



Operation **Manual**

iMars series

PV Energy Storage Inverter



INVT Solar Technology (Shenzhen) CO., LTD

Preface

The manual is intended to provide detailed information of product information, installation, application, trouble shooting, precautions and maintenance of iMars series energy storage inverters. The manual does not contain all the information of the energy storage system. Please read this manual carefully and follow all safety precautions seriously before any moving, installation, operation and maintenance to ensure correct use and high performance of operation on the inverter.

The use of the iMars series energy storage inverters must comply with local laws and regulations on grid-tied power generation.

The manual needs to be kept well and be available at all times.

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There may be data deviation because of product improving. Detailed information is in accordant with the final product.

Content

Preface..... 1

Content 2

1 Safety precautions 5

 1.1 Warning marks.....6

 1.2 Safety guidance.....6

 1.3 Delivery and installation.....8

 1.3.1 Grid-tied operation9

 1.3.2 Maintenance and inspection.....9

 1.3.3 What to do after scrapping..... 10

2 Product overview 11

 2.1 Energy storage system 11

 2.2 Product appearance 12

 2.2.1 Key component description 12

 2.2.2 Nameplate 13

 2.2.3 DRM instruction..... 14

 2.3 Product models..... 15

 2.4 Dimensions and weight..... 15

3 Storage 17

4 Installation..... 18

 4.1 Unpacking inspection 18

4.2 Before installation	20
4.2.1 Installation tools.....	20
4.2.2 Specification of cable	23
4.2.3 Circuit breaker	24
4.3 Mechanical installation.....	24
5 Electrical connection	26
5.1 PV connection.....	27
5.1.1 Procedures of PV connection	28
5.2 Grid and load connection	31
5.3 Battery connection	33
5.4 CAN communication connection	34
5.5 RS-485 communication connection	35
5.6 USB connection (reserved).....	36
5.7 DRM ports.....	37
6 LCD operation instructions.....	38
6.1 LED indicator instruction.....	38
6.2 LCD display instruction	38
6.2.1 Key instruction	38
6.2.2 Instruction for main page.....	38
6.2.3 Icon instruction	39
6.3 Display menu	40
6.4 Inverter parameter setup	42

6.4.1 Parameter classification page	42
6.4.2 Parameter edit mode	42
6.4.3 Instruction for setup parameter	43
7 Working mode	46
7.1 Mode 1(Self-consumption)	46
7.2 Mode 2(Peak- shaving and valley-filling)	47
7.3 Mode 3(EPS)	47
8 Fault code	48
9 Technical parameter	50
10 Contact us	52

1 Safety precautions

iMars series energy storage inverters are designed and tested strictly in accordance with relevant international safety standards. As an electrical and electronic device, all relevant safety regulations must be strictly complied during installation, operation, and maintenance. Incorrect use or misuse may result in:

- Injury to the life and personal safety of the operator or other people.
- Damage to the inverter or other property belonging to the operator or other people.

In order to avoid personal injury, damage to the inverter or other devices, please strictly observe the following safety precautions.

This chapter mainly describes various warning symbols in operation manual and provides safety instructions for the installation, operation, maintenance and use of the iMars series energy storage inverters.









Statement

Our company reserves the right not to perform quality assurance in any of the following cases.


- Damage caused by transportation.
- The storage conditions do not meet the requirements of the product specification, resulting in damage.
- Incorrect storage, installation and use.
- Unqualified personnel install and operate the inverter.
- Operate in harsh environments that exceed product specifications.
- Exceed the operation range of parameters that specified in the technical specification.
- Unauthorized disassembly, modification, or modification of the software code.
- Equipment damage caused by abnormal natural environment (force majeure, such as lightning strikes, earthquakes, fires, storms, etc.).
- The warranty period is exceeded and the warranty service is not extended.
- Exceeding the installation and operating environment specified in the relevant international standards.







1.1 Warning marks

Warning marks inform users of conditions which can cause serious physical injury or death, or damage to the device. They also tell users how to prevent the dangers. The warning marks used in this operation manual are shown below:

Mark	Name	Instruction	Abbreviation
 Danger	Danger	Serious physical injury or even death may occur if not follow relevant requirements.	
 Warning	Warning	Physical injury or damage to the device may occur if not follow relevant requirements.	
 Forbid	Electrostatic sensitive	Damage may occur if relevant requirements are not followed.	
 Hot	High temperature	Do not touch the base of the inverter as it will become hot.	
Note	Note	The procedures taken for ensuring proper operation.	Note

1.2 Safety guidance

	<ul style="list-style-type: none"> ● After receiving this product, first confirm the product package is intact. If any question, contact the logistic company or local distributor immediately. ● The installation and operation of inverter must be carried out by professional technicians who have received professional trainings and thoroughly familiar with all the contents in this manual and the safety requirements of the electrical system.
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	<ul style="list-style-type: none"> Do not carry out connection/disconnection, unpacking inspection and unit replacement operations on the inverter when power source is applied. Before wiring and inspection, users must confirm the breakers on DC and AC side of inverter are disconnected and wait for at least 5 minutes.
	<ul style="list-style-type: none"> Ensure there is no strong electromagnetic interference caused by other electronic or electrical devices around the installation site. Do not refit the inverter unless authorized. All the electrical installation must conform to local and national electrical standards.
	<ul style="list-style-type: none"> Do not touch the housing of the inverter or the radiator to avoid scald as they may become hot during operation
	<ul style="list-style-type: none"> Ground with proper technics before operation.
	<ul style="list-style-type: none"> Do not open the surface cover of the inverter unless authorized. The electronic components inside the inverter are electrostatic sensitive. Do take proper anti-electrostatic measures during authorized operation.
	<ul style="list-style-type: none"> The inverter needs to be reliably grounded.
	<ul style="list-style-type: none"> Ensure that DC and AC side circuit breakers have been disconnected and wait at least 5 minutes before wiring and checking.
<p>Note: Technical personnel who can perform installation, wiring, commissioning, maintenance, troubleshooting and replacement of the energy storage inverters must meet the following requirements:</p>	
<ul style="list-style-type: none"> Operators need professional training. Operators must read this manual completely and master the related safety precautions. Operators need to be familiar with the relevant safety regulations for electrical systems. Operators need to be fully familiar with the composition and operating principle of the entire energy storage system and related standards of the countries/regions in which the project is located. 	

- Operators must wear personal protective equipment.


1.3 Delivery and installation




- Keep the package and unit complete, dry and clean during storage and delivery.
- Please remove and install the inverter with two or more people, because of the inverter is heavy.
- Remove and install the inverter with appropriate tools to ensure safe and normal operation and avoid physical injury or death. The people also need mechanical protective measures, such as protective shoes and work clothes.
- Only qualified electricians are allowed to install the inverter.
- Do not put and install the inverter on or close to combustible materials.
- Keep the installation site away from children and other public places which is easy to access.
- Remove the metal jewelry such as ring and bracelet before installation and electrical connection to avoid electric shock.
- The solar panel exposed to the sunlight may generate dangerous voltage. Users must cover the solar panel with fully-lightproof materials before electrical connection
- The inverter input voltage should not exceed the maximum input voltage, otherwise inverter damage may occur.
- The positive and negative pole of solar modules can not be grounded, otherwise irrecoverable damage may occur.
- Ensure the proper grounding of the inverter.
- Ensure reliable installation and electrical connection.

