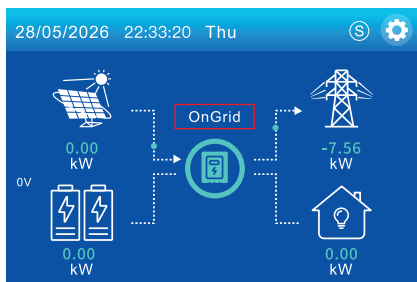
Max A Discharge

☐ Parallel bat1&bat2

- D. Turn on the ON/OFF button of inverter



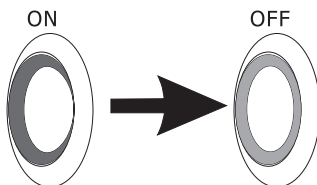
- E. Wait for the "DC/AC" LED indicator to turn on. This may take a few minutes
 F. Wait until the inverter LCD displays "On Grid"



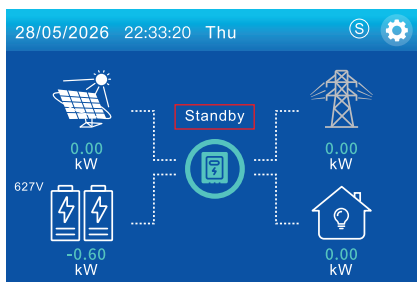
5.3 Power ON the Inverter | Parallel Install

5.3.1 Powering up from a Battery bank. (Off-Grid/On-Grid)

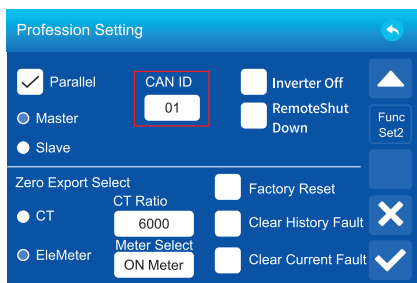
1. Ensure that the parallel wiring and DIP switch settings are correct as shown in chapter 9.4 "Three Phase Parallel Connection Diagram" on page 86.
2. Turn ON the external battery breakers for all of the units, Until inverter LCD and battery LED lights up and displays battery data.
3. Turn off the ON/OFF button in all units;



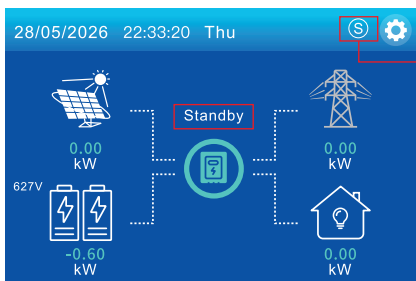
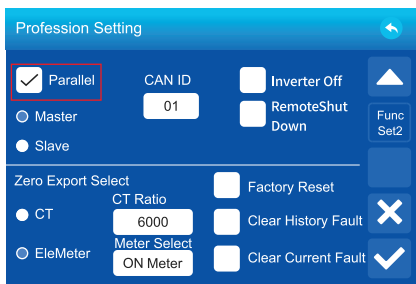
4. Wait until inverter enter Standby mode as following.



5. PROGRAM the CAN ID setting of each units one by one (From master to slave, set them sequentially from 1 to 10)



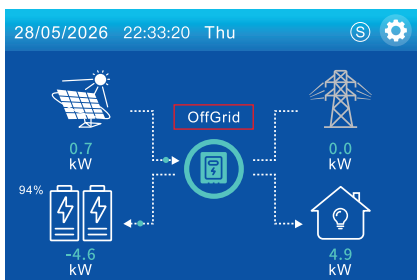
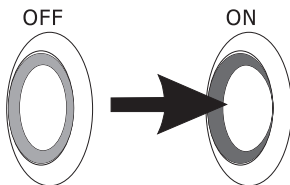
6.Enable Parallel mode for each units. Then confirm that the Parallel System Host or Slave Flag is displayed on the LCD of each unit and there are no error messages.



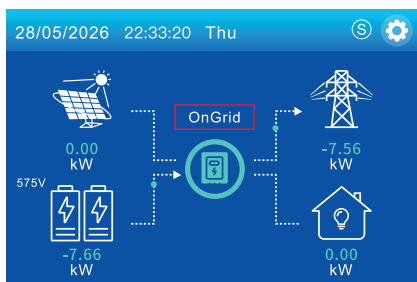
M for Master unit,
S for Slave unit.

7.PROGRAM remains parameter on the "Master" unit, including Grid Setup , Battery Setup and Advance Setup. The parallel communication will copy the settings from the " Master" unit to all "Slave" units. It's not necessary to program remains settings in each unit.

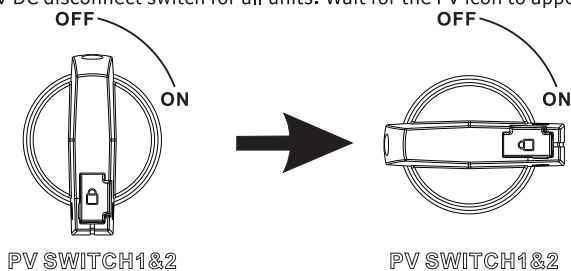
8.Turn on the ON/OFF button in all units, until all inverter LCD show up"Off Grid"icon.



9. Turn ON the external "GRID" disconnect/breakers of all units. Wait for GRID LED indicator to turn on and LCD displays "On Grid" for all units.



10. Turn ON the PV DC disconnect switch for all units. Wait for the PV icon to appear on LCD for all units.

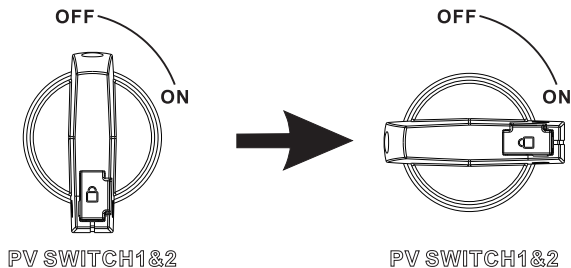


11. Turn ON the GEN breakers of all units.
12. Turn ON the LOAD breakers of all units.

5.3.2 Powering up from PV. (On-Grid)

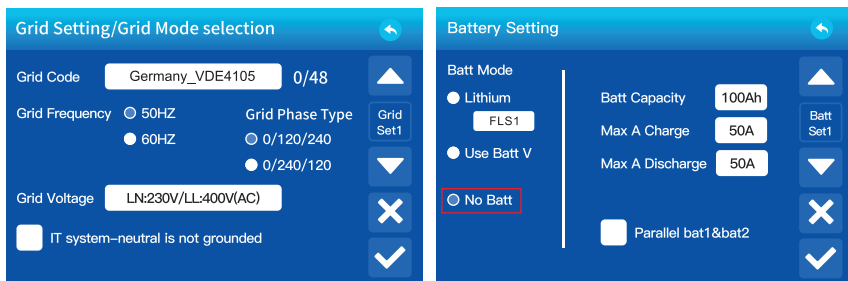
A.Ensure that the parallel wiring and DIP switch settings are correct as shown in chapter 9.4 "Three Phase Parallel Connection Diagram" on page 86.

B.Turn ON the PV DC disconnect switch of all inverters. Wait for the PV icon appear on LCD of all units.

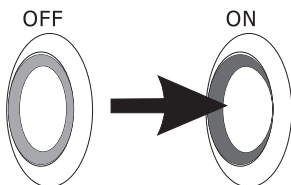


C. Turn ON the external GRID disconnect of all inverters. Wait for GRID LED indicator to turn on of all units.

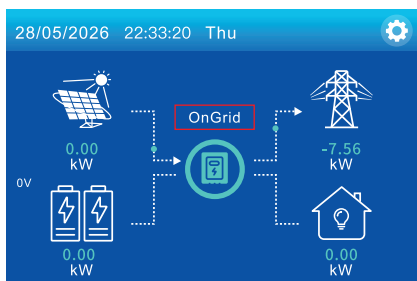
D.PROGRAM the settings on the master inverter according to your GRID type, and set the "Battery Type" as "No Batt". The parallel communication will copy the settings from the " Master" unit to all "Slave" units. It's not necessary to program remains settings in each unit



E. Turn on the ON/OFF button of inverter

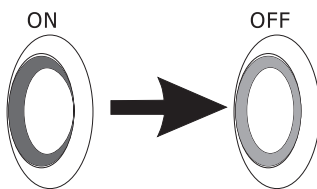


- F. Wait for the " DC/AC" LED indicator to turn on. This may take a few minutes
G. Wait until the inverter LCD displays "On Grid"

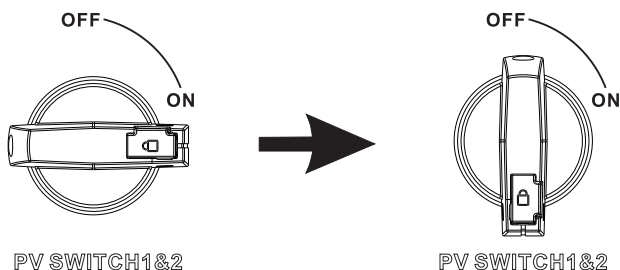


5.4 Power OFF the Inverter | Single Inverter Systems

1. TURN OFF the ON/OFF button of the inverter



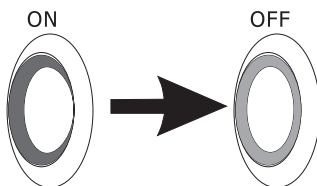
2. TURN OFF all LOAD breakers and disconnects.
3. TURN OFF all GEN breakers and disconnects.
4. TURN OFF all GRID breakers and disconnects.
5. TURN OFF the external battery breakers.
6. TURN OFF the built-in PV DC disconnect switch on the side of all inverter.



7. Wait a moment (~1 min). The LCD screen will turn off and make sure the inverter is completely de-energized.

5.5 Power OFF the Inverter | Parallel Install

1. TURN OFF the ON/OFF button of the inverter



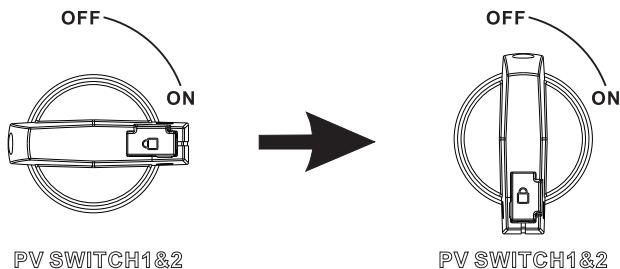
2. TURN OFF all LOAD breakers and disconnects.

3. TURN OFF all GEN breakers and disconnects.

4. TURN OFF all GRID breakers and disconnects.

5. TURN OFF the external battery breakers.

6. TURN OFF the built-in PV DC disconnect switch on the side of all inverter.



7. Wait a moment (~1 min), The LCD screen will turn off and make sure the inverter is completely de-energized.

6. 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 can be solved quickly.

- Inverter SN
- Inverter Usage Duration
- System On-Site Status (with attached images or videos)
- Detailed Problem Description (with attached images or videos)

6.1 Warning Code

The inverter's Fault LED does not remain lit, but an error code flashes on the screen. In most cases, these codes indicate warnings rather than actual faults.

Warning Code	Warning Information	Warning Information
13	DC Lightning Protection Alarm	If the DC lightning protector is abnormal, check whether the lightning protector is abnormal.
14	AC Lightning Protection Alarm	If the AC lightning protector is abnormal, check whether the lightning protector is abnormal.
18	Fan 1 Alarm	Fan 1 stops abnormally, check fan wiring.
19	Fan 2 Alarm	Fan 2 stops abnormally, check fan wiring.
20	Fan 3 Alarm	Fan 3 stops abnormally, check fan wiring.
21	Fan 4 Alarm	Fan 4 stops abnormally, check fan wiring.
22	Internal Fan Alarm	Internal fan stops working abnormally, check internal fan wiring.

