



BD–RH1 Series Hybrid Inverters

User Manual

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1 Notes on this Manual











1.1 Scope of Validity

This manual is an integral part of inverter, It describes the assembly, install maintenance and failure of the product. Please read it carefully before operating.

BD6KTL- RH1	BD7K6TL- RH1	BD9KTL- RH1	BD10KTL -RH1	BD11K4TL- RH1
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1.2 Explanation of Symbol

This section gives an explanation of all the symbols shown on the inverter and on the type label.

	This symbol indicates that you should wait at least 5mins after disconnecting the inverter from the utility grid and from the PV panel before touching any inner live parts.
	Keep dry! The package/product must be protected from excessive humidity and must be stored under cover.
	Refer to the operating instructions.
	Fragile - The package/product should be handled carefully and never be tipped over or slung.
	Products should not be disposed as household waste.
	No more than six(6) identical packages being stacked on each other
	Components of the product can be recycled.
	Danger of hot surface!
	Danger of high voltage and electric shock!
	Caution! Failure to observe a warning indicated in this manual may result in injury

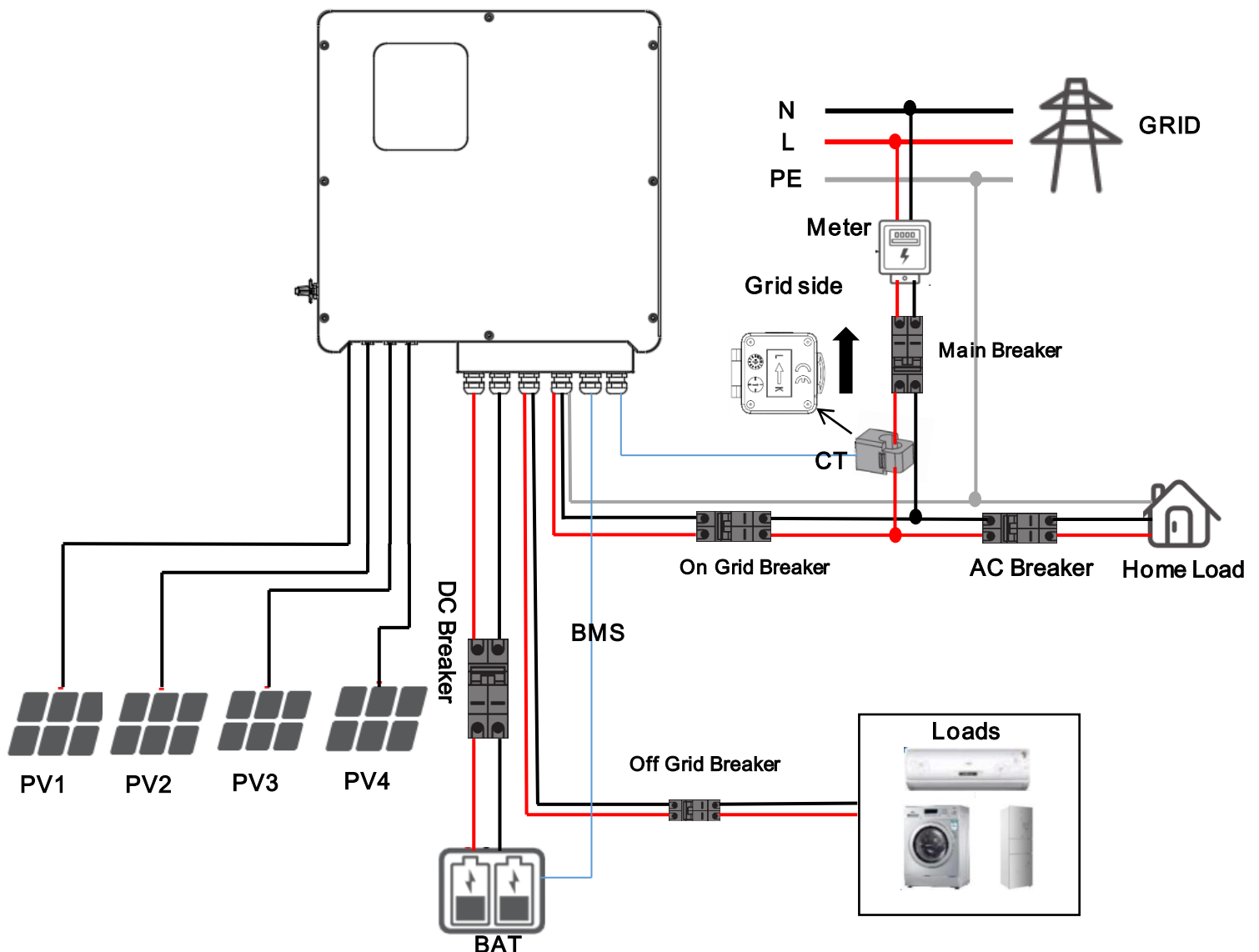
2 Introduction

2.1 Basic features

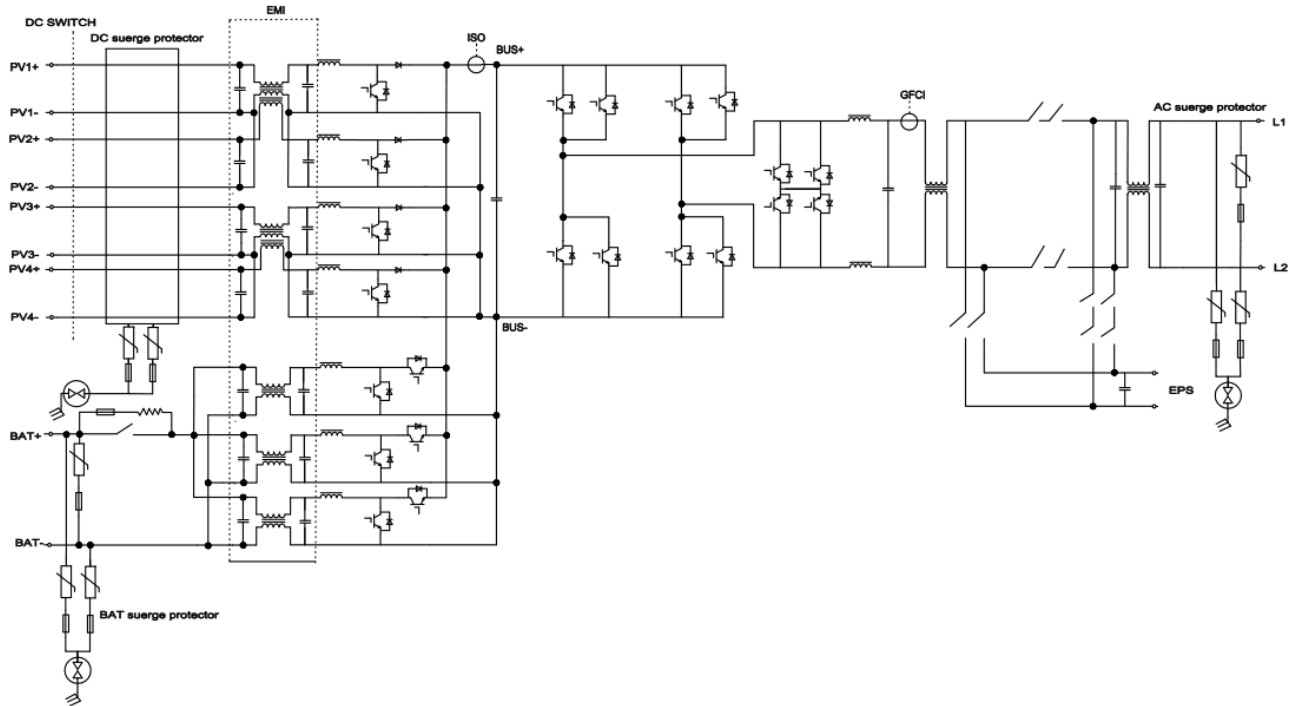
The inverter is a high-quality inverter which can convert solar energy to AC energy and store energy into battery. The inverter can be used to optimize self consumption, store in the battery for future use or feed-in to public grid. Work mode depends on PV energy and user's preference. It can provide power for emergency use during the grid lost by using the energy from battery and inverter (generated from PV).

2.2 System Diagram

2.2.1 Networking application

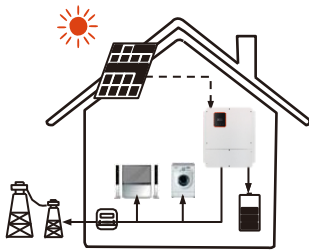


