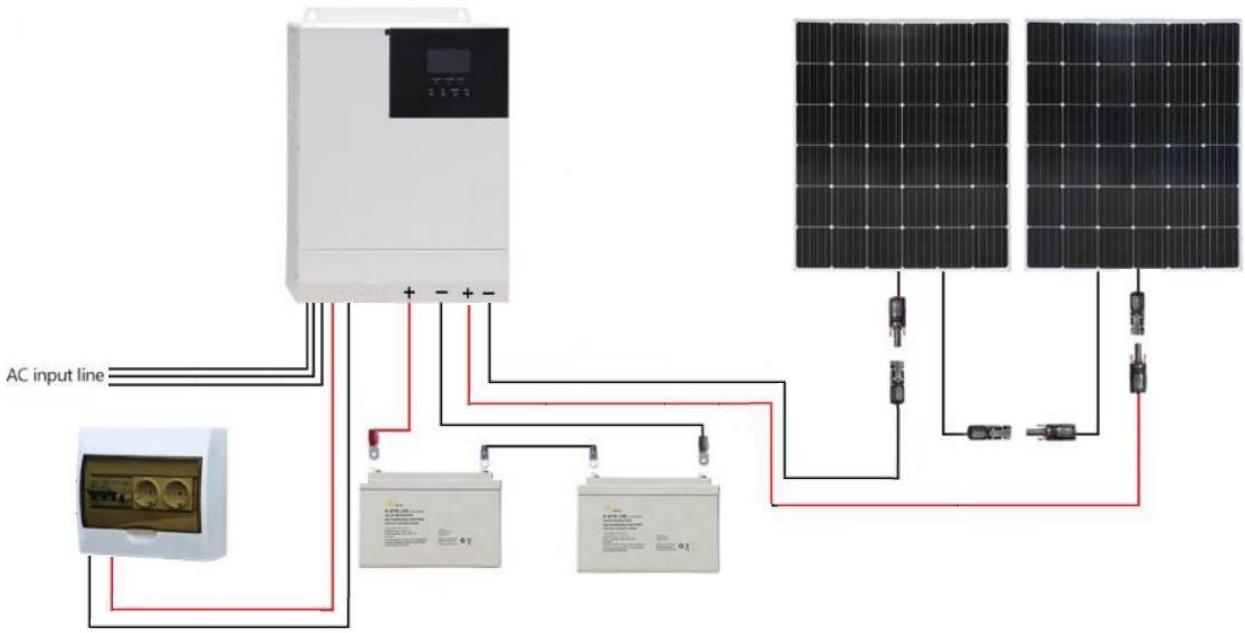
400W 24V Off-Grid Solar System Install Guide & Manual

1. Component List

Item	Module No	Specification	Quantity	Remark
Glass Solar Panel	PG-GSP200W	200W/19.8V	2PCS	
Hybrid Inverter	HF2430S60-100	3000W / 230V AC / 24V DC	1PC	
Battery	6-GFM-120	12V/120Ah	2PCS	
Distributor Box	BS-D01-1B (Socket)	250V / 16A	2PCS	
	JVL-29-63 (RCBO)	230V / 20A	1PC	
Cable	NA	5M 4mm² cable,with MC4 connector at one end	1set	Connect hybrid inverter to solar panels
		3M 4mm² cable,open-end to open-end	1set	Connect hybrid inverter to switch panel
		0.5M 35mm² cable, with O shape connector at both ends	1set	Connect 2pcs of battery in series
		2M 35mm² cable， with O shape connector at both ends	1set	Connect battery to inverter

2. Diagram



3. Explanation of symbols

The lightning symbol inside a triangle is used when there is a potential risk of personal injury, such as electric shock.

An exclamation mark in a triangle indicates important instructions in this operating manual that absolutely have to be observed.

The “arrow” symbol indicates that special advice and notes on operation are provided

This symbol marks a connection terminal for ground potential on the inverter.

4. Install instruction

(1) Step 1: Connect 2pcs of solar panel in series.

(2) Step 2: Connect 2pcs of battery in series

(3) Step 3：Connect hybrid inverter to battery

(4) Step 4: Connect hybrid inverter to switch panel

(5) Step 5: Connect hybrid inverter to solar panels

(6) Steps 6: Connect AC input to hybrid inverter (If there isn't AC input, skip this step)

5. Manual

(1) Battery Manual

A. Battery Installation And Storage

1) Checkup and Temporary Storage after Receiving

Battery after arrival shall be checked at once for the following steps:

a. Open the battery packing box near the installation site , check the number and appearance of the battery , and check whether there is any abnormality in the appearance. Check whether the system components, product certifications, mountings and accessories are complete against the invoice.

b. According to the drawings, mount inventory beams, columns and connected contact parts, check their sizes and specifications ;

c. The battery should be kept upright during storage, and the poles should be protected. The surface of the battery should not be compressed, the safety valve should not be loosened, short circuit is strictly prohibited, and batteries without outer packaging should not be stacked.

d. The battery should be kept upright during moving. Handle gently. It's forbidden to place upside down, roll, throw, hit, put under the blazing sun,expose to rain and so on.

e. Temporary storage of batteries: New Batteries with full capacity before leave the factory, can be temporarily stored for 3 months, please install batteries and on-line charging in 3 months , if stored for more than 3 months, need to use charging equipment to recharge, otherwise, there will be irreversible battery sulfation, seriously affecting the life of the battery, the company promised warranty period is no longer valid.

2) Battery lifting and handling

a. Hoisting, handling notes: in order to make the smooth movement of the battery, for precise position adjustment, to use tap water lubrication, do not use anti-rust agent or detergent. Otherwise, it may cause the battery case to crack, resulting in electrolyte leakage.

b. When moving the battery to another location, do not grab the battery terminal, lead wire or safety valve exhaust plug, as this can cause battery damage.

c. As the battery is very heavy, you should be very careful when handling it.

d. When handling the battery, be careful not to hit the battery, for example: the battery hit a hard object or fall to the ground. Otherwise, the battery may be damaged.

e. In principle, the handling of the battery should force the bottom of the battery shell, and usually the short-time lifting and handling methods should be carried out according to the method described in Table 1.

Note: Moving the terminal wire part of the battery will make the seal crack, so please absolutely do not lift the terminal wire for handling!

Table 1 Transportation and temporary lifting methods of fixed batteries

Unit weight range (kg/ piece)	Temporary lifting, hoisting	Transportation
Below 25kg	Support the bottom of the battery case with both hands.	Support the bottom of the battery case with both hands.
25kg-75kg	Support the bottom of the battery case with both hands.	Use manual hoist and other tools to carry.
75kg or more	If there is no lifting hole , hang the bottom of the battery case with a strap.	Use manual hoist and other tools tocarry.
	If there is a lifting hole, hang the lifting hole on the battery shell with a hook.	

3) Battery installation program

a. Battery installation program

- Select the appropriate location and conditions according to the actual situation to install, according to ground load, ventilation environment, sunlight exposure, organic solvent corrosion , computer room layout and convenient maintenance, etc.;
- According to the transportation attention points, when moving the batteries on the battery rack or into the battery cabinet, a ventilation and heat

dissipation gap of 8mm or more should be reserved between the batteries (subject to the specific design drawing).

- An forbidden to mix old and new batteries, and don't mix different types and brands of batteries;
- According to Connection example or the drawing of series and parallel line, connect the batteries of different columns,inter-layers, panels and terminals. Before installing the end connection and conducting the whole system, measure and record the single static voltage one by one and each group the total voltage and the system voltage , and carefully check the polarity.

Note: Under the premise of meeting the designed cross-sectional area, the lead wire should be as short as possible to reduce the voltage drop during high-current discharging; when two or more batteries are connected in parallel, the cables from each battery to the load should be of equal length to facilitatethe current balance of each group during battery charging and discharging;

- When the battery connection, the screws must be fastened, otherwise, may spark and / or terminal damage, or even fire and explosion accident,But also to prevent the twist force is too large but damaged copper wire; the handle of wrench and other tools must be tightly wrapped with insulating tape.
- At the end of the installation, the system voltage and the battery positive and negative electrode direction should be checked again, to ensure that the battery is placed correctly, and resolutely prevent the phenomenon of reverse connection;
- Cleaning after installation. Generally, the new battery does not need to be cleaned. If the pollution is serious, use a soft cloth soaked in soapy water to clean the battery case, panel and connecting wire. Do not use organic solvents to clean it to avoid corrosion of the case and other parts to do bad to performance;
- The temperature probe of power switch should be pasted on the one side between two cells to ensure the accuracy of the data.

b. Replacement Procedures

- Check whether the appearance of the newly arrived battery is intact and whether the voltage is normal.
- Remove the faulty battery from the battery pack:
  - Turn off the charger, if possible, remove the connection of the positive and negative connection cables and the entire power system , turn off the isolation switch.
  - Before disassembling the battery , untie all the battery connecting bars and connecting cables in adjacent rows and columns to avoid accidental short circuits.
- Connect the new battery to the battery pack according to the original wiring method and charge it.
- Connect the battery pack and the charger, float charge in accordance with the number of series-connected batteries and ambient temperature.
- Note for battery replacement:
  - Turn off the equipment and disconnect it from the mains before replacing the battery ;
  - Operators are not allowed to wear metal objects such as rings to avoid short circuits;
  - It is normal for small sparks to appear at the connector when connecting the battery cable, and will not cause harm to personal safety and UPS ;
  - Remember! Do not short-circuit or reverse the battery's positive and negative poles.

4) Safety instructions

- This safety measures must be taken during installation work (using handling tools, wearing clothes, safety helmets, and safety shoes, paying attention to safety signs, etc.) to ensure safety and avoid accidents.
- Since the battery has been charged, do not use metal tools or similar tools to cause short-circuit of the battery .Wear insulating gloves and keep the torque wrench, wrench, or other similar metal tools insulated from the body and handle.
- Install the battery and store it in well ventilated, away from heat and direct sunlight. Do not install and store batteries close to transformers and other heating equipment and close to switches, fuses, and other places where a spark may occur, which creates a danger of fire or explosion.
- Install the battery as specified in the layout drawing, and take care to ensure that the positive (+) negative (-) polar connection of the terminals is correct. Otherwise, it may cause a fire or cause battery or charger damage.
- Tighten the battery terminal nuts and bolts to the specified torque. Otherwise, there may cause sparks and / or terminal damage, even fire and explosion accidents.