6.2 Fault Code

The inverter's Fault indicator light is solid red, and a fault code is flashing on the screen. Please follow the steps in the table below.

If the issue persists, contact Felicity's official technical support team immediately

Warning Code	Warning Information	Warning Information
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
14	Battery 1 Overvoltage Fault	Battery 1 voltage is too high, the battery should be discharged
15	Battery 2 Overvoltage Fault	Battery 2 voltage is too high, the battery should be discharged
18	Battery 1 Undervoltage Fault	Battery 1 voltage is too low, the battery should be charged
19	Battery 2 Undervoltage Fault	Battery 2 voltage is too low, the battery should be charged

20	Battery 1 Overcurrent Fault	Battery 1 current is too large, check the battery charge and discharge power
21	Battery 2 Overcurrent Fault	Battery 2 current is too large, check the battery charge and discharge power
24	Battery 1 Reverse Connection Fault	Battery 1 positive and negative poles is reversed, check the battery wiring
25	Battery 2 Reverse Connection Fault	Battery 2 positive and negative poles is reversed, check the battery wiring
26	Battery 1 Relay Circuit Fault	Battery 1 relay not closing properly causing open circuit, or battery 1 relay not properly disconnected causing short circuit, shutdown and restart
27	Battery 2 Relay Circuit Fault	Battery 2 relay not closing properly causing open circuit, or battery 1 relay not properly disconnected causing short circuit, shutdown and restart
30	Battery 1 Soft Start Fault	Battery 1 fails to raise the input voltage normally, shutdown and restart
31	Battery 2 Soft Start Fault	Battery 2 fails to raise the input voltage normally, shutdown and restart
32	Battery 1 SOC Low Fault	Battery 1 SOC is too low, the battery should be charged
33	Battery 2 SOC Low Fault	Battery 2 SOC is too low, the battery should be charged
35	Bus Overvoltage Fault	Bus voltage is too high, shutdown and restart.
37	Bus Undervoltage Fault	Bus voltage is too low, shutdown and restart.
38	Positive and Negative Bus Imbalance Fault	Positive bus voltage does not match negative bus voltage, shutdown and restart.
39	Bus Soft Start Fault	Bus voltage fails to rise normally at startup, shutdown and restart.
41	Balanced Bridge Overcurrent Fault	Balanced bridge current is too high, shutdown and restart.
43	Inverter Self Check Fault	Reserved
44	Inverter Soft Start Fault	Inverter voltage fails to rise normally at startup, shutdown and restart
45	Inverter Voltage Fault	Inverter voltage is too high, shutdown and restart.
46	Inverter Overcurrent Fault	Inverter current is too high, check the given power and load size.
48	Inverter Short Circuit Fault	Short circuit at inverter, shutdown and restart.
49	Inverter Voltage DC Component Fault	Inverter voltage DC component is too high, shutdown and restart.

50	Inverter Current DC Component Fault	Inverter current DC component is too high, shutdown and restart.
51	Grid Overvoltage Fault	The grid voltage is too high, check whether the grid voltage is within the normal range
52	Grid Undervoltage Fault	The grid voltage is too low, check whether the grid voltage is within the normal range
53	Grid Overfrequency Fault	The grid frequency is too high, check whether the grid frequency is within the normal range
54	Grid Underfrequency Fault	The grid frequency is too low, check whether the grid frequency is within the normal range
55	Grid Reverse Sequence Fault	The grid phase sequence is reversed, check the grid phase sequence wiring
56	Grid Overload Fault	The load of the grid access is too large, and the load should be reduced
59	Load Overload Fault	The load exceeds , the load should be reduced
63	EPO Fault	Inverter emergency shutdown
64	IGBT Overtemperature Fault	Inverter device temperature is too high.
65	Ambient Overtemperature Fault	The ambient temperature of the inverter is too high
66	Fan Fault	Fan is faulty, check whether the fan is normal
71	EEPROM Fault	There was an error with the EEPROM write
72	12V Auxiliary Power Supply Fault	Failure of 12V auxiliary power supply.
73	CT or Hall Open Circuit Fault	current sensing device is faulty, check CT or Hall element connections.
74	Main and Auxiliary DSP Communication Fault	There is an error in the DSP communication, try to upgrade the software
76	Leakage Current Fault	The leakage current of the inverter is too large, check the wiring of the inverter
77	BUS Insulation Impedance Fault	The insulation of the BUS string is abnormal
78	BAT1 Insulation Impedance Fault	Battery 1 insulation is abnormal
79	BAT2 Insulation Impedance Fault	Battery 2 insulation is abnormal
80	GND Fault	Reserved
81	GEN Relay Fault	Gen relay not closing properly causing open circuit, or Gen relay not properly disconnected causing short circuit, shutdown and restart

7. User Interface

7.1 LED Indicators



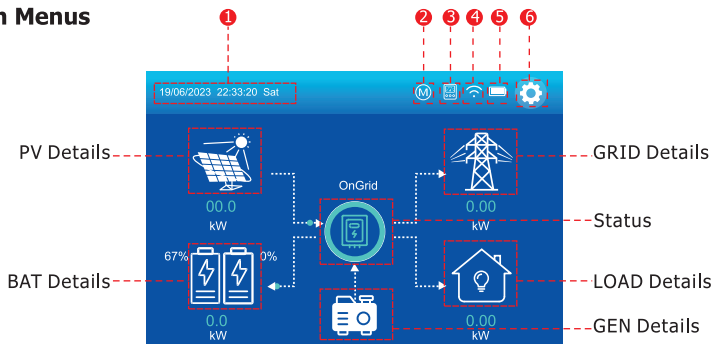
Numeber	LED Indicator		Messages
1	Fault	Red led solid light	Malfunction or warning
2	DC/AC	Green led solid light	Inverter operation normal
3	GRID	Green led solid light	Grid connection normal
4	BATTERY	Green led solid light	Battery connection normal

Numeber	Function Key	Description
5	Esc	To exit setting mode
6	Up	To go to previous selection
7	Down	To go to next selection
8	Enter	To confirm the selection



Fully energizing the unit constitutes at least:
a. DC Solar panels AND Grid OR.
b. Batteries only.

7.2 Main Menus



Numeber/Icon Name	Messages
1	Day/Month/Year, Time , Week .
2	Parallel System Host or Slave Flag.
3	Smart Meter Communication Success.
4	WIFI Communication Success.
5	Battery BMS Communication Success .
6	System Setup Icon . Press It to Enter Basic Setting, Battery Setting, Grid Setting, Work Mode Setting, Gen Setting, Profession Setting and Alarm Info.
Status Icon	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 Alarm Info).

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

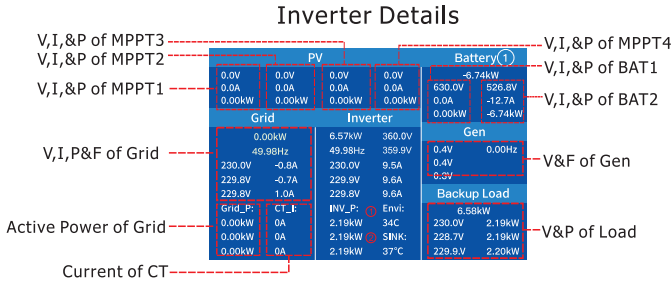
- PV power always keep positive.
- Grid power negative means sell to grid, positive means get from grid.
- Battery power positive means charge, negative means discharge.
- In a single-unit system, the load value is always positive.

In parallel systems, inconsistent load cable lengths can lead to inconsistent line impedances, resulting in negative load values. We recommend ensuring that load cables are of consistent length.

The System has nine states, including PoweOn, StandBy, Bypass, OffGrid, Fault, Line, PVCharge, OnGen, TrunOff.

Mode	Description
Power-On Mode	After the inverter ON/OFF switch is turned on, the inverter powers up and the LCD screen lights up.
Standby Mode	The inverter stops inverting output power.
Bypass Mode	The grid supplies power directly to the load.
Off-Grid Mode	The inverter operates without a grid connection.
Fault Mode	The inverter cannot operate normally when a fault occurs.
Line Mode	The grid supplies power to the load while simultaneously charging the battery.
PV Charge Mode	Only PV power is used to charge the battery.
Generator Mode	A generator is connected to the inverter.
Power-Off Mode	After the inverter ON/OFF switch is turned off, the inverter powers down and the LCD screen turns off.

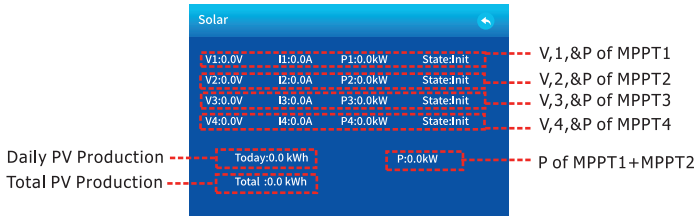
7.3 Details Screen



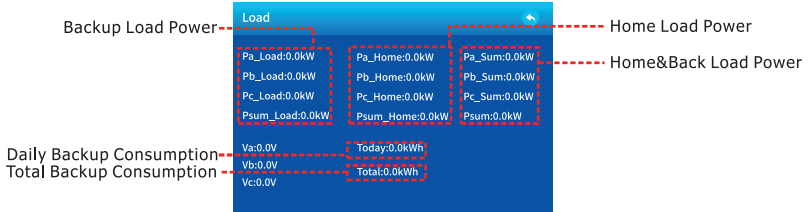
① Envi: Ambient temperature inside the machine.

② SINK: Heat-sink temperature.

PV Details



Load Details



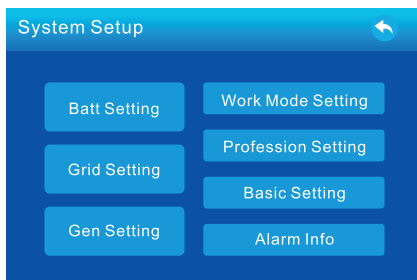
Grid Details



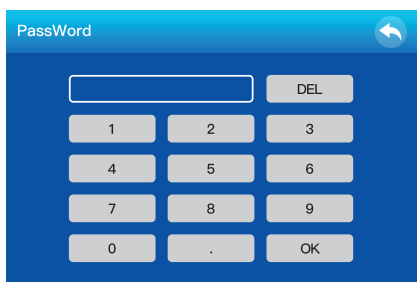
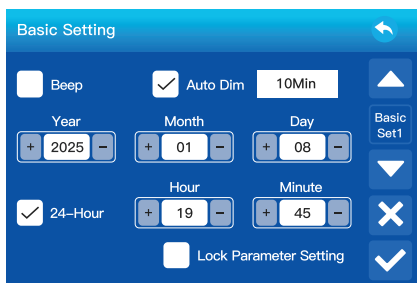
① LD: Power detected using internal sensors on AC grid in/out breaker.

② CT: Power detected by the external current sensors.

7.4 System Setup Menu



7.5 Basic Setup



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 unless it is active.

Lock Parameter Setting Password: 123456

Auto Dim: Enable LCD dimming time: 1-10 min; Disable to keep screen on permanently.

7.6 Battery Setup

Battery Setting

Batt Mode

- ☐ Lithium
-
- ☒ Use Batt V
- ☐ No Batt

Batt Capacity 100Ah

Max A Charge 50A

Max A Discharge 50A

☐ Parallel bat1&bat2

Navigation buttons: Up, Down, Back, Confirm

Batt Capacity: This function is reserved. It is not recommended.