Note: iMars BD series energy storage inverters are only for crystalline silicon solar modules.

1.3.1 Grid-tied operation

	<ul style="list-style-type: none"> ● Only qualified electricians are allowed to operate the inverter under the permission of local power departments. ● All electrical connections must meet the electrical standards of the countries/regions in which the project is located. ● Ensure reliable installation and electrical connection before operation. ● Do not open the cover of inverter during operation or voltage is present.
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1.3.2 Maintenance and inspection

	<ul style="list-style-type: none"> ● Only qualified electricians are allowed to perform the maintenance, inspection, and components replacement of the inverter. ● Contact with the local dealer or supplier for maintenance. ● In order to avoid irrelevant personnel from entering the maintenance area during maintenance, temporary warning labels must be placed to warn non-professionals to enter or use fence for isolation. ● Before carrying out any maintenance operations, all input power to the inverter must be disconnected first and wait for at least 5 minutes until the internal parts of the inverter are fully discharged. ● Please follow electrostatic protection norms and take correct protective measures because of the electrostatic sensitive circuits and devices in the inverter. ● Do not use parts and components not provided by our company during maintenance. ● Restart the inverter after settling the fault and problem which may affect the safety and performance of the inverter. ● Do not get close to or touch any metal conductive part of the grid or inverter, otherwise electric shock, physical injury or death and fire may occur. Please do not ignore the warning icons and instructions with “electric shock”.
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1.3.3 What to do after scrapping



- Do not dispose of the inverter together with household waste. The user has the responsibility and obligation to send it to the designated organization for recycling and disposal.

2 Product overview

This chapter mainly describes the appearance, packaging accessories, nameplate, and other information of iMars series energy storage inverters.

2.1 Energy storage system

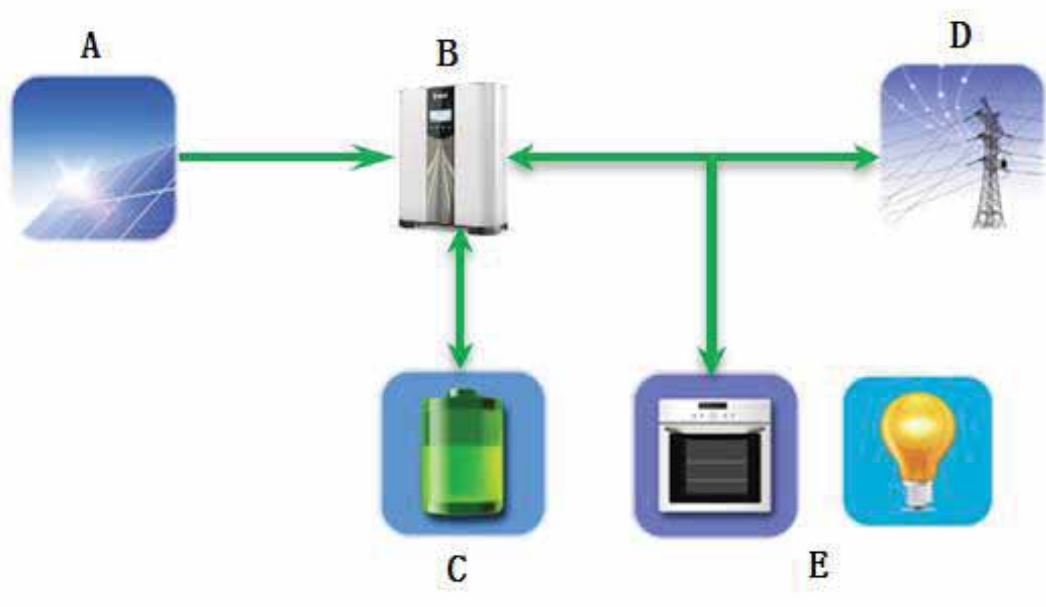


Figure 2.1 Energy storage system

No.	A	B	C	D	E
Name	PV module	Energy storage inverter	Battery	Public grid	Load

2.2 Product appearance

2.2.1 Key component description

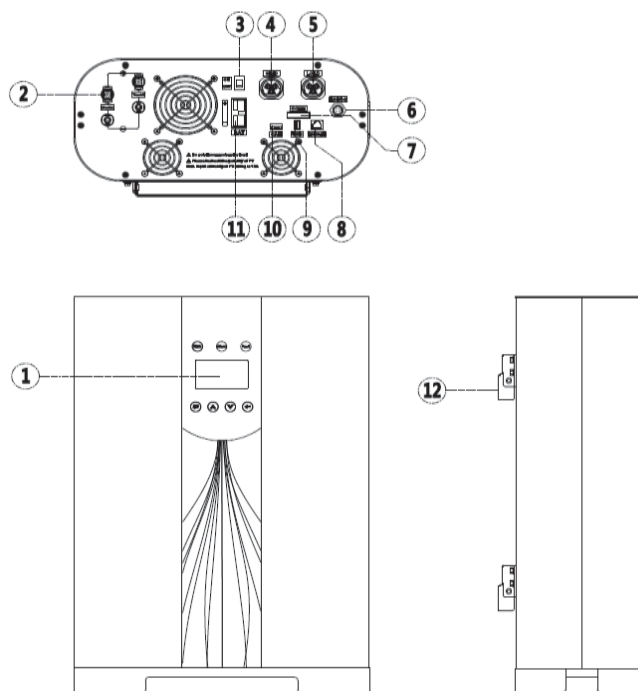


Figure 2.2.1 Appearance diagram of 3~5kW energy storage inverter

No.	Name	Silk screen
1	Operation display panel	/
2	PV input terminal	TrackA、TrackB
3	E-stop switch	ON/OFF
4	AC terminal	GRID
5	Load terminal	LOAD
6	RS485 communication interface	RS485-2/1
7	Communication interface	COMM/ DRM Communication port
8	RS485 communication interface	RS485-3
9	USB interface	USB
10	Lithium battery CAN communication interface	CAN
11	Battery terminal	BAT

2.2.2 Nameplate





invt Hybrid Inverter	
iMars BD5KTL	
DC input parameter	
Vmax. PV	500V
Isc PV	15.6AX2
Grid output parameter	
Max AC apparent power	4600VA
Max AC output current	22.2A
Rated grid voltage	230Vac
Rated grid frequency	50Hz / 60Hz
Power factor range	-0.95~+0.95
Maximum continuous input current	26A
Off-grid parameter	
MAX AC apparent power	4.6kVA
Max AC output current	22.2A
Rated grid voltage	230Vac
Rated grid frequency	50Hz / 60Hz
Power factor range	-0.95~+0.95
Battery side	
Voltage (nominal)	48V
Voltage (range)	42V~58V
Max. charging current	100A
Max. discharging current	100A
Storage type	Li-ion/Lead-acid
System	
Inverter topology	Non-isolated
Protective class	I
Protection level	IP20
	
Grid Monitoring: VDE-AR-N 4105:2011 AS/NZS 4777.2:2015	
<div></div>	
Made in China	
INVT Solar Technology (Shenzhen) Co., Ltd.	

