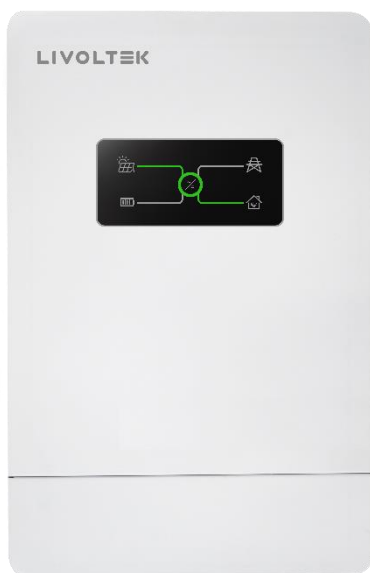




## User Manual Off-Grid Inverter



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GF1- 21-V4-2209



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# 1. About This Manual

## 1.1 Scope




The user manual mainly describes the product information, safety and installation guidelines as well as information on wiring and troubleshooting of the unit. This manual is valid for **GF1-3K48S1, GF1-5K48S1**.

## 1.2 Target Group

This manual is intended for qualified personnel who are responsible for the installation and commissioning of the inverter. Any electrical installation and maintenance on this inverter must be performed by professional electrical personnel who has obtained the license from local authorities.

## 1.3 Levels of warning messages

Safety instructions will be highlighted with the following symbols.

Symbol	Description
 <b>DANGER</b>	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
<b>NOTICE</b>	Indicates a situation that, if not avoided, could result in property damage.

## 1.4 How to use this manual

Read the manual and other related documents before performing any operation on the inverter. Documents must be stored carefully and be available at all times.

*The information in this manual is subject to change without notice.*

*Please check [www.livoltek.com](http://www.livoltek.com) for more information.*

## 2. Safety

### 2.1 Safety Instructions

#### **WARNING**

- Read all safety instructions carefully prior to any work and observe them at all times when working on or with the inverter.
- The safety instructions in this manual cannot cover all the precautions that should be followed. Perform operations considering actual onsite conditions.
- LIVOLTEK shall not be held liable for any damage caused by violation of the safety instructions in this manual.

#### 2.1.1 Personnel Safety

- Have the inverter and the battery mounted, installed and commissioned only by qualified persons with the appropriate skills.
- The qualified persons must be familiar with the safety regulations of electrical system, working process of PV power generation system, and standards of local power grid;
- Prior to performing any work on the inverter or the battery, disconnect the inverter from all voltage sources as described in this manual
- Do not touch non-insulated cable ends and any live components.
- If an error occurs, have it rectified by qualified persons only.

#### 2.1.2 Inverter Protection

#### **WARNING**

- The product must only be used as stationary equipment.
- The product is suitable for indoor use.
- Do not disconnect the PV connectors or battery connectors when the inverter is running.

- Wait at least 10 minutes for the internal capacitors to discharge after the battery is turned off.
- Ensure that there is no voltage or current before installing or disconnecting any connectors.
- All safety instructions, warning labels, and nameplate on the inverter should not be removed or covered.



### **CAUTION**

- Do not touch any hot parts during operation.

### **NOTICE**

- As soon as receiving the inverter please check if it is damaged during its transportation. If yes, please contact your dealer immediately.
- Only qualified personnel can change the country settings.
- Adequate ventilation must be provided for inverter installation location Mount the inverter in vertical direction, and ensure that no objects block the heat dissipation









## **2.1.3 Battery Protection**



### **DANGER**

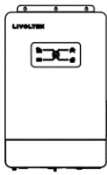








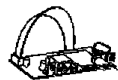
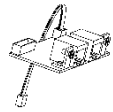

- The battery must comply with the locally applicable standards and directives and must be intrinsically safe
- The communication interface of the battery must be compatible with the product.
- The entire battery voltage range must be completely within the permissible input voltage range of the product.
- Batteries deliver electric power, resulting in burns or a fire hazard when they are short circuited, or wrongly installed.
- Lethal voltages are present at the battery terminals and cables connecting to the inverter.
- Severe injuries or death may occur if the cables and terminals in the inverter are touched.

## 2.2 Symbol on the Type Label

Symbol	Explanation
	CE mark. The inverter complies with the requirements of the applicable CE guild lines
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Danger of high voltages. Danger to life due to high voltages in the inverter!
	Danger. Risk of electric shock!
	Observe enclosed documentation.
	The inverter can not be disposed together with the household waste. Disposal information can be found in the enclosed documentation.
	The inverter can not be disposed together with the household waste. Disposal information can be found in the enclosed documentation.
	Danger to life due to high voltage. There is residual voltage in the inverter which needs 5 min to discharge. <ul style="list-style-type: none"> <li>• Wait 5 min before you open the upper lid or the DC lid.</li> </ul>



# 3. Scope of Delivery

 <p>A</p>	 <p>B</p>	 <p>C</p>	 <p>D</p>
 <p>E</p>	 <p>F</p>	 <p>G</p>	 <p>H</p>
 <p>I</p>	 <p>J(optional)</p>	 <p>K(optional)</p>	 <p>L(optional)</p>

Item	QTY	Designation
A	1	Inverter
B	5	Expansion Screws for Fixing Mounting Bracket
C	4	M3 Screws for Fixing the inverter
D	1	NTC cable
E	2	Terminal block SC25-5 for battery cables
F	4	Terminal block for PV and AC cables
G	1	User Manual
H	1	Tape for NTC cable
I	1	Certificate card
J	1	Wi-Fi & LAN board (optional)
K	1	Parallel board (optional)
L	1	LCD Display kits (optional)

Note: Delivery marked with“（optional）”, which need to be purchased additionally, please contact your local dealer for details respectively.

## **4. Product Introduction**

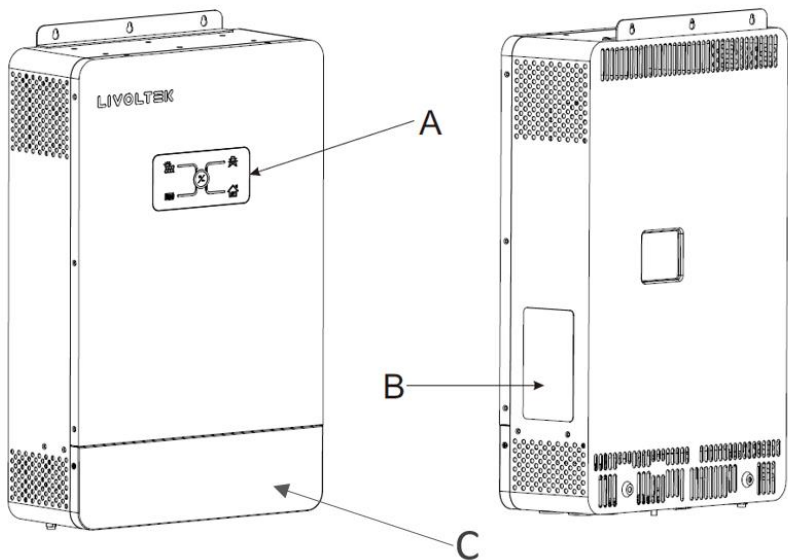
LIVOLTEK GF Series off-grid inverter is an important part of the off-grid solar power supply system, combining functions of inverter, MPPT solar charger and battery charger to offer uninterruptible power supply, which is ideal for off-grid backup power and self-consumption applications.

The whole system also need other devices to achieve complete running such as PV modules, generator, or Utility grid. Please consult with your system integrator for other possible system architectures depending on your requirements.

### **4.1 Features**

- Pure sine wave inverter
- Built-in Bluetooth communication
- Built-in MPPT solar charge controller
- Zero transfer time to protect critical loads
- Compatible with or without a battery
- Compatible to Lead acid & Lithium battery
- Compatible to mains voltage or generator power
- Configurable input voltage range
- Multiple protection function
- Intelligent battery management function
- USB upgrade, easy operation and maintenance
- Parallel operation available (optional)
- Remote configuration & upgrade (optional)
- Split LCD screen & comprehensive display (optional)

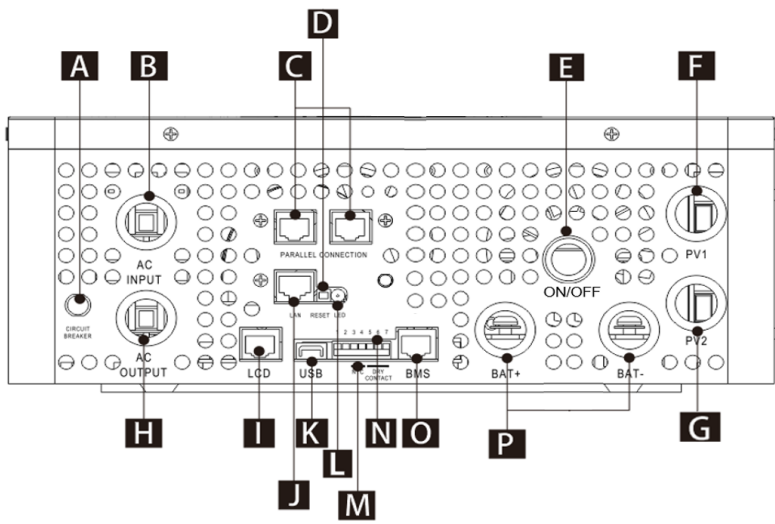
## 4.2 Appearance



**View of the GF1 Series off-grid inverter**

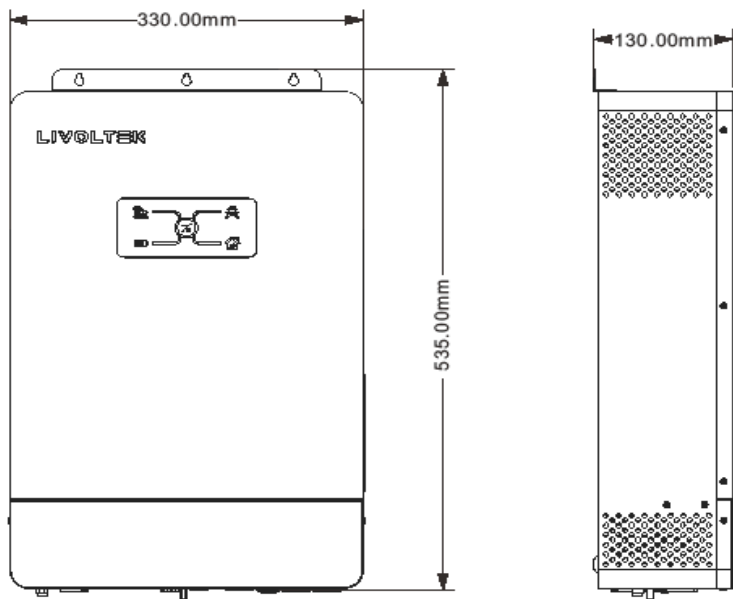
Position	Designation
A	LED indicators Indicates the current working state of the inverter.
B	Type Label The type label uniquely identifies the inverter. You will find the following information on the type label: <ul style="list-style-type: none"><li>• Inverter device type (Model)</li><li>• Serial number of the inverter (S/N)</li><li>• Specific characteristics</li></ul>
C	Enclosure lid for the electrical connection area The electrical connection area includes DC & AC & battery & communication terminals ,etc.