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" based 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. When no battery is connected, the inverter can only operate if both the PV and the grid are connected simultaneously.

Max A Charge/ Discharge: Max battery charge/discharge current

- For AGM and Flooded, we recommend Ah battery size $\times 20\% = \text{Charge/Discharge amps}$.
- For Lithium, we recommend Ah battery size $\times 50\% = \text{Charge/Discharge amps}$.
- For Gel, follow manufacturer's instructions.

Parallel bat1&bat2: If a set of batteries are connected to both BAT1 and BAT2 simultaneously, this function needs to be enabled.

Battery Setting

Gen Start 10%

Gen Exit 95%

Gen A Charge 50A

☒ Gen Charge

☐ Gen Start Signal

Gen Max Run Time 24 hours

Gen Cool Down Time 0.0 hours

Grid Start 10%

Grid Exit 95%

Grid A Charge 50A

☒ Grid Charge

☐ Grid Start Signal

☐ Gen Force

Navigation buttons: Up, Down, Back, Confirm

This is Generator Charge.

- Gen Start Charge = 10%:** When battery SOC or voltage drop to this set value, system will Auto Start a connected generator to charge the battery bank.
Gen Exit = 95%: When battery SOC or voltage raise to this set value, system will Auto Break generator.
Gen A Charge = 50A: The Battery charging current that the generator will support.
Gen Charge: Use the power of diesel generator to charge the battery.
Gen Start Signal: The normally open relay will close when tick this item.
- Gen Max Run Time:** It indicates the longest time. Generator can run in one time, when time is up, the Generator will be turned off. 24H means that it does not shut down all the time.
Gen Down Time: It indicates the rest time of the Generator before the inverter restart it again.

This is Grid Charge, you need select. ③

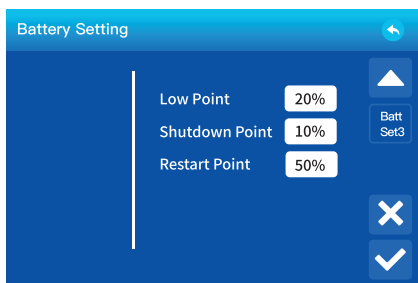
Grid Start Charge =10%: When battery SOC or voltage drop to this set value, inverter will start the Grid Start Signal connected to the grid port automatically to charge the battery.

Grid Exit=95%: When battery SOC or voltage raise to this set value, inverter will not charge the battery.

Grid A Charge=50A: 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 Start Signal' can be used to control the dry contact to start or stop the generator.



Float voltage: Only Batt Mode select "Use Batt V", this item can show.

Low Point: Be valid in On-grid mode, The energy of the battery is not allowed to be lower than this value.

Shutdown Point : Be valid in Off-grid mode, battery can discharge to this value, then the DC/AC inverter module of this inverter will be shut down and the solar power can only be used to charge the battery.

Restart Point: Be valid in Off-grid mode, after the DC/AC inverter module of this inverter is shut down, the PV power can only be used to charge the battery. After the battery value has resumed to this "Restart" value, the inverter module will restart to output AC power.

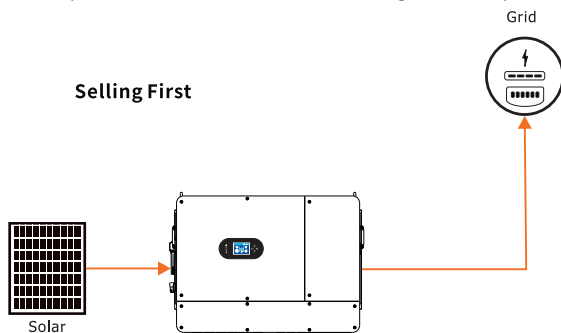
7.7 Work Mode Setup

7.7.1 Selling First

The inverter will produce as much power as it has available from PV array according to the programming.

General Description

- This mode allows your inverter to sell back to the grid all the excess power generated from the PV arrays without limitation.
- The inverter will only show loads connected to the BACKUP LOAD terminal.
- The inverter will measure all power in/out of the GRID terminal as grid consumption or grid sell back.



Max Solar Power: The maximum PV input power allowed.

Max-Export Power: Allowed the maximum output power to flow to grid.

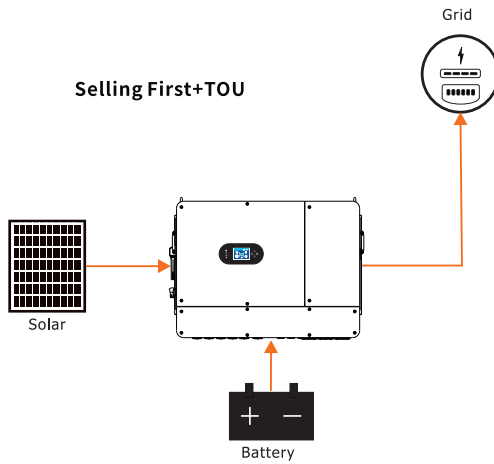
7.7.2 Selling First+TOU

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 Solar Priority tick Batt First.
 - 3.Battery (until programable SOC discharge is reached).
- when Solar Priority tick Load First and disable Grid charge.

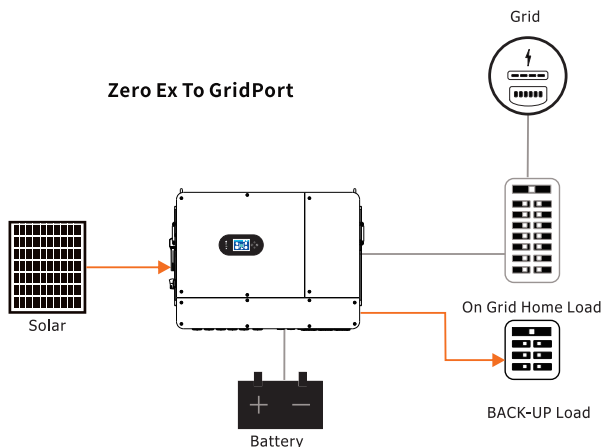


7.7.3 Zero Ex To GridPort

This mode limits the solar production to cover BACKUP LOAD demand (essential loads panel) exclusively. In this mode, the system disregards loads in the main service panel and will not deliver power to the GRID terminal.

General Description:

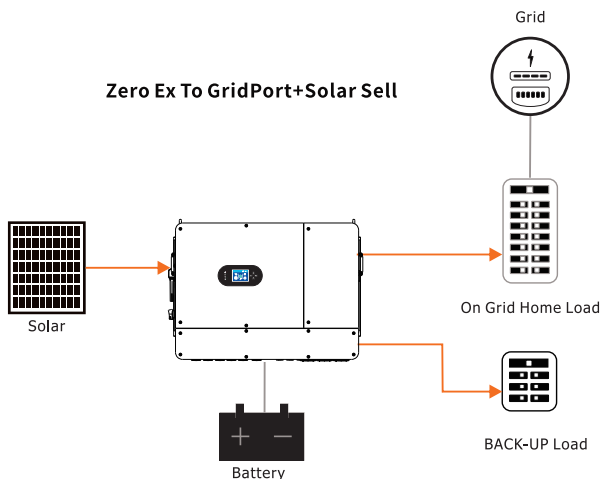
- The inverter will cover only the loads connected to the "BACKUP LOAD" terminal.
- It will NOT produce more power than the load demand.
- This work mode will NOT deliver power to the "GRID" terminal (will NOT sell back).
- The loads reported by the inverter will be from only the essential loads panel ("BACKUP LOAD" terminal).
- This system work mode is recommended for off-grid applications.



7.7.4 Zero Ex To GridPort+Solar Sell

This mode will NOT limit solar production to BACKUP LOAD demand. The inverter delivers power to the BACKUP LOAD terminal(essential loads panel) + excess power to the GRID terminal(main service panel AND grid); however, it will track LOAD demand and sell excess solar only up to a programmable limit(Max-Export Power).

GRID loads cannot be measured, only the total output through the GRID terminal. This mode is recommended for single inverter systems or for whole-home backup installations.



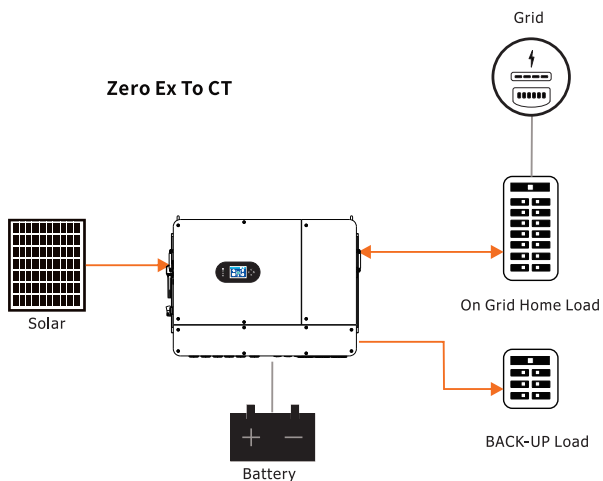
7.7.5 Zero Export To CT

This mode limits the energy produced by the inverter to satisfy the home demand (essential loads panel + main service panel). In this mode, the inverter delivers power to the BACKUP LOAD terminal (essential loads panel) + the GRID terminal (main service panel).

CT sensors **MUST** be installed. These sensors measure load consumption in the main service panel to offset total load demand and prevent selling to the utility. This system work mode is useful for users who don't have a permit to sell back. See **"4.10 Only CT Connection(Recommend)" on page 31** for instructions on installing external CTs.

General Description

1. Power is delivered to the whole home without selling the excess solar back to the utility (this is required if there's no permit to sell back from the utility company).
2. External CT sensors are required for proper operation of this system work mode.
3. Monitored loads will be the sum of the main service panel + essential loads panel.

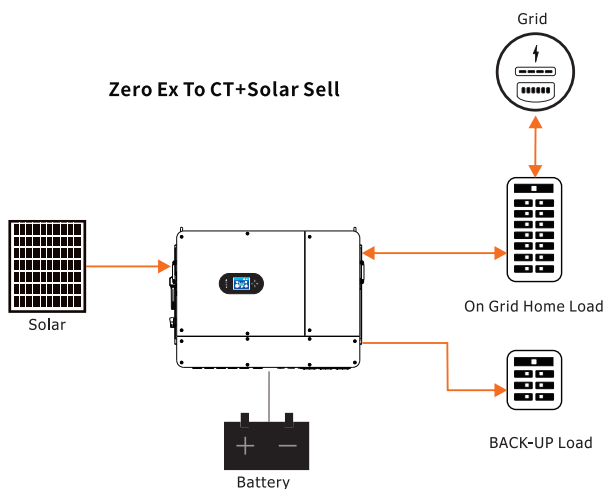


7.7.6 Zero Export To CT+Solar Sell

This mode will NOT limit solar production to home demand. In this mode, the inverter delivers power to the BACKUP LOAD terminal (essential loads panel) + excess power to the "GRID" terminal (main service panel AND grid).

The Inverter will monitor grid sell and load consumption simultaneously (with +/- 3% error from CT sensors). The CT sensors MUST be installed. The inverter will sell excess solar power up to a programmable limit(Max-Export Power).

See "**4.10 Only CT Connection(Recommend)" on page 31** for correct placement of external CTs.



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.

Load First: PV power is firstly used to power the load and then used to charge the battery.

7.7.7 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. This mode will automatically adjust the "Grid Charge" amperage (A) to avoid generator overloads during battery charging.
4. Grid Peak-Shaving will automatically enable "Time of Use" and MUST be configured.
5. When both PV and battery power are insufficient, the inverter will continue to draw power from the grid to power the load, even if the load consumption exceeds the power limit of the Grid Peak Shaving.