Figure 2.2.2 Nameplate for inverter

- (1) Trademark and product type
- (2) Model and important technical parameters
- (3) Certification system of the inverter confirming
- (4) Serial number, company name and country of origin

Icons	Instruction
	<ul style="list-style-type: none">• TUV certification mark. The inverter is certified by TUV.
	<ul style="list-style-type: none">• CE certification mark. The inverter complies with the CE directive.
	<ul style="list-style-type: none">• CQC certification mark. The inverter passed CQC certification.

2.2.3 DRM instruction

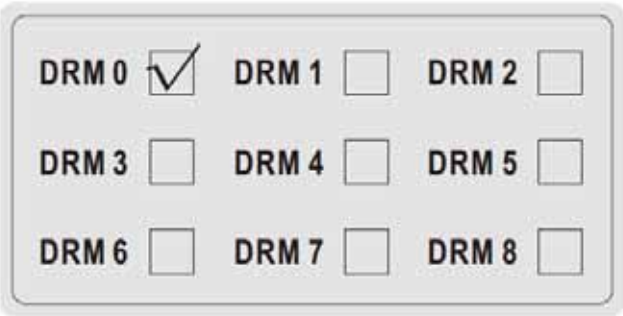


Figure 2.2.3DRM label

Table 2-2 DRMs instruction

No.	Mode	Requirement
1	DRM0	Operter the disconnection devise
2	DRM1	Do not consume power
3	DRM2	Do not consume at more than 50% of rated power
4	DRM3	Do not consume at more than 75% of rated power AND Source reactive power if capable
5	DRM4	Increase power consumption(subject to constraints from other active DRMs)

No.	Mode	Requirement
6	DRM5	Do not generate power
7	DRM6	Do not generate at more than 50% of rated power
8	DRM7	Do not generate at more than 75% of rated power AND Sink reactive power if capable
9	DRM8	Increase power generation(subject to constraints from other active DRMs)

Note: Our product only realize the DRM0 function

2.3 Product models

Product name	Model	Rated output power （W）
Single phase （L、N、 PE）		
Single-phase energy storage inverter	3kW	3000
Single-phase energy storage inverter	5kW	4600

Note: Technical parameters of iMars series energy storage inverter refers to appendix.

2.4 Dimensions and weight

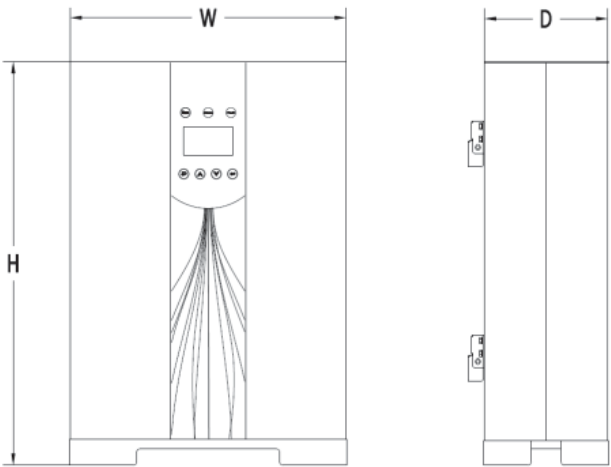


Figure 2.4 Dimensions of the energy storage inverter

Inverter dimension and net weight

Model	H(mm)	W(mm)	D(mm)	Net weight (kg)
3kW/5kW	622	425	190	19

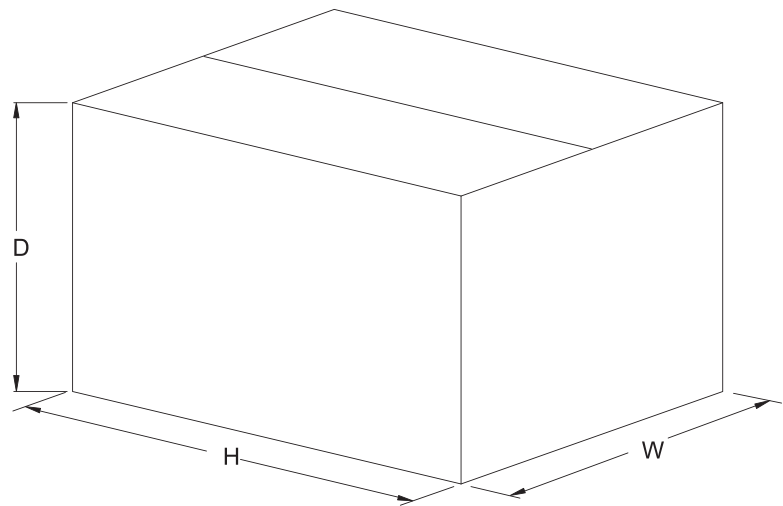


Figure 3.3 Paper package size

Package size and gross weight

Model	H(mm)	W(mm)	D(mm)	Weight(kg)	Packaging Material
3kW/5kW	760	555	328	25	Paper

3 Storage

If the inverter is not put into use immediately, the storage of inverter should meet the following requirements:

- Do not remove the outer packing.
- The inverter needs to be stored in a clean and dry place, and prevent the erosion of dust and water vapor.
- The storage temperature should be kept at $-30^{\circ}\text{C}\sim+70^{\circ}\text{C}$, and the relative humidity should be kept at 5%RH~95%RH.
- The stacking of inverters is recommended to be placed according to the number of stacking layers in the original shipment. Place the inverter carefully during stacking to avoid personal injury or equipment damage caused by the falling of equipment.
- Keep away from chemically corrosive substances that may corrode the inverter.
- Periodic inspections are required. If damages are found by worms and rats, or packages are found to be damaged, the packaging materials must be replaced in time.

After long-term storage, inverters need to be inspected and tested by qualified personnel before put into use.

4 Installation

This chapter describes the installation of the inverter and the connection of the inverter to the energy storage system. It mainly involves the connection of the PV string, the public power grid, the battery, and the load to the inverter. Read this chapter carefully and ensure all installation requirements are met before installation. Only qualified electricians are allowed to install the inverter.