2.2.2 Conceptual diagram



2.3 Work Modes

Inverter provides multiple work modes based on different requirements.

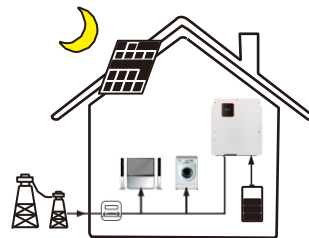


Work modes: **Selfuse** (with PV Power)

Priority: load>battery>grid

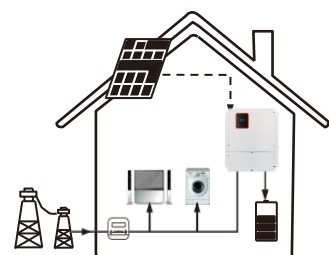
This mode applies the area that has low feed-in tariff and high energy price.

The power generated from PV will be used to supply the local loads firstly, then to charge the battery. The redundant power will export to the public grid.



Work modes: **Selfuse** (without PV Power)

When no PV supplied, battery will discharge for local loads firstly, and grid will supply power when the battery capacity is not enough.



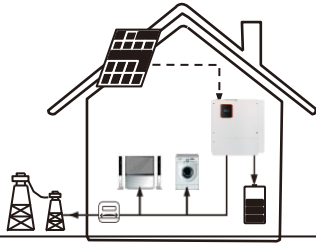
Work modes: **Force time use**

Priority: battery>load>grid (when charging)

Priority: load>battery>grid (when discharging) this mode applies the area that has electricity price between peak and valley. User can use off-

peak electricity to charge the battery.

The charging and discharging time can be set flexibly, and it also allows to choose whether charge from the grid or not.

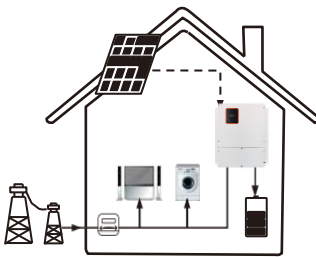


Work modes: **Feed in Priority**

Priority: load>grid>battery

This mode applies the area that has high feed-in tariff and export control.

The PV generated power will be used to supply the local loads first, then export to the public grid. The redundant power will charge the battery.

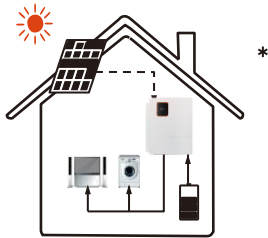


Work modes: **Back up mode**

Priority: battery>load>grid

This mode applies the area that has frequent power outages. And this mode ensures the battery will have enough energy to supply when the grid is off.

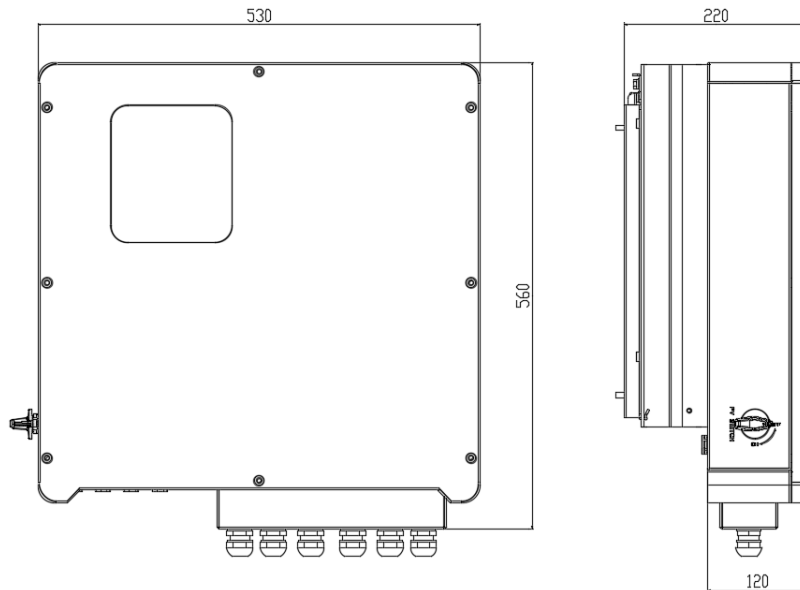
In this mode battery will be charging forcibly in the setting time and will never be discharged when the grid is on, and it also allows to choose whether charge from the grid or not.