7.7.8 Time Of Use

Work Mode Setting							
Grid Chg	Gen Chg	Pv Sell	Pv Off	Time1	Time2	Power	Batt
☒	☐	☐	☐	00:00	08:00	50.0kW	90%
☒	☐	☐	☐	08:00	12:00	50.0kW	40%
☒	☐	☐	☐	12:00	14:00	50.0kW	90%
☐	☐	☐	☐	14:00	18:00	50.0kW	40%
☐	☒	☐	☐	18:00	22:00	50.0kW	40%
☒	☒	☐	☐	22:00	00:00	50.0kW	90%

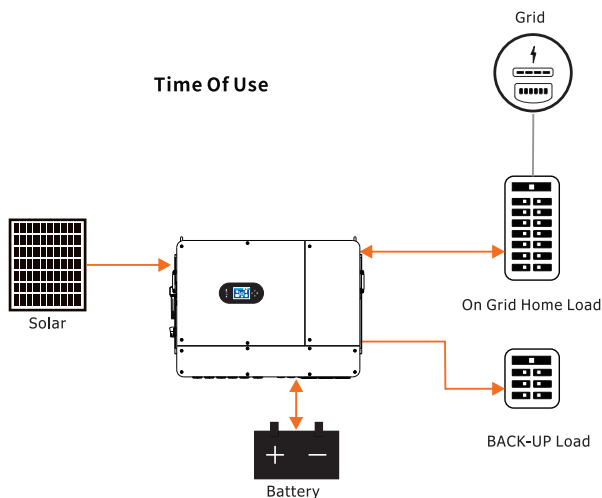
Time Of Use ☐ Work Mode2

This mode combined with Limited Power to Home or Limited Power to Load lets you use battery backup power to reduce consumption from the grid during specific time intervals. Battery power will cover load demand at a programmable power rate Power(W) down to a programmable Batt (V/%SOC). You can configure six different time intervals over a 24-hour period to cover a wide range of battery discharge or charge behaviors.

General Description

- Uses battery power to reduce the power consumption during user defined time intervals.
- Power (W) dictates the rate at which the battery discharges to assist with load demand.
- Batt (V or %) dictates the lower discharge limit or upper charge limit.

Energy Priority: 1. Solar PV Power | 2. Batteries (down to programmed discharge V or %) | 3. Grid Power | 4. Generator.



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.

Sell: Enable battery sell to grid

PV Off: Disable PV charge

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 and 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,

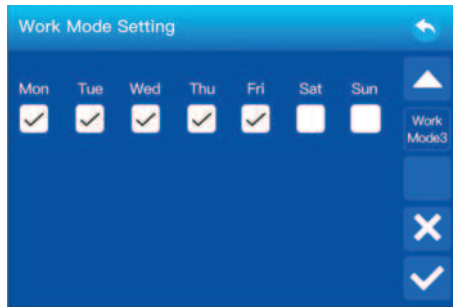
when battery SOC is higher than 40%, hybrid inverter will discharge the battery until the SOC reaches 40%.if battery SOC is lower than 40%, neither the diesel generator nor the grid will charge the battery.

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.

7.8 Grid Setup

Grid Setting/Grid Mode selection

Grid Code: 0/48

Grid Frequency: ☐ 50Hz ☒ 60Hz

Grid Phase Type: ☐ 0/120/240 ☒ 0/240/120

Grid Voltage:

☐ IT system-neutral is not grounded

Grid Code:

- | | | |
|-------------------------------|---------------------------|---------------------------|
| 0: Germany_VDE4105 | 17: Spain_UNE217001 | 33: EN50549_1_Switzerland |
| 1: Warehouse | 18: cNetherlands | 34: EN50549_1_GR |
| 2: General Standard_50Hz | 19: Australia_B | 35: Poland_TypeB |
| 3: General Standard_60Hz | 20: Australia_C | 36: CEI_0_21_External |
| 4: Italy_CEI_021_2019 | 21: Australia_AS 4777.2 | 37: CEI_0_21_Areti |
| 5: Britain_G99 | 22: UL1741 &IEEE1547 | 38: CEI_0_16_IT |
| 6: Australia_A | 23: CPUC RULE21 | 39: NI_G98 |
| 7: NewZealand_AS4777 | 24: SRD-UL-1741 | 40: NI_G99 |
| 8: SouthAfrican_NRS097 | 25: Britain_G98 | 41: ESB Networks(Ireland) |
| 9: Netherlands_EN 50549-1 | 26: EN50549_1_Norway_133V | 42: Belgium_C10 |
| 10: Brazil | 27: EN50549_1_Norway_230V | 43: Belgium_C11 |
| 11: EN50549 | 28: Japan_200VAC_3P3W | 44: Chile |
| 12: Poland_TypeA | 29: Japan_400VAC_3P3W | 45: Colombia |
| 13: Czech_CSN 50549-1 | 30: Japan_415VAC_3P4W | 46: Hungary |
| 14: Austria_R25:2020-03 | 31: EN50549_CZ-PPDS(>16A) | 47: Thailand_PEA |
| 15: Austria_OVE-directive_R25 | 32: EN50549_CZ_PPDS_L16A | 48: Thailand_MEA |
| 16: Spain_NTS_2021 | | |

Grid level: there're several voltage levels for the inverter output voltage such as LN:120V/LL:208V(AC), LN:277V/LL:480V(AC)mode ...eg.

IT system: If the grid system is IT system, then please enable this option. All the live lines of IT system are insulated from ground, and the neutral point of the IT system is grounded through high impedance or not grounded.

Grid Setting/Basic

P Ramp Rate:

Q Response T (3Tau):

RCOF: ☐

Val:

☐ Unlock Setting

Q Mode: ☐ Disable ☒ Const PF ☒ Const Q ☒ Q Curve

Const Q:

Const PF:

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

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 Inductive reactive power, Const Q <0 means Inverter output capacitive reactive power.

Const PF: Setting the power factor(cos p) value, Const PF>0 means Inverter output inductive power (cause the grid voltage to rise),Const PF<0 means Inverter output capacitive power(cause the grid voltage to reduce).

Normal connect: The allowed grid voltage/frequency range when the inverter operates normally.

Normal Ramp rate: It is the startup power ramp.

Reconnect after trip: The allowed grid voltage/frequency range for the inverter connects the grid after the inverter trip from the grid.

Reconnect 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 I over frequency protection point;

HF2: Level2 over frequency protection point;

HF3: Level 3 over frequency protection point.

LF1: Level I under frequency protection point;

LF2: Level2 under frequency protection point;

LF3: Level 3 under frequency protection point.

Grid Setting/P(F)

P(F)

- ☐ OF En
- ☒ UF En
- ☐ OF Rec En
- ☐ UF Rec En

Basic Power

- ☐ Rated Power
- ☒ Derating Pre-Power

P Respon Rate: 0%Pn/M
 P Respon Time: 0.00S
 P Recover Rate: 0%Pn/M
 P Recover Time: 0.00S

Grid Set5

OF En: It is used to enable the adjustment (derating) of the inverter's output active power according to the high grid frequency.

UF En: It is used to enable the adjustment (boosting) of the inverter's output active power according to the low grid frequency.

OF Rec En / UF Rec En: It is used to enable the active power recovery process when the grid frequency returns to the normal operating range.

Basic Power: The reference power used for F(P) regulation calculations. It can be set to "Rated Power" (nominal power) or "Derating Pre-Power" (the actual output active power right before the frequency event occurred).

Grid Setting/P(F)

OF Droop Rate: 0.00
 UF Droop Rate: 0.00

OF Start F: 0.000Hz
 UF Start F: 0.000Hz

OF Recover F: 0.000Hz
 UF Recover F: 0.000Hz

OF Trans. F: 0.000Hz
 UF Trans. F: 0.000Hz

OF End F: 0.000Hz
 UF End F: 0.000Hz

OF End P: 0.0%
 UF End P: 0.0%

Grid Set6

OF / UF Droop Rate: The frequency-active power droop percentage coefficient, which defines the proportional relationship between the relative change in grid frequency and the target active power adjustment. For a 50Hz nominal grid, a 4% droop rate means that a 4% deviation in grid frequency (i.e., 2Hz) will require the inverter to adjust its active power by 100% of its nominal power.

For example, assuming a 50Hz grid, "OF En" is enabled, "P Respon Rate" = 1000%Pn/M, "OF Droop Rate" = 4%, "OF Start F" = 50.2Hz, and "OF Recover F" = 50.1Hz. When the grid frequency reaches 51.2Hz (1.0Hz over the start frequency), the inverter will decrease its active power by 50% of its nominal power (calculated from the 4% droop rate) at a response speed of 1000%Pn/M. And then when the grid system frequency is less than 50.1Hz, the inverter will stop decreasing output power and prepare to recover. For the detailed setup values, please follow the local grid code.

Grid Setting/P(U)

☒ **OV Curve** ☒ **UV Curve**
 P Response T(3Tau) P Response T(3Tau)
 0.0S 0.0S

V1	0%	P1	0.0%	V1	0%	P1	0.0%
V2	0%	P2	0.0%	V2	0%	P2	0.0%
V3	0%	P3	0.0%	V3	0%	P3	0.0%
V4	0%	P4	0.0%	V4	0%	P4	0.0%

Grid Set7

OV / UV Curve Enable: The checkboxes are used to activate the Over-Voltage (OV) or Under-Voltage (UV) active power response functions. It is used to adjust the inverter's active power according to the set grid voltage.

For example, assuming a grid configuration where the OV Curve is enabled, the Filter Time is 15.0s, and the curve points are set to V1/V2 = 110%, P1/P2 = 100% and V3/V4 = 112%, P3/P4 = 0%. When the grid voltage is at or below 110% of the nominal value, the inverter operates normally with a maximum power output of 100%. Once the voltage exceeds 110%, the inverter starts linearly decreasing its active power output. If the voltage reaches 112%, the active power target is derated completely to 0%. This power adjustment process will take 15 seconds to fully settle to the target value due to the specified filter time.

Grid Setting/Q(U)

☒ **Q(U) Curve** Lock-in/Pn Lock-out/Pn
☒ **P-LockIn** 0.0%Pn 0.0%Pn
☒ **Min CosPhi**

Vref Adj V1 Q1 V2 Q2 V3 Q3 V4 Q4

☒ **Disable** 0% 0.0%Pn 0% 0.0%Pn 0% 0.0%Pn 0% 0.0%Pn
☐ **Auto Adj**
☐ **Manual Adj**

Adj V Adj Time Q Bias Coff Min cos phi
 0% 0.0S 0.0% 0.000

Grid Set8

QU Curve / P-LockIn / Min CosPhi: Checkboxes to enable the respective functions. "QU Curve" activates this voltage-reactive control mode. "P-LockIn" enables active power thresholds for this mode. "Min CosPhi" enforces a hard limit on the power factor.

Vref Adj: This setting determines whether the baseline reference voltage for the Q(U) curve shifts. Selecting "Disable" uses the fixed standard nominal grid voltage as the baseline; selecting "Auto Adj" allows the inverter to automatically shift the curve based on the average actual grid voltage calculated over the "Adj Time" period (to prevent continuous reactive power output); and selecting "Manual Adj" shifts the curve according to the specific fixed percentage manually entered in the "Adj V" parameter.

Lock-in / Pn: The active power threshold to activate the Q(U) function. The inverter must be generating active power above this percentage for reactive power regulation to start.

Lock-out / Pn: The active power threshold to deactivate the Q(U) function. If the inverter's active power drops below this percentage, reactive power regulation stops.