### 4.3 Interfaces



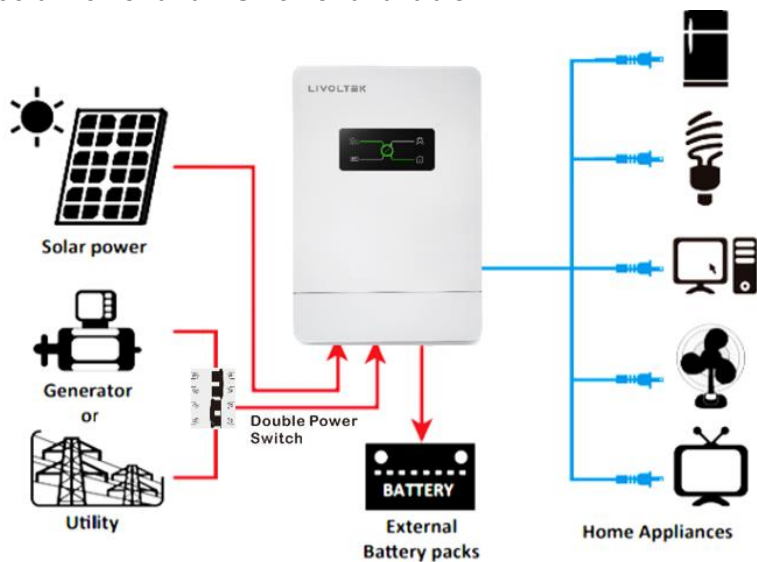
A	Circuit breaker
B	AC input port
C	Parallel communication ports (for parallel mode)
D	Reset function key for internal Wi-Fi or LAN
E	EPS output on/off switch
F	PV1 connection Area (PV string1 input )
G	PV2 connection Area (PV string2 input only for 5kW )
H	AC output port
I	Split LCD screen communication port
J	Ethernet cabling port
K	USB port for upgrading
L	Status indicator for internal Wi-Fi
M	NTC connection port for Lead-acid battery
N	Dry contact
O	BMS communication port
P	Battery connection Area

4.4 Dimensions

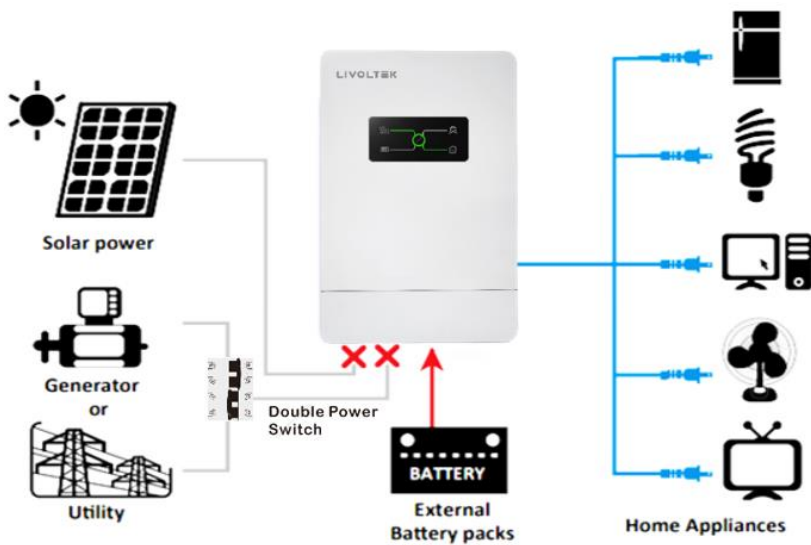


## 4.5 System Diagram

Solar Power and AC Power available



Solar Power and AC Power not available



## 4.6 Working Modes

LIVOLTEK GF Series off-grid inverters is for autonomous solar energy generation, and incorporate batteries and generators to maintain a constant supply of electricity to your home, shack or farm.

With the intelligent AC and PV complementation power supply function, the unit can seamless switch in auto between different power sources to offer uninterruptible power support. The batteries can also automatically charges and discharges based on your configuration, which help using more solar energy and save electricity.

There are three modes (Off-grid mode, Backup mode, and Economic mode) to ensure the best situation for you.

### 4.6.1 Off-grid Mode

Suitable for non-grid areas and the inverter will automatic activation this mode in the event of grid failure (Battery is necessary in this mode). The off-gird mode ensures that the inverter forms a battery-backup grid that uses energy from the battery and the PV system to supply the loads. The switch time in this system is 0ms from one mode to another.

#### In Off-grid Mode:

- When the sunlight is sufficient, the system supplies power to loads and stores surplus solar energy in the battery.
- When the sunlight is insufficient or there is no sunlight, the battery discharge to supply power to loads automatically until reach low battery warning.
- If enough sunlight is available, the system will charge the battery automatically and simultaneously support the loads.
- Output source Priority is Solar-> Battery
- Charging source priority is Solar Power only.



#### **4.6.2 Backup Mode:**

This mode allows you to dedicate the full capacity of the battery for backup power supply during public electricity network fails, meanwhile to avoid excess battery charge/discharge and prolong battery life. If you never know when the next grid outage might be, it makes perfect sense to prioritize keeping a full battery.

##### **In Backup Mode:**

- When operating in this mode, solar energy and grid will fully charge battery as first priority at the same time. The loads will be supplied by the surplus solar production supplemented, if necessary by the public electricity grid. The battery will be used only when the grid failure.
- When solar energy is sufficient to power the battery and the loads, Utility will stand by until solar power ceases.
- When the sunlight is insufficient, Utility will power the loads and battery.
- When the sunlight is insufficient and there is no Utility, the inverter automatically switches to off-grid mode and the battery will discharge for loads consumption until reaches its power limit value. Then the generator will be activation if there is a generator connected.
- If enough sunlight or Utility is available, the system will fully charge the battery automatically and simultaneously support the loads.
- Load supply source: Solar >Utility >Generator
- Battery charging source: Solar > Utility>Generator

### 4.6.3 Economic Mode (Default)

This mode applies to areas where the electricity price is high, the unit allows you to choose on how to power your loads, which help to optimize self-consumption and reducing electricity costs.

#### In Economic Mode:

- The discharge cut-off voltage (lead-acid battery) or SOC (lithium battery) can be set via APP or LCD.
- When solar energy is sufficient, the system supplies power to loads and stores surplus solar energy in the battery.
- When the solar energy is insufficient or there is no sunlight, the battery will discharge for loads consumption until reaches its power limit value. Then Utility will provide power to the loads.
- Power source Priority is Solar > Bat > Utility
- Charging source Priority is Solar > Utility

### 4.7 Storage

The following storage instructions apply if the inverter is not installed immediately.

- Do not unpack the inverter (put desiccant in the original box if the inverter is unpacked).
- The storage temperature must be always between -15° C and +60° C, and the storage relative humidity must be always between 0 and 95 %, non-condensing.
- In case of stacking storage, the number of stacking layers should never exceed the limit marked on the outer side of the packing case.
- Do not position the inverter at a front tilt excessive back tilt or side tilt or upside down.
- Conduct periodic inspection during storage Replace the packing materials immediately if any rodent bites are found.
- Ensure that qualified personnel inspect and test the inverter before use if it has been stored for a long time.

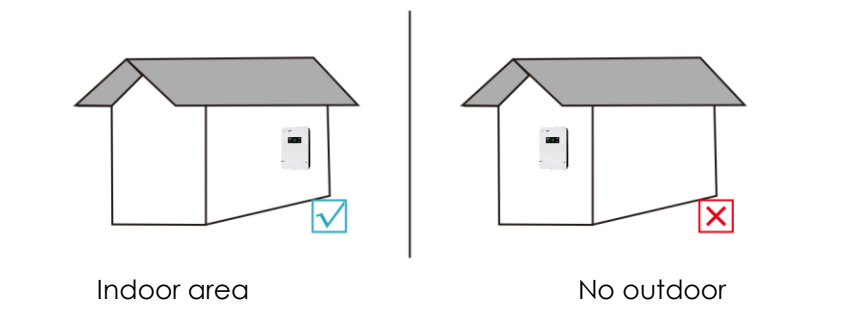
## 5. Mechanical Mounting

### 5.1 Requirements for Mounting

#### NOTICE

- Make sure there is no electrical connection before installation.
- In order to avoid electric shock or other injury, make sure that holes will not be drilled over any electricity or plumbing installations.
- Always follow the instructions when moving and positioning the inverter.
- Improper operation may cause injuries or serious wounds. In the case of poor ventilation, the system performance may compromise.

#### 5.1.1 Location Requirements



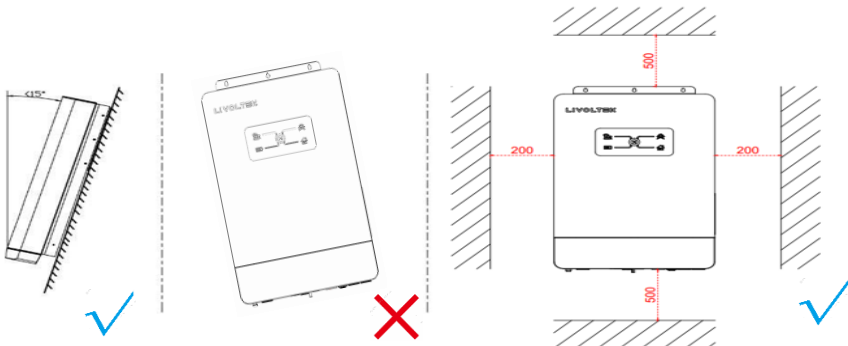
- Select an optimal mounting location for safe operation, long service life and expected performance. During the installation and operation process, please pay attention to install the inverter indoors.
- Don't install the inverter where people may touch its casing and radiator, because these parts will be very hot during operation.

### 5.1.2 Environment Requirements

The inverter should be installed in a ventilated environment to ensure good heat dissipation. Make sure the installation site meets the following conditions:

- Not in areas where highly flammable materials are stored.
  - Not in potential explosive areas.
  - Not in the cool air directly.
  - Not near the television antenna or antenna cable.
  - Not higher than altitude of about 2000m above sea level.
  - Not in environment of precipitation or humidity ( $>95\%$ ).
  - Under good ventilation condition.
  - The ambient temperature in the range of  $-15^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$ .
  - The slope of the wall should be within  $\pm 5^{\circ}\text{C}$ .
  - The wall hanging the inverter should meet conditions below:
- ✓ The wall must be solid enough to bear the weight of the inverter.
- ✓ Do not install the inverter on a wall made of gypsum boards or similar materials with weak sound insulation to avoid noise disturbance in a residential area.

### 5.1.3 Angle and Space Requirements



## NOTICE

Never install the inverter horizontally, or with a forward tilt or with a backward tilt or even with upside down. The horizontal installation can result in damage to the inverter. Install the inverter upright or at a maximum back tilt of 15 degrees to facilitate heat dissipation.

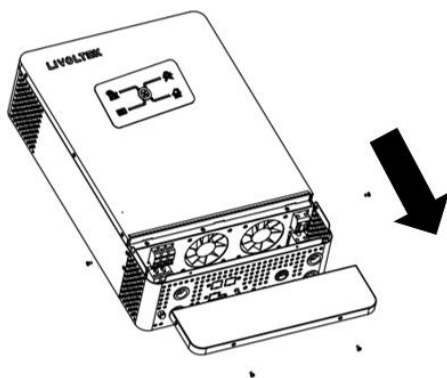
## 5.2 Mounting Instructions

**Installation Tools** (recommended but not limited to the following ones):

Protective glasses and gloves, Marker, Measuring tape, Multi-meter, Wire crimper, Stripping pliers, Screwdriver, Manual wrench, Hammer drill and drill bit, etc.

### Preparation

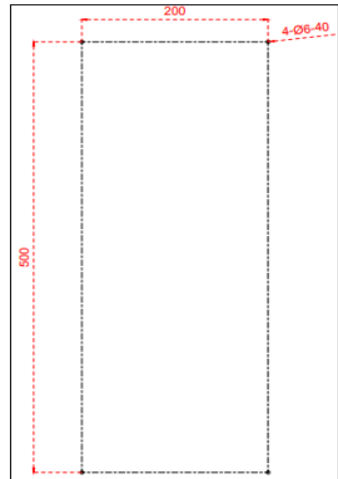
Before connecting all wiring, please take off the bottom cover by removing four screws as below.



## Mounting the Inverter

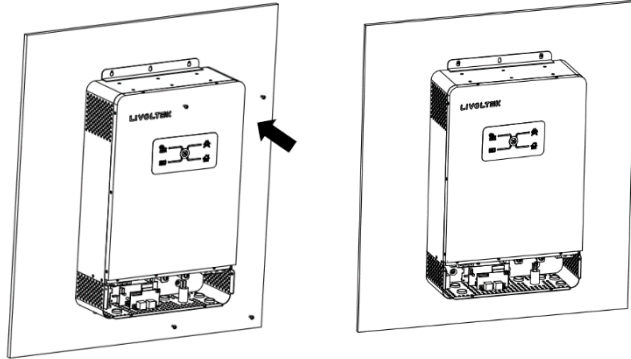
### Step1: Drill holes on the wall

- Locate the appropriate drilling holes and mark it with a marker pen.
- Drill holes with driller, make sure the holes are deep enough (at least 50mm) to support the inverter.