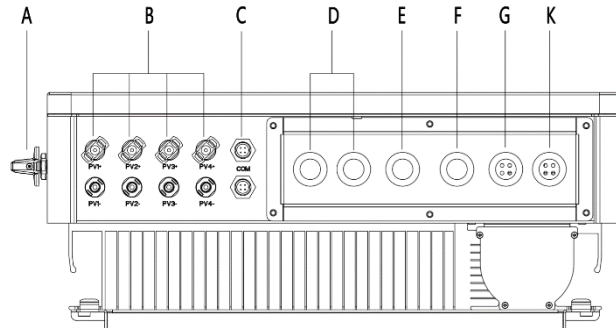
Back-up status

When the grid is off, system will supply emergency power from PV or battery to supply the home loads. (Battery is necessary in BACK-UP mode.)

2.4 Dimension



2.5 Port Description



Object	Description
A	DC switch
B	PV1~PV4 input
C	Wifi/GPRS
D	BAT input
E	BACK-UP output
F	GRID
G	DRM/BMS/CT
K	DRY IO/CAN/USB

3 Technical Parameters

Technical Data	BD6KTL- RH1	BD7K6TL- RH1	BD9KTL- RH1	BD10KTL- RH1	BD11K4TL- RH1
Efficiency					
Europe Efficiency	> =98.2%				
MAX. Battery to Load Efficiency	> =97.2%				
AC Output Data(On-Grid)					
MAX. Apparent Power Output to Grid	6kVA	7.6kVA	9kVA	10kVA	11.4KVA
Output Voltage Range	175V-270V /230 1 phase				
Output Frequency	50/60Hz (45 to 54.9Hz / 55 to 65Hz)				
Max. AC Current Output to Grid	26A	33A	39.2A	43.5A	49.5A
Output Power Factor	0.8leading...0.8lagging				
Output THDI	< 2%				
AC Output Data(Back-Up)					
Nominal. Apparent Power Output	6kVA	7.6kVA	9kVA	10KVA	11.4KVA
Nominal Output Voltage	220V~240V				
Nominal Output Frequency	50Hz/60Hz				
Output THDU	< 2%				
PV Sting Input					
MAX. DC Input Power	8.5kW	10kW	11.7kW	13kW	14.82kW
NO. MPPT Tracker	4				
MPPT Range	150 - 500V				
MAX. DC Input Voltage	500V				
MAX. Input Current	12A	12A	12A	12A	12A
Battery Input Data					
MAX. Charging/Discharging Current	80 A / 80 A	80 A / 80 A	62.5A/62.5 A	69.5A/69.5A	79A/79A
Battery Voltage Range	96V~350V	90V~350V	150V~350V	150V~350V	150V~350V
Battery Type	LI-ion/Lead-acid				
Charging Strategy for Li-Ion Battery	Self-adaption to BMS				

Protection					
Grounding detection	YES				
Island Protection	YES				
Battery reverse Polarity	YES				
Insulation Resistor Detection	YES				
Residual Current Monitoring Unit	YES				
Output Over Current Protection	YES				
Back-up Output Short Protection	YES				
Terminal temperature detection	YES				
Output Over Voltage Protection	YES				
Output Under Voltage Protection	YES				
General Data					
Operating Temperature Range	-25 ~ +60°C				
Relative Humidity	0-95%				
Operating Altitude	0~4000m				
Ingress Protection	IP65/NEMA 3R				
Weight	32kg				
Size (Width*Height*Depth)	530mm x 565mm x 220mm				
Cooling	Natural Convection				
Noise emission	<25dB	<29dB	<29dB	<29dB	<29dB
Display	LCD				
Communication With BMS/Meter /EMS	Modbus, RS485 , WIFI,4G				

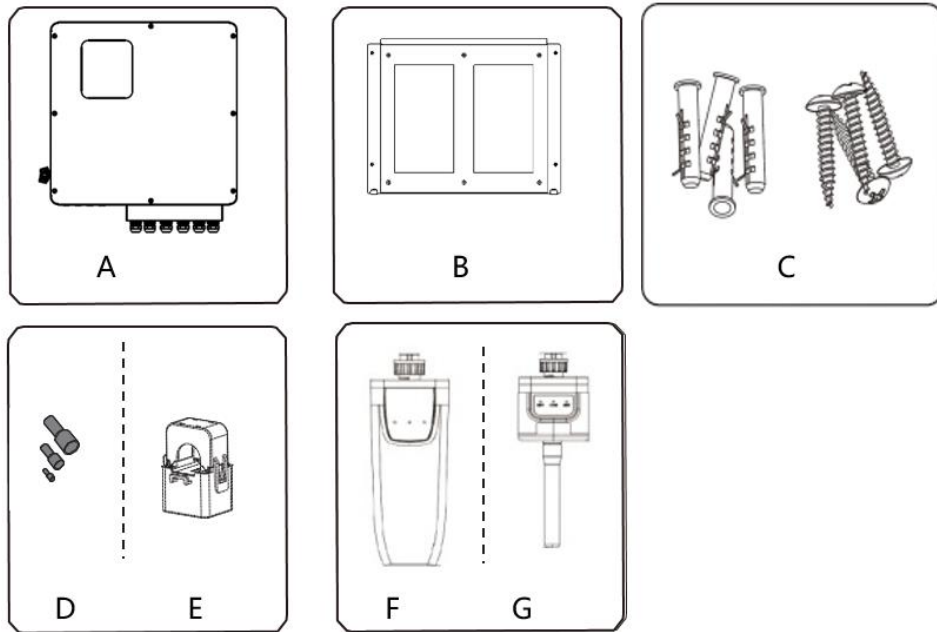
4 Installation

4.1 Check for Physical Damage

Make sure the inverter is intact during transportation. If there is any visible damage, such as cracks, please contact your dealer immediately.

4.2 Packing List

Open the package and take out the product, please check the accessories first. The packing list shown as below.