- Although the battery is sealed, stay away from the fire. Never use ignition sources (such as lit cigarettes, electric drills, and other tools that can cause sparks) in the battery rooms (near the battery equipment)
- The battery case and battery cover are made of synthetic material. Therefore, when wiping the battery, avoid using organic solvents (such as benzene, gasoline and diluent), oil, detergent, chemical fiber cloth, but use waste cotton cloth soaked with tap water or warm water. Do not clean with dry cloth or wool duster; when covering batteries, use anti-static film, electrostatic charge accumulation, may cause the risk of fire or explosion. Be careful not to let films containing plasticizers (e. g., soft polyvinyl chloride or benzene), diluent, gasoline, alcohol, and other organic solvents, rust resistance, or detergents contact the battery shell and the battery cover, otherwise, the battery shell may crack and cause electrolyte leakage.
- If the battery is accidentally damaged and the electrolyte splashes on your eyes, skin, or clothing, rinse with plenty of water. If you splash into your eyes or accidentally swallow the electrolyte, ask your doctor to check it immediately.

B. Debugging and Operation

1) Debugging after installation and replacement

a. Inspection : Check whether the insulation of the charging equipment is good.

Specific method: use 500V meg-ohmmeter to measure DC charging and the screen bus bar is notless than 10M Ω.

b. Confirm total battery open circuit voltage.

U Total = U(average voltage) × the number of battery connected in series Test and confirm that all bolts are tightened.

c. Float voltage: typically 25℃, the single float voltage is 2.25V±0.02V. Principles of setting float voltage :

- The floating charge current is sufficient to compensate the loss of the self-discharging;
- After discharging, it is sufficient to compensate the lost power by float charging and make it reach a fully charged state;
- If the float charge voltage was set to low, it's difficult to meet the demands mentioned before;if too high, it will accelerate the corrosion of the positive electrode plate and the loss of the electrolyte. The selecting of float charge voltage affects the cycle life of batteries.
- The setting of float voltage should fully consider the electrolyte density, alloy composition, and electrode plate additives.

d. Equalizing charge voltage: Principles of setting equalizing charge voltage :

- Before the battery pack is officially put into use, if the battery has been stored for more than 6 months (more than 3 months in summer), it should be equalizing charged once.
- When the battery runs for 3 months, the difference of the floating charge pressure exceeds the standard requirement, and an equalizing charge should be performed.
- The discharge capacity is beyond 70%, then equalizing charge the battery once.
- Charge Method : at 25 ℃, equalizing charge the cell in a mode of constant voltage and restricted-current for 10-15 hours with a voltage of 2.35V.

e. Temperature compensation

- The current and voltage in this measure are set as the standard values at the ambient temperature of 25 ℃. If the working ambient temperature of the battery exceeds the range of 20 ℃ -30 ℃, the voltage of floating and equalizing charging should be changed accordingly, and the correcting cell voltage should be changed according to the formula:

$V_{correcting}$ = V(at 25 ℃)-0.003×(T_{actual} -25)

For every 1℃ increase in temperature, floating charge voltage decreases by 3mV(if equalizing charge, it will be 4mV). For every 1℃ decrease, floating charge voltage increases by 3mV(if equalizing charge, it will be 4mV)

2) Normal Operation

a. For a new battery ,set the float voltage in accordance with the actual ambient temperature. If there is the need of equalizing charge all batteries, transfer to floating charge and officially put into use after equalizing charge ending. Measure the float voltage of the battery one by one and make a record.

b. After normal operating, the float voltage should be measured regularly once a month.

c. Online products, when the power is normal, the battery has been in a floating charging state, when the power is cut off, the battery supplies the load

through the control device (UPS, switch power supply, inverter, etc.), to achieve the purpose of using the battery

d. Off-grid products, generally solar wind power generation, power to the load, while charging the battery, when the solar wind power is insufficient, the battery power to the load.

e. If there is no power failure for more than half a year, a check discharge can be carried out. If conditions permit, the mains can be directly disconnected by battery mode. generally discharge about 30%, record the voltage when the discharge is terminated.

f. After two years, a checking discharge should be conducted and discharge with external load for safety

3) Precautions for operation

- Charging: constant voltage and limited current (floating or equalizing charge)
- Don't overcharge or over-discharge.
- Avoid direct sunlight.
- The temperature of the installation site should be controllable by air conditioner or heating. 5.The distance between batteries should be kept above 8mm for ventilation.
- Good ventilation, to ensure that the internal temperature difference of the battery is not higher than 3℃.
- Don't install batteries in a fully enclosed occasion in order to avoid explosion caused by accumulation of hydrogen explode.
- Regular inspect the floating charge of the battery pack, and equalizing charge if necessary. Time of equalizing charging at room temperature= (2×Capacity/Maximum Charging Current)+3
- If the battery is stored or the equipment stops for 3 months, the battery must be recharged once in a balanced charging mode

C. Maintenance

1) System Description

a. VRLA Gel Battery need no maintenance of electrolyte and free of make-up wate

2) Safety Instruction

Battery maintenance and operation must be implemented by battery-familiar personnel. Payattention to the safety of persons and equipment.

- Electrical safety : the battery system has a high risk of electric shock and short-circuit.

  Battery System is at risk of corrosion, fire, explosion and thermal accident.
- Don't discard batteries causally. Batteries must be recycled, discarded and handled by the special recycling agency.
- The battery should be handled carefully to avoid damage; at the same time, be careful not to hurt yourself.

3) Periodic maintenance requirements：Except discharge capacity, maintain at least once a quarter; discharge capacity test can be conducted once a year.

Items	Review Contents	Tools and Methods
System Stability	Completely install the entire battery, the iron frame is stable and does not shake.	Visual inspection
Battery Appearance	Whether there are traces of liquid leakage on the surface of the battery , whether the connecting parts are corroded , whether there are stains, cracks, and deformation.	Visual inspection
Connection	Tighten the screws of each conductive part, 2V series torque 15N.M ; 12V series torque 10N.M	Special wrench, torque wrench
Uniformity of Voltage and Internal Resistance	After float charging for 24 hours later, whether the voltage of each cell and resistance meet the demand.	Inner resistance meter
System Input AC	The balance of current	Caliper Multimeter
Discharge Capacity	discharge 30% battery capacity	Discharge load Multimeter The newly installed battery can adopt the offline test of discharge load; Recommend to discharge equipment.
Battery storage or equipment to stop	The battery needs to be recharged once in three months	Charger or device charging system

4) Cleaning & Caution

Batteries that become dirty should be cleaned with a lint-free shop cloth that is clean, dry, and free of oil. If the battery has caked-on dirt or grime , use a cloth dampened with tap water, then wipe dry.Do not use any tape of solvent to clean the battery. Solvents may damage the battery.

D. Highlight and Features

1) Highlight:

a. Long life design(up to 12 years)

b. Reliably sealed

c. High specific energy,low IR & self discharge

d. Higher reaction efficiency and conformity

2) Features

a. Float charging life prolonged by our proprietary corrosion resistant alloy;

b. High-purity electrolytes and special agents reduce water loss;

c. Impacts from earthquakes are reduced by compact seismic ABS jars and covers;

d. Delicate seal technologies protect the battery from electrolyte leakage and creepage;

e. The delicate construction of self-relief valves can avoid bulges and cracks.

E. Specifications

1) Technical Data

Model	6-GFM-120	
Design Life	12 years	
Voltage	12 V	
Number of cells	6 pieces	
Nominal Capacity	20HR (6.48A, 1.80V)	129.6Ah
	10HR(12A, 1.80V)	120Ah
	3HR(32.4A, 1.80V)	97.2Ah
	1HR(66A.1.80V)	66Ah
Internal Resistance	4.5mΩ(Full Charge)	
Self Discharge	≤3% per month	
Charge Voltage	Cycle Use	Standby Use
	2.35V/Cell (-4mV/°C/Cell) Max. Charge Current:18A	2.25V/Cell (-3mV/°C/Cell))

Note: Data contained herein are measured at 25°C.

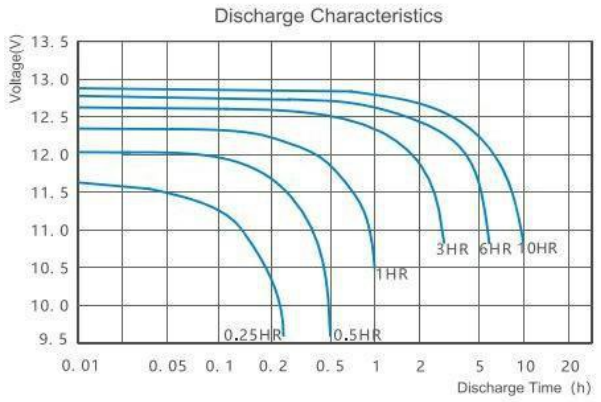
2) Constant Current Discharge Rate(A,25℃)

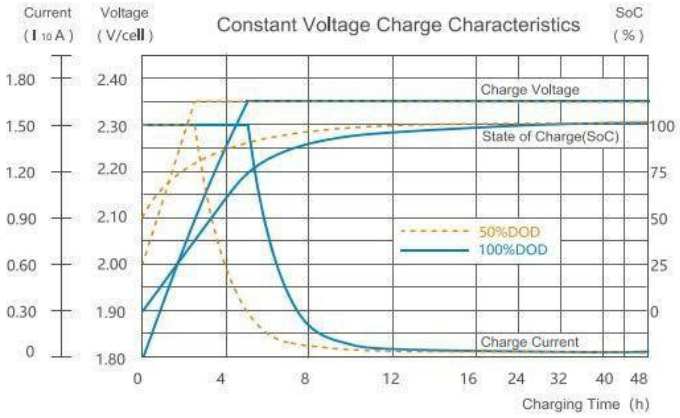
Model	F.V. (V/Cell)	Minute						Hour								
		5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
6-GFM-120	1.85	233	190	159	136	107	76.8	65.4	40.1	29.7	24.0	20.3	17.8	14.3	11.9	6.31
	1.80	274	216	177	153	114	80.0	67.3	41.0	30.6	24.6	20.8	18.2	14.6	12.2	6.43
	1.75	302	227	185	160	119	83.3	69.7	42.2	31.2	25.0	21.2	18.5	14.8	12.3	6.52
	1.70	323	242	196	171	125	86.4	71.9	43.2	31.8	25.5	21.6	18.9	15.1	12.4	6.60
	1.67	337	254	209	179	129	89.0	73.7	44.1	32.4	26.1	22.1	19.3	15.3	12.5	6.67
	1.60	352	269	219	185	134	91.3	76.6	44.8	33.2	26.6	22.6	19.6	15.5	12.6	6.72

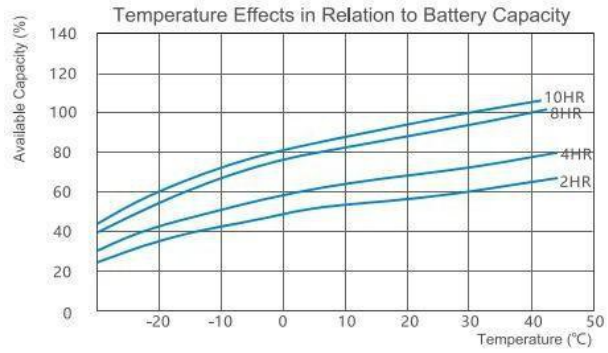
3) Constant Power Discharge Rate(Watt/Cell,25℃)