### Step 2: Install the inverter to the wall

Insert the expansion tubes into the holes and tighten them. Then install the inverter by screwing the screws.



### Step 3: Installation Self-check

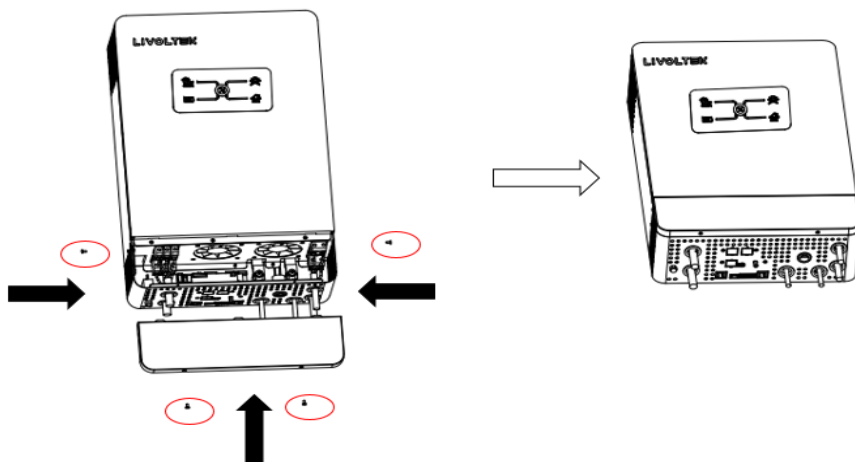
Make sure the inverter is well fixed.

### Step 4: Electrical Connection

Please refer to the operating instructions in the next chapter.

## Step 5: Final Assembly

After connecting all wirings, please put bottom cover back by screwing four screws as shown below.



## 6. Electrical Connection

This chapter mainly describes the cable connections of the system. Prior to any electrical connections, keep in mind that the inverter has dual power supplies. It is mandatory for the qualified personnel to wear personal protective equipments (PPE) during the electrical work.

### **DANGER**

Danger to life due to a high voltage inside the inverter!

- The PV string will generate lethal high voltage when exposed to sunlight.
- Before starting electrical connections, disconnect the DC and AC circuit breakers and prevent them from inadvertent reconnection.
- Ensure that all cables are voltage free before performing cable connection.

### **WARNING**

- Any improper operations during cable connection can cause device damage or personal injury.
- Only qualified personnel can perform cable connection.
- All cables must be firmly attached, undamaged, properly insulated and adequately dimensioned.

### **NOTICE**

- Comply with the safety instructions related to the PV strings and the regulations related to the Utility grid.
- All electrical connections must be in accordance with local and national standards.



## 6.1 PV Connection

Please only use the PV connectors from the accessory box for connection. Before connecting, please make sure:

- The voltage, current and power ratings of the panels to be connected are within the allowable range of the inverter. Ensure polarity is correct. Please refer to the Technical Data in chapter 9 for voltage and current limits.
- Since the inverter is transformerless, please do not ground either output of the PV panels. Ground the panel frames.
- Before connecting to PV modules, please install separately a DC circuit breaker between inverter and PV modules.
- To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter.
- It's requested to use PV junction box with surge protection. Otherwise, it will cause damage on inverter when lightning occurs on PV modules.

### **WARNING**

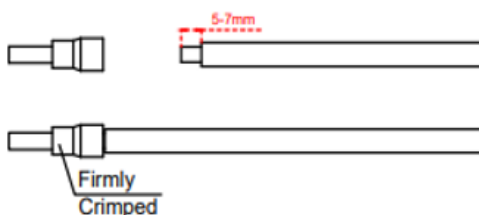
- Use IEC61730 class-A Rating PV modules.
- When exposed to light, PV panels will generate DC voltage.
- Turn off the DC circuit breaker before connecting any wiring.
- All wiring must be performed by a qualified personnel.
- It's very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size as below

## Wiring Connection

**Please follow below steps to implement PV module connection:**

Step1: Remove an appropriate length of the insulation layer from the positive and negative power cables using a wire stripper.

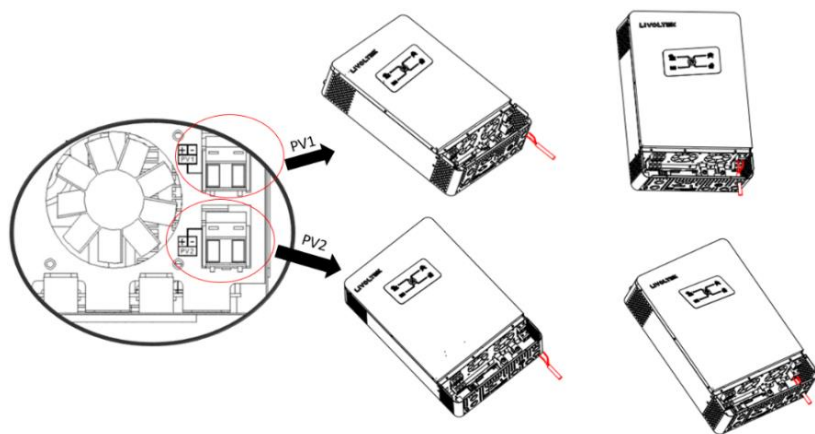
Step2. Insert the exposed areas of the positive and negative power cables into the metal terminals of the positive and negative connectors respectively and crimp them using a crimping tool.



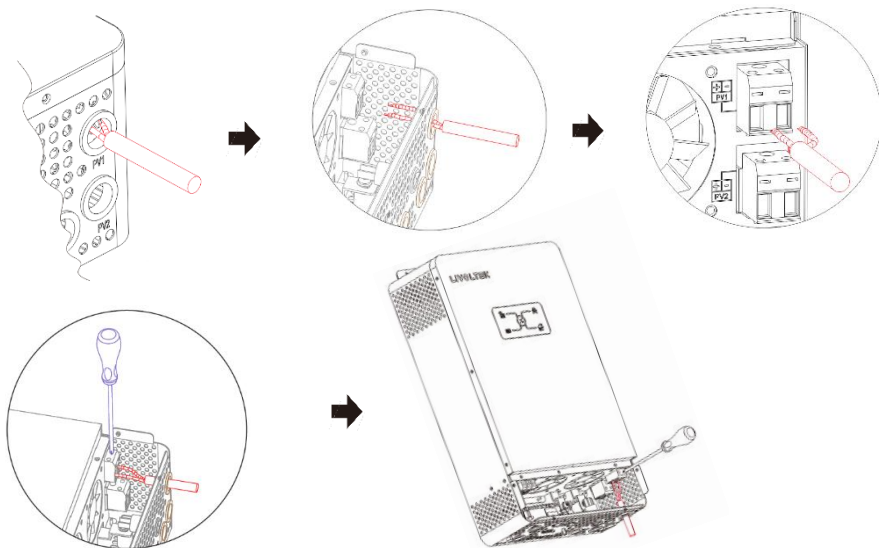
Step3. Check correct polarity of wire connection from PV modules and PV input connectors. Then, connect positive pole (+) of connection wire to positive pole (+) of PV input connector. Connect negative pole (-) of connection wire to negative pole (-) of PV input connector. Screw two wires tightly in clockwise direction. Recommended tool: 4mm blade screwdriver. Torque: 1.6N.m (16kgf.cm) .

Step4. Make sure the wires are securely connected.

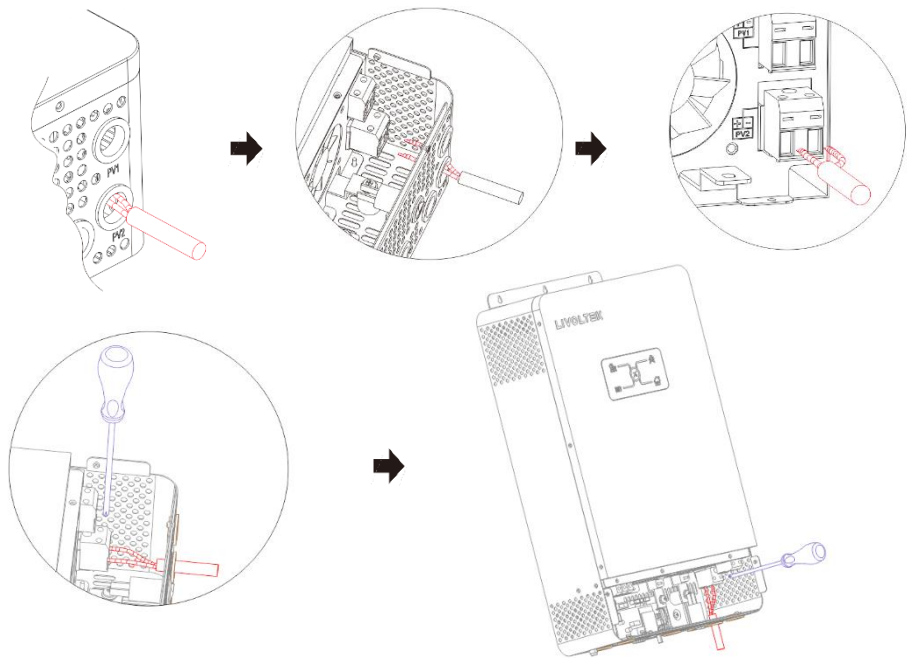
Step3:



Step4:  
PV1 connection



PV2 connection



## 6.2 AC Input / Output Connection

### **WARNING**

- The grid voltage and frequency must be in the permissible range.
- An external AC breaker ( $\geq 25\text{A}@GF1-3K48S1$ ,  $\geq 40\text{A}@GF1-5K48S1$ ) must be installed between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input.
- There are two terminal blocks with "IN" and "OUT" markings. Please do NOT misconnect input and output connectors.
- All wiring must be performed by a qualified personnel.
- Before making AC input/output connection, be sure to open DC protector or disconnection first.
- Disconnect the AC circuit breaker and secure it against reconnection.

### **Suggested cable requirement for AC wires**

It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

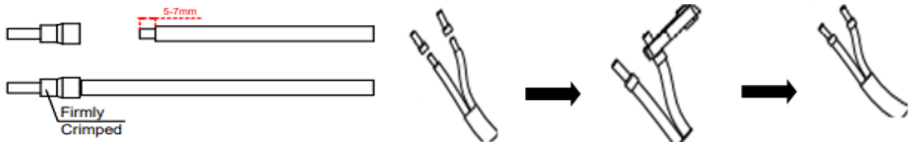
Model	Wire Size	Cable	Beaker	Torque Valu (max)
3KVA	12AWG	3.3mm <sup>2</sup>	23A	1.6N • m
5KVA	12AWG	3.3mm <sup>2</sup>	40A	1.6N • m

### **Procedure:**

#### **Step1: Assembling the AC Connector**

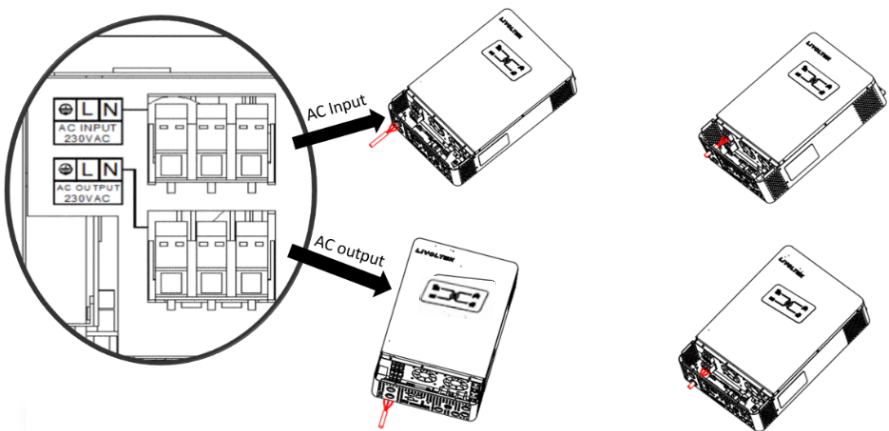
- Remove the cable jacket and strip the wire insulation by 5–7 mm.