Object	Description
A	Inverter
B	Bracket
C	Expansion screws and pan-head screws
D	Pin Terminal 3 sizes: L, M, S
E	CT
F	Wifi module (optional)
G	GPRS module (optional)

4.3 Mounting

4.3.1 Installation Precaution

Inverter is designed for outdoor installation (IP 65). Make sure the installation site meets the following conditions:

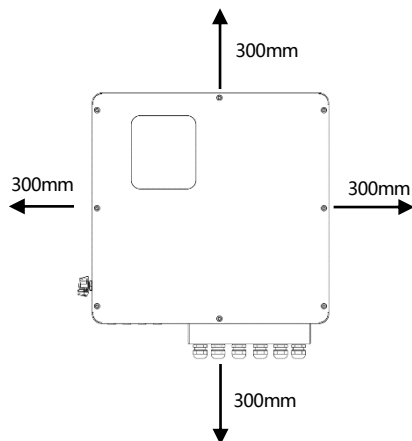
- ◆ Not in direct sunlight.
- ◆ Not in areas where highly Flammable materials are stored.

- ◆ 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 -20°C to +60°C.
- ◆ The slope of the wall should be within $\pm 5^\circ$.
- ◆ The wall hanging the inverter should meet conditions below:

- 1) Solid brick/concrete, or strength equivalent mounting surface;
- 2) Inverter must be supported or strengthened if the wall's strength isn't enough (such as wooden wall, the wall covered by thick layer of decoration)

Please AVOID direct sunlight, rain exposure, snow laying up during installation and operation.

4.3.2 Space Requirement



Position	Min. size
Left	300mm
Right	300mm
Top	300mm
Bottom	300mm
Front	300mm

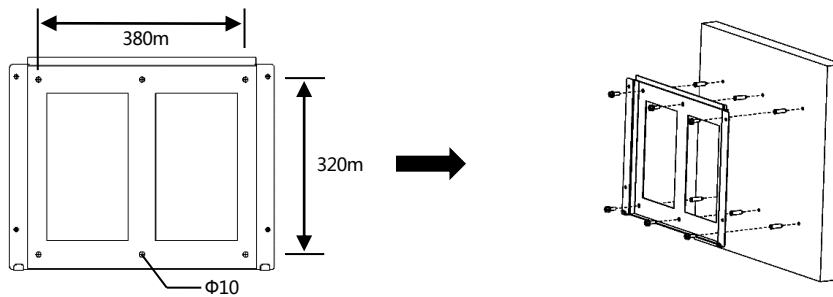
4.3.3 Mounting

Tools required for installation.

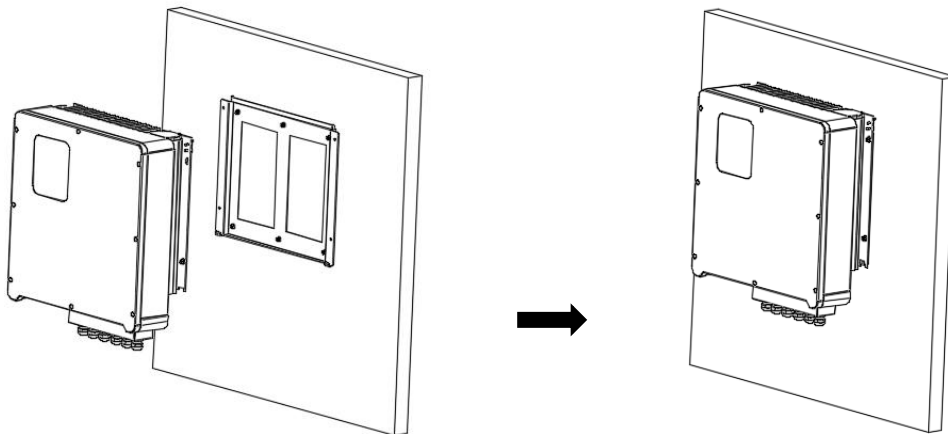
Installation tools: crimping pliers for binding post and RJ 45, screwdriver, manual wrench etc.



Step 1: Screw the wall bracket on the wall



Step 2: Place the inverter on the wall mounted bracket by holding the handle on the side.



5. Electrical Connection

5.1 PV connection

Hybrid can be connected in series with 4-strings PV modules for 10KVA, 12KVA, 15KVA. Select PV modules with excellent function and reliable quality. Open-circuit voltage of module arrays connected in series should be <Max. DC input voltage; operating voltage should be conformed to MPPT voltage range.



Warning!

- PV module voltage is very high, which already achieve dangerous voltage range, please comply with electric safety rules when connecting.
- Please do not make PV positive or negative ground!

Step 1: Connection Steps

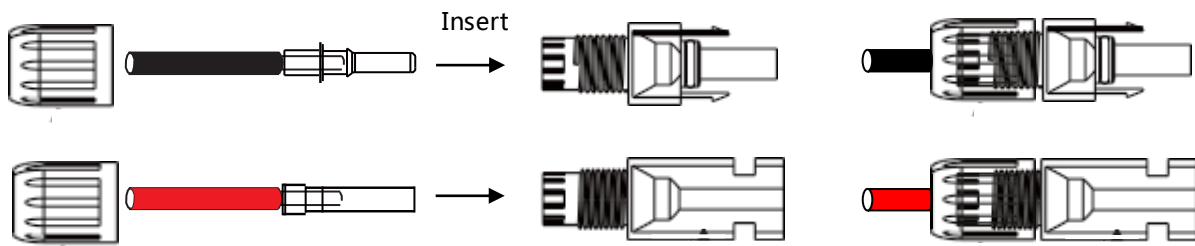
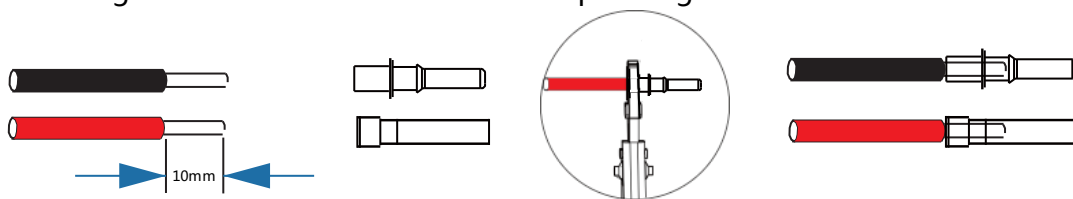
1. Checking PV module.

- 1.1 Use multi meter to measure module array voltage.
- 1.2 Check the PV+ and PV- from the PV string combiner box correctly.
- 1.3 Please make sure the impedance between the positive pole and negative pole of PV to earth should be MΩ level.

Step 2: Separating the PV connector.