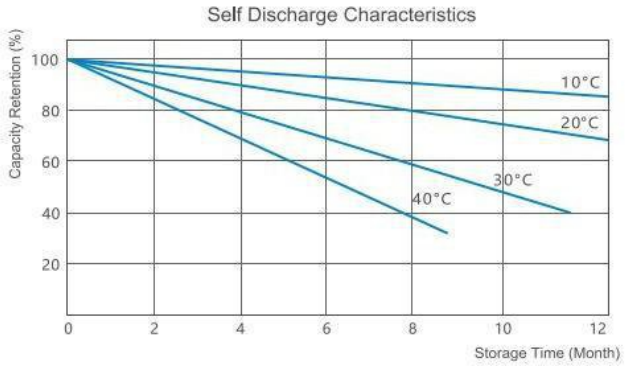
Model	F.V. (V/Cell)	Minute						Hour								
		5	10	15	20	30	45	1	2	3	4	5	6	8	10	20
6-GFM-120	1.85	350	302	269	244	201	161	134	91.9	64.8	50.5	42.9	38.1	38.1	24.1	13.4
	1.80	410	330	295	267	219	173	142	95.3	67.1	51.9	44.0	39.3	39.3	24.7	14.0
	1.75	441	353	315	285	231	180	147	96.7	67.9	52.3	44.3	39.7	39.7	25.1	14.1
	1.70	474	388	330	294	237	185	149	97.8	68.7	53.8	44.6	39.9	39.9	25.3	14.2
	1.67	498	410	344	305	242	187	150	98.3	69.2	53.0	44.8	40.1	40.1	25.4	14.3
	1.60	515	431	358	314	246	189	151	99.2	69.4	53.2	44.9	44.9	40.2	25.5	14.4

4) Performance









Disposal

Battery that has reached the end of their service life should be returned to a local or regional collection center for recycling. All local regulations and ordinances must be followed. Never discard the AGM battery in the trash or in a landfill.

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(2) Solar Panel Manual

A. Install solar panel

Plan the installation position, place the solar panel on the installation area, and fix the solar panel with screws so that it will not shake. Start the wires connection after solar panel is fixed.

B. Safety instructions

Read the operating instructions carefully and especially observe the safety information. If you do not follow the safety instructions and information on properhandling in this manual, we assume no liability for any resulting personal injury or damage to property. Such cases will invalidate the warranty/guarantee.

- The device is not a toy. Keep it out of the reach of children and pets.
- Do not leave packaging material lying around carelessly. This may become dangerous playing material for children.
- Protect the product from extreme temperatures, strong jolts, high humidity, moisture, flammable gases, vapours and solvents.
- Do not place the product under any mechanical stress.
- If it is no longer possible to operate the product safely, take it out of operation and protect it from any accidental use. Safe operation can no longer be guaranteed if the product:
  - is visibly damaged,
  - is no longer working properly,
  - has been stored for extended periods in poor ambient conditions or
  - has been subjected to any serious transport-related stresses.
- Please handle the product carefully. Jolts, impacts or a fall even from a low height can damage the product.
- Also observe the safety and operating instructions of any other devices which are connected to the product.
- The solar module performance can vary depending on weather conditions. Keep this in mind when operating a device with this product.
- Do not touch the terminal points during operation.
- Use suitable extension cables and adaptor plugs approved for outside operation . Do not use bare wires or other uninsulated objects to connect the product.
- Always ensure correct polarity when connecting a device.
- Avoid direct contact with the surface. The surface is sensitive and can be easily scratched or destroyed through contamination.
- solar module may only be used in a temperate climate. The solar module is a device which is not secured against explosions. Thus, it may not be installed in the vicinity of highly inflammable gases and vapours.
- If this solar module is used in a system consisting of multiply solar modules, all modules used must have the same amperage. Only solar modules with identical amperage may be used when connected in series. Only solar modules with identical voltage may be used when connected in parallel.
- Consult an expert when in doubt about operation, safety or connection of the device.
- Maintenance, modifications and repairs are to be performed exclusively by an expert.

C. Attention and cleaning

Regularly clean the solar module, as its performance would otherwise decrease and the surface could be irreversibly damaged.

- Please read the user guide before using this product.
- The solar panel will generate voltage when it was exposed in the sun, so please avoid installing the solar system in the sun. If it must be installed in the sun, insulation protection is required.
- Before assembling, pay attention to the positive and negative signs, the positive and negative poles cannot be reversed.
- Do not step on, or disassemble the solar panel.
- Do not place the solar panel in shading places such as trees and buildings.
- Do not soak the solar panel in water or any other liquid.

- Do not use or store solar panels near open flames or flammable materials.
- Do not scratch the solar panel with sharp objects.
- Do not put corrosive substances on the solar panel.
- When using the solar panel the circuit must be correctly connected to the equipment and check the connection status of each component each wire and plug.
- Due to the material characteristics of the product it is strictly forbidden to drop it, otherwise it will cause the internal damage of the solar panel and make the product unusable.
- Use a soft brush or damp cloth to clean the dust on the surface of the product If there is bird droppings or other sticky objects on the surface of the product it should be cleaned up immediately.
- What should I do if there is no output from the solar panel?
- Please put the solar panel in a sunny environment and check the connection status of each component, each wire and plug. You can try to replace the data cable or charging device to check whether the solar panel is working.

D. Specification

Model	PG-GSP200W
Maximum power	200W
Maximum Power Voltage	19.8V
Maximum Power current	10.1A
Open Circuit Voltage	23.76V
Short Circuit current	11.11A
Size	1045*1030*25mm
Operating temperature	-20-85 ℃
Weight	11kg

Disposal

This symbol must appear on any electrical and electronic equipment placed on the EU market. This symbol indicates that this device should not be disposed of as unsorted municipal waste at the end of its service life.

Owners of WEEE (Waste from Electrical and Electronic Equipment) shall dispose of it separately from unsorted municipal waste.
Spent batteries and accumulators, which are not enclosed by the WEEE, as well as lamps that can be removed from the WEEE in a non-destructive manner, must be removed by end users from the WEEE in a non-destructive manner before it is handed over to a collection point.
Distributors of electrical and electronic equipment are legally obliged to provide free take-back of waste. Conrad provides the following return options free of charge(more details on our website):

- in our Conrad offices
- at the Conrad collection points
- at the collection points of public waste management authorities or the collection points set up by manufacturers or distributors within the meaning of the ElektroG

End users are responsible for deleting personal data from the WEEE to be disposed of.
It should be noted that different obligations about the return or recycling of WEEE may apply in countries outside of Germany.

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(3) Hybrid Inverter- Manual (Model:HF 2430S60-100)

Important safety instructions

Please keep this manual for future use.

This manual contains all safety, installation and operating instructions for the hybrid solar charge inverter.

Please read all instructions and precautions in the manual carefully before installation and use.

a. Non-safety voltage exists inside the hybrid solar charge inverter. To avoid personal injury, users shall not disassemble the hybrid solar charge inverter themselves. Contact our professional maintenance personnel if their is a need for repair.

b. Do not place the hybrid solar charge inverter within the reach of children.

c. Do not install the hybrid solar charge inverter in harsh environments such as moist, oily, flammable or explosive, or heavily dusty areas.

d. The mains input and AC output are high voltage, so please do not touch the wiring terminals.

e. The housing of the hybrid solar charge inverter is hot when it is working. Do not touch it.

f. Do not open the terminal protective cover when the hybrid solar charge inverter is working.

g. It is recommended to attach proper fuse or circuit breaker to the outside of the hybrid solar charge inverter.

h. Always disconnect the fuse or circuit breaker near the terminals of PV array, mains and battery before installing and adjusting the wiring of the hybrid solar charge inverter.

i. After installation, check that all wire connections are tight to avoid heat accumulation due to poor connection, which is dangerous.

j. The hybrid solar charge inverter is off-grid. It is necessary to confirm that it is the only input device for load, and it is forbidden to use it in parallel with other input AC power to avoid damage.

A. General information

1) Product overview and features

- HF series is a new hybrid hybrid solar charge inverter, which integrates solar energy storage & means charging energy storage and AC sine wave output. Thanks to DSP control and advanced control algorithm, it has high response speed, high reliability and high industrial standard. Four charging modes are optional, i.e. Only Solar, Mains Priority, Solar Priority and Mains & Solar hybrid charging; and two output modes are available, i.e. Inverter and Mains, to meet different application requirements.
- The solar charging module applies the latest optimized MPPT technology to quickly track the maximum power point of the PV array in any environment and obtain the maximum energy of the solar panel in real time.
- Through a state of the art control algorithm, the AC-DC charging module realizes fully digital voltage and current double closed loop control, with high control precision in a small volume. Wide AC voltage input range and complete input/output protections are designed for stable and reliable battery charging and protection.
- Based on full-digital intelligent design, the DC-AC inverter module employs advanced SPWM technology and outputs pure sine wave to convert DC into AC. It is ideal for AC loads such as household appliances, power tools, industrial equipment, and electronic audio and video equipment. The product comes with a segment LCD display design which allows real-time display of the operating data and status of the system. Comprehensive electronic protections keep the entire system safer and more stable.

Features:

a. Full digital voltage and current double closed loop control, advanced SPWM technology, outputof pure sine wave.

b. Two output modes: mains bypass and inverter output; uninterrupted power supply.

c. Available in 4 charging modes: Only Solar, Mains Priority, Solar Priority and Mains & Solar hybrid charging.

d. Advanced MPPT technology with an efficiency of 99.9%.

e. Designed with a LCD screen and 3 LED indicators for dynamic display of system data and operating status.

f. ON/OFF rocker switch for AC output control.

g. Power saving mode available to reduce no-load loss.

h. Intelligent variable speed fan to efficiently dissipate heat and extend system life.

i. Lithium battery activation by PV solar or mains, allowing access of lead-acid battery and lithium battery.

j. 360 ° all-round protection with a number of protection functions.

k. Complete protections, including short circuit protection, over voltage and under voltage protection, overload protection, reverse protection, etc.

2) Basic system introduction

The figure below shows the system application scenario of this product. A complete system consists of the following parts:

a. PV module: Convert light energy into DC power, and charge the battery through the hybrid solar charge inverter, or directly invert into AC power to drive the load.