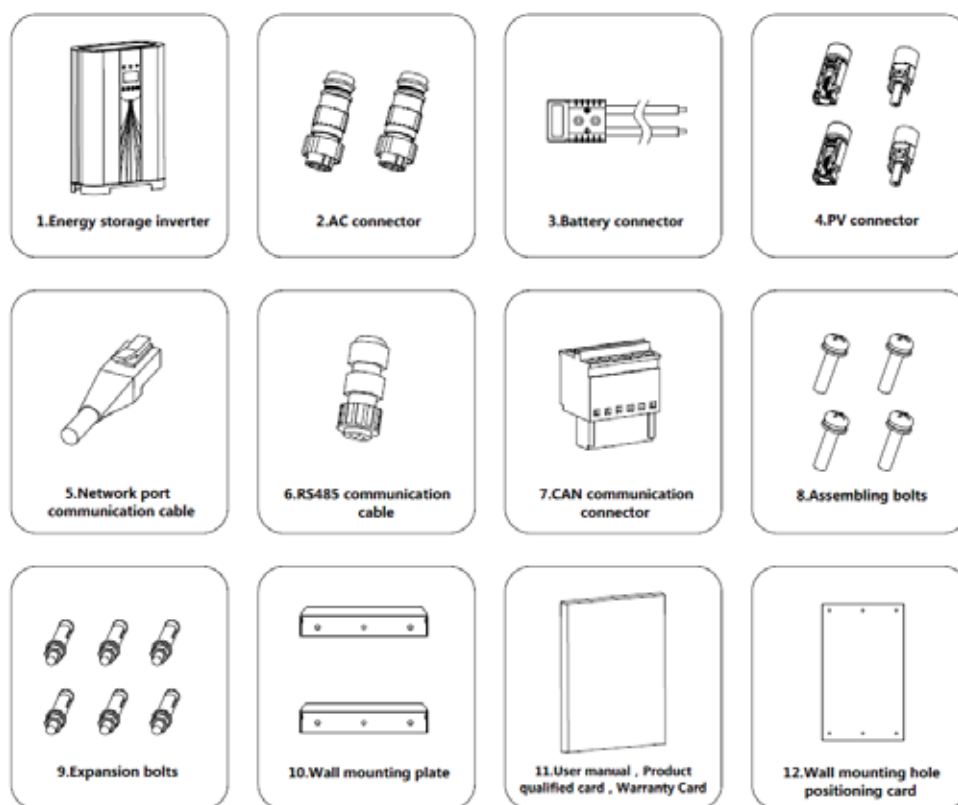
4.1 Unpacking inspection

The inverter has been thoroughly tested and rigorously checked before delivery, but damage may still occur during transportation. Before unpacking, check carefully whether the product information in the order is consistent with that on the nameplate of the package box and whether the product package is intact. If any damage is detected, please contact the shipping company or the supplier directly. Please also provide photos of the damage to get our fastest and best service.

Store the idled inverter in its original package and take anti-moisture and anti-dust measures.

After taking the inverter out of the box, check the following items:

- (1) Confirm the main body of the inverter is intact and free from any damage;
- (2) Confirm there is operation manual, interface accessories and installation accessories inside the package box;
- (3) Confirm the deliverables inside the package box are intact and complete;
- (4) Check whether the product information in the order is consistent with that on the inverter nameplate;
- (5) The standard delivery list is shown below.





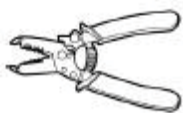
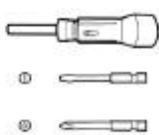




















Delivery list of 3kW / 5kW energy storage inverter

No.	Name	Quantity
1	3kW / 5kW / inverter	1
2	AC connector	2
3	Battery connector	1
4	PV connector	2 pairs
5	Network port communication cable	1
6	RS485 communication cable	1
7	CAN communication connector	1
8	M5*20 assembling bolts	4
9	M6*50 expansion bolts	6
10	Wall mounting plate	2
11	User manual	1
12	Product qualified card	1
13	Warranty Card	1
14	Wall mounting hole positioning card	1

4.2 Before installation

4.2.1 Installation tools

Species	Tools and instruments		
Installation	 Impact drill (bit Φ 10mm)	 Torque socket wrench (sleeve opening: 13mm, suitable for M8 bolts, torque range: 0 N•m-15 N•m)	 Torque wrench (opening size: 13mm, 33mm, torque range: 0 N•m-15 N•m)
	 Diagonal pliers	 Wire stripper	 Torque screwdriver (cutting head: M4, M6, torque range: 0 N•m-5 N•m)
	 Rubber hammer	 Utility knife	 Wire cutters
	 Wire crimpers	 Open spanner	 Cable tie
	 Vacuum cleaner	 Multimeter (DC voltage range \geq 600VDC)	 Marking pen

Species	Tools and instruments		
	 Steel tape	 Level ruler	 Hydraulic clamp
	 Heat-shrinkable tubing	 Hot air heating gun	-
Personal protective equipment	 Safety gloves	 Safety goggles	 Dust mask
	 Safety shoes	-	-

Select installation site according to below requirements:

- (1) The height of the installation position should ensure that the line of sight is on the same level as the LCD for viewing the parameters inverter conveniently.
- (2) The installation site must be well ventilated and away from raindrops or direct sunlight.
- (3) There must be enough pre-reserved space around the installation site for convenient disassemble of the inverter and air convection, as shown in Fig 3.4.
- (4) The ambient temperature of installation should be $-10^{\circ}\text{C}\sim 40^{\circ}\text{C}$.
- (5) The installation site should be away from electronic devices which can generate strong electromagnetic interference.
- (6) The inverter should be installed on firm and solid surface such as wall surface and metal bracket.
- (7) The installation surface should be vertical to the horizontal line, as shown in Figure 4.21.