1. Wiring.

- 1.1 Choose the 12 AWG wire to connect with the cold-pressed terminal.
- 1.2 Remove 12mm of insulation from the end of wire.
- 1.3 Insert the insulation into pin contact and use crimping plier to clamp it.
- 1.4 Insert pin contact through the cable nut to assemble into back of the male or female plug. When you feel or heard a “click” sound the pin contact assembly is seated correctl.
- 1.5 Plug the PV connector into the corresponding PV connector on inverter.



Note!

- The following requirements of PV modules need to be applied for each input area;
- Please do not make PV positive or negative ground!
- In order to save cable and reduce the DC loss, we suggest to install the inverter near PV modules.

5.2 Grid Connection

Hybrid series inverter are designed for single phase grid. Voltage is 230V, frequency is 50Hz. Other technical requests should comply with the requirement of the local public grid.

	BD6KTL- RH1	BD7K6TL- RH1	BD9KTL- RH1	BD10KTL- RH1	BD11K4TL- RH1
Micro-breake	32A	40A	50A	64A	64A

Micro-breaker should be installed between inverter and grid, any load should not be connected with inverter directly.

Step1. Check the grid voltage.

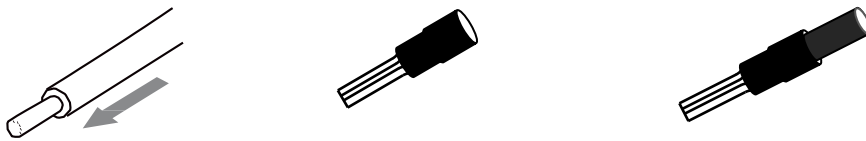
- 1.1 Check the grid voltage and compare with the permissive voltage range (Please refer to technical data).
- 1.2 Disconnect the circuit board from all the phases and secure against re-connection.

Step2. Grid cables choose

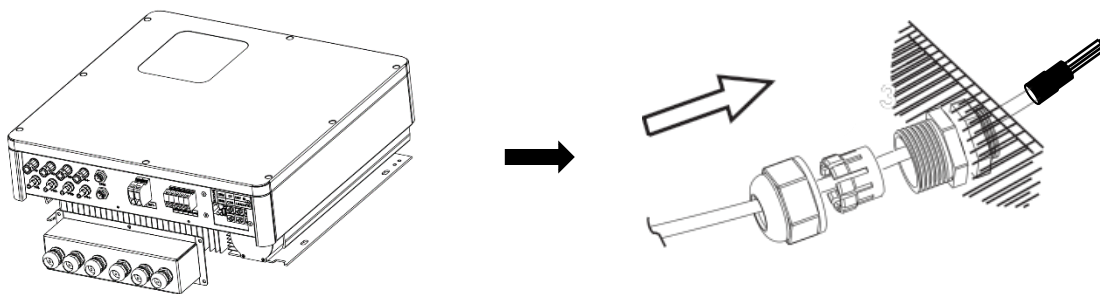
Use the right pin terminal from the accessory box. Press the connectors on cable conductor core tightly.

	BD6KTL- RH1	BD7K6TL- RH1	BD9KTL- RH1	BD10KTL- RH1	BD11K4TL- RH1
Cable	10AWG	8AWG	8AWG	7AWG	7AWG

Step3. Choose the wire to connect with the cold-pressed terminal.
(Remove 18mm of insulation from the end of wire.)



Step4. Cross the Grid cables through the grid port, connect Grid cables to Grid terminals.




5.3 BACK-UP Connection

Inverter has on and off grid function, the inverter will deliver output power through AC port when the grid is on, and it will deliver output power through BACK-UP port when the grid is off.

➤ **Auto & Manual**

BACK-UP function can be achieved automatically or manually according to user's wishes. BACK-UP function can only be triggered automatically.

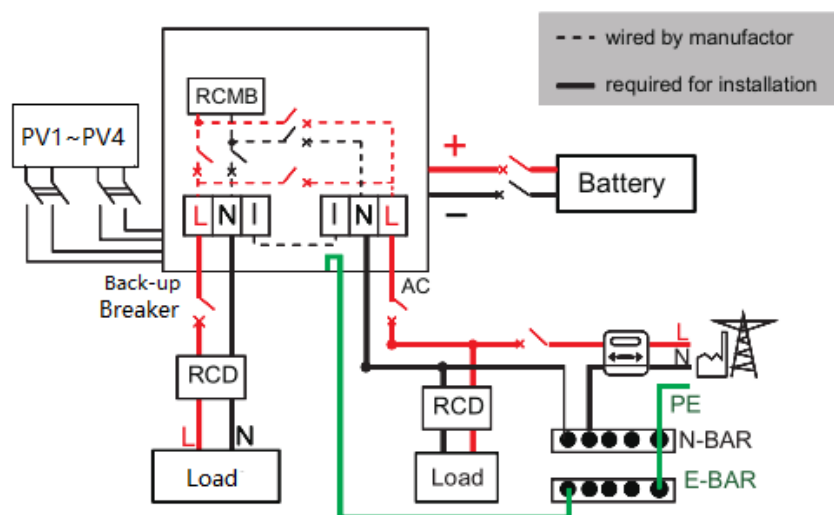
1. For inverter, the standard PV installation typically consists of the connection of the inverter with both panels and batteries. In case of systems not connected to the batteries, the Back-Up function is strongly not advised to use. We shall not cover the standard warranty and be liable for any consequences arising from users not following this instruction.
2. Hybrid inverters are able to supply over load output at its Back-Up. For details please refer to the technical parameters of inverter. And the inverter has self-protection derating at high ambient temperature.
3. For complicated application, or Special load , please contact after-sales.



Note!

In case of discrepancies between wiring mode of local policy and the operation guide above, especially for the wiring of neutral line, grounding and RCD, please contact us before any operation!

➤ **Back-Up Connection:**



When using the off grid function, please add off grid AC breaker in off grid output cable to ensure safety.


	BD6KTL- RH1	BD7K6TL- RH1	BD9KTL- RH1	BD10KTL- RH1	BD11K4TL- RH1
Micro-breaker	32A	40A	50A	64A	64A

Note: The absence of AC breaker on back-up side will lead to inverter damage if an electrical short circuit happens on back-up side.

Step1. Make BACK-UP wires like Grid wires.