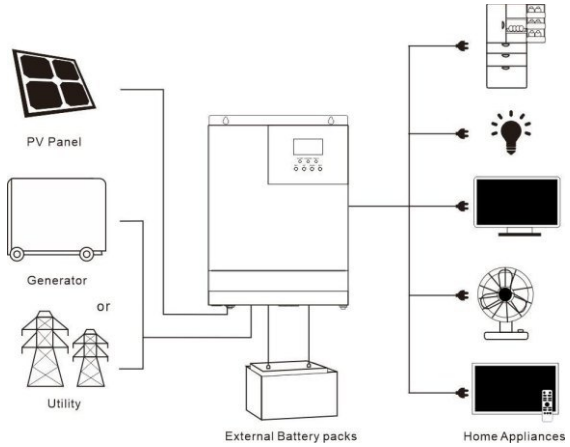
b. Mains or generator: Connected at the AC input, to power the load while charging the battery. If the mains or generator is not connected, the system can also operate normally, and the load is powered by the battery and PV module.

c. Battery: Provided to ensure normal power supply to the system loads when solar energy is insufficient and the Mains is not connected.

d. Household load: Allow connection of various household and office loads, including refrigerators, lamps, TVs, fans and air conditioners.

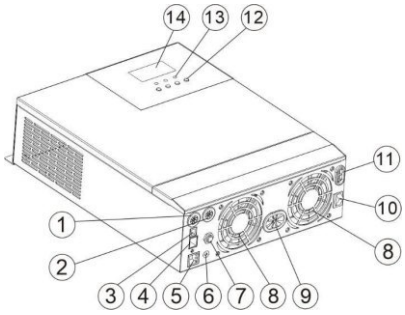
e. hybrid solar charge inverter: The energy conversion unit of the whole system.

f. Specific system wiring method depends on the actual application scenario.

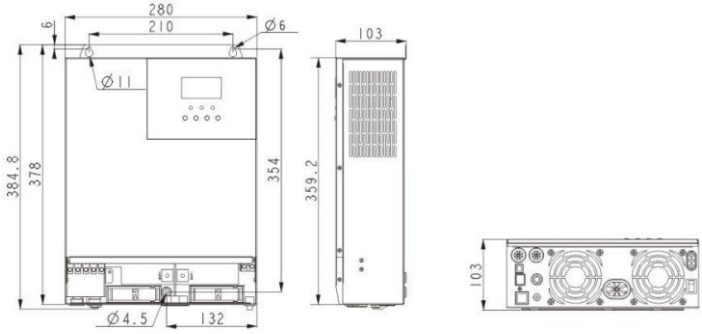


3) Appearance

①	AC input port	⑧	Cooling fan
②	AC output port	⑨	Battery port
③	USB communication port	⑩	ON/OFF rocker switch
④	RS485 communication port	⑪	PV port
⑤	Dry node port	⑫	Touch button
⑥	Grounding screw hole	⑬	LED Indicator
⑦	AC input Overload protector	⑭	LCD screen



4) Dimension drawing



B. Installation instructions

1) Installation precautions

Please read this manual carefully prior to installation to familiarize yourself with the installationsteps.

a. Be very careful when installing the battery. Wear safety goggles when installing a lead-acid liquid battery. Once coming into contact with the battery acid, rinse with clean water timely.

b. Do not place metal objects near the battery to prevent short-circuit of the battery

c. Acid gas may be generated when the battery is charged. So, please ensure good ventilation.

d. When installing the cabinet, be sure to leave enough space around the hybrid solar charge inverter for heat dissipation. Do not install the hybrid solar charge inverter and lead-acid battery in the same cabinet to avoid corrosion by acid gas generated during battery operation.

e. Only the battery that meets the requirements of the hybrid unit can be charged.

f. Poorly connected connections and corroded wires may cause great heat which will melt the wire insulation, burn the surrounding materials, and even cause fires. So, make sure the connectors have been tightened, and the wires are secured with ties to avoid looseness of connections caused by shaking of wires during mobile application.

g. The system connection wires are selected according to a current density of not more than 5 A/mm2.

h. Avoid direct sunlight and rainwater infiltration for outdoor installation.

i. Even after the power is turned off, there is still high voltage inside the unit. Do not open or touch the internal components, and avoid related operations until the capacitor completely discharges.

j. Do not install the hybrid solar charge inverter in harsh environments such as moist, oily, flammable or explosive, or heavily dusty areas.

k. Polarity at the battery input end of this product shall not be reversed, otherwise it may damage the device or cause unpredictable danger.

l. The mains input and AC output are high voltage, so please do not touch the wiring terminals.

m. When the fan is working, do not touch it to prevent injury.

n. Load equipment input power needs to confirm that this hybrid solar charge inverter is the only input device, and it is forbidden to use in parallel with other input AC power to avoid damage. It is necessary to confirm that the solar charge inverter is the only input device for load equipment, and it is forbidden to use it in parallel with other input AC power to avoid damage.

2) Wiring specifications and circuit breaker selection

Wiring and installation must comply with national and local electrical codes.

Recommended PV array wiring specifications and circuit breaker selection: Since the output current of the PV array is affected by the type, connection method and illumination angle of the PV module, the minimum wire diameter of the PV array is calculated according to its short-circuit current; refer to the short-circuit current value in the PV module specification (the short-circuit current is constant when thePV modules are connected in series; the short-circuit current is the sum of the short-circuit currents of all PV modules connected in parallel); the short-circuit current of the PV array shall not exceed the maximum input current.

a. Refer to the table below for PV input wire diameter and switch:

Models	Recommended PV wiring diameter (based on Maximum PV input current at 40A)	Maximum PV input current	Recommended air switch or circuit breaker type
HF2430S60-100	8mm2 / 8AWG	40A	2P—63A

Note: The voltage in series shall not exceed the maximum PV input open circuit voltage.

b. Refer to the table below for recommended AC input wire diameter and switch

Models	Recommended AC input wiring diameter	Maximum bypassinput current	Recommended air switch orcircuit breaker type
HF2430S60-100	$6mm^2$/10AWG	30A	2P—40A

Note: There is already an appropriate circuit breaker at the Mains input wiring terminal, so it is not necessary to add one more.

c. Recommended battery input wire diameter and switch selection

Models	Recommendedbattery wiring diameter	Rated batterydischarge current	Maximum charge current	Recommended air switch or circuit breakertype
HF2430S60-100	30mm^2/2AWG	140A	140A	2P—160A

Note: The wiring diameter is for reference only. If the distance between the PV array and the hybrid solar charge inverter or the distance between the hybrid solar charge inverter and the battery is relatively long, using a thicker wire can reduce the voltage drop to improve system performance.

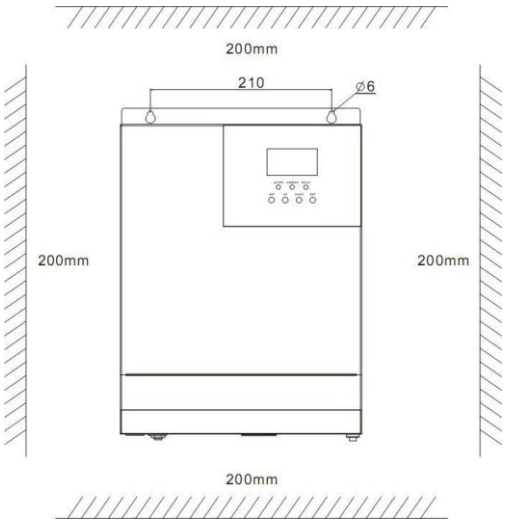
Note: The above are only recommended wiring diameter and circuit breaker. Please select the appropriate wiring diameter and circuit breaker according to actual situations.

3) Installation and wiring

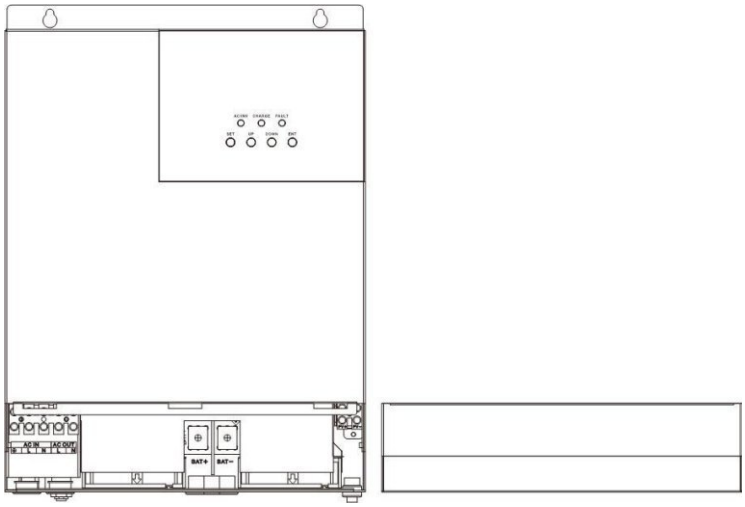
Installation steps:

Step 1: Determine the installation position and the space for heat dissipation. Determine the installation position of the hybrid solar charge inverter, such as wall surface; when installing the hybrid solar charge inverter, ensure that there is enough air flowing through the heat sink, and space of at least 200m to the left and right air outlets of the inverter shall be left to ensure natural convection heat dissipation. Refer to the installation diagram of the whole machine as above.

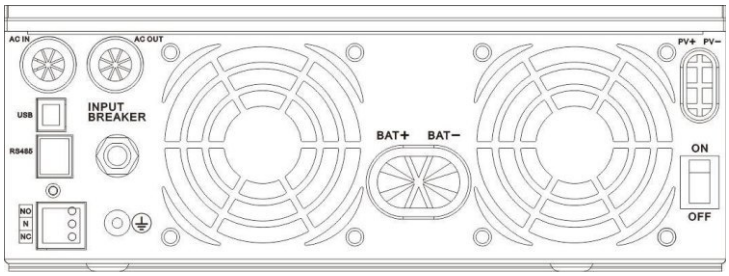
Warning: Danger of explosion! Never install the hybrid solar charge inverter and lead-acid battery in the same confined space! Also do not install in a confined place where battery gas may collect.