For example, assuming a grid configuration where the Q(U) curve is enabled, and the core curve points are set to V1 = 92%, Q1 = 43.6% and V4 = 108%, Q4 = -43.6%. When the grid voltage drops to 92%, the inverter will inject reactive power at 43.6% capacity. Conversely, when the grid voltage rises to 108%, the inverter will absorb reactive power at 43.6% capacity.

QP Curve Enable: 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.

Q Basic (P Set / P Curr): Selects the active power reference used for the Q(P) curve calculation. "P Set" uses the target/commanded active power, while "P Curr" uses the actual/current active power output of the inverter.

For example, assuming a grid configuration where the Q(P) curve is enabled, and the core curve points are set to P1 = -100%, Q1 = 43.6% and P6 = 100%, Q6 = -43.6%. When the inverter's active power reaches -100%, it will inject reactive power at 43.6% capacity. When the inverter's active power reaches 100%, it will absorb reactive power at 43.6% capacity.

PFP Curve: It is used to adjust the PF of inverter according to the set active power. For the detailed setup values, please follow the local grid code.

P-LockIn / V-LockIn: Check boxes to enable the active power and grid voltage thresholds for activating or deactivating this mode.

7.9 Gen Setup

The GEN port can be connected to Generator, Smart Load, or Micro-Inverter.

When connected to Generator, the following settings can be configured.

GEN Connect to Grid: connect the diesel generator to the grid input port. If this option is checked, the system will show that it is running in OnGrid status, but it will actually operate as a diesel generator and not allow energy to flow into the diesel generator. Meanwhile, the protection parameters also operate in accordance with the protection parameters of the diesel generator.

Generator input rated power: allowed Max. power from diesel generator.

Gen Peak shaving: Limit the maximum output power of the generator to the set rated power on "GEN PORT USE" page, the rest of power consumption will be provided by inverter to ensure that the generator will not overload.

Gen Port Setting

Mode
☐ Generator Input
☐ Smart Load Output
☐ Micro Inv Input

Rated Power
 50.0kW

AC Couple Frz High
 55.00Hz

Time
 Start Stop

SOC 90% ON 80% OFF

Gen Peak Shaving
☐

Gen Connect to Grid
☐

On Grid Always On
☐

AC Couple On Grid Side
☐

AC Couple On Load Side
☐

MI ExportToGrid Off
☐

Gen Set1
 Gen Set2

Generator Setting/IP Protection

Volt	Value	Time	Freq	Value	Time
HV1	120%	2.00S	HF1	51.5Hz	2.00S
HV2	130%	0.20S	HF2	52.0Hz	0.20S
LV1	70%	2.00S	LP1	46.5Hz	2.00S
LV2	60%	0.20S	LP2	46.0Hz	0.20S

Gen Set2

When connected to Smart Load, the following settings can be configured.

Smart Load Output: 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: 90%, OFF: 80%: When the battery bank SOC reaches 90%, Smart Load Port will switch on automatically and power the load connected. when the battery bank SOC < 80%, the Smart Load Port will switch off automatically.

On Grid always on: When "on Grid always on" is checked, the smart load port will always keep switching on if hybrid inverter is operating in on-grid mode.

When connected to Micro-Inverter, the following settings can be configured.

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 closed(ON), Grid-Tied inverter can operate normally.

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 frequency will become the setting value (AC couple Frz high) and the Microinverter will stop working.

MI export to Grid off: Stop exporting power produced by the microinverter or Grid Tied inverter to the grid.

AC Couple on Grid port: Reserved

AC Couple on Load port: Use the Load port as an AC couple input port, which can be connected with micro-inverter or other Grid-Tied inverter.

7.10 Profession Setup

DRM: For AS4777 standard.

Backup Delay: When the grid cuts off, the inverter will output power after the set time.

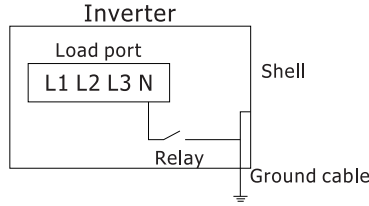
For example, backup delay: 600s. the inverter will give output power after 600s when the grid cuts off.

GFCI: the ground-fault circuit interrupter function.

Active Islanding: Active islanding detection enable or not.

Voltage Adjust: if the inverter is working at off grid, we can adjust the output voltage by Voltage Adjust.

Neutral Ground Relay: If "Neutral-Ground Relay" is checked and when inverter is in off-grid mode, the relay on the Neutral line of load port will switch on, then the N line of load port will bind to ground.



Grid Port Balanced: When the loads connected to the Load port have an unbalanced distribution on the three phases and the inverter is working in on-grid mode, enabling this function will ensure an equal power absorption from the three phases of grid.

Force Off Grid: When activated, the inverter will force off-grid. The inverter switches back to grid-tied, when the battery SOC falls below the "Grid Start" value on "Battery Setting" page. It returns to off-grid, when the battery SOC rises above the "Grid Exit" value.

Grid Tie Meter2: When there are one or more grid-tied inverters AC coupled on the grid or load port side of the hybrid inverter, and external meter is installed for this/these grid-tied inverters, it is necessary to enable this function to upload the data of the external meter to the hybrid inverter to ensure that the power consumption data of the load is correct. The baud rate of the external meter should be set to 9600, and the ID address should be set to 2. The brand and model of the external Meter2 must match Meter1.

CT Check: Inverter will perform self check on external CT and return the test results.

MPPT Scan: After enabling this function, MPPT will perform I-V curve scanning by the MPPT Scan time to find the maximum power point again and eliminate MPPT failure caused by shadows.

CT SelfCheck			
CT Check Status:Fail			
	CT_A:	CT_B:	CT_C:
CT_Result	Init	Init	Init
GridPower	0.00kw	0.00kw	0.00kw
CTPower	0.00kw	0.00kw	0.00kw

Parallel: if user want to parallel operation to Expand system capacity, we need to click the parallel. And in a parallel system, we can have and must have only one Master, and the others must be set as Slaver, and we need to set a unique CAN ID to each inverter, the CAN ID is from 1 to 12.

Master: Select any hybrid inverter in the parallel system as the master inverter, and the master inverter will manage the working mode of the parallel system. The CT needs to be connected only to the Master 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.

Zero Export Select: Select CT or EleMeter when using zero-export to CT work mode.

CT Ratio: The CT ratio of the zero-export to CT mode.

1. The default range of CT is 300A.

2. The default transformation ratio for CT is 6000:1.

The external CT has a ratio of 300 A : 5 A, providing the first-stage ratio of 60 : 1.

The internal circuit of terminals 1-6 provides conversion ratio of 5A:50mA, providing the second-stage ratio of 100 : 1. Therefore, the total CT Ratio is 6000 : 1.

Meter Select: Use the different meters.e.g.Eastron and CHINT.

Factory Reset: Reset all parameters of the inverter.

Clear History Fault: Clear all fault records on the LCD.

Clear Current Fault:Clear all current fault so that Inverter operating normal.

Grid Peak Shaving: When it is active, grid current will be limited within the set value.

Single-Phase Grid A: Enable this function only under single-phase grid conditions. When only Phase A grid is connected, the inverter can operate normally. Note: After enabling this function, Phases B and C must not be connected to the grid.

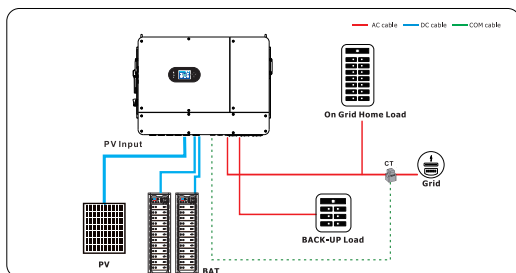
Ignore High SOC Current Limit: When activated, the inverter will no longer limit the battery current; the battery current is constrained solely by the battery pack itself.

CT Self-Adaptive: Inverter will perform self check on external CT and adapt to their phase sequence and polarity automatically.

8. System Application

8.1 Basic Mode

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.

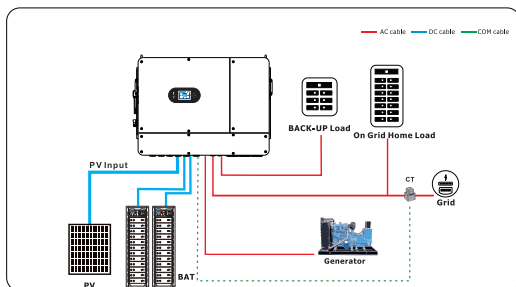
The two battery input terminals of the IVGM INVERTER can be configured as parallel batteries in the settings screen. If a charging/discharging rate of 100A is required, the battery must be connected to two input terminals BAT1 and BAT2. If multiple batteries are connected to a single inverter input terminal, the positive and negative outputs of the batteries must be connected together before connecting them to the inverter terminal.



1. ALL systems MUST be connected to their own battery bank.
2. DO NOT parallel batteries between inverters.

8.2 Generator Mode

Mode II: With Generator



Gen Port Setting

Mode

☐ Generator Input

Rated Power
50.0kW

☒ Smart Load Output

AC Couple Frz High
55.00Hz

☒ Micro Inv Input

☐ MI ExportToGrid Off

☐ GEN Peak Shaving

☐ Gen Connect to Grid

☐ On Grid Always On

SOC 90% ON 80% OFF

Time Start Stop

☐ AC Couple On Grid Side

☐ AC Couple On Load Side

Gen Set1

Gen Set2

Gen Set3

Gen Set4

Gen Set5

Gen Set6

Gen Set7

Gen Set8

Gen Set9

Gen Set10

Gen Set11

Gen Set12

Gen Set13

Gen Set14

Gen Set15

Gen Set16

Gen Set17

Gen Set18

Gen Set19

Gen Set20

Gen Set21

Gen Set22

Gen Set23

Gen Set24

Gen Set25

Gen Set26

Gen Set27

Gen Set28

Gen Set29

Gen Set30

Gen Set31

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Gen Set88

Gen Set89

Gen Set90

Gen Set91

Gen Set92

Gen Set93

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Gen Set95

Gen Set96

Gen Set97

Gen Set98

Gen Set99

Gen Set100

Generators Smaller than 124kW (On "GEN" Input)

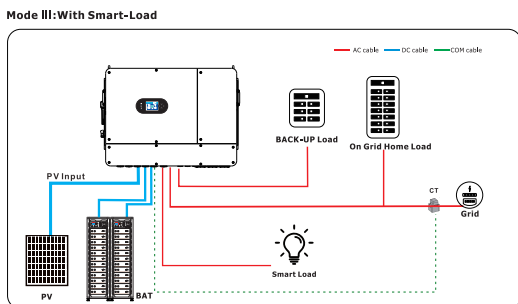
1. Supports three-phase 208/400/480Vac generators.
2. 200A rated "GEN" terminal. 180A continuous.
3. A THD (Total Harmonic Distortion) of less than 15% is required for stable operation.

Generators Greater than 124kW (On "GRID" Input)

1. Supports three-phase 208/400/480Vac 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 generator is 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.

8.3 Smart Load Mode



Gen Port Setting

Mode

☒ Generator Input

Rated Power: 50.0kW

☐ Smart Load Output

AC Couple Frz High: 55.00Hz

Time: Start Stop

☒ Micro Inv Input

☐ MI ExportToGrid Off

☐ GEN Peak Shaving

☐ Gen Connect to Grid

☐ On Grid Always On

SOC: 90% ON 80% OFF

☐ AC Couple On Grid Side

☐ AC Couple On Load Side

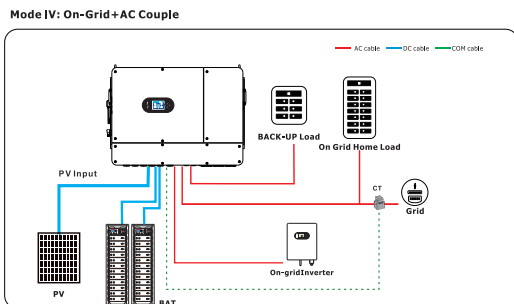
Gen Set1

X

✓

1. This mode uses the "GEN" 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 "SmartLoad 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.