	BD6KTL- RH1	BD7K6TL- RH1	BD9KTL- RH1	BD10KTL- RH1	BD11K4TL- RH1
Cable	10AWG	8AWG	8AWG	7AWG	7AWG

➤ **Requirements for BACK-UP load**

	WARNING!
	Make sure the BACK-UP load power rating is within BACK-UP output rating, otherwise the inverter will shutdown with an “over load” warning.
	When an “over load” is appeared, adjust the load power to make sure it is within the BACK-UP output power range, then turn the inverter back on.
	For the nonlinear load, please make sure the inrush power should be within the BACK-UP output power range.

5.4 Battery Connection

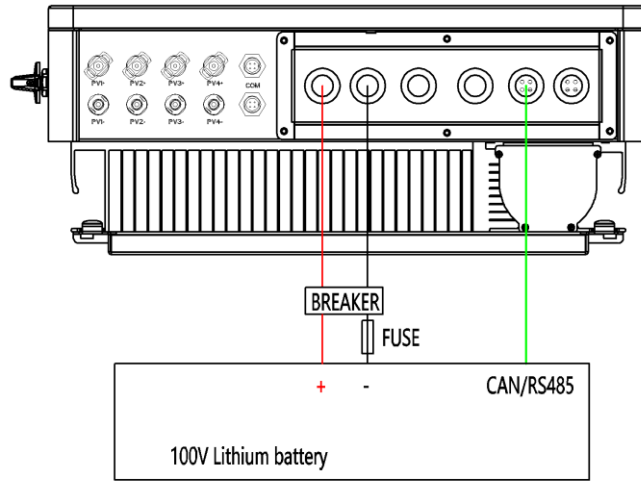
Charging & discharging system of inverter is designed for high-voltage lithium battery. Before choosing battery, please note the maximum voltage of battery cannot exceed 350V and the rated voltage of battery cannot exceed 336V, and the battery communication should be compatible with inverter.

➤ **Battery breaker**

Before connecting to battery, please install a nonpolar DC breaker to make sure inverter can be securely disconnected during maintenance.

Model	BD6KTL-RH1	BD7K6TL-RH1	BD9KTL-RH1	BD10KTL-RH1	BD11K4TL-RH1
Voltage	Nominal voltage of DC breaker should be larger than maximum voltage of battery				
Current(A)	110A				

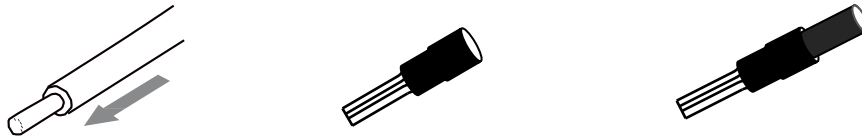
➤ **Battery connection diagram**



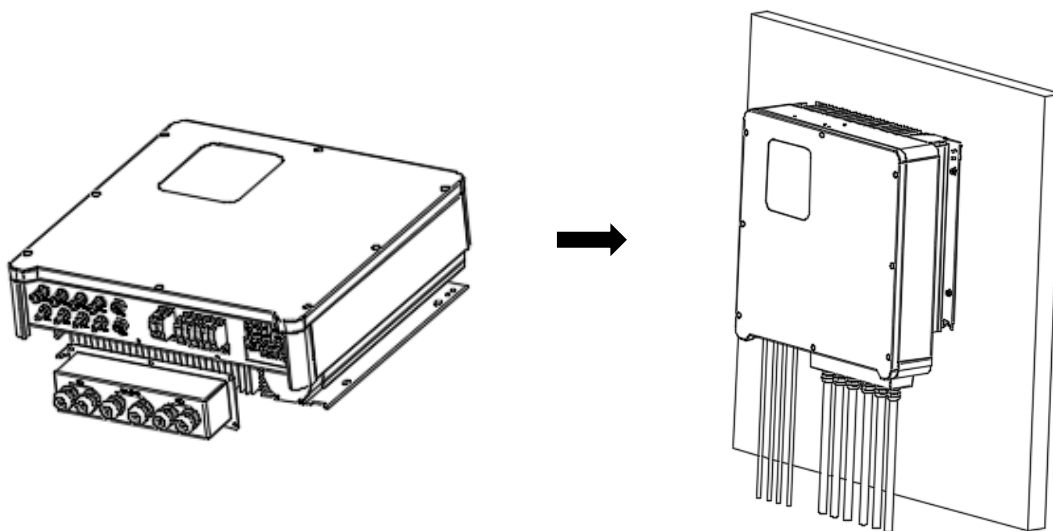
➤ **Power Connection Battery**

Step1

Choose the 4 AWG wire and strip the cable to 15mm. Select two O-terminals with an aperture of M8. Insert the stripping line into the O-terminal and clamp it with a crimping clamp.



Step2. Cross the battery cable through the battery port. Connect battery cable to battery terminal.



5.5 Interface definition

This chapter introduces the definition of hybrid inverter's external interface and cable manufacturing.


➤ BMS (RJ45 PIN) Definition

Communication interface between inverter and battery is RS485 or CAN with RS485 connector.

	PIN	1	2	3	4	5	6	7	8
CAN	Definition	X	X	X	BMS_CANH	BMS_CANL	X	X	X
RS485	Definition	X	X	X	X	X	GND	BMS_485A	BMS_485B

When using RS485 protocol, please note that PIN2 must be disconnected.

Note !



The battery communication can only work when the battery BMS is compatible with the inverter.

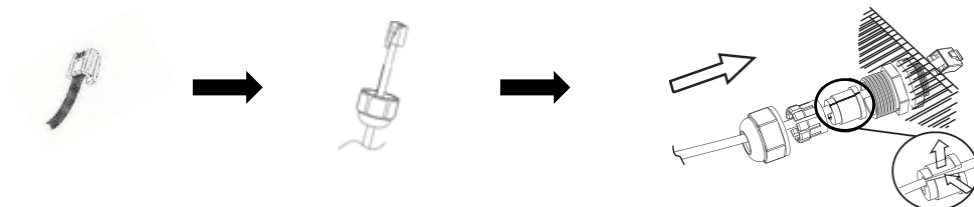
➤ Dry_IO (RJ45 PIN) Definition

1	2	3	4	5	6	7	8
DRYO_1A	DRYO_1B	X	DRYI_1	DRYI_1B	X	X	X
Dry contact short		X	Dry contact Input	+5V	X	X	X

Please refer to BMS connection for Meter connection. Please kindly note the PIN definition and port position will be slightly different.