- Insert the conductors to the corresponding terminal and crimp them.
- Pull cables outward to check whether they are firmly installed.

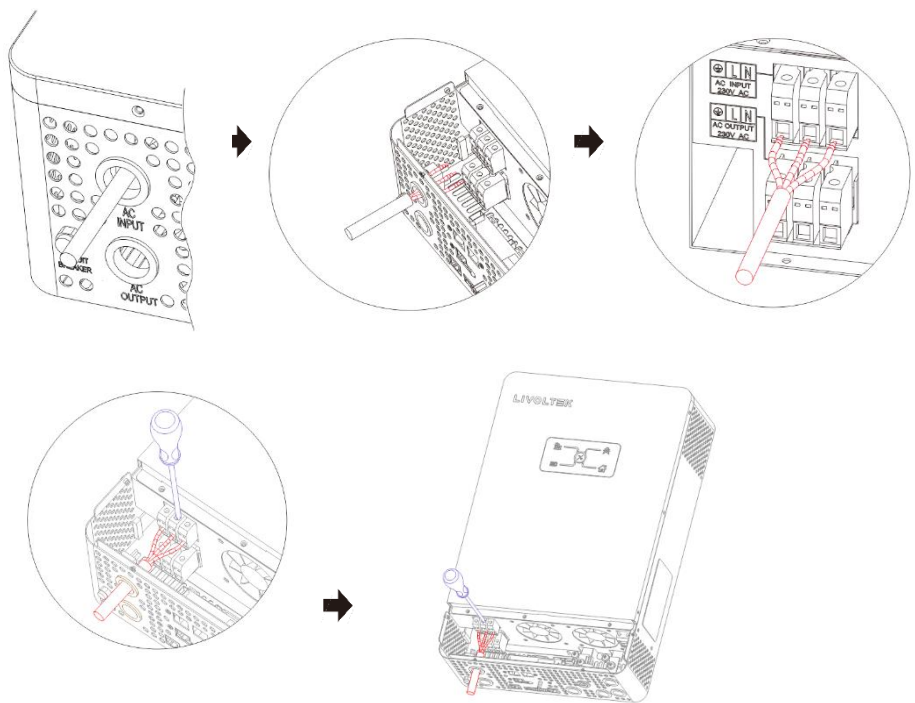


## Step 2: Installing the AC Connector

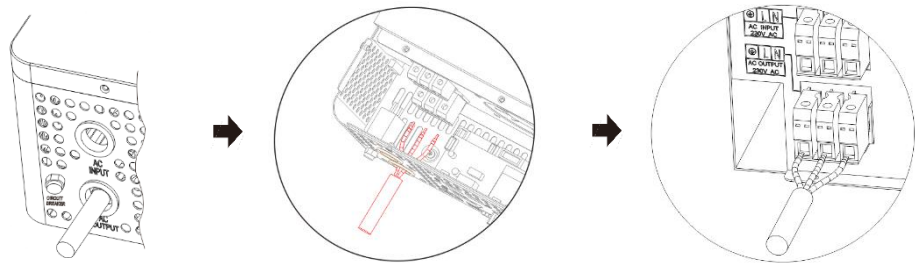
- Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws.
- Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws.
- Connect “PE” conductor to the grounding electrode. Connect “L” and “N” conductors to the AC circuit breaker.
- Make sure the wires are securely connected.

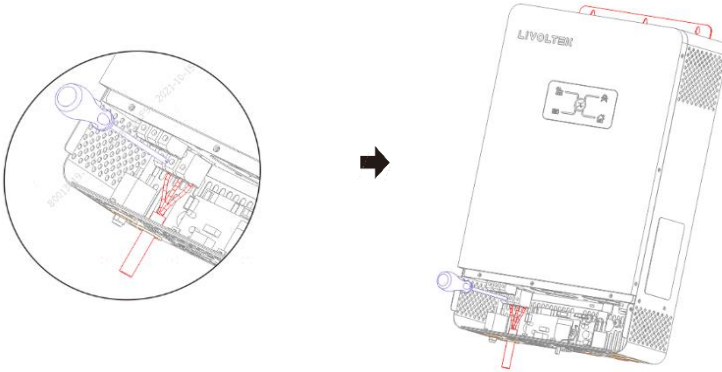


**AC input connection:**



**AC output connection:**





Note: It is important to make sure that the combined power required for all devices connected to this output does not exceed the power rating of the inverter.

**⚠ WARNING**

- Earth connection essential before connecting supply
- Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

**NOTICE**

Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances.

To prevent this kind of damage, please check manufacturer of air conditioner if it is equipped with time-delay function before installation. Otherwise, this inverter/charger will trig overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.



## 6.3 Battery Connection



### DANGER

- Be careful against any electric shock or chemical hazard.
- Only use properly insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, use electrical tape to cover the entire exposed metal surfaces of the available tools except their tips.
- Connect battery cables with correct polarity. If battery cables are reversely connected, the solar inverter may be damaged.
- All wiring must be performed by a professional person.
- Do not disconnect under load! Battery can be placed in a no load state by shutting down the inverter completely.

### NOTICE

- This inverter can be connected to proper capacity lead-acid battery with a nominal voltage at 48V.
- For lithium batteries, this inverter can only be connected with LIVOLTEK or Pylontech low-voltage lithium batteries with nominal voltage from 40V to 60V now. If you choose other lithium batteries, please consult LIVOLTEK for compatibility. Otherwise inverter will not work normally.
- For safe operation and compliance, a two-pole DC circuit breaker with overcurrent protection should be installed between the inverter and the battery.
- If you do not have battery now, you can float BAT terminal, and this hybrid inverter will only work like a PV inverter.

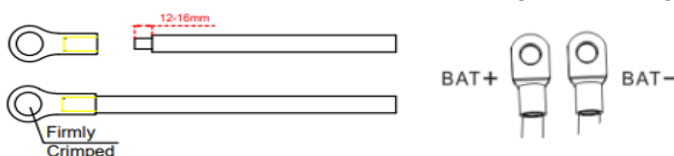
### Recommended battery cable size

Model	Wire Size	Cable	Breaker	Torque Value(max)
3KVA	2AWG	33.63mm <sup>2</sup>	80V/80A	3N • m

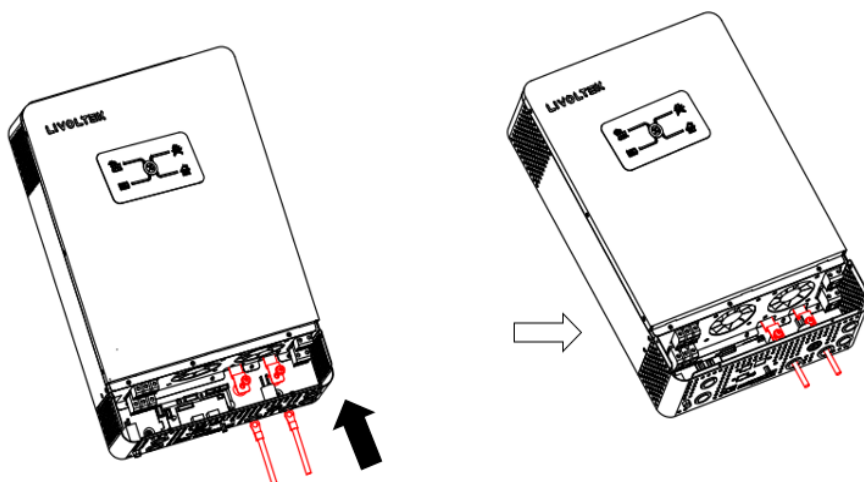
5KVA	2AWG	33.63mm <sup>2</sup>	80V/125 A	3N • m
------	------	----------------------	-----------	--------

### 6.3.1 Wiring Procedure

1. Remove insulation sleeve 12-16 mm for positive and negative conductors.
2. Insert the exposed areas of the positive and negative power cables into the metal terminals of the positive and negative connectors respectively and crimp them using a crimping tool.



3. Insert the battery wires flatly into battery connectors of inverter and make sure the bolts are tightened in clockwise direction.
4. Make sure polarity at both the battery and the inverter/charge is correctly connected and conductors are tightly screwed into the battery terminals.
5. To firmly secure wire connection, you may fix the wires to strain relief with cable tie.



**WARNING**

- Installation must be performed with care due to high battery voltage in series.
- Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur.
- Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.
- Before making the final DC connection or closing DC breaker/disconnection, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).

**6.3.2 BMS Communication for Lithium battery****NOTICE**

- If choosing lithium battery, make sure to connect the BMS communication cable between the battery and the inverter.
- The CAN cable enables the communication between the inverter and the Lithium Battery.
- Communication interface between inverter and battery is CAN with a RJ45 connector.
- The battery communication can only work when the battery BMS is compatible with the inverter.

**Procedure:**

**Step 1:** Communication interface between inverter and battery is CAN with a RJ45 connector. Insert the RJ45 connector with into the port marked with “BMS” on inverter and fasten the cap.

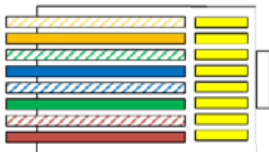
**Step 2:** Insert other side of the BMS cable into COM port on the battery.

BMS Pin Definition

NOTICE

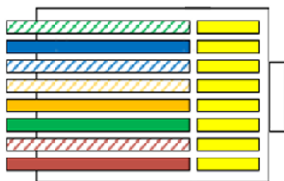
- The BMS Pin Definition for battery from the Pylontech and LIVOLTEK are different.
- Make sure the right wire sequence, otherwise will cause failure.

BMS Pin Definition  
for Lithium Battery  
from LIVOLTEK



- |              |              |
|--------------|--------------|
| Orange white | 1. BMS_CAN_H |
| Orange       | 2. BMS_CAN_L |
| Green white  | 3. NULL      |
| Blue         | 4. GND       |
| Blue white   | 5. NULL      |
| Green        | 6. NULL      |
| Brown white  | 7. NULL      |
| Brown        | 8. NULL      |
|              |              |
|              |              |

BMS Pin Definition  
for Lithium Battery  
from Pylontech



- |              |             |
|--------------|-------------|
| Green white  | 1.NULL      |
| Blue         | 2.GND       |
| Blue white   | 3.NULL      |
| Orange white | 4.BMS_CAN_H |
| Orange       | 5.BMS_CAN_L |
| Green        | 6.NULL      |
| Brown white  | 7.NULL      |
| Brown        | 8.NULL      |
|              |             |
|              |             |

### **6.3.3 NTC Communication for Lead-acid battery**

The inverter has integrated a NTC temperature sampling port for lead-acid batteries. With the external NTC cable installed, it can sample the temperatures of the battery cabinet to avoid damage caused by low or high temperature. The protective temperature of lead-acid battery ranges from -25°C to +60°C.

#### **Procedure:**

**Step 1:** Please find the NTC cable and a piece of tape in the accessories package of inverter.

**Step 2:** Make the tape adhere to NTC interface.

**Step 3:** Please clean battery surface before sticking

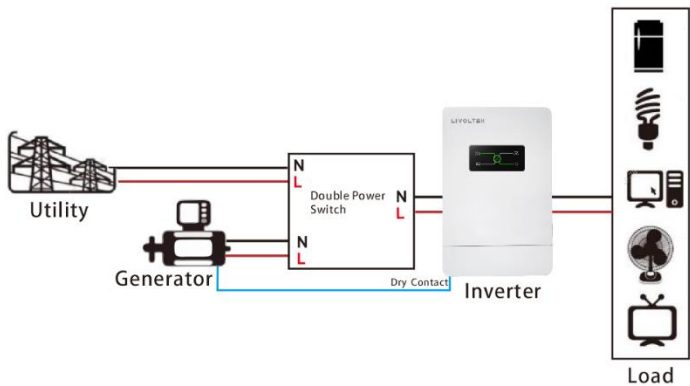
**Step 4:** Insert the RJ45 port of NTC into BMS port of inverter, and make the interface adhere to the battery interface (any place but must be nonmetallic).