Step 2: Remove the terminal cover



Step3: Wiring

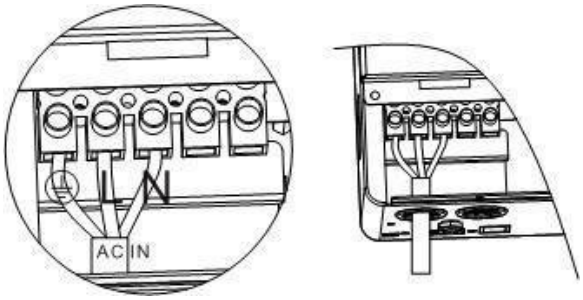


AC input / output wiring method:

a. Prior to AC input/output wiring, disconnect the external circuit breaker and confirm that the wire used is thick enough. Please refer to Section 2.2 “Wiring Specifications and Circuit Breaker Selection”;

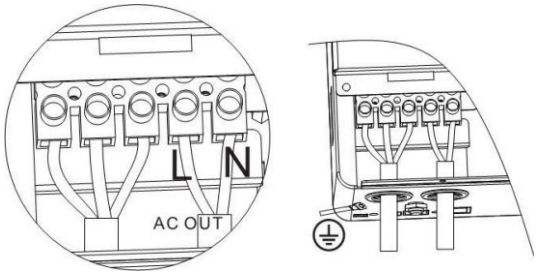
b. Properly connect the AC input wire according to the wire sequence and terminal position shown in the figure below. Please connect the ground wire first, and then the live wire and the neutral wire;

: Ground L: Live N: Neutral



c. Properly connect the AC output wire according to the wire sequence and terminal position shown in the figure below. Please connect the ground wire first, and then the live wire and the neutral wire. The ground wire is connected to the grounding screw hole on the cabinet through the O-type terminal.

: Ground L: Live N: Neutral



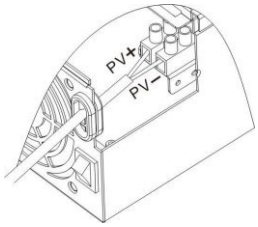
Note: The grounding wire shall be as thick as possible (cross-sectional area is not less than 4mm^2). The grounding point shall be as close as possible to the hybrid solar charge inverter. The shorter the grounding wire, the better.

PV input wiring method:

a. Prior to wiring, disconnect the external circuit breaker and confirm that the wire used is thick enough. Please refer to Section 2.2 “Wiring Specifications and Circuit Breaker Selection”;

b. Properly connect the PV input wire according to the wire sequence and terminal position shown in the figure below.

PV+: PV input positive pole PV-: PV input negative pole

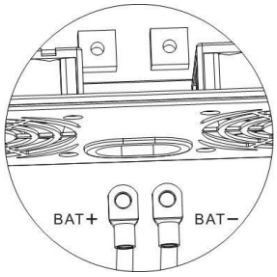


BAT wiring method:

a. Prior to wiring, disconnect the external circuit breaker and confirm that the wire used is thick enough. Please refer to Section 2.2 “Wiring Specifications and Circuit Breaker Selection”. The BAT wire needs to be connected to the machine through the O-type terminal. The O-type terminal with an inner diameter of 5 mm is recommended. The O-type terminal shall firmly press the BAT wire to prevent excessive heat generation caused by excessive contact resistance;

b. Properly connect the BAT wire according to the wire sequence and terminal position shown in the figure below.

BAT+: Battery positive electrode BAT-: Battery negative electrode



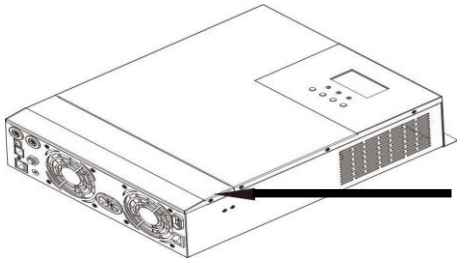
Warnings:

a. Mains input, AC output and PV array will generate high voltage. So, before wiring, be sure to disconnect the circuit breaker or fuse;

b. Be very careful during wiring; do not close the circuit breaker or fuse during wiring, and ensure that the “+” and “-” pole leads of each component are connected properly; a circuit breaker must be installed at the battery terminal. Refer to Section 2.2 “Wiring Specifications and Circuit Breaker Selection” to select a right circuit breaker. Before wiring, be sure to disconnect the circuit breaker to prevent strong electric sparks and avoid battery short circuit; if the hybrid solar charge inverter is used in an area with frequent lightning, it is recommended to install an external lightening arrester at the PV input terminal.

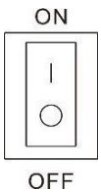
Step 4: Check if the wiring is correct and firm. In particular, check if the battery polarity is reversed, if the PV input polarity is reversed and if the AC input is properly connected.

Step 5: **Install the terminals cover.**



Step 6: Turn on the hybrid solar charge inverter

First, close the circuit breaker at the battery terminal, and then turn the rocker switch on the left side of the machine to the "ON" state. The "AC/INV" indicator flashing indicates that the inverter is working normally. Close the circuit breakers of the PV array and the Mains. Finally, turn on AC loads one by one as the AC output is normal to avoid a protection action caused by a large momentary shock due to simultaneousturning on the loads simultaneously. Now, the machine goes into a normal operation according to the set mode.



Note: If power is supplied to different AC loads, it is recommended to first turn on the load with a large surge current. After the load is stable, turn on the load with a small surge current.

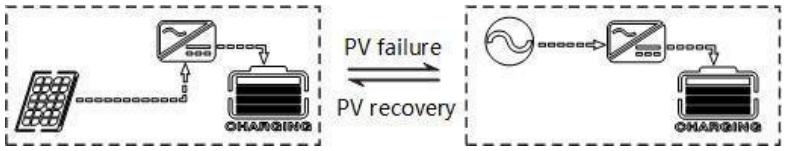
Note: If the hybrid solar charge inverter does not work properly or the **LCD** or indicator is abnormal, refer to Chapter 6 to handle the exceptions.

C. Operating modes

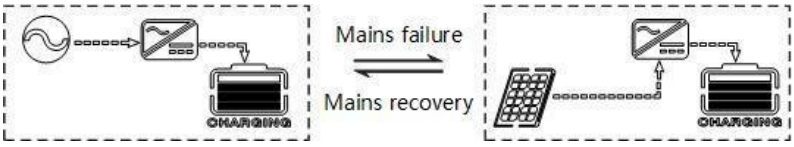
1) Charging mode

a. PV priority: PV module will charge the battery preferentially, and the battery is charged by the Mains only when the PV system fails. During the day, solar energy

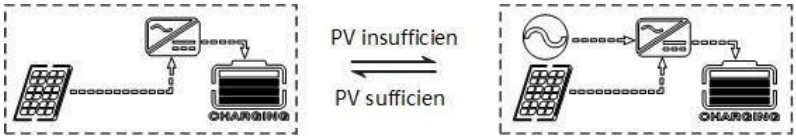
is fully used to charge, while atnight, it converts to the Mains. This can maintain battery level, and is ideal for areas where the grid is relatively stable and electricity price is relatively high.



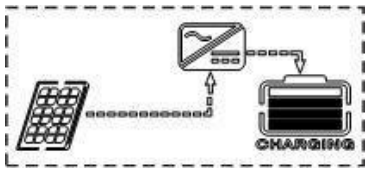
b. Mains priority: The Mains supply is preferentially used to charge the battery. Only when the Mainsfails, the PV charging can be activated.



c. Hybrid charging: PV and mains hybrid charging. PV MPPT charging is a priority, and when PV energyis insufficient, the mains supply supplements. When the PV energy is sufficient again, the mains stops charging. This is the fastest charging mode, suitable for the areas where power grid is unstable, providing sufficient backup power supply at any time.



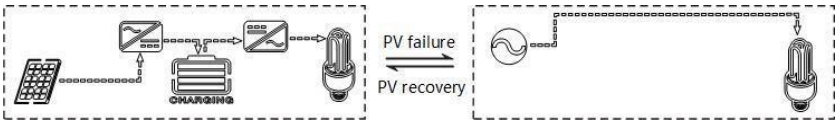
d. Only Solar (Only Solar): Only PV charging, without Mains charging. This is the most energy-efficient way in which battery is charged only by solar panels, and is usually used in areas with good lighting conditions.



2) Output mode

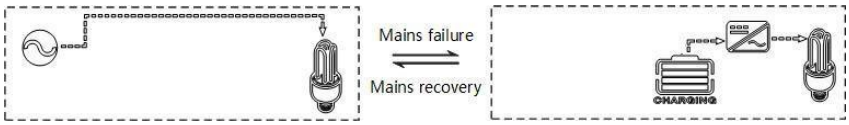
a. PV priority mode:

Switch to mains supply when the PV charging fails. This mode maximizes the use of solar energywhile maintaining battery power, suitable for use in the areas with relatively stable grid.



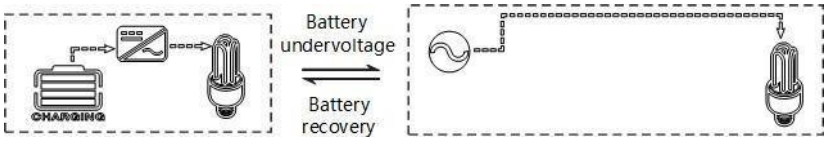
b. Mains priority mode:

Switch to inverter only when the mains fails (when there was mains power, switch to mains power for charging and power supply).Then, the unit is equivalent to a backup UPS, suitable for areas with unstable grid. Switching does not affect PV charging.



c. Inverter priority mode:

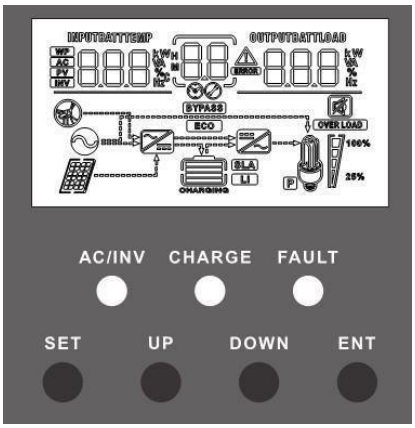
Switch to mains supply only when the battery discharge undervoltage is lower than the set point (item 04). When the charging battery is higher than the set point of (05 setting item), switch to the battery discharge mode. This can cycle the battery charge and discharge. This mode maximizes the use of DC power and is used in the area with stable grid. Switching does not affect PV charging.



D. LCD screen operating instructions

1) Operation and display panel

The operation and display panel is as shown below, including 1 LCD screen, 3 indicators and 4 operationbuttons.