Step1. Make RS485 wire, Cross the Meter wire through the com port

Step2. Insert one RJ45 side of the cable into Meter port inside of inverter and the other side into BMS-485port of the meter.



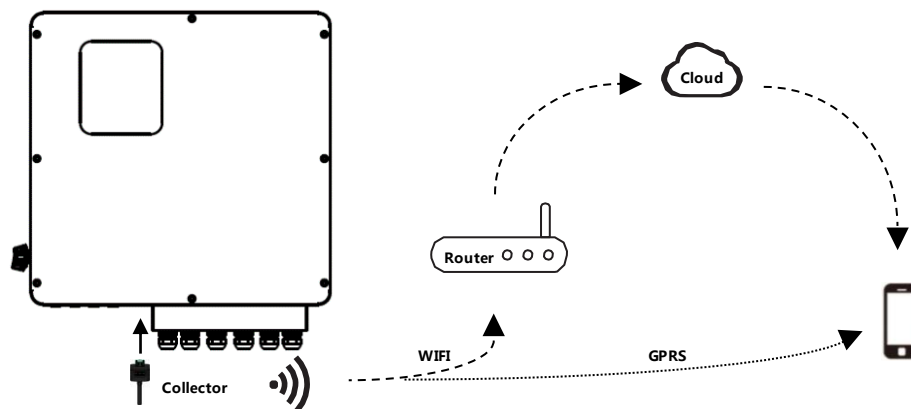
DRM	CT	Dry IO
BMS	Power CAN	NTC

5.6 WiFi / GPRS Connection (optional)

WiFi: Inverter provides a WiFi port which can collect data from inverter and transmit it to monitoring-website by WiFi. (Purchase the product from supplier if needed)

GPRS: INVT Hybrid inverter provides a GPRS(radio frequency) interface which control the switch time of a designated load via an external Smart Plug (purchase the product from supplier if needed.) so that the load mostly consumes PV energy and incurs the lowest-possible energy costs during operation

1. Diagram



2. Connection

2.1 WiFi Connection

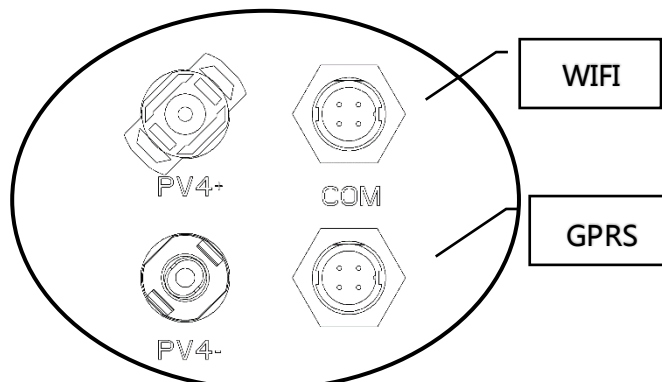
Step1. Plug WiFi into "WiFi" port at the bottom of the inverter.

Step2. Build the connection between the inverter and router.

Step3. Create a user account online.(Please check the WiFi user manual for more details).

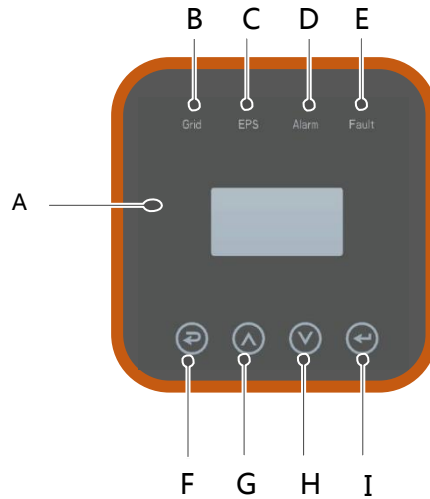
2.2 GPRS Connection

Step1. Please refer to the Smart Plug user manual for detailed connection.



6. Setting

6.1 Control Panel



Object	Name	Description
A	LCD Screen	Display the information of the inverter.
B	Indicator LED	Lit in green: The inverter is in grid mode. Off: The inverter is in not in grid
C		Lit in green: The inverter is in off-grid mode. Off: The inverter is in not in off-grid
D		Lit in Yellow: The inverter is in warning. Off: The inverter has no Inverter
E		Lit in red: The inverter is in fault status. Off: The inverter has no errors.
F	Function Button	Esc: Return from current interface or function.
G		Up: Move cursor to upside or increase value.
H		Down: Move cursor to downside or decrease value.
I		Enter: Confirm the selection.

6.2 Instructions for LED Indicator

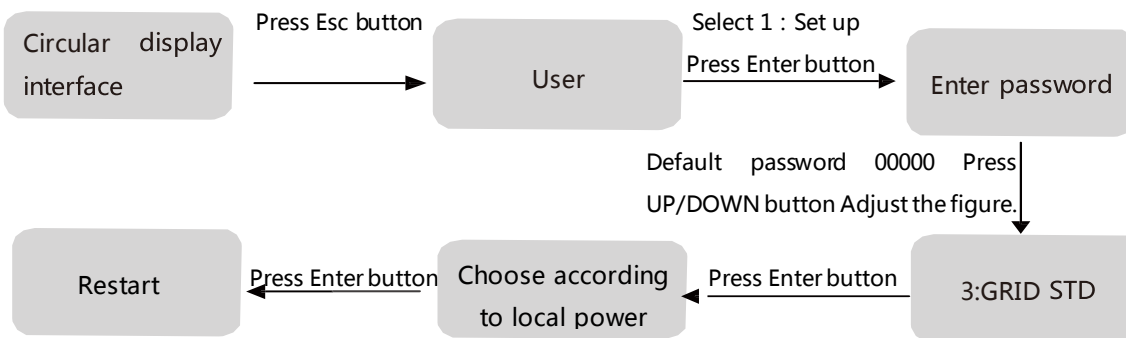
	Grid (Green)	BAC K-UP	Alarm (Yellow)	Fault (Red)
Initialization	off	off	off	off
Stand-by	off	off	off	off
Grid mode	on	off	off	off
Off-Grid	off	on	off	off

Bypass of mains	off	on	on	off
Fault	off	off	off	on

6.3 Instructions for the use of three modes

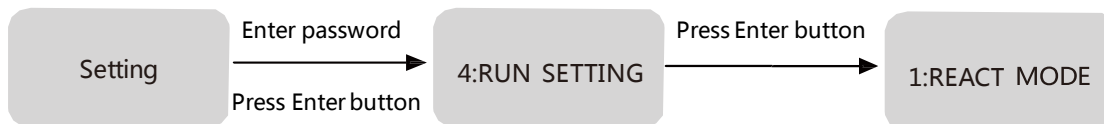
6.3.1 Before selecting the mode, you can set it up according to the local power grid, PV input mode and battery type.