6.4 Dry Contact Signal for Generator

GF1 series inverter has the function of being able to connect to the generator, and the generator function provides the system function of uninterrupted power supply for some areas with long-term power outages.

GF1 series inverter is connected to the generator through a dry contact (3A/250VAC) on the back panel of the inverter. It can be used to send a signal to a diesel generator when the battery voltage reaches a warning level. In addition, a dual power switch control needs to be connected between the inverter and the generator. When there no Utility, the switch is connected to the generator side, and the generator supplies power; when there is Utility, the switch is switched to disconnect the generator and switch to the Utility, the Utility supply power;

Remarks: The generator used in connection must have the function of inputting dry contacts.



Unit Status	Condition		 Dry contact port:: NC C NO	
			NC & C	NO & C
Power Off	Inverter is off and no output is powered		Close	Open
Power On	Output is powered from Utility.		Close	Open
	Output is powered from Battery or Solar	Battery voltage < Setting value or Low DC warning value	Open	Close
		Battery voltage > Setting value or battery charging reaches floating stage.	Close	Open

## 6.5 WIFI & LAN Module Connection (Optional)

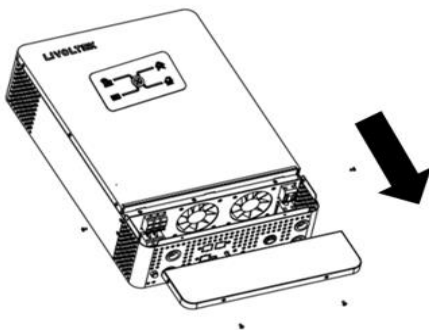
- **WIFI & LAN** 2 in 1 module implements communication with LIVOLTEK Cloud server through wireless or Ethernet network to monitor inverter's data status. (If necessary, purchase it from Livoltek)
- 



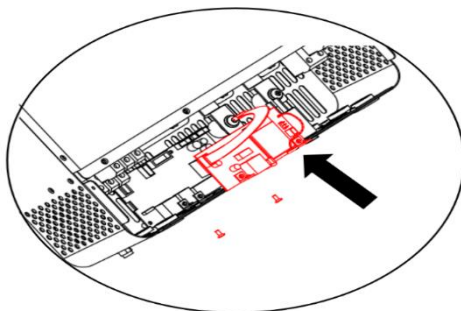
Monitoring module connection diagram

### Wiring Connection Procedure:

- Remove the lower cover and WIFI port baffle from the inverter.



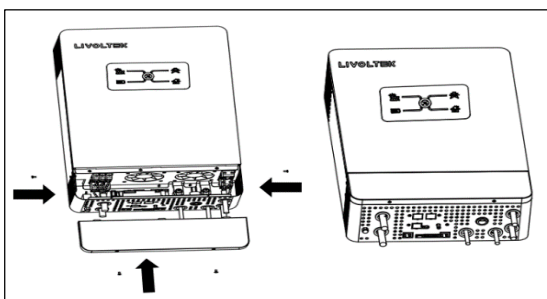
- Assemble the Wi-Fi & LAN 2 in1 Board to the corresponding position in the inverter, then tighten the screws and fixed accessories.



- Plug one end of the flat cable (A) into the Wi-Fi & LAN 2 in 1 Board and the other end (B) into **the left plug** on the communication board.



- Check the Wi-Fi & LAN 2 in 1 Board and the inverter are well connected. Then tighten the screws to lock back the lower cover.



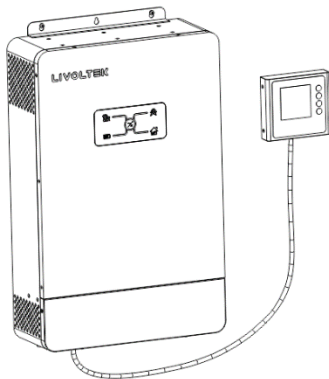
- Check the Wi-Fi & LAN 2 in 1 Board and the inverter are well connected. Then tighten the screws to lock back the lower cover.
- WIFI configuration please refer to Chapter 8.



## 6.6 External LCD Display (Optional)

LCD Display indicates the operating status and input/output power the information of the inverter. You can also set the parameters on it. Please follow user manual of LCD Display panel for the detailed wire connection.

LCD display connection diagram:

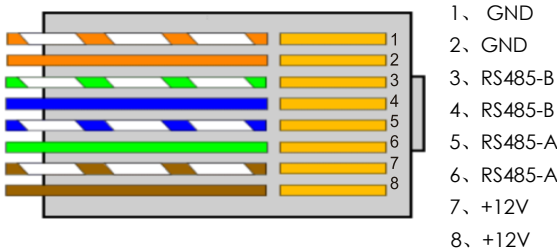


### Wiring Connection Procedure:

**Step 1:** Communication interface between inverter and external LCD screen is RS485 with a RJ45 connector. Insert the RJ45 connector into the port marked "LCD" on the inverter and tighten the cover.

**Step 2:** Plug the other end of the RJ45 cable into the port of the external LCD screen.

### LCD Cable Pin Definition:



## **6.7 Parallel Connection (Optional)**

Parallel connection function of the inverter is a solution for system capacity extension to provide bigger power. This inverter supports multi Parallel operation in 1-Phase or 3-Phase (needing to purchase additional parallel kits). For more details, please refer to the parallel instructions.

## **6.8 Installation Verification**

Check the following items after the inverter is installed.

- No other objects put on the inverter.
- All screws especially the screws used for electrical connections are tightened.
- The inverter is installed correctly and securely.
- Ground, AC, DC and Communications cables are connected tightly correctly and securely.
- Check there is no open circuit or short circuits at AC and DC terminals using multi-meter.
- All safety warning symbols are intact and complete on the inverter.

## 7. System Operation

### 7.1 Powering ON the Inverter

#### Step 1: Switch ON the DC and AC circuit breaker

Wait a few seconds and the inverter will start a self-test procedure when the indicator light flashes, when it is done successfully, the green led should be solid on and the graphical display should start displaying.

#### Step 2: Switch ON the circuit breaker on the battery side

For Lithium battery, turn on the isolator firstly, then switch on the battery; Then the battery icon and its parameters should be shown on the screen.

#### Step 3: Press EPS Output On/Off switch

The EPS Output on/off switch is used to control the relay of the EPS port, when the switch is off means that there is no output from the EPS port.



#### Step 4: Switch on the loads

The load parameters should show. It's recommended to turn on one by one, to avoid triggering the protection action due to a large instantaneous impact when the load is turned on at the same time.

### 7.2 Powering OFF the Inverter

**Step 1:** Turn off the loads;

**Step 2:** Turn off the PV;

**Step 3:** Turn off battery (For Lithium battery, switch off the battery firstly, then disconnect the isolator.)

**Step 4:** Turn off the AC switch;

**Step 5:** Wait for at least 5 minutes after the LED and graphical display black out for the internal circuits to discharge energy;

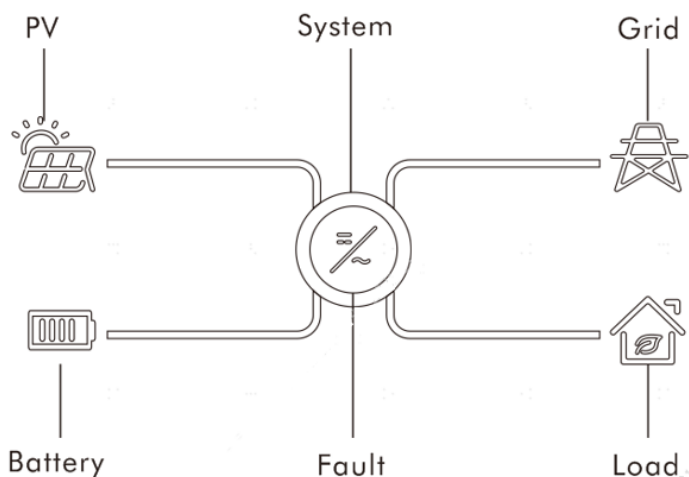
**Step 6:** Disconnect all the power cables and communication cables if needed.

### **⚠ WARNING**

After the inverter powers off the remaining electricity and heat may still cause electrical shock and body burns. Please only begin servicing the inverter ten minutes after the power-off.

## **7.3 LEDs Display**

The inverter operation status can be obtained from observing LED indicator status.



Color	Status	Description
Green	on	The inverter is running normally
	off	Other statuses except Running
Red	on	Fault occurs
	off	No fault occurs
Green/Red	blink	System startup

For more details, refer to Table LED indicator status below.

Error Message	PV	BAT	GRID	LOAD	PV	BATTERY	GRID	LOAD	SYSTEM	FAULT
Starting up	X	X	X	X	X	X	X	X	★	★
Normal status	◎	◎	◎	◎	◎	◎	◎	◎	●	X
Wi-Fi communication	◎	◎	◎	◎	◎	◎	◎	◎	●	X
PV over Volt	★	◎	◎	◎	X	◎	◎	◎	X	●
PV over current	★	◎	◎	◎	X	◎	◎	◎	X	●
PV energy weak	★	◎	◎	◎	X	◎	◎	◎	●	X
PV Strings Reverse	★	◎	◎	◎	X	◎	◎	◎	X	●
Low battery	◎	★	◎	◎	◎	X	◎	◎	●	X
BAT Temp High	◎	★	◎	◎	◎	X	◎	◎	●	X
BAT Volt Fault	◎	★	◎	◎	◎	X	◎	◎	X	●
Inter CKT Fault	◎	★	◎	◎	◎	X	◎	◎	X	●
BMS Lost	◎	★	◎	◎	◎	X	◎	◎	X	●
BMS Fault	◎	★	◎	◎	◎	X	◎	◎	X	●
BMS Error	◎	★	◎	◎	◎	X	◎	◎	X	●
AC Volt Fault	◎	◎	★-X	◎	◎	◎	X	◎	●	X
AC Freq Fault	◎	◎	★-X	◎	◎	◎	X	◎	●	X
EPS Volt Fault	◎	◎	◎	★	◎	◎	◎	X	X	●
EPS Over Load	◎	◎	◎	★	◎	◎	◎	X	X	●
Inter Temp High	◎	◎	◎	◎	◎	◎	◎	◎	X	●
Inter CKT Fault	X	X	X	X	X	X	X	X	X	●
Inter Com Fault	X	X	X	X	X	X	X	X	X	●
EEPROM Fault	X	X	X	X	X	X	X	X	X	●
Firmware Fault	X	X	X	X	X	X	X	X	X	●
Fan abnormal	X	X	X	X	X	X	X	X	X	●
LCD Fault	◎	◎	◎	◎	◎	◎	◎	◎	X	●
ATF Over temp	◎	◎	◎	★	◎	◎	◎	X	X	●
EPS Overload(L1)	◎	◎	◎	★	◎	◎	◎	X	X	●
EPS Overload(L2)	◎	◎	◎	★	◎	◎	◎	X	X	●
ATF Com Lost	◎	◎	◎	★	◎	◎	◎	X	X	●

● means light on, X means light off, ★ means blink, ◎ means keep original status.