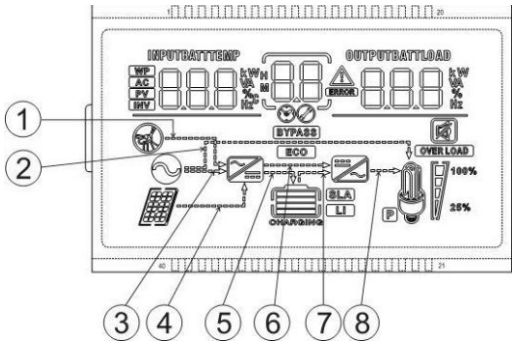
Operation buttons introduction

Function buttons	Description
SET	Enter/Exit Settings menu
UP	Previous choice
DOWN	Next choice
ENT	Confirm/Enter Options under the settings menu,

Indicators introduction

Indicators	Colors	Description
AC/INV	Yellow	Steady on: Mains output
		Flash: Inverter output
CHARGE	Green	Flash: Battery charging
		Steady on: Charging completed
FAULT	Red	Steady on: Fault state

LCD screen introduction



Icons	Functions	Icons	Functions
	Indicates that the AC input terminal has been connected to the grid		Indicates that the inverter circuit is working
	Indicates that the AC input mode in APL mode (wide voltage range)	BYPASS	Indicates that the machine is in the Mains Bypass mode
	Indicates that the PV input terminal has been connected to the solar panel	OVER LOAD	Indicates that the AC output is in an overload state
	Indicates that the machine has been connected to the battery: indicates that the remaining battery is 0%~24%; indicates that the remaining battery is 25%~49%; indicates that the remaining battery is 50%~74%; indicates that the remaining battery is 75%~100%.		Indicates the percentage of AC output loads: indicates that the load percentage is 0%~24%; indicates that the load percentage is 25%~49%, indicates that the load percentage is 50%~74%, indicates that the load percentage is ≥75%.
LI	Indicates that the battery type of the machine is a lithium battery		Indicates that the buzzer is not enabled
SLA	Indicates that the current battery type of the machine is a lead-acid battery		Indicates that the machine has an alarm
CHARGING	Indicates that the battery is in charging state	ERROR	Indicates that the machine is in a fault condition
	Indicates that the AC/PV charging circuit is working		Indicates that the machine is in setup mode
	Indicates that the AC output terminal has an AC voltage output		The parameters displayed in the middle of the screen: 1. In the non-setup mode, the alarm or fault code is displayed. 2. In the setup mode, the currently set parameter item code is displayed.
Parameters display on the left side of the screen: input parameters			
AC	Indicates AC input		
PV	Indicates PV input		
INV	Indicates inverter circuit		
WP	This icon is not displayed		
	Display battery voltage, battery charge total current, mains charge power, AC input voltage, AC input frequency, PV input voltage, internal heat sink temperature,software version		
Parameters display on the right side of the screen: Output parameters			
	Indicates output voltage, output current, output active power, output apparent power, battery discharge current, software version; in setup mode, displays the set parameters under the currently set parameter item code		
Arrow display			
①	The arrow is not displayed	⑤	Indicates the charging circuit charging the battery terminal
②	Indicates the grid supplying power to the load	⑥	The arrow is not displayed
③	Indicates grid supplying power to the charging circuit	⑦	Indicates the battery terminal supplying power to the inverter circuit
④	Indicates PV module supplying power to the charging circuit	⑧	Indicates the inverter circuit supplying power to the load

Real-time data viewing method

On the LCD main screen, press the “UP” and “DOWN” buttons to scroll through the real-time data of the machine.

Page	Parameters on the left side of the screen	Parameters in the middle of the screen	Parameters on the right side of the screen
1	INPUT BATT V (Battery input voltage)	Fault code	OUTPUT LOAD V (Output load voltage)
2	PV TEMP ℃ (PV charger heatsink temperature)		PV OUTPUT KW (PV output power)
3	PV INPUT V (PV input voltage)		PV OUTPUT A (PV output current)
4	INPUT BATT A (Input battery current)		OUTPUT BATT A (Battery output current)
5	INPUT BATT KW (Battery input power)		OUTPUT BATT KW (Battery output power)
6	AC INPUT Hz (AC input frequency)		AC OUTPUT LOAD Hz (AC output frequency)
7	AC INPUT V (AC input voltage)		AC OUTPUT LOAD A (AC output load current)
8	INPUT V (For maintain)		OUTPUT LOAD KVA (Load apparent power)
9	INV TEMP ℃ (AC charge or battery discharge heatsink temperature)		INV OUTPUT LOAD KW (Load active power)
10	APP software version		Bootloader software version
11	Model Battery Voltage Rating		Model Output Power Rating
12	Model PV Voltage Rating		Model PV Current Rating

2) Setup parameters description

Buttons operation instructions: Press the “SET” button to enter the setup menu and exit the setup menu. After entering the setup menu, the parameter number [00] will flash. At this point, press the “UP” and “DOWN” buttons to select the code of parameter item to be set. Then, press the “ENT” button to enter the parameter editing mode, and the value of the parameter is flashing. Adjust the value of the parameter with the “UP” and “DOWN” buttons. Finally, press the “ENT” button to complete the parameter editing and return to the parameter selection state.

Parameter no.	Parameter name	Settings	Description
0	Exit setting menu	[00] ESC	Exit the setup menu
1	Output source priority	[01] SOL	PV priority mode, switching to the Mains when the PV fails or the battery is lower than the set value of parameter [04].
		[01] UTI **default**	Mains priority mode, switching to inverter only when the mains fails.
		[01] SBU	Inverter priority mode, switching to the mains only when the battery is under voltage or lower than the set value of parameter [04].
2	Output Frequency	[02] 50.0	Bypass self-adaptation; when the mains is connected, it automatically adapts to the mains frequency; when the mains is disconnected, the output frequency can be set through this menu. The default output frequency of the 230V machine is 50HZ;
		[02] 60.0	
3	AC Input Voltage Range	[03] APL	Wide mains input voltage range of 230V machine: 90~280V
		[03] UPS **default**	Narrow mains input voltage range of 230V machine: 170~280V
4	Battery Power to Utility Setpoint	[04] 21.8 **default**	When the parameter [01] =SOL/SBU, the battery voltage is lower than the set value, and the output is switched from the inverter to the mains. Setting range: 22V~26V. Cannot exceed the value of [14] settings.
5	Utility to Battery Power Setpoint	[05]28.8V **default**	When the parameter [01] =SOL/SBU, the battery voltage is higher than the set value, and the output is switched from the mains to the inverter. Setting range: 24V~30V. Cannot be lower than the value of [04] / [35] settings.

Parameter no.	Parameter name	Settings	Description
6	Charger source priority	[06] CSO	PV priority charging; only when the PV charging fails, the mains charging is started.
		[06] CUB	Mains priority charging; only when the mains charging fails, the PV charging is started.
		[06] SNU **default**	PV and Mains hybrid charging; PV charging is a priority, and when the PV energy is insufficient, the Mains charging supplements. When the PV energy is sufficient, the Mains charging stops. Note: Only when the Mains bypass output is loaded, the PV charging and the mains charging can work at the same time. When the inverter works, only the PV charging can be started.
		[06] OSO	Only PV charging, with the Mains charging not activated.
7	Max charger current	[07] 60A **default**	230V Max charger current (AC charger+PV charger). Setting range: 0~140A；
8	Battery Type	[08] USE	User-defined; all battery parameters can be set.
		[08] SLd	Sealed lead-acid battery; constant-voltage charge voltage: 28.8V, floating charge voltage: 27.6V.
		[08] FLd	Vented lead-acid battery; constant-voltage charge voltage: 29.2V, floating charge voltage: 27.6V.
		[08] GEL **default**	Colloidal lead-acid battery; constant-voltage charge voltage: 28.4V, floating charge voltage: 27.6V.
9	Battery boost charge voltage	[09] 28.8 **default**	Boost charge voltage setting; the setting range is 24V~29.2V, with step of 0.2V; it is valid for user-defined battery and lithium battery.
10	Battery boost charge time	[10] 120 **default**	Boost charge maximum time setting, which means the maximum charging time to reach the set voltage of parameter [09] during constant-voltage charging. The setting range is 5min~900min, with a step of 5 minutes. It is valid for user-defined battery and lithium battery.
11	Battery floating charge voltage	[11] 27.6V **default**	Floating charge voltage, setting range: 24V~229.V, step: 0.2V, valid when battery type is user-defined.
12	Battery over discharge voltage (delay off)	[12] 21V **default**	Over-discharge voltage; when the battery voltage is lower than this judgment point, delay the time set by parameter [13] and turn off inverter output. Setting range is 20V~24V, with a step of 0.2V. It is valid for user-defined battery and lithium battery.
13	Battery over discharge delay time	[13] 5S **default**	Over-discharge delay time; when the battery voltage is lower than the parameter [12], the inverter output will be turned off after the time set by this parameter is delayed. The setting range is 5S~50S, with a step of 5S. It is valid for user-defined battery and lithium battery.
14	Battery under voltage alarm	[14] 22V **default**	Battery under voltage alarm point; when the battery voltage is lower than the point, an under voltage alarm is given, and the output is not turned off; the setting range is 20V~26V, with a step of 0.2V. It is valid for user-defined battery and lithium battery.
15	Battery discharge limit voltage	[15] 20V **default**	Battery discharge limit voltage; when the battery voltage is lower than the point, the output is turned off immediately; the setting range is 20V~26V, with a step of 0.2V. It is valid for user-defined battery and lithium battery.
16	Battery equalization enable	[16] DIS	Equalizing charge is disabled
		[16] ENA **default**	Equalizing charge is enabled, only valid for vented lead-acid battery and sealed lead-acid battery
17	Battery equalization voltage	[17] 31.6V **default**	Equalizing charge voltage; setting range: 24V~31.6V, with a step of 0.2V; valid for vented lead-acid battery and sealed lead-acid battery
18	Battery equalized time out	[18] 120 **default**	Equalizing charge time; setting range: 5min~900min, with a step of 5 minutes; valid for vented lead-acid battery and sealed lead-acid battery

Parameter no.	Parameter name	Settings	Description
19	Battery equalized time out	[19] 120 **default**	Equalizing charge delay; setting range: 5min~900min, with a step of 5 minutes; valid for vented lead-acid battery and sealed lead-acid battery
20	Battery equalization interval	[20] 30 **default**	Equalizing charge derating time, 0~30days, with a step of 1 day; valid for vented lead-acid battery and sealed lead-acid battery
21	Battery equalization immediately	[21] DIS	Stop equalizing charge immediately.
22		[22] DIS **default**	Power saving mode disabled.
	Power saving mode	[22] ENA	After the power saving mode is enabled, if the load is null or less than 50W, the inverter output is turned off after a delay for a certain period of time. When the load is more than 50W, the inverter automatic restart.
23	Restart when over load	[23] DIS	Automatic restart when overload is disabled. If an overload occurs and the output is turned off, the machine will not restart.
		[23] ENA **default**	Automatic restart when overload is enabled. If an overload occurs and the output is turned off, the machine will restart after a delay of 3 minutes. After it reaches 5 cumulative times,the machine will not restart.
24	Restart when over temperature	[24] DIS	Automatic restart when over temperature is disabled. If an over-temperature shutdown occurs, machine will not restart to turn the output on.
		[24] ENA **default**	Automatic restart when over temperature is enabled. If an over-temperature shutdown occurs, the machine will restart when the temperature drops.
25	Alarm enable	[25] DIS	Alarm is disabled
		[25] ENA **default**	Alarm is enabled
26	Beeps while primary source is interrupted	[26] DIS	Alarm beep is disabled when the status of the main input source changes
		[26] ENA **default**	Alarm beep is enabled when the status of the main input source changes
27	Bypass output when over load	[27] DIS	It is disabled to automatically switch to the Mains when the inverter is overloaded.
		[27] ENA **default**	It is enabled to automatically switch to the Mains when the inverter is overloaded.
28	Max AC charger current	[28] 80A **default**	**S series model**：Max AC charger current. Setting range: 0~80A；
29	Split Phase	[29] DIS **default**	Supply for industrial frequency transformer (disabled)
		[29] ENA	Supply for industrial frequency transformer (enabled)
35	Battery under voltage recovery point	[35] 26V **default**	When the battery voltage is under voltage, the battery voltage needs to recover more than this set value before the inverter starts the output
36	Max PV charger current	[36] 60A **default**	Max PV charger current. Setting range: 0~60A
37	Battery fully charged recovery point	[37] 26V **default**	After the battery is fully charged, it needs to be lower than this set voltage before it can be recharged
38	AC outputvoltagesetting (only canbesetin the standbymode)	[38]230Vac default	**S series model**：230Vac **default**. Allow to set to 200/208/220/230/240Vac.The rated output power will be reduced=(Power Rate)*(Vset/230)