8.4 AC Couple Mode



The IVGM INVERTER supports the addition of grid-tied solar inverters, this allows the systems total solar power input to be expanded by coupling 3Φ 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 UL 1741 or IEEE 1547 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.

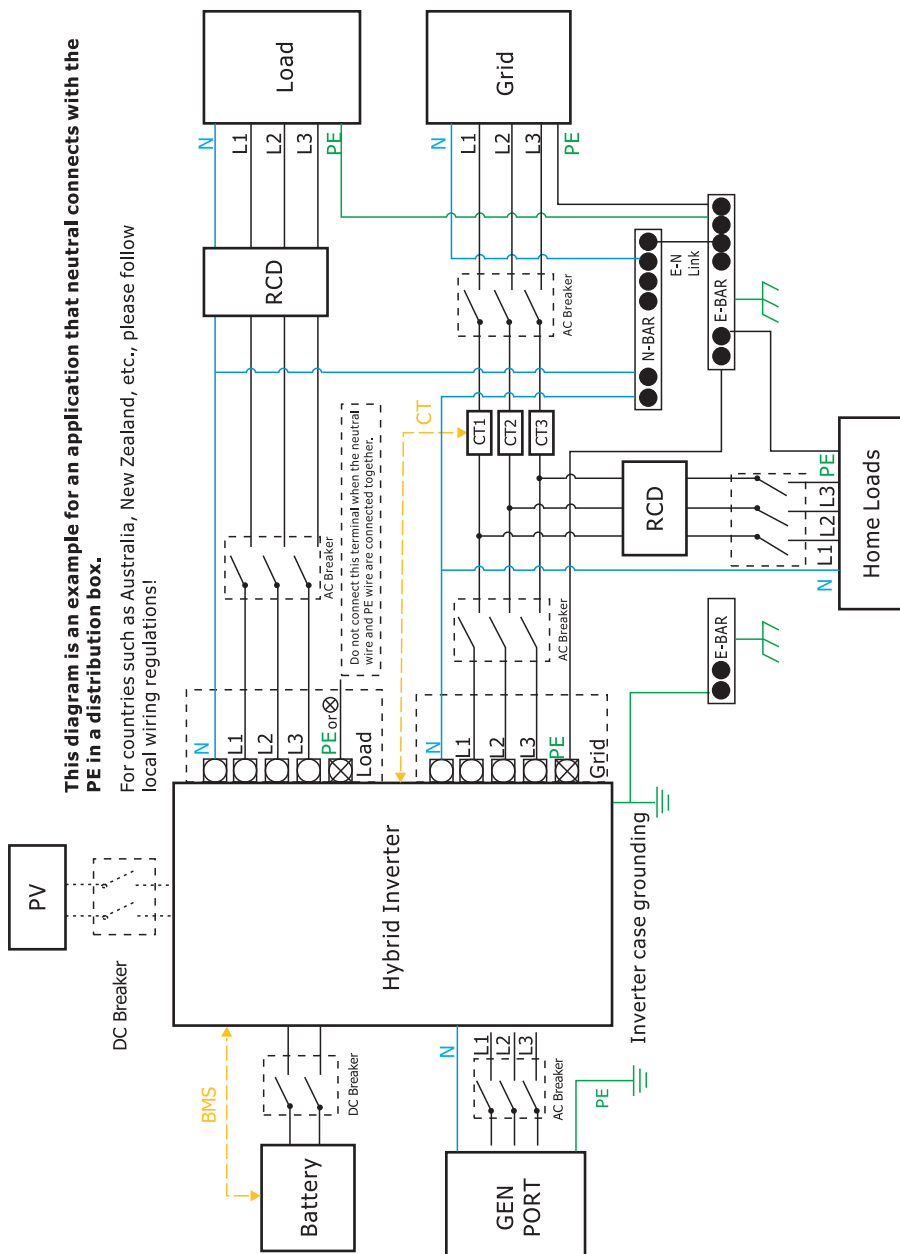
Using the GEN terminal also allows for comprehensive monitoring of solar production, giving users valuable insights into the system's performance.

9. Wiring Diagrams

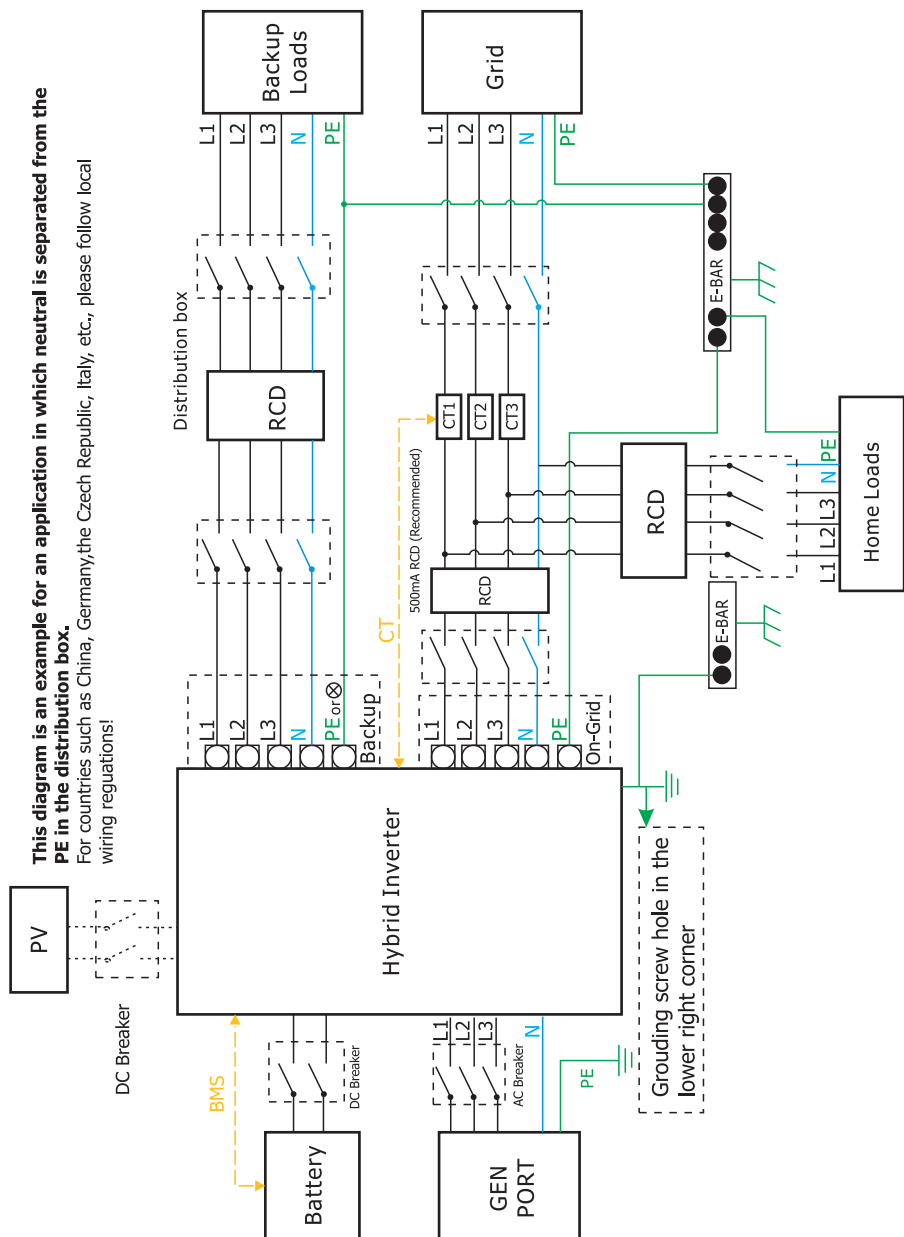


The following diagrams are general use cases. Installers are reminded that adherence to local electrical codes and regulations is mandatory. While these diagrams offer general guidance, they may not encompass all variations and specifics required by local codes. Consult with relevant authorities and ensure compliance before proceeding with any installation. The diagrams presented herein are not exhaustive and should not be relied upon solely for permitting or warranty verification. Installers are encouraged to exercise caution, seek professional advice when necessary, and undertake installations with due diligence and in accordance with established electrical standards and regulations.