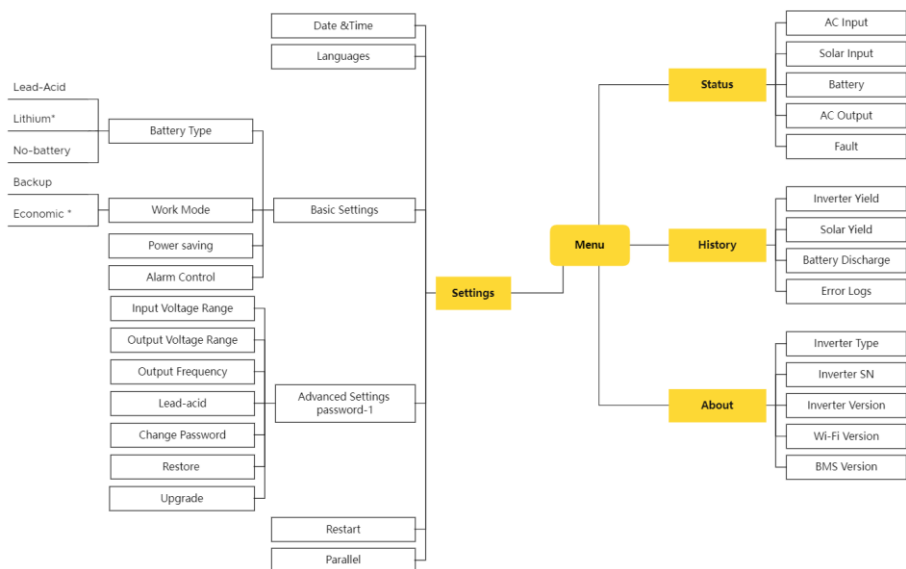
## 8. APP Operation

LIVOLTEK portal is a platform that the inverter connects through WIFI Stick, and upload the data to it every 5 minutes. You can log in account at any time through a computer, IOS or Android to achieve real-time display and remote control.

WEB: <https://www.livoltek-portal.com/>

APP: Search for Livoltek on Apple App Store, Google Play and download the latest installation package.

### 8.1 User interface on the APP

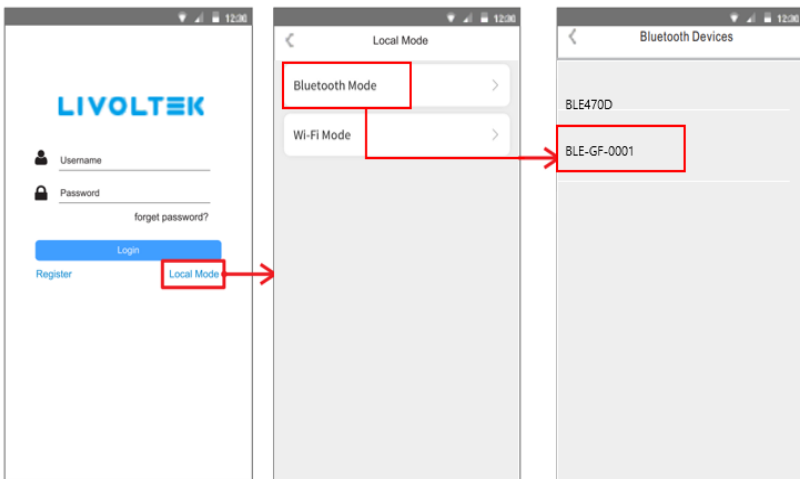


**Notes:** The advanced setting and Maintenance settings can only be check and set via local mode or Web.

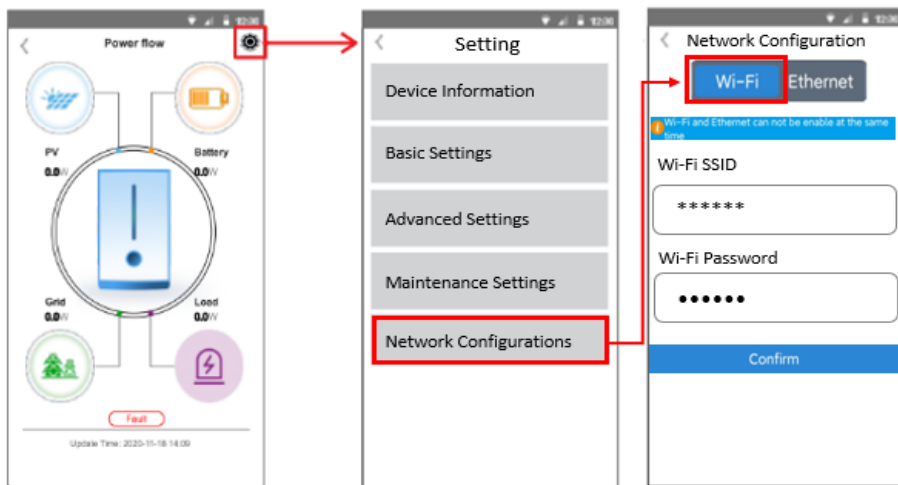
## 8.2 WIFI Configuration

### Preparation

- Power on inverter
  - Power on router and check the wireless networks that your mobile phone joined
  - Open the LIVOLTEK APP
- ① Click on "Local Mode\* ".
  - ② Click on "Bluetooth Mode".
  - ③ Find your inverter ("BLF-GF- xxxx\* ").



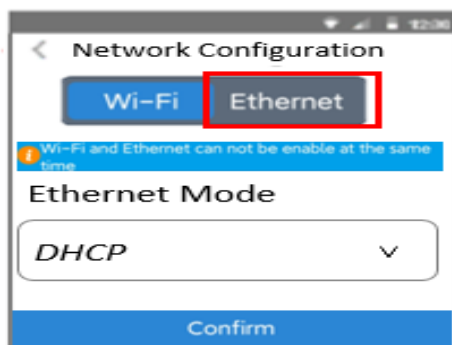
- ④ Click on "⚙️" to go setting.
- ⑤ Click on "Network Configurations".
- ⑥ Choose "Wi-Fi".
- ⑦ Enter wireless network name & password
- ⑧ Click on "Confirm" and wait 10s, "Success" will display on the APP if connection is successful.



\* Local real-time monitoring via Bluetooth.

\* Refers to the last four digits of inverter's SN.

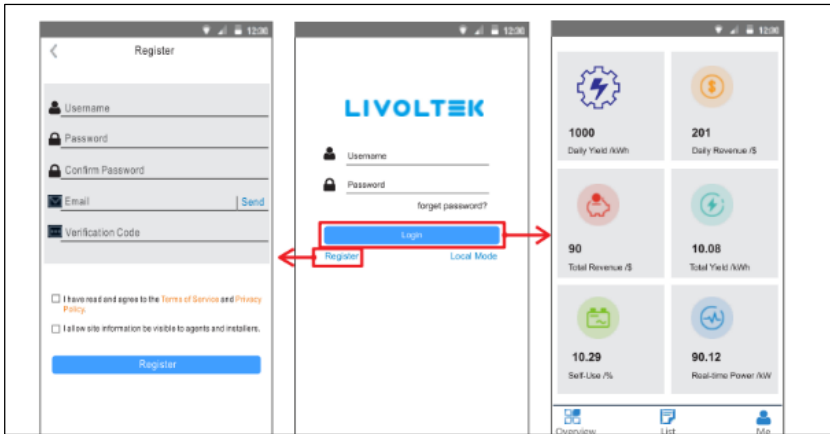
\* If it's not possible to connect to the wireless network, or you do not want to do so, select the "Ethernet" to connect by LAN connection.





### 8.3 Register an account

Open the app or web and login with the username & password. Register it first if you don't have an account, which provides access to the remote monitoring and management.




#### NOTICE

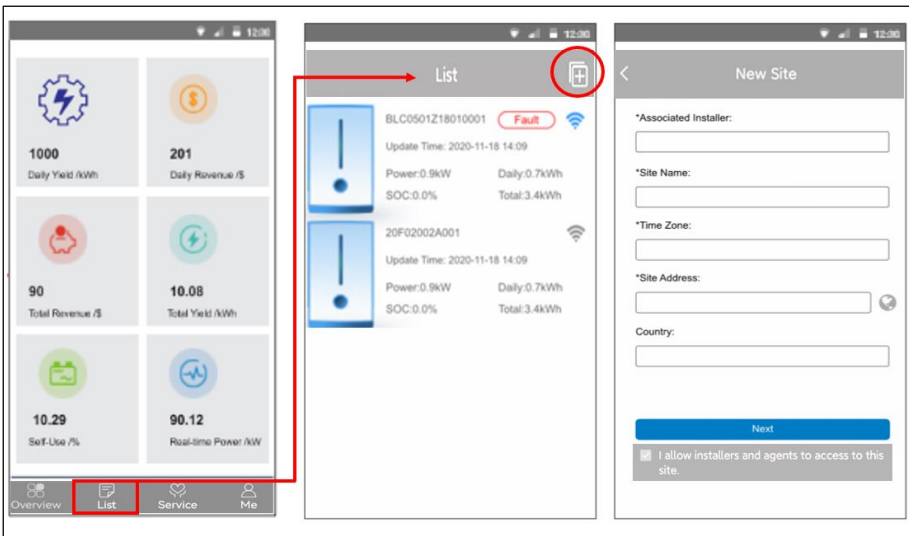
- There are two different accounts for end users and business (agents/installers), with different account authorizations.
- Business accounts can only be registered through web.
- Only end user accounts can be registered through the APP.
- The agent/installer can create a sub-account for the end user after the power site (PV plant) is created.

## 8.4 Create a site and add the inverter to the site

You can edit the site (PV Plant) information, add the new inverter to the site, delete the site, expand the list of added inverters of the site and set the electricity price.

### 8.4.1 Add Site

- Open the app and login with the username & password.
- Enter the "List" Page, touch "Add" button [  ] at the top right of the page.
- Choose the Installer, enter the Plant Name, Time Zone, location and other basic information.
- For the location, click the "Re-locate", system will automatically fill in the details according to what you enter.



Notes: Tick "I agree installers to access to this site ", then your installer can assist you to set the inverter remotely.

### 8.4.2 Setting Site and Authorization

- Enter the PV capacity and system type (solar storage system) for your site.

- Set local electricity price to calculate grid-connected revenue and electricity saved.
- Choose your region and account to create a sub account for target user.

The image displays three sequential mobile application screens for configuring a system.

**Site Settings**

- Header: Site Settings
- Field: PV Capacity (input field with a red 'kWp' label)
- Field: System Type (dropdown menu)
- Button: Next

**Tariff Settings**

- Header: Tariff Settings
- Text: Please select the currency
- Field: Currency (dropdown menu showing '\$(USD)')
- Section: Feed-in Tariff (+/- icon)
 

Start Time	Stop Time	Price
00:00	24:00	0.0
- Section: Self-use Tariff (+/- icon)
 


Start Time	Stop Time	Price
00:00	24:00	0.0
- Button: Next

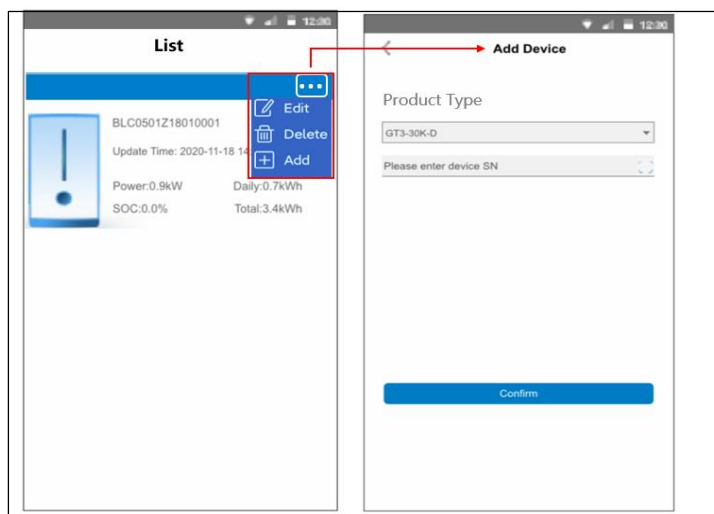
**Owner Information**

- Header: Owner Information
- Field: Owner Region (dropdown menu)
- Field: Owner Account (dropdown menu)
- Buttons: Back, Confirm

Notes: The time frame must be 24 hours in Tariff settings.