3) Battery type parameters For Lead-acid Battery :

Parameters \ Battery type	Sealed lead acid battery (SLD)	Colloidal lead acid battery (GEL)	Vented lead acid battery (FLD)	User-defined (User)
Overvoltage disconnection voltage	30.0V	30.0V	31.0V	18～30V
Battery fully charged recovery point(setup item 37)	26V (Adjustable)	26V (Adjustable)	26V (Adjustable)	26V (Adjustable)
Equalizing charge voltage	29.2V	-	29.6V	18～30V
Boost charge voltage	28.8V	28.4V	29.2V	18～30V (Adjustable)
Floating charge voltage	27.6V	27.6V	27.6V	18～30V (Adjustable)
Under voltage alarm voltage(01 fault)	22V	22V	22V	18～30V (Adjustable)
Under voltage alarm voltage recovery point(01 fault)	Under voltage alarm voltage+0.4V			
Low voltage disconnection voltage(04 fault)	21.0V	21.0V	21.0V	18～30V (Adjustable)
Low voltage disconnection voltage recovery point (04 fault)(setup item 35)	26V (Adjustable)	26V (Adjustable)	26V (Adjustable)	26V (Adjustable)
Discharge limit voltage	20.0V	20.0V	20.0V	18～30V (Adjustable)
Over-discharge delay time	5s	5s	5s	1～30s (Adjustable)
Equalizing charge duration	120 minutes	-	120 minutes	0～600 minutes (Adjustable)
Equalizing charge interval	30 days	-	30 days	0～250 days (Adjustable)
Boost charge duration	120 minutes	120 minutes	120 minutes	10～600 minutes (Adjustable)

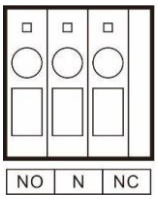
For Lithium Battery :

Parameters \ Battery type	Ternary lithium battery (N07)	Ternary lithium battery (N08)	Lithium iron phosphat e battery (LF07)	Lithium iron phosphate battery (LF08)	Lithium iron phosphate battery (LF09)
Overvoltage disconnection voltage	31.6V	33V	30V	30V	33V
Battery fully charged recovery point(setup item 37)	27.4V (Adjustable)	30.4V (Adjustable)	23.2V (Adjustable)	26.8V (Adjustable)	29.8V (Adjustable)
Equalizing charge voltage	28.8V (Adjustable)	31.6V(Adjustable)	24.6V(Adjustable)	28.4V (Adjustable)	31.6V (Adjustable)
Boost charge voltage	28.8V (Adjustable)	31.6V(Adjustable)	24.6V(Adjustable)	28.4V(Adjustable)	31.6V (Adjustable)
Floating charge voltage	28.8V (Adjustable)	31.6V(Adjustable)	24.6V (Adjustable)	28.4V (Adjustable)	31.6V (Adjustable)
Under voltage alarm voltage (01 fault)	23.4V Adjustable)	26.8V(Adjustable)	21.6V (Adjustable)	24.8V (Adjustable)	27.8V (Adjustable)
Under voltage alarm voltage recovery point(01 fault)	Under voltage alarm voltage+0.4V				
Low voltage disconnection voltage (04 fault)	21.0V (Adjustable)	24.0V(Adjustable)	21.0V (Adjustable)	24.4V(Adjustable)	27.0V (Adjustable)

Parameters \ Battery type	Ternary lithium battery (N07)	Ternary lithium battery (N08)	Lithium iron phosphat e battery (LF07)	Lithium iron phosphat e battery (LF08)	Lithium iron phosphate battery (LF09)
Low voltage disconnection voltage recovery point (04 fault)(setup item 35)	26V (Adjustable)	29.6V (Adjustable)	23.8V (Adjustable)	27.2V (Adjustable)	30.6V (Adjustable)
Discharge limit voltage	19.6V	22.4V	20.4V	23.2V	26.2V
Over-discharge delay time	30s (Adjustable)	30s (Adjustable)	30s (Adjustable)	30s (Adjustable)	30s (Adjustable)
Equalizing charge duration	-	-	-	-	-
Equalizing charge interval	-	-	-	-	-
Boost charge duration	120 minutes (Adjustable)	120 minutes (Adjustable)	120 minutes (Adjustable)	120 minutes (Adjustable)	120 minutes (Adjustable)

E. Other functions

1) Dry node



Working principle: This dry node can control the ON/OFF of the diesel generator to charge the battery. ① Normally, the terminals are that the NC-N point is closed andthe NO-N point is open; ② When the battery voltage reaches the low voltage disconnection point, the relay coil is energized, and the terminals turn to that the NO-N point is closed while NC-N point is open. At this point, NO-N point can drive resistive loads: 125VAC/1A, 230VAC/1A, 30VDC/1A.

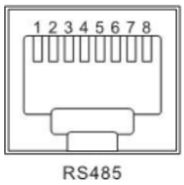
2) RS485 communication port

This port is an RS485 communication port ;

This port is an RS485 communication port which comes with two functions:

a. It allows direct communication with the optional host computer developed by our company through this port, and enables monitoring of the equipment running status and setting of some parameters on the computer;

b. It also allows direct connection with the optional RS485 to WiFi/GPRS communication module developed by our company through this port. After the module is selected, you can connect the hybrid solar charge inverter through the mobile phone WiFi/GPRS APP, on which you can view the operating parameters and status of the device.

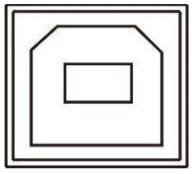


RS485

As shown in the figure:

Pin 1 is 5V power supply, Pin 2 is GND, Pin 7 is RS485-A, and Pin 8 is RS485-B ;Pin 5 is CAN-H, and Pin 6 is CAN-L ;

3) USB communication port



This is a USB communication port, which can be used for USB communication with the optional PC host software. To use this port, you should install the corresponding "USB to serial chip CH340T driver" and APP in the computer.

F. Protection

1) Protections provided

No.	Protections	Description
1	PV current/power limiting protection	When charging current or power of the PV array configured exceeds the PV rated, it will charge at the rated.
2	PV night reverse- current protection	At night, the battery is prevented from discharging through the PV module because the battery voltage is greater than the voltage of PV module.
3	Mains input over voltage protection	When the mains voltage exceeds 280V (230V model) or 140V (120V model), the mains charging will be stopped and switched to the inverter mode.
4	Mains input under voltage protection	When the mains voltage is lower than 170V (230V model /UPS mode) or 90V (120V model or APL mode), the mains charging will be stopped and switched to the inverter mode.
5	Battery over voltage protection	When the battery voltage reaches the over voltage disconnection point, the PV and the mains will be automatically stopped to charge the battery to prevent the battery from being overcharged and damaged.
6	Battery low voltage protection	When the battery voltage reaches the low voltage disconnection point, the battery discharging will be automatically stopped to prevent the battery from being over-discharged and damaged.
7	Load output short circuit protection	When a short-circuit fault occurs at the load output terminal, the AC output is immediately turned off and turned on again after 1 second.
8	Heat sink over temperature protection	When the internal temperature is too high, the all-in-one machine will stop charging and discharging; when the temperature returns to normal, charging and discharging will resume.
9	Overload protection	Output again 3 minutes after an overload protection, and turn the output off after 5 consecutive times of overload protection until the machine is re-powered. For the specific overload level and duration, refer to the technical parameters table in the manual.
10	PV reverse polarity protection	When the PV polarity is reversed, the machine will not be damaged.
11	AC reverse protection	Prevent battery inverter AC current from being reversely input to Bypass.
12	Bypass over current protection	Built-in AC input overcurrent protection circuit breaker.
13	Battery input over current protection	When the discharge output current of the battery is greater than the maximum value and lasts for 1 minute, the AC input would switched to load.
14	Battery input protection	When the battery is reversely connected or the inverter is short- circuited, the battery input fuse in the inverter will blow out to prevent the battery from being damaged or causing a fire.
15	Charge short protection	When the external battery port is short-circuited in the PV or AC charging state, the inverter will protect and stop the output current.