Power grid

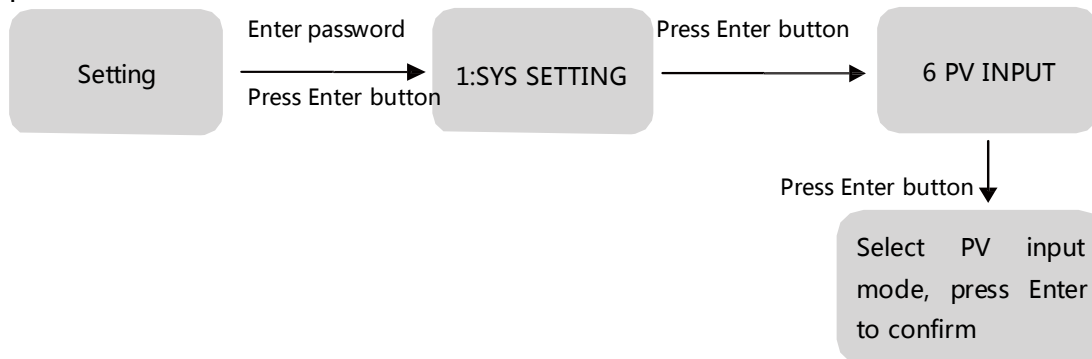


Note: If local grid connection requires reactive power, please set the required reactive power according to the following reference.

6.3.2 Set according to actual needs



PV input mode :

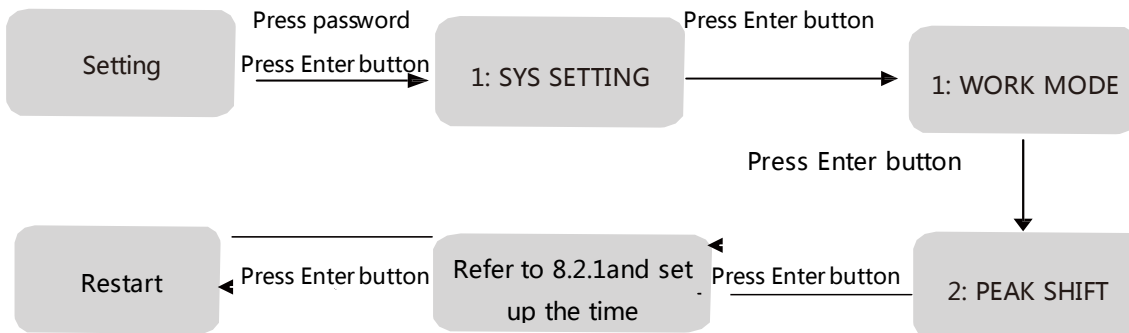


Battery parameters :



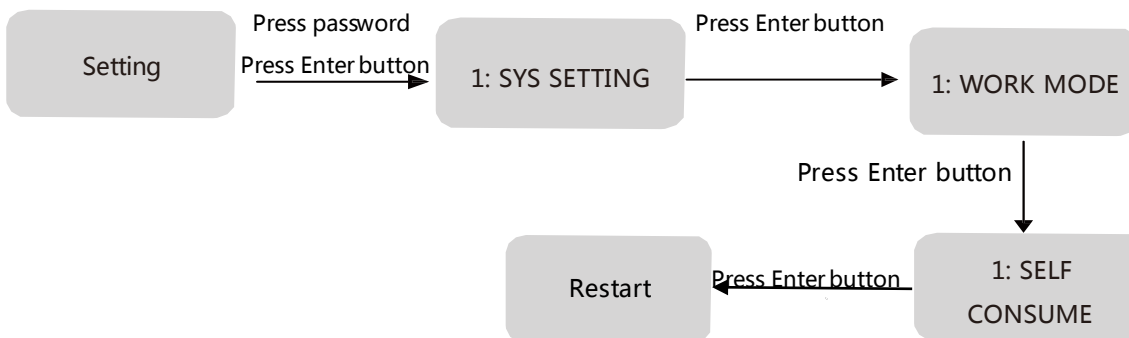
Peak load shifting :

After finishing the setting of Peak load shifting mode the charging and discharging time also need to be set up.



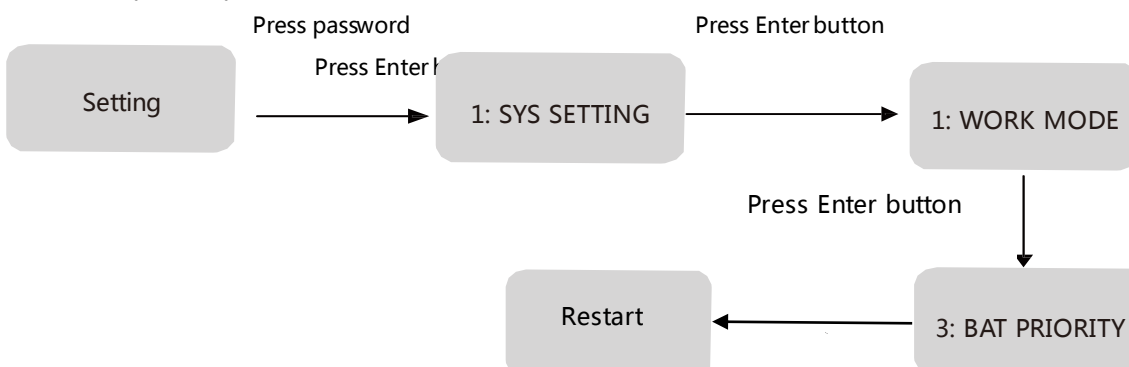
Note: If the time setting is not correct, you need to set the correct time before pressing Enter to exit the interface.

(2) Select the corresponding mode based on actual situation Self-generation and self-consumption (system default mode)



If you want to set up more items, please restart after completing the setup.

Battery priority :



About INVT Solar

If you have any questions about this product, please contact us.

Please remember the following contact information:

Name: INVT Solar Technology (Shenzhen) Co., Ltd.

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Guangming, Shenzhen, China

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