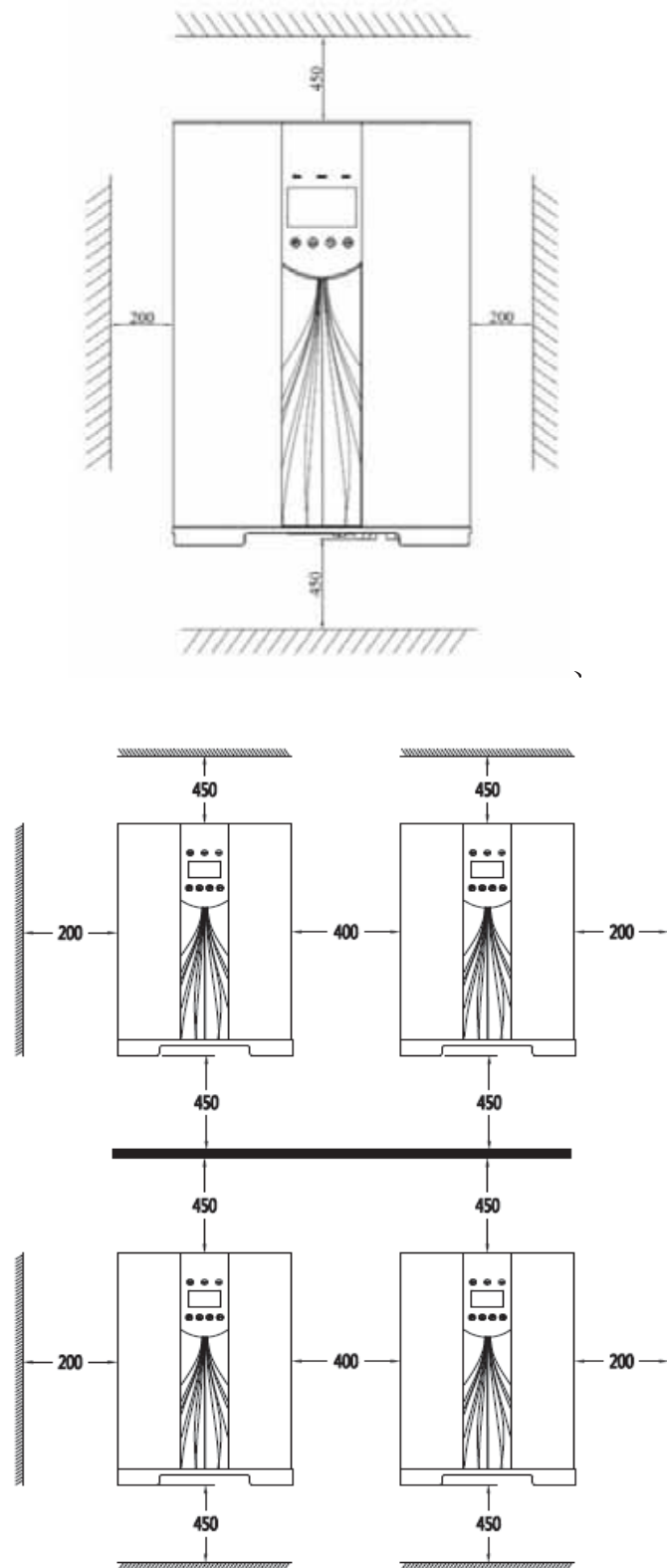


Figure 4.2.1 Installation spacing

In order to ensure good ventilation of the energy storage inverter, please reserve enough installation space around the inverter during installation.

Installation spacing

	Minimum spacing
Side spacing	200mm
Top spacing	450mm
Bottom spacing	450mm

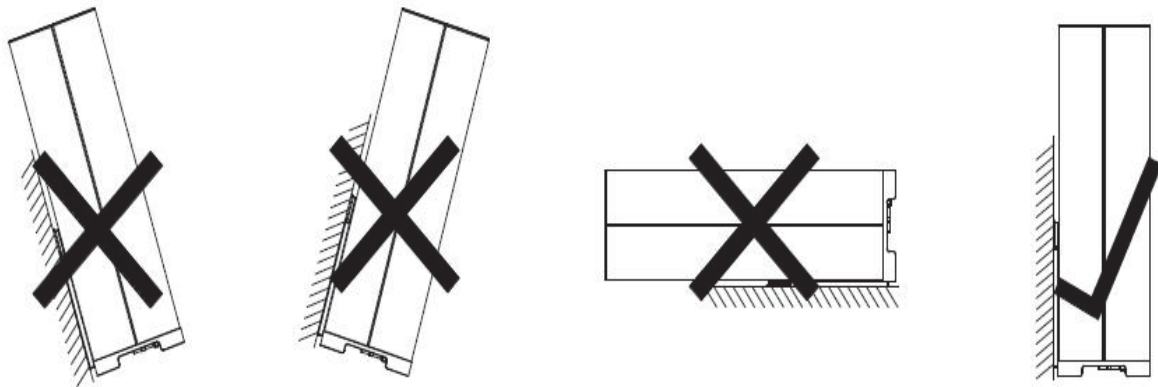


Figure 4.2.2 Inverter installation position



- Do not open the surface cover of the inverter or replace any part as incomplete inverter may cause electric shock and damage the device during operation.

4.2.2 Specification of cable

In order to regulate and compatible with the inverter AC/DC connector or wiring terminal specifications, below requirements on the AC/DC cable connected to corresponding inverter models should be fulfilled:

Inverter model	PV side		AC and load side		Battery side
	Min cross-section area mm ² (length ≤ 50m)	Min cross section area mm ² (Length > 50m)	Min cross-section area mm ² (length ≤ 50m)		Min cross-section area mm ² (length ≤ 50m)
3kW	4	6	6	4	16-25
5kW	4	6	8	4	25-35

4.2.3 Circuit breaker

In order to ensure safe operation of the inverter and circuits, it is recommended to configure the miniature circuit breaker or fuse of the corresponding specification on the DC input side, AC output side, load side and battery input side of the inverter. Recommended requirements for circuit breakers:

Inverter model	PV side	AC and load side	Battery side
	Recommended circuit breaker specifications		
3kW	DC600V, C32A, 2P	AC250V, C20A, 2P	DC100V, C100A, 2P
5kW	DC600V, C32A, 2P	AC250V, C25A, 2P	DC100V, C150A, 2P

4.3 Mechanical installation

Wall mounting procedures

(1) Place the positioning paper card in the appropriate position on the wall, and use the electric drill ($\Phi 8$ drill bit) to make 6 mounting holes on the wall, the depth of the holes is 70-90mm, then install the hanging plate.

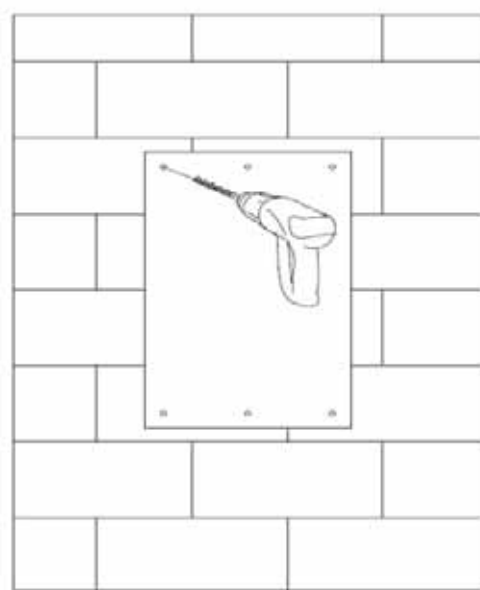


Figure 4.3.1 Punch positioning

- (2) Use a rubber mallet to knock the expansion bolt into the mounting hole.

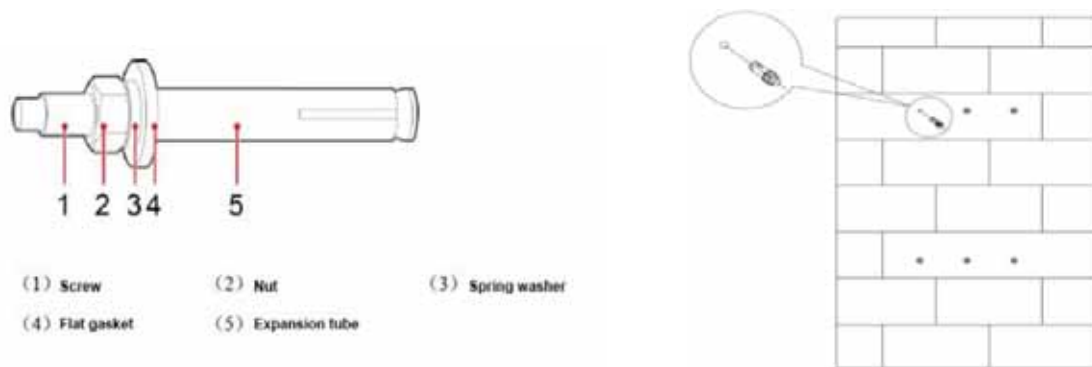


Figure 4.3.2 Install the expansion bolt

- (3) Install the wall mounting plate.