### 8.4.3 Add Device

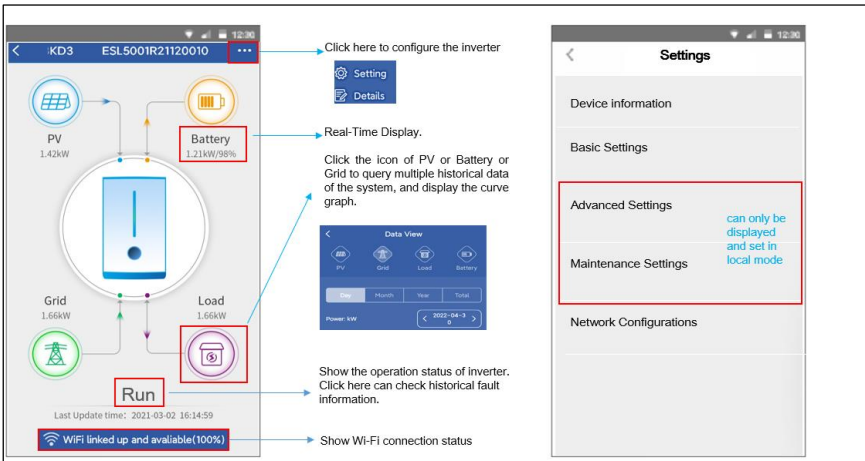
- Touch "Add" button [- Choose your product model and enter SN number, then touch [confirm].



## 8.5 Settings on the APP

### 8.5.1 Home Page Overview

You can check Parameters of System. The status and data on this page might be a few minutes delay from the real-time inverter data. By touch the icons on the diagram, it will show the historical data of each part.

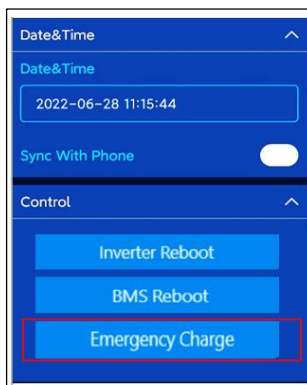


### 8.5.2 Basic Settings

You can set the inverter time, Restart the inverter, choosing work modes, battery type and buzzer in Basic settings.

#### 8.5.2.1 Emergency Charge

- Emergency Charge is design to avoid the damage caused by long time excessive discharge.
- It is recommend to manually click this button to charge the battery after installing the battery for the first time.
- The inverter cannot respond to the discharge command during emergency charge.
- In this mode, the battery will be charged to 54V, and it will exit this mode after 2 hours. But you can exit this mode by clicking "Restart" during this process.



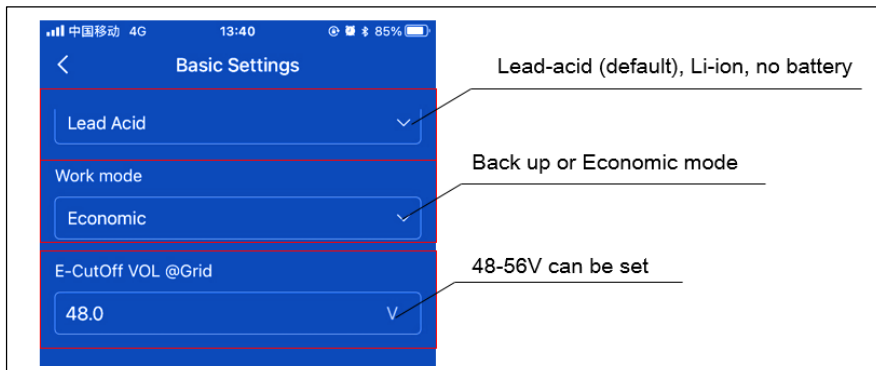
### 8.5.2.2 Select Battery type and Work Modes

In the battery type, you can choose proper capacity lead acid battery with a nominal voltage at 48V. And you need to choose battery type as "Lead-acid".

If you choose lithium battery, you are allowed to use the lithium battery only which we have configured. Also, you need to choose battery type as "Li-ion".

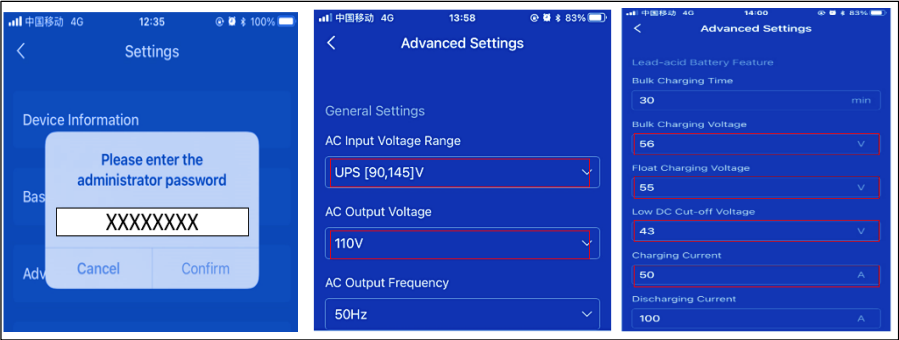
If you have no battery now, you can also float BAT terminal, and this inverter will only work like a PV inverter.

Work Modes decides the operation logic of the hybrid system. So make sure what you select is exactly what you want. The detailed description about the working modes, please refer to the chapter 4.6 Work Modes.



### 8.5.3 Advanced Settings

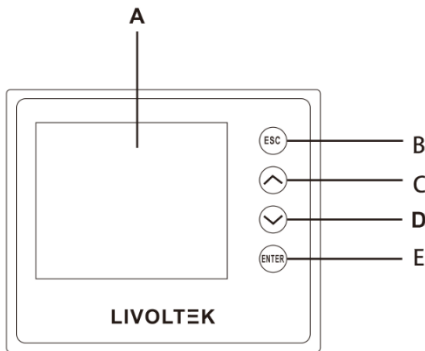
Advanced settings is generally customization for lead-acid battery and protection value of grid. Please contact your installer or factory and enter the installer password.



Notes: All the settings must be 100% honest to the battery specifications first.

## 9. LCD Operation

The LCD display information will be switched in turns by pressing “UP” or “DOWN” key.

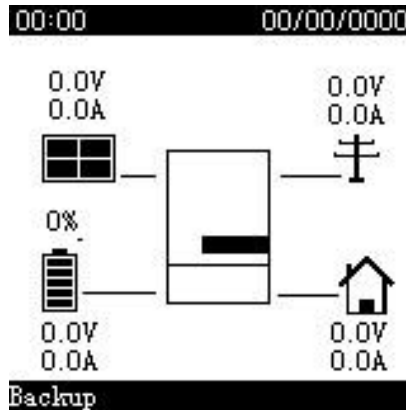


Object	Name	Description
A	LCD Screen	Display inverter information on the LCD display.
B	Key Function	ESC button: Return from the current interface or function.
C		Up button: Move the cursor to the upper part or increase the
D		Down button: Move the cursor down or decrease the value.
E		Enter button: Confirm selection.

The main inter face is the default inter face, the inverter will automatically return to this interface when the system started up successfully or not operated for a period of time.

The information of the interface is as below. “Power” means the instant output power; “ Today ” means the power generated within the day. “Battery” means the left capacity of battery energy.

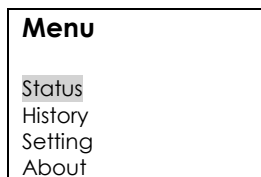




### ➤ Menu

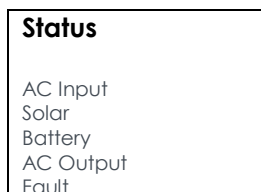
The menu is another interface for users to change settings or obtain information.

- When the LCD displays the main interface, click "OK" to enter this interface.
- The user can select up and down the menu, and press the "OK" key to confirm.



### ➤ Status

Status contains six content: AC Input/ Solar/ Battery/ AC Output/Fault. Press up and down to select, press "Enter" to confirm the selection, and press "ESC" to return to the menu.



### AC Input

Users can view the voltage/current/power/ frequency input by the grid here.

AC Input
Voltage: 0.0V
Current: 0.0A
Power: 0.0W
Frequency: 0.0Hz

### Solar

Users can see the voltage/current/power/frequency on the PV side here.

Solar
Voltage: 0.0V
Current: 0.0A
Power: 0.0W

### Battery

Users can check the battery voltage/current/power/capacity/temperature.

Battery
Voltage: 0.0V
Current: 0.0A
Power: 0.0W
SOC: 100%
Temperature: 0 °C

### AC output

Users can view the voltage/current/power/output by the grid here.

AC output
Voltage: 0.0V
Current: 0.0A
Power: 0.0W

Fault

Users can view the recent 7 errors reported by the inverter here.

Fault
EPS Over Load
Inter Temp High
EPS Over Load
EPS Volt Fault
AC Freq Fault
Inter Temp High
EPS Over Load

➤ History

The history data contains five pieces of information: on-grid power of the inverter, off-grid power generation, power of the meter /CT and error Error logs.

History
Power consumption
Solar yield
Battery discharge yield
Error logs

Power Consumption

Users can check the Power consumption to the Load here.

Power consumption
Today: 0.0Kw.h
Month: 0.0Kw.h
Total: 1000.0Kw.h

Solar yield

Users can check the yield of the Solar here.

Solar Yield
Today: 1.7 Kw.h
Month: 18.9 Kw.h
Total: 1000.0 Kw.h

Battery discharge yield

Users can check the discharge yield of the battery here.

**Battery Discharge Yield**  
  
Today: 0,0 Kw.h  
Month: 0,0 Kw.h  
Total: 1000.0Kw.h

Error logs

Users can see the most recent seven error logs.

**Error logs**  
  
EPS Volt Fault  
AC Freq Fault

➤ **Setting**

Users can set the inverter time, application language, power parameters and historical data cleaning here.

**Setting**  
  
Date time  
Languages  
Basic  
Advanced setting  
History clear

Date time

This interface is for users to set the system date and time.

**Date time**  
  
2021/11/10  
16:18:21

## Languages

This inverter provides multiple languages for customers to choose.

**Languages**  
English

## Basic

The user can set the basic settings of the inverter here, such as: the battery type with the inverter, the working mode of the inverter, whether the power saving function of the inverter is turned on, whether the clock of the inverter is turned on, and the inverter Ethernet selection.

**Basic**  
Battery type  
Work mode  
Power Control  
Ethernet

## Battery type

User can set the battery type selection for the inverter. For example: lead-acid battery/lithium battery.

**Battery type**  
Lin-ion  
Lead-Acid  
No Battery

## Work mode

Users can set the working mode of the inverter here. Where the economy mode is selected, the reserved reserve energy can be set up to the end of the battery discharge to facilitate the use when the power is cut off. (For the work mode of the inverter can refer to the second chapter work mode selection)

**Work Mode**  
Backup Mode  
Economic Mode

**Economic Mode**  
  
E-CutOffSoc: 60%

**Economic Mode**  
  
E-CutOffVol:48V

Alarm Control

Users can turn on the alarm control function of the inverter here. This function is turned off by default.

**Alarm Control**  
  
Alarm on  
Alarm off

Ethernet

Users can set the IP link mode of the WiFi module here. There are two ways to obtain it, one is the dynamic mode (DHCP), and the other is the static mode (STATIC). If you need to set the static mode, you need to set the IP address for network configuration. Note that when configuring the network, the WiFi module is disconnected and stops transmitting data. After the configuration is completed, the WiFi module will automatically restart the connection to transmit data.

**Ethernet**  
  
Go to commend mode

**Ethernet**  
  
DHCP  
Static

**Ethernet**  
  
initializing  
**Ethernet**

**IP Setting**  
  
IP Address  
Subnet mask  
Gateway

**Ethernet**  
  
Communication fault  
failed  
Please check the  
module.

**IP Setting**  
  
IP Address  
000.000.000.000

**IP Setting**  
  
Gateway  
000.000.000.000

**IP Setting**  
  
Dns Address  
000.000.000.000

➤ **Advanced setting**

Users can enter the advanced settings to set the range of grid input voltage, output power to grid voltage, output power to grid frequency, lead-acid battery parameter settings, advanced settings password change, inverter factory reset, inverter's Firmware version.

**Advanced setting**

Input voltage range

Output voltage

Output frequency

Lead-acid

Change password

Restore

Update

Input voltage range

User can set the voltage range here according to the local grid voltage standard.

**Input voltage range**

Appliances 90-280VAC

UPS 170-280VAC

Output voltage

Here the user can select the voltage according to the local grid voltage standard.