9.1 Wiring Diagram with Neutral Line Grounded

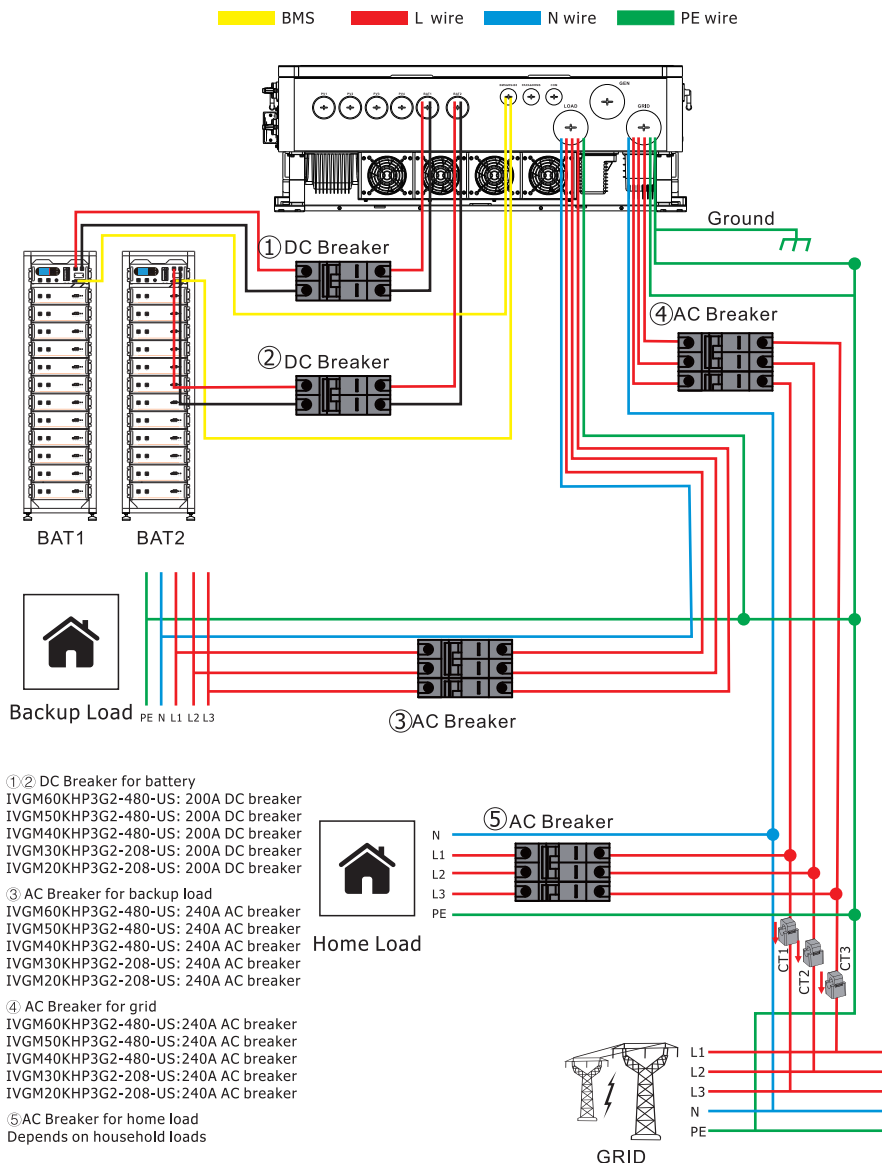


9.2 Wiring Diagram with Neutral Line Ungrounded



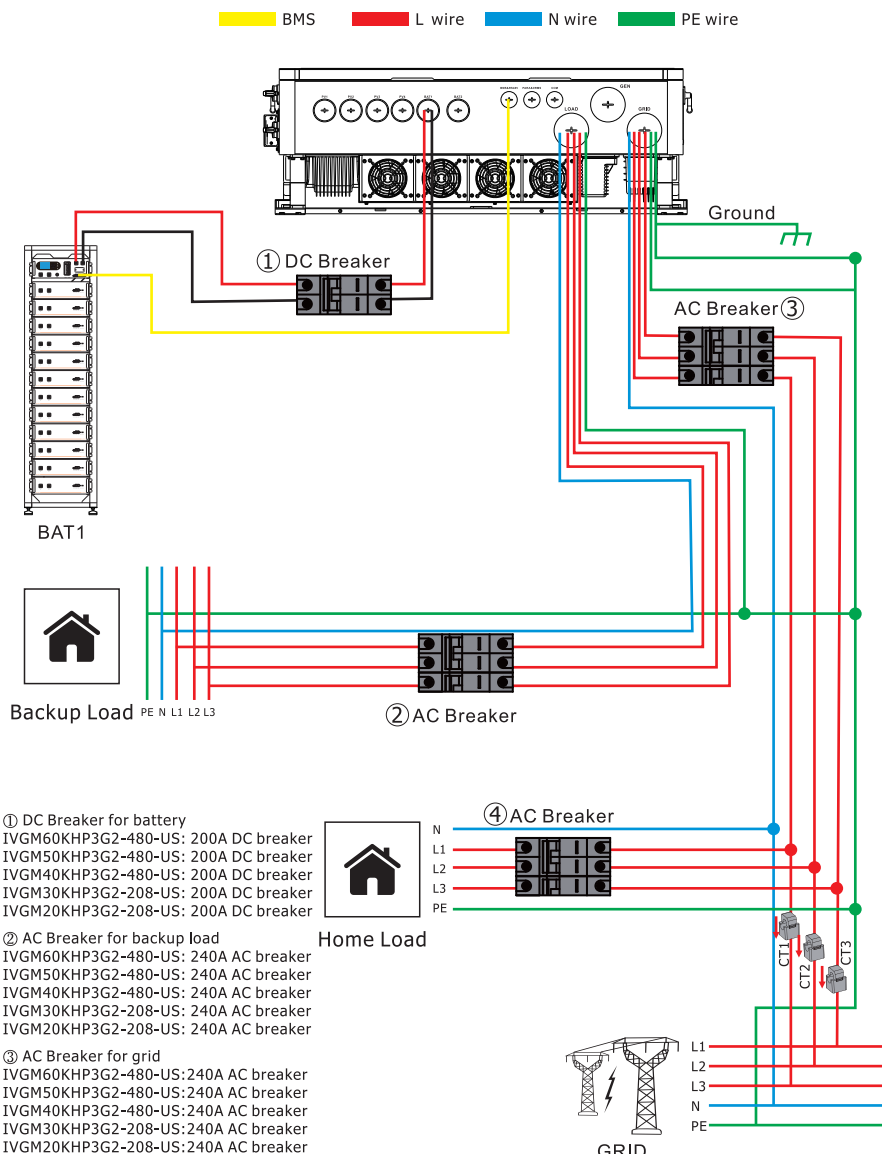
9.3 Typical Application Diagram of Grid Power

Scenario 1: If there are two high-voltage battery clusters (BAT1 and BAT2), battery cluster 1 is connected to the BAT1 port of the inverter, and the BMS communication line is connected to the BMS1 port of the inverter; Battery cluster 2 is connected to the BAT2 port of the inverter, and the BMS communication line is connected to the BMS2 port of the inverter.

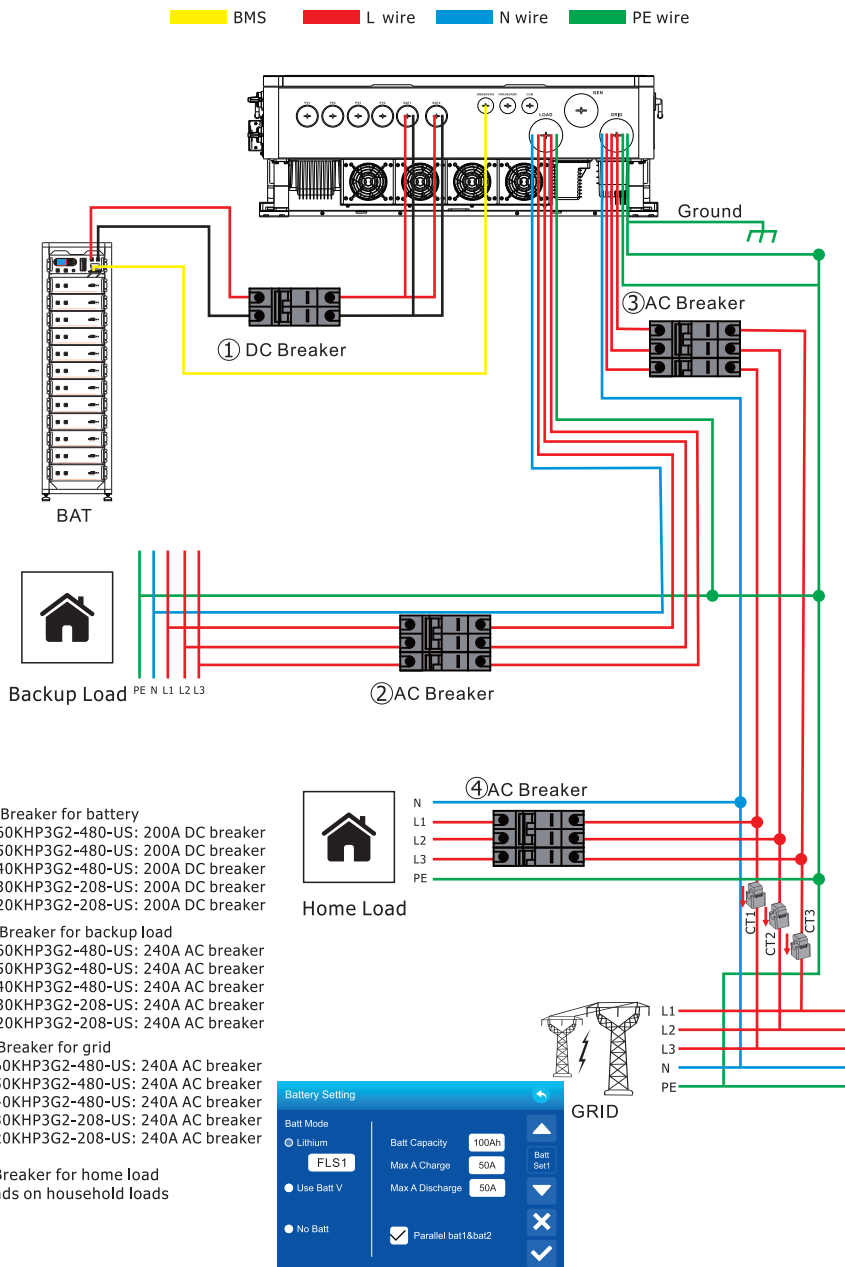


Scenario 2: If there is only one high-voltage battery cluster (BAT), the battery cluster is connected to the BAT1 port of the inverter, and the BMS communication line is connected to the BMS1 port of the inverter; Alternatively, the battery cluster can be connected to the BAT2 port of the inverter, while the BMS communication line can be connected to the BMS2 port of the inverter.

Note: The inverter has two battery ports, BAT1 and BAT2. The power of a single battery port can only reach 25KW, and it cannot output the rated power of 50KW. To operate at the rated power of 50KW, both battery ports BAT1 and BAT2 need to be used, as shown in Scenario 1 and Scenario 3.



Scenario 3: If there is only one high-voltage battery cluster (BAT), the battery output can be connected to both BAT1 and BAT2 interfaces, and the BMS communication line must be connected to the BMS1 port of the inverter. Additionally, it is necessary to set "Parallel bat1 & bat2" in on the screen.



① DC Breaker for battery
IVGM60KHP3G2-480-US: 200A DC breaker
IVGM50KHP3G2-480-US: 200A DC breaker
IVGM40KHP3G2-480-US: 200A DC breaker
IVGM30KHP3G2-208-US: 200A DC breaker
IVGM20KHP3G2-208-US: 200A DC breaker

② AC Breaker for backup load
IVGM60KHP3G2-480-US: 240A AC breaker
IVGM50KHP3G2-480-US: 240A AC breaker
IVGM40KHP3G2-480-US: 240A AC breaker
IVGM30KHP3G2-208-US: 240A AC breaker
IVGM20KHP3G2-208-US: 240A AC breaker

③ AC Breaker for grid
IVGM60KHP3G2-480-US: 240A AC breaker
IVGM50KHP3G2-480-US: 240A AC breaker
IVGM40KHP3G2-480-US: 240A AC breaker
IVGM30KHP3G2-208-US: 240A AC breaker
IVGM20KHP3G2-208-US: 240A AC breaker

④ AC Breaker for home load
Depends on household loads

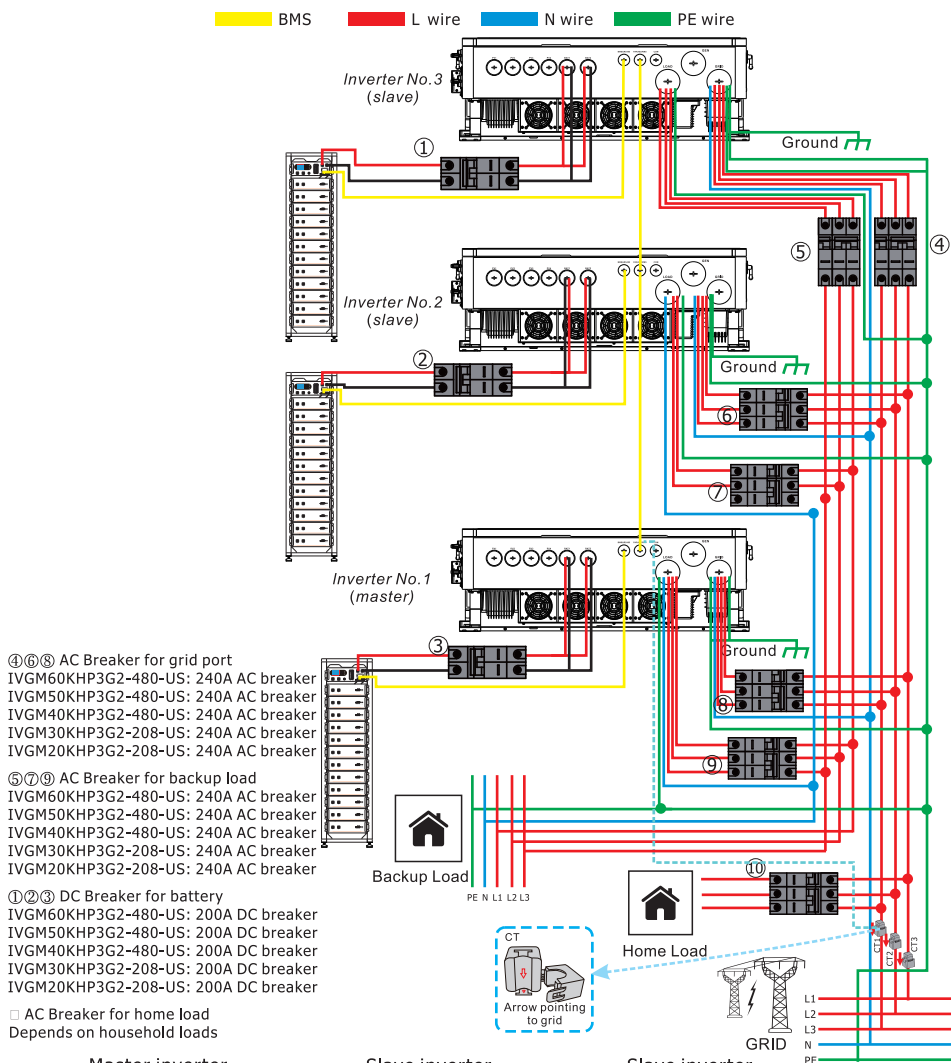
9.4 Three Phase Parallel Connection Diagram

Max. 12pcs parallel for on-grid and off-grid operation.