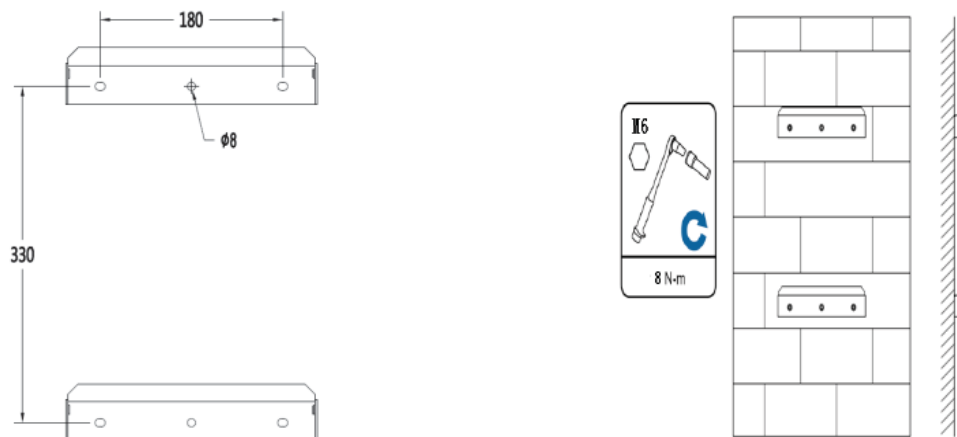


Figure 4.3.3 Mounting bracket

- (4) Install the energy storage inverter

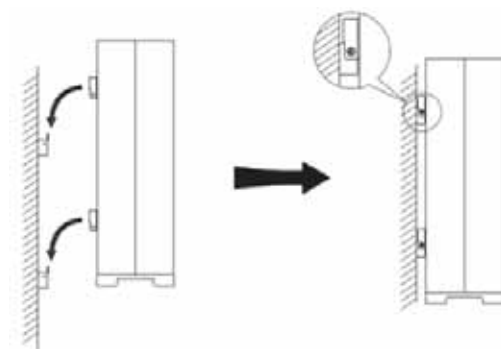
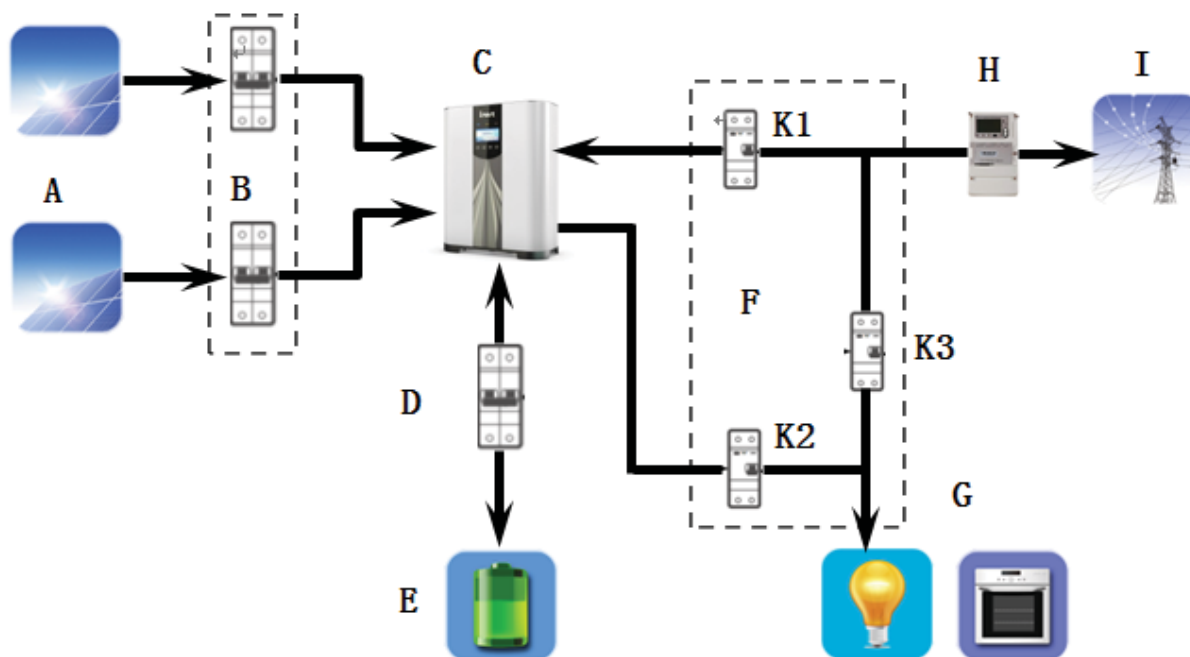


Figure 4.3.4 Installation of energy storage inverter



5 Electrical connection

This section presents the detailed contents and safety precautions related to electrical connection.



Fig 5.1 Connection diagram for energy storage system.



No.	Name
A	PV string
B	PV side DC switch
C	Energy storage inverter
D	Battery side DC switch
E	Battery
F	AC switch
G	Load
H	Digital meter
I	Public grid

	<ul style="list-style-type: none"> ● K3 is a bypass switch. When the inverter system is running normally, it is forbidden to close K3. Otherwise the inverter will be damaged. ● When repairing, need to disconnect K1 and K2 before close K3.
	<ul style="list-style-type: none"> ● Electrical connection must be carried out by professional technicians as wrong operation may cause damage to the device, physical injuries or even death during system operation. ● All the electrical installation must conform to the national and regional regulations concerning electrical safety regulations. ● Ensure all the cables are installed firmly according to the specified safety requirements and free from any damage. ● It is not allowed to close the AC and DC breakers before the inverter is electrically connected.
Note	<ul style="list-style-type: none"> ● Read this section carefully and operate strictly according to the requirements. ● Note the rated voltage and current value specified in the manual as they cannot be exceeded.

5.1 PV connection

	<ul style="list-style-type: none"> ● Inverter can be connected only after protection measures which conform to local electrical regulations are taken and the technical parameters in this manual are fulfilled.
	<ul style="list-style-type: none"> ● The PV string connected to energy storage inverter must adopt the DC connector configured especially for the inverter, do not use other connection devices without authorization from our company, otherwise damage to the device, unstable operation or fire may occur and our company will not undertake quality assurance or assume any direct or joint liability thereof.