**Output voltage**

200V

230V

240V

Output frequency

The user can select the frequency here according to the local grid standard.

Output frequency

50Hz  
60Hz

➤ Lead-acid

Users can set the Absorption charge voltage, Absorption charge time, float charge voltage, DC minimum cut-off voltage, charge and discharge current, and battery balance of the lead-acid battery here.

Lead-acid

No Lead-Acid

Absorption  
Charging Voltage

56.4V

Absorption  
Charging  
Time

500min

Floating  
Charging  
Voltage

54.0V

Low DC cut-off  
Voltage

42.0V

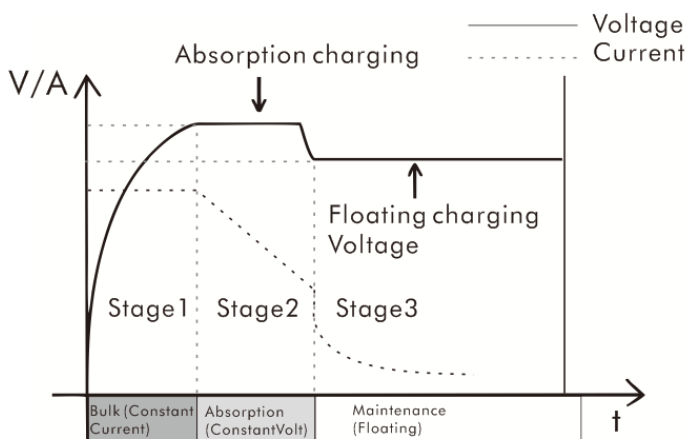
Charging/Discharging  
Current

30A

Due to considering the lead acid character and lifetime, it need to set 3 stages during charging, which can increase its charging efficiency. In stage 1, it will be charged with constant current till the voltage rises to charge absorption volt to enter stage 2. In stage 2, it can be charged more efficiently with constant voltage till charge current is more than 300W. Then it will enter stage 3 for floating charging.

Normally rated charge absorption/float voltage and discharge cut voltage of one single battery can be found in battery manual. Qualified electricians should calculate battery-set parameters before setting.





Lead Acid Battery

## Battery Equalization

Battery  
Equalization

Enable  
Disable

Battery  
Equalization  
Voltage

42.0V

Battery Equalization  
Time

60min

Battery  
Equalization  
Timeout

120min

Equalization  
Interval

30days

## Change password

Users can change the password here, (used by the installer, not allowed to change at will)

Change  
password

0 0 0 0

## Restore

User can set inverter restoration here.

Restore

YES

NO

## Update select

Users can set up the inverter and battery firmware upgrade by inserting the U disk here.

Update select

ARM

DSP1

DSP2

BMS

LCD

File List

DSP1\_ver.00

DSP1\_ver1.01.hex

DSP2.ver1.02.hex

Updating

Updating now...

Please don't shot machine

## ➤ Restart

Users can restart the inverter here.

Restart

YES

NO

## ➤ History clear

Users can clear historical data here.

History clear

YES

NO

## ➤ About

Users can check the inverter model/SN number, WiFi version number, software version number, LCD version number, Bluetooth name and Bluetooth here.

About

Inverter Type:GF1-

Serial Number:

WiFi Version:

ARM Version:

MDSP Version:

SDSP Version:

BMS Version:

LCD Version:

Bluetooth Name:

Bluetooth MAC

## 10. Troubleshooting

This chapter is a guide for troubleshooting problems of GF series inverters. When the inverter has an exception, its basic common warning and exception handling methods are shown in the table below.

Error Message	Explanation/Possible causes	Suggestion
PV over Volt	PV input voltage is not within permissible range.	Check if voltage and number of PV modules are meet requirements and adjust it if need.
PV over current	PV input current is not within permissible range.	1. Check the PV input power and configuration. 2. Wait a moment for inverter recovery or restart the system.
Low battery	The battery voltage/capacity is too low.	1.Re-charge battery. 2..If the alarm occurs repeatedly, contact your dealer for technical support.
PV energy weak	Insufficient power supply from PV string.	1. When sunlight intensity weakens, PV modules voltage decreases. No action is needed. 2. If such phenomena occur when sunlight intensity does not weaken, check if there is shielded, or short circuit, open circuit etc. in the PV strings.
AC Volt Fault	AC voltage is not within permissible range.	1. If the alarm occurs accidentally, possibly the AC power is abnormal accidentally. No extra action is needed. 2. If the alarm persists for a long time, check if the AC circuit breaker/AC terminals is disconnected or not, or if the grid or generator(if applied) is working well, or if input voltage range setting is correct.(UPS->appliance)
AC Freq Fault	AC frequency is not within permissible range.	

Inter CKT Fault	BUS Voltage(AC Side) is too high.	1. Wait for a while to check if it can automatically recover to the normal operating status after the fault is rectified.
Inter CKT Fault	Over current fault detected by software.	2.Restart the inverter,If the problem remains, please contact your dealer for technical support.
Inter CKT Fault	Inverter current component failure.	
EPS Volt Fault	Output Voltage abnormal (Inverter voltage below than 190Vac or is higher than 260Vac)	1. Make sure the load power is within the EPS power range. 2. Check if the AC output wires are connected well. 3. Check if the host setting is correct in parallel situation.
EPS Over Load	Overload error. The inverter is overload 110% and time is up( more than Five time)	1. Reduce the connected load by switching off some equipment, and wait for a while to check if it can automatically recover to the normal operating status after the fault is rectified. 2.Restart the inverter,If the problem remains, please contact your dealer for technical support.
Inter Temp High	Internal temperature of component is too high.	1.Check if the air flow of the unit is blocked or whethe the ambient temperature is too high. 2.Try to close inverter for 30 mins, then restart the inverter, If the problem remains, please contact your dealer for technical support.
BAT Temp High	Battery(Lead-Acid) temperature is not within permissible range.	1.Check if the environment temperature of battery is in the range of specification. 2.Wait for a while to check if it can automatically recover,if not, contact your dealer for technical support.

BAT Volt Fault	Battery voltage is not within permissible range.	<p>1.Check if spec and quantity of batteries are meet requirements.</p> <p>2.Check if the batteries are connected well.</p> <p>3.Wait for a while to check if it can automatically recover,if not, contact your dealer for technical support.</p>
PV Strings Reverse	The cables of PV strings are connected reversely.	Check if the cables of PV strings are correctly connected.If they are connected reversely reconnect the cables.
Fan abnormal	Fan fault	<p>1.Check if the fan is jammed by abnormal objects.</p> <p>2.Restart the inverter,If the problem remains, please contact your dealer for technical support.</p>
LCD Fault	External screen Communication lost.	<p>1.Check if the distance and cables bewteen LCD and inverter are meet requirements and adjust it if need.</p> <p>2.Restart inverter and reconnect the LCD, If the problem remains, please contact your dealer for technical support.</p>
BMS Lost	BMS Communication lost.	<p>1.Check if the lithium Battery is open.</p> <p>2.Check if the BMS cable is loose or broken.</p> <p>3.Reconnect the BMS cable,If the problem remains, please contact your dealer for technical support.</p>
Firmware Fault	Software version incompatibility	<p>1.Check if the firmware version is correct from LCD or Livoltek-portal.</p> <p>2.Restart inverter, If the problem remains, please contact your dealer for technical support.</p>

Low battery	The battery voltage is too low.	1.Re-charge battery. 2.If the problem remains, please contact your dealer for technical support.
Inter CKT Fault	Over current occurs during battery charging or discharging.	1.Restart inverter and check if it still occurs. If not, it's just an occasional situation. 2.If the problem remains, please contact your dealer for technical support.
Inter CKT Fault	BUS Voltage(Middle) is too high.	
Inter CKT Fault	Internal Relay failed	
Inter CKT Fault	Internal EEPROM Component(DSP) damaged.	
Inter Com Fault	Internal Communication failure(ARM&DSP).	
EEPROM Fault	Internal EEPROM Component(ARM) damaged.	
PV over current	PV input current is not within permissible range.	
BMS Fault	BMS communication failure.	
BMS Error	BMS communication abnormal.	

## 11. Technical Data

Model	GF1-3K48S1	GF1-5K48S1
<b>PV Input</b>		
Recommended max. PV power (Wp)	3300	5500
Max. Open Circuit Voltage (V)	500	
MPP Range Voltage (V)	90~480	
Max. PV Current (A)	14	25
Max. Short Circuit Current (A)	17	31.25
No. of MPPTs/Strings per MPPT	1/1	1/2
<b>AC Input</b>		
Input Voltage Waveform	Sinusoidal (Utility or Generator)	
Rated Input Voltage(V)	230	
Selectable Voltage Range(V)	170~280(Computers) 90~280( Appliances)	
Rated Input Frequency(Hz)	50 /60	
Frequency Range(Hz)	45~55/55~65	
Max. AC to DC Efficiency	>95%	
Max. Input Current(A)	14	23.9
<b>INV Output</b>		
Output Waveform	Pure Sine Wave	
Rated Power(VA/W)	3000/3000	5000/5000
Peak Power(VA)	6000	10000
Power Factor	1	
Rated Output Voltage(V)	220/230/240 ±5%	
Rated Frequency Range(Hz)	50 /60 (Auto sensing)	
Typical Transfer Time	0ms	
Surge Power	10sec (110% ~ 150%), 2sec (150% ~ 200%)	
Max. Efficiency(PV to AC )	94%	
Max. Efficiency(BAT to AC )	94%	

THDv (@linear load)	<3%	
Battery & Charger		
Battery Type	Lead-acid/Lithium	
Rated Battery Voltage(V)	48	
Charging Algorithm	3-Step	
Communication with BMS	CAN	
Solar Charger Type	MPPT	
Max. Solar Charging Current (A)	60	100
Max. AC Charging Current (A)	60	100
Max. Charging Current (A)	60	100
General Data		
Demensions(W*H*D mm)	330*535*130	
Weight (kg)	12	12
Ingress Protection	IP21	
Cooling	Fan	
Operating Temperature Range(°C)	-10 ~ 55	
Humidity	5% to 95% (Non-condensing)	
Standby power consumption	<2W	
Max. Operating Altitude(m)	2000	
Typical Noise Emission(dB)	<60	
Display	LED+APP/ LCD (Optional)	
Communication	CAN/USB/Dry Contact/Bluetooth/NTC/RS485/WiFi(Optional)/LCD(Optional)	

\*Certifications may vary according to dierent regions.

\*All Specifications are subject to change without notice.



## 12. Disclaimer

The GF1 series inverters are transported, used and operated under limited condition, such as environmental, electrical etc. Livoltek shall not be liable to provide the service, technical support or compensation under conditions listed below, including but not limited to:

- . Inverter is damaged or broken by force majeure (such as earthquake, flooding, thunderstorm, lighting, fire hazard, volcanic eruption etc.).
- . Inverter's warranty is expired and doesn't buy extended warranty.
- . Can't provide the inverter's SN, warranty card or invoice.
- . Inverter is damaged by man-made cause.
- . Inverter is used or operated against any items in local policy.
- . Inverter's installation, configuration, commissioning doesn't follow the requirements mentioned in this manual.
- . Inverter is installed, refitted or operated in improper ways mentioned in this manual without authority from Livoltek.
- . Inverter is installed, operated under improper environment or electrical condition mentioned in this manual without authority from Livoltek.
- . Inverter is changed, updated or disassembled on hardware or software without authority from Livoltek.
- . Obtain the communication protocol from other illegal channels.
- . Build monitoring, control system without authority from Livoltek.
- . Livoltek will keep right to explain all the contents in this user manual.

# Warranty Card Registration

# LIVOLTEK

Dear customer, thank you for choosing LIVOLTEK product.  
For registering product warranty, please prepare everything  
ready and register on

<https://www.livoltek.com/registration.html>.

Product Information	
Product Type	
Product S/N	
Installation date	
Installation Company	
Personal Information	
Your name	
Your contact number	
Your Email address	
Your home address	

\*Warranties should be registered within 36 months of installation, however it is recommended that they are registered no more than 6 weeks following the successful installation and commissioning of the Product where possible, thanks for your cooperation.



## **Contacts**

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