Note: In the parallel system, the power cables for the grid and the load must be identical in length.

Note: In the parallel system, the CTs or meter should be connect to the master.

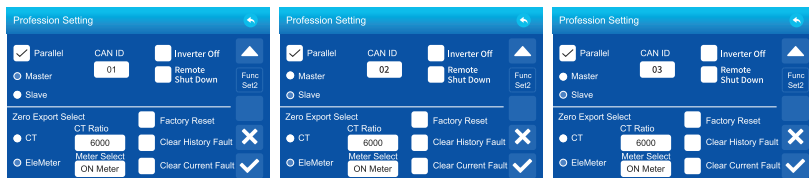
Note: Multiple parallel inverters shall not be connected to a single battery input.



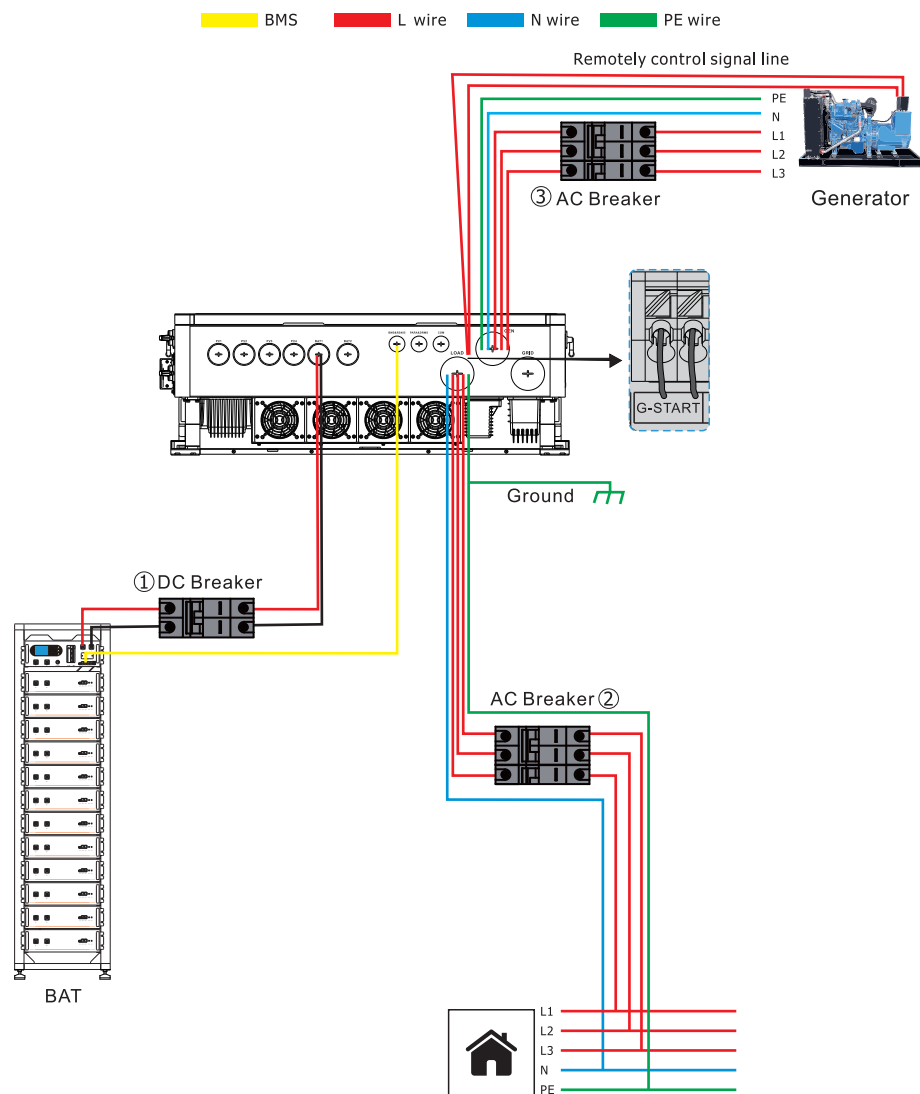
Master inverter

Slave inverter

Slave inverter



9.5 Typical Application Diagram of Diesel Generator



① DC Breaker for battery

IVGM60KHP3G2-480-US: 200A DC breaker
IVGM50KHP3G2-480-US: 200A DC breaker
IVGM40KHP3G2-480-US: 200A DC breaker
IVGM30KHP3G2-208-US: 200A DC breaker
IVGM20KHP3G2-208-US: 200A DC breaker

② AC Breaker for backup load

IVGM60KHP3G2-480-US: 240A AC breaker
IVGM50KHP3G2-480-US: 240A AC breaker
IVGM40KHP3G2-480-US: 240A AC breaker
IVGM30KHP3G2-208-US: 240A AC breaker
IVGM20KHP3G2-208-US: 240A AC breaker

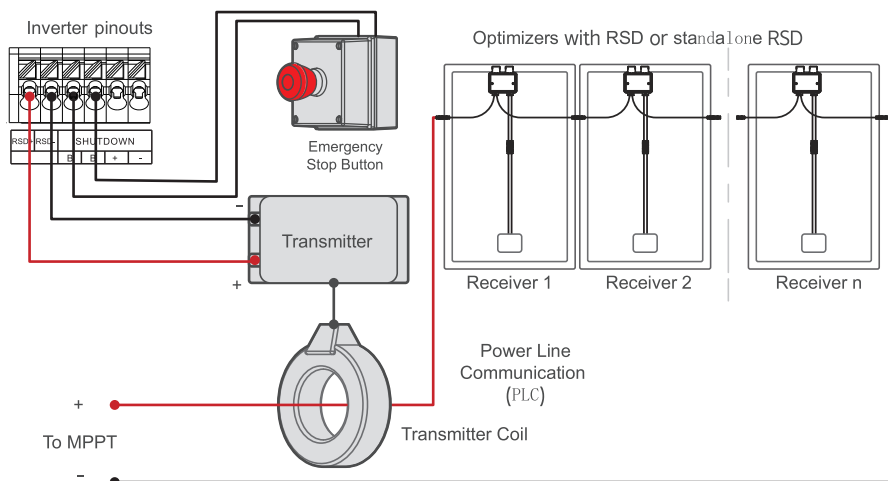
③ AC Breaker for Generator port

IVGM60KHP3G2-480-US: 240A AC breaker
IVGM50KHP3G2-480-US: 240A AC breaker
IVGM40KHP3G2-480-US: 240A AC breaker
IVGM30KHP3G2-208-US: 240A AC breaker
IVGM20KHP3G2-208-US: 240A AC breaker

9.6 Emergency Stop and Rapid Shutdown

The "B" & "B" (pins 21&22) emergency stop pins of the inverter are an ordinarily open contact that triggers rapid shutdown (RSD) when closed. RSD will cut all power including internal power supply and stop all AC outputs. The internal 12Vdc (~3%) power supply of the inverter pinouts (pins 19 & 20) will disconnect any RSD transmitter that will then shut down all solar panels when the emergency stop button is pressed.

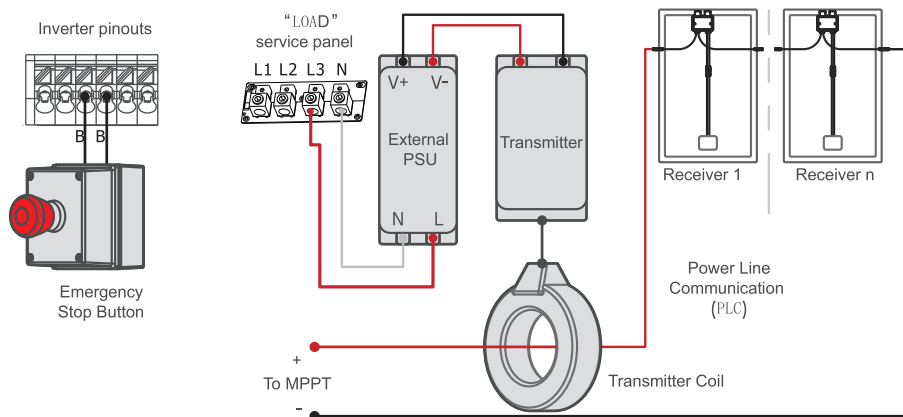
- Emergency stop button connects to "B" & "B" (pins 21&22).
- RSD transmitter connects to "RSD+" & "RSD-" (pins 19&20) to obtain 12 Vdc power.
- Transmitters placed inside the user area of the inverter can cause interference.



RSD Warning!

The Built in 12vdc power supply of the inverter (Pins 19 & 20) is rated for 100mA (1.2W). Do not exceed! If unsure of the current (A) rating of the transmitter contact the manufacturer before connecting.

A transmitter that exceeds the maximum 100mA limit can still be integrated into the inverter through an external power supply connected to the "LOAD" output. Pressing the e-stop button will disconnect all AC outputs, cutting power to the "LOAD" service panel which will initiate rapid



10. Maintenance

10.1 Storage Conditions

If the inverter will not be installed immediately:

- Store in the original packaging
- Keep in a dry and ventilated location
- Avoid direct sunlight and moisture exposure
- Prevent mechanical impact or vibration

10.2 Routine Inspection

Perform periodic inspections to ensure safe and reliable operation.

Inspection items include:

- Loose electrical connections
- Cable damage
- Ventilation blockage
- Corrosion or moisture ingress
- Abnormal noise or odor

10.3 Cleaning

Use a dry cloth or soft brush to remove dust from ventilation areas.

Do not use:

- Solvents
- Abrasive cleaners
- High-pressure water
- Corrosive chemicals



Failure to strictly follow the storage, inspection, and cleaning procedures may result in equipment damage, reduced performance, or safety hazards. Any damage, malfunction, or loss arising from improper storage, inadequate maintenance, unauthorized cleaning methods, or failure to comply with the specified instructions shall not be covered under warranty, and the manufacturer shall not be liable for any resulting damages.

11. Warranty

As to warranty terms, please refer to <FelicitySolar Warranty Policy >. 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 these 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.

12. Decommissioning and Disposal

12.1 Equipment Removal

Before removing the inverter from service:

- Disconnect the utility grid.
- Disconnect PV inputs.
- Disconnect battery connections.
- Wait at least 5 minutes for internal discharge.
- Verify zero voltage before handling conductors.

12.2 Disposal Requirements

Dispose of the inverter in accordance with local regulations for electronic equipment and electrical waste.



Do not dispose of electronic equipment with household waste.