- Ensure that the maximum open circuit voltage of each PV string is not higher than the maximum input voltage of the energy storage inverter under any circumstances.

- It is forbidden to connect the PE wire (ground wire) to the positive and negative poles of the PV strings, otherwise it will cause damage to the energy storage inverter.
- Ensure that the PV string polarity matches the PV connector, otherwise the energy storage inverter will be damaged.
- The insulation resistance of the PV panel to the ground should be greater than the safety regulation, otherwise there will be electrical hazards.

5.1.1 Procedures of PV connection

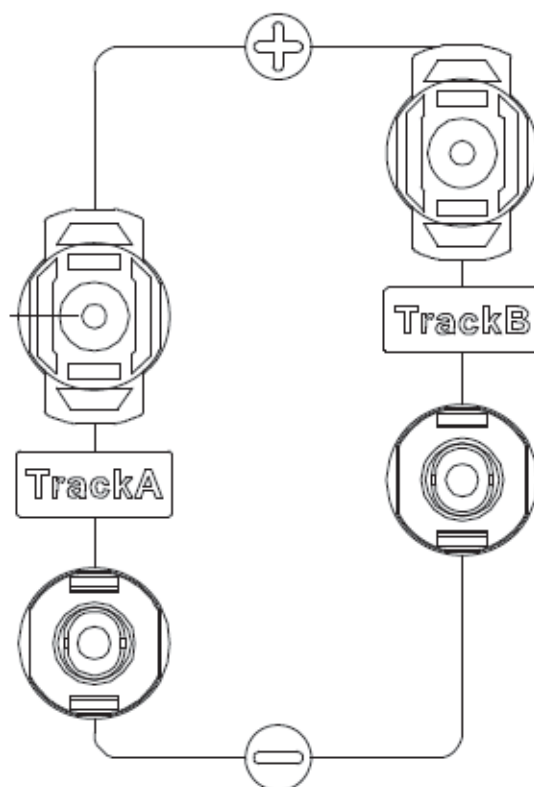


Figure 5.1.1 Inverter DC side input terminal

Steps

- (1) Assemble the positive and negative connectors.

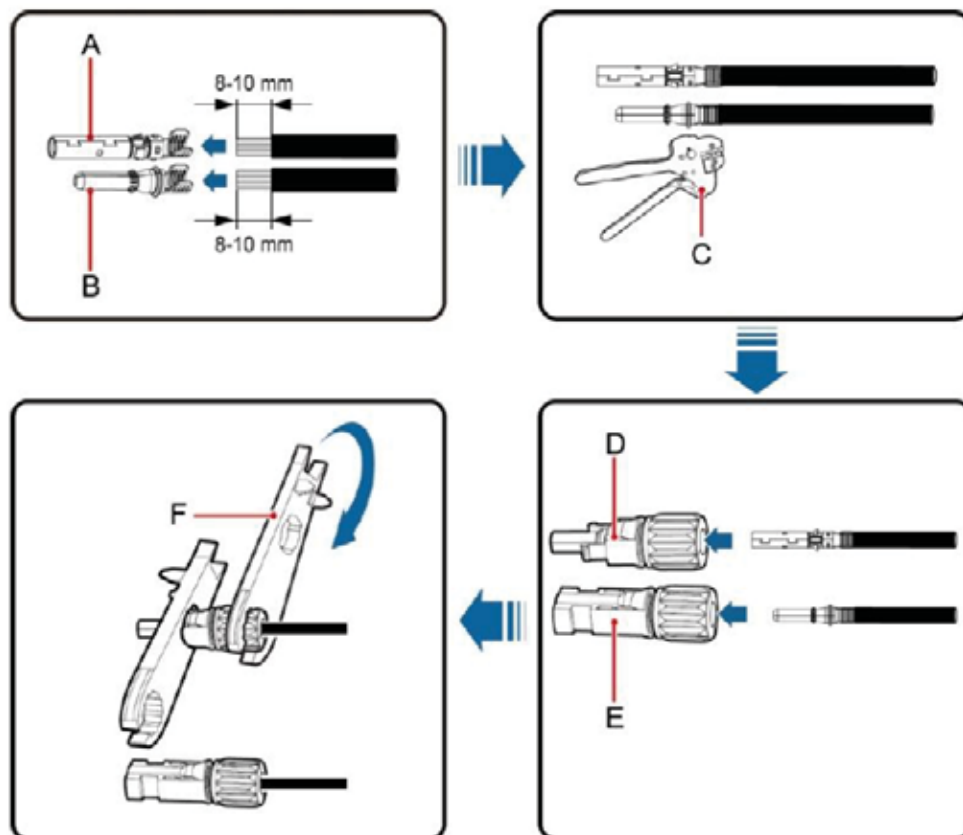


Figure 5.1.2 Crimp PV Connector

(A) Positive metal terminal (B) Negative metal terminal

(C) Crimping Tool (D) Positive connector

(E) Negative connector (F) Open end wrench

- (2) Use a multimeter to measure the voltage of the DC input string, verify the polarity of the DC input cable, and ensure that the voltage of each string is within the allowable range of the inverter

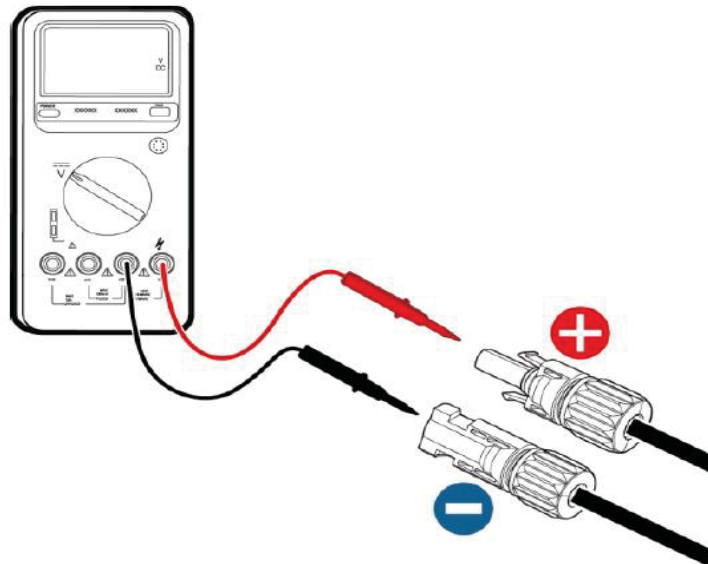
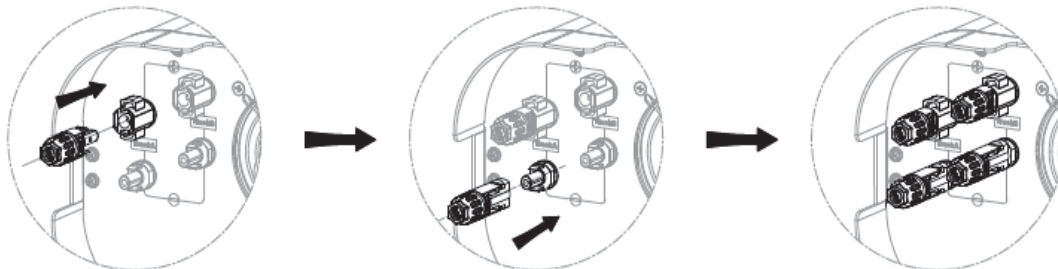


Figure 5.1.3 Measuring DC input voltage

(3) Insert the PV positive and negative connectors into the DC terminals corresponding to the energy storage inverter.