2) Fault code meaning

Fault code	Fault name	Whether it affects the output or not	Description
【01】	BatVoltLow	Yes	Battery undervoltage alarm
【02】	BatOverCurrSw	Yes	Battery discharge average current overcurrent software protection
【03】	BatOpen	Yes	Battery not-connected alarm
【04】	BatLowEod	Yes	Battery undervoltage stop discharge alarm
【05】	BatOverCurrHw	Yes	Battery overcurrent hardware protection
【06】	BatOverVolt	Yes	Charging overvoltage protection

Fault code	Fault name	Whether it affects the output or not	Description
【07】	BusOverVoltHw	Yes	Bus overvoltage hardware protection
【08】	BusOverVoltSw	Yes	Bus overvoltage software protection
【09】	PvVoltHigh	No	PV overvoltage protection
【10】	PvBuckOCSw	No	Buck overcurrent software protection
【11】	PvBuckOCHw	No	Buck overcurrent hardware protection
【12】	bLineLoss	No	Mains power down
【13】	OverloadBypass	Yes	Bypass overload protection
【14】	OverloadInverter	Yes	Inverter overload protection
【15】	AcOverCurrHw	Yes	Inverter overcurrent hardware protection
【17】	InvShort	Yes	Inverter short circuit protection
【19】	OverTemperMppt	No	Buck heat sink over temperature protection
【20】	OverTemperInv	Yes	Inverter heat sink over temperature protection
【21】	FanFail	Yes	Fan failure
【22】	EEPROM	Yes	Memory failure
【23】	ModelNumErr	Yes	Model setting error
【26】	RlyShort	Yes	Inverted AC Output Back fills to Bypass AC Input
【29】	BusLow	Yes	Internal battery boost circuit failure

3) Handling measures for part of faults

Fault code	Faults	Handling measures
Display	No display on the screen	Check if the battery air switch or the PV air switch has been closed; if the switch is in the "ON" state; press any button on the screen to exit the screen sleep mode.
【06】	Battery overvoltage protection	Measure if the battery voltage exceeds rated, and turn off the PV array air switch and Mains air switch.
【01】【04】	Battery under voltage protection	Charge the battery until it returns to the low voltage disconnection recovery voltage.
【21】	Fan failure	Check if the fan is not turning or blocked by foreign object.
【19】【20】	Heat sink over temperature protection	When the temperature of the device is cooled below the recovery temperature, normal charge and discharge control is resumed.
【13】【14】	Bypass overload protection, inverter overload protection	① Reduce the use of power equipment; ② Restart the unit to resume load output.
【17】	Inverter short circuit protection	① Check the load connection carefully and clear the short- circuit fault points; ② Re-power up to resume load output.
【09】	PV overvoltage	Use a multimeter to check if the PV input voltage exceeds the maximum allowable input voltage rated.
【03】	Battery missed alarm	Check if the battery is not connected or if the battery circuit breaker is not closed.
【26】	Inverted AC Output Back fills to Bypass AC Input	Disconnect the AC input,PV input and battery input. After the screen is off, only connect the battery and start up. If fault 26 is reported, it indicates that the AC input relay switch is short-circuited, and you need to contact the manufacturer to replace it.

G. System maintenance

In order to maintain the best long-term performance, it is recommended to conduct following checks twice a year.

1) Make sure that the airflow around the unit is not blocked and remove any dirt or debris fromthe heat sink.

2) Check that all exposed wires are damaged by exposure to sunlight, friction with other objects around them, dryness, bite by insects or rodents, etc., and the wires shall be repaired or replaced if necessary.

3) Verify for the consistency of indication and display with the operation of the device. Please pay attention to the display of any faults or errors, and take corrective actions if necessary.

4) Check all wiring terminals for corrosion, insulation damage, signs of high temperature or burning/discoloration, and tighten the screws.

5) Check for dirt, nesting insects and corrosion, and clean up as required.

6) If the arrester has failed, replace in time to prevent lightning damage to the unit or even otherequipment of the user.

Warning: Danger of electric shock! When doing the above operations, make sure that all power supplies of the hybrid machine have beendisconnected, and all capacitors have been discharged, and then check or operate accordingly!

The company does not assume any liability for damage caused by:

a. Improper use or use in improper site.

b. Open circuit voltage of the PV module exceeds the maximum allowable voltage rated.

c. Temperature in the operating environment exceeds the limited operating temperature range.

d. Disassemble and repair the hybrid solar charge inverter without permission.

e. Force majeure: Damage that occurs in transportation or handling of the hybrid solar charge inverter.

H. Technical Data

Models	HF2430S60 -100
AC mode	
Rated input voltage	220/230Vac
Input voltage range	(170Vac~280Vac) ±2% (90Vac-280Vac) ±2%
Frequency	50Hz/ 60Hz (Auto detection)
Frequency Range	47±0.3Hz ~ 55±0.3Hz (50Hz); 57±0.3Hz ~ 65±0.3Hz (60Hz);
Overload/short circuit protection	Circuit breaker
Efficiency	>95%
Conversion time (bypass and inverter)	10ms (typical)
AC reverse protection	Available
Maximum bypass overload current	30A
Inverter mode	
Output voltage waveform	Pure sine wave
Rated output power (VA)	3000
Rated output power (W)	3000
Power factor	1
Rated output voltage (Vac)	230Vac
Output voltage error	±5%
Output frequency range (Hz)	50Hz ± 0.3Hz; 60Hz ± 0.3Hz
Maximum Efficiency	>92%

Overload protection	(102% < load <125%) ±10%: report error and turn off the output after 5 minutes; (125% < load < 150%) ± 10%: report error and turn off the output after 10 seconds; Load >150% ±10%: report error and turn off the output after 5 seconds;
Peak power	6000VA
Loaded motor capability	2HP
Rated battery input voltage	24V (Minimum starting voltage 22V)
Battery voltage range	Undervoltage alarm/shutdown voltage/overvoltage alarm /overvoltage recovery... settable on LCD screen)
Power saving mode	Load ≤50W
AC charging	
Battery type	Lead acid or lithium battery
Maximum charge current(can be set)	0-80A
Charge current error	± 5Adc
Charge voltage range	20 –33Vdc
Short circuit protection	Circuit breaker and blown fuse
Circuit breaker specifications	30A
Overcharge protection	Alarm and turn off charging after 1 minute
PV charging	
Maximum PV open circuit voltage	100Vdc
PV operating voltage range	30-100Vdc
MPPT voltage range	30-85Vdc
Battery voltage range	20 –33Vdc
Maximum output power	1400W
PV charging current range (can be set)	0-60A
Charging short circuit protection	Blown fuse
Wiring protection	Reverse polarity protection
Hybrid charging Max charger current specifications (AC charger+PV charger)	
Max charger current(can be set)	0-140A
Certified specifications	
Certification	CE(IEC 62109-1)
EMC certification level	EN61000, C2
Operating temperature range	-15°C to 55°C
Storage temperature range	-25°C ~ 60°C
Humidity range	5% to 95% (Conformal coating protection)
Noise	≤60dB
Heat dissipation	Forced air cooling, variable speed of fan
Communication interface	USB/RS485(WiFi/GPRS)/Dry node control
Size (L*W*D)	378mm*280mm*103mm
Weight (kg)	6.2

Disposal

This symbol must appear on any electrical and electronic equipment placed on the EU market. This symbol indicates that this device should not be disposed of as unsorted municipal waste at the end of its service life.

Owners of WEEE (Waste from Electrical and Electronic Equipment) shall dispose of it separately from unsorted municipal waste.
Spent batteries and accumulators, which are not enclosed by the WEEE, as well as lamps that can be removed from the WEEE in a non-destructive manner, must be removed by end users from the WEEE in a non-destructive manner before it is handed over to a collection point.
Distributors of electrical and electronic equipment are legally obliged to provide free take-back of waste. Conrad provides the following return options free of charge(more details on our website):

- in our Conrad offices
- at the Conrad collection points
- at the collection points of public waste management authorities or the collection points set up by manufacturers or distributors within the meaning of the ElektroG

End users are responsible for deleting personal data from the WEEE to be disposed of.
It should be noted that different obligations about the return or recycling of WEEE may apply in countries outside of Germany.

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(4) Distributor box - Manual (1PC RCBO + 2PCS Socket)

A. Install Instruction:

1) Step1: Unscrew the two screws (a & b) on the distribution box.

2) Step 2: Connect cable to Residual Current Circuit Breaker with Overcurrent Protection (RCBO)

Cut a hole in the distributor box, so that the AC line can pass through this hole and connect to the RCBO.

3) Step 3: Select a suitable place to Install and secure the distribution box

Note: Do not install the in harsh environments such as moist, oily, flammable or explosive, or heavily dusty areas.

B. Instruction for Circuit Breaker with Overcurrent Protection (RCBO) (Model # JVL-29-63)

1) Important safety instructions

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH.

a. Turn off all power supplying this device before working on it.
b. Use a voltage tester a suitable rated voltage in order to check that all active conductors aren't energized.
c. Failure to follow these instructions will result in death or serious injury

2) Note:

a. Do not place the switch panel within the reach of children.

b. Do not install the in harsh environments such as moist, oily, flammable or explosive, or heavily dusty areas.

c. The installation, maintenance and replacement of this device must only be carried out by a qualified electrician.

d. This device must not be repaired.

e. All applicable local, regional and national regulations must be complied with during the installation, use, maintenance and replacement of this device.

f. This device should not be installed if, when unpacking it, you observe that it is damaged.

g. CEI cannot be held responsible in the event of noncompliance with the instructions in this document and in the documents to which it refers.

h. The service instruction must be observed throughout the life time of this device.

3) Residual Current Circuit Breaker with Overcurrent Protection (RCBO) provides:

a. Protection against short-circuits

b. Protection against overloads

c. Protection against electrocution by indirect contact, and by direct contact for 30mA sensitivity

d. Protection against fire hazards due to persistent earth fault current

4) Connection:

Electrical feeding from the bottom only

5) Test

a. Test: In the absence of any regulation, the test must be carried out once a month.

b. The RCBO will trip immediately when press test button, and failure to do so indicates either no supply to the RCBO or a faulty device

Notice:

HAZARD OF IMPROPER OPERATION

Do not use test button to switch OFF RCBO.

Failure to follow these instructions can result in equipment damage.

6) Technical Data

a. Pole No.: 2P+N

b. Residual current characteristics: AC, A

c. Rated current (A): 20

d. Rated short-circuit capacity: 6kA

e. Voltage: 230V AC

f. Rated frequency: 50/60Hz

g. Rated residual operating current(A): 0.03

h. Tripping duration: instantaneous≤0.1s

C. Socket Specification (model #BS-D01-1B)

1) Characteristics:

a. Rating: 16A 250V~

b. Insulation Resistance:100MΩ Min, AT 500V DC

c. Electric Strength:AC 2000V For one minute

2) Use condition : This socket should be used Max 70℃.

3) Store condition : This socket should be store Max 65℃.

4) Electrical

a. Dielectric strength : The Receptacles should withstand a potential of direct current 2000V/minute.

b. Insulation resistance

Insulation resistance between pins should not be less than 100MΩ.It

is measured with 500V DC.

c. Contact resistance: Contact resistance should not exceed 30mΩ.

Disposal

This symbol must appear on any electrical and electronic equipment placed on the EU market. This symbol indicates that this device should not be disposed of as unsorted municipal waste at the end of its service life.

Owners of WEEE (Waste from Electrical and Electronic Equipment) shall dispose of it separately from unsorted municipal waste.
Spent batteries and accumulators, which are not enclosed by the WEEE, as well as lamps that can be removed from the WEEE in a non-destructive manner, must be removed by end users from the WEEE in a non-destructive manner before it is handed over to a collection point.
Distributors of electrical and electronic equipment are legally obliged to provide free take-back of waste. Conrad provides the following return options free of charge(more details on our website):

- in our Conrad offices
- at the Conrad collection points
- at the collection points of public waste management authorities or the collection points set up by manufacturers or distributors within the meaning of the ElektroG

End users are responsible for deleting personal data from the WEEE to be disposed of.
It should be noted that different obligations about the return or recycling of WEEE may apply in countries outside of Germany.

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