- Connect PV string to the inverter and ensure tightly-fastened
- When removing the DC connector from the inverter, insert the head of the straight screwdriver into the raised hole in the middle of the connector, and force the movable end of the connector to exit.

5.2 Grid and load connection



- Only qualified cables under the local electrical safety laws and regulations and comply with the technical parameters of this manual are allowed to connect to the inverter.
- Only with the permission of the local electric power company can the inverter be connected to the utility grid.

- Need to install an AC breaker between the grid and the energy storage inverter (recommend 250V/30A). For safe system operation, the recommended wire sizes are as follows:

Wire specification

Energy storage inverter model	Grid AC	Load AC
	Min cross-section area mm ² (length≤50m)	Min cross-section area mm ² (length≤50m)
3kW / 5kW	6	4

Please follow the steps below to install the grid and load wiring:

(1) Before connecting the AC power grid cable to the energy storage inverter, the lightning protection and short circuit protection measures must be taken in accordance with the local electrical safety regulations. The PE cable (grounding cable) of the inverter must be reliably grounded.

(2) Connect the three wires of the single-phase public power grid L, N, and PE to the AC terminal and lock them according to Figure 5.2. The crimping torque is 1.2N·m. Ensure that the wire conductor is crimped firmly and not exposed, then connect the AC terminal to the AC port of the energy storage inverter. Turn the connector cover until you hear the sound 'click'.

(3) Connect the three wires of the load L, N, and PE to the quick-connect terminal and lock them as shown in Figure 5.2. The crimping torque is 1.2N·m, ensuring that the wire conductor is not exposed and crimped firmly, then connect quick-connect terminal to the Load port of the energy storage inverter. Turn the connector cover until you hear the sound 'click'.

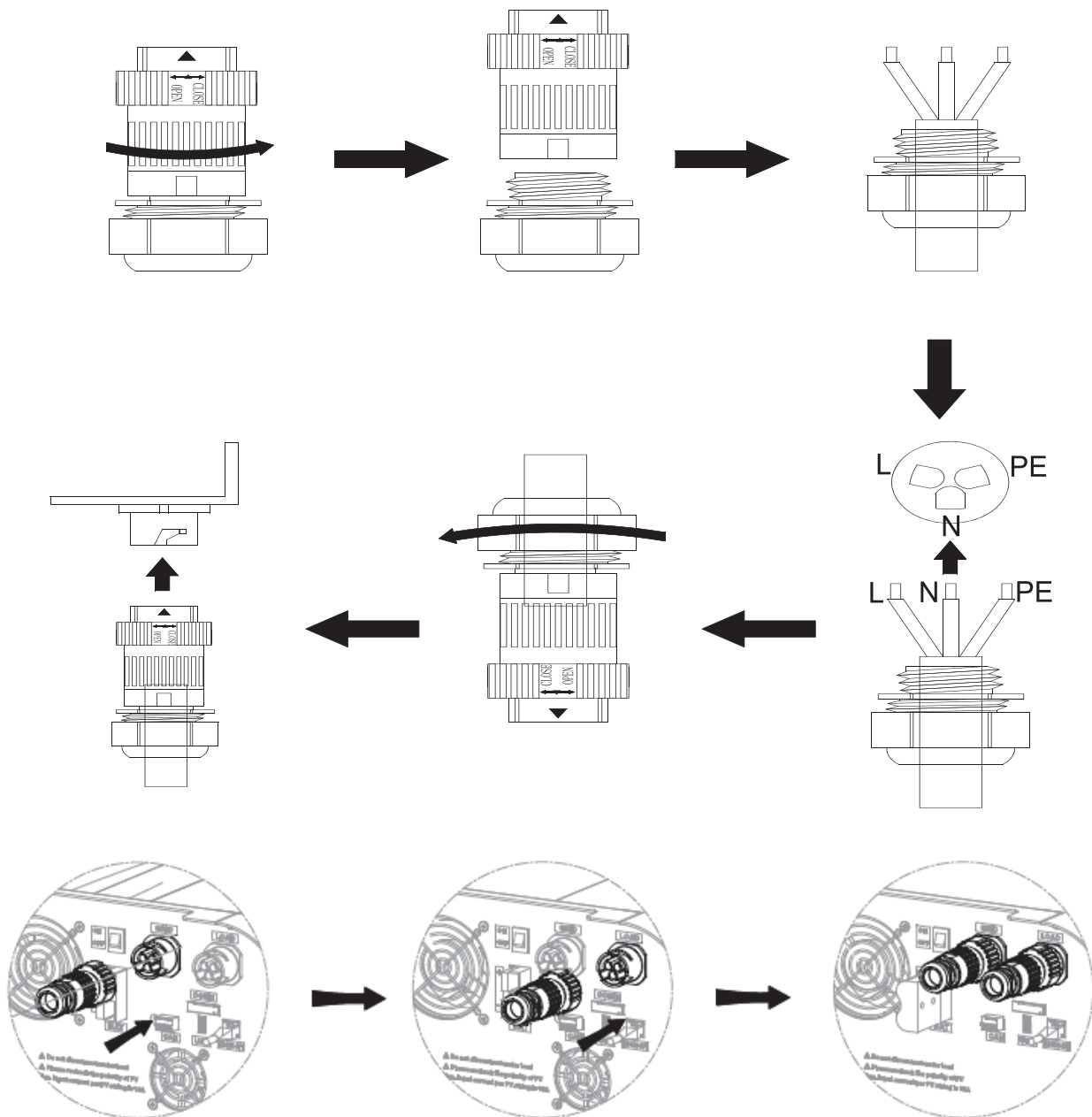




Figure 5.2 AC/load side and energy storage inverter wiring diagram

5.3 Battery connection

	<ul style="list-style-type: none"> Only qualified cables under the local electrical safety laws and regulations and comply with the technical parameters of this manual are allowed to connect to the inverter.
	<ul style="list-style-type: none"> Reverse polarity of the battery will damage the energy storage inverter! Please ensure that the wiring is correct, otherwise, our company will not assume the relevant responsibilities and warranty.

Need to install a DC breaker between the battery and the energy storage inverter (recommend 150A or bigger).

Recommended wire specifications for safe system operation shows as below table.

Energy storage inverter model	Battery cable
	Min cross-section area mm ² (length≤5m)
3kW / 5kW	25~36

Please follow the steps below to connect the battery:

- (1) Check if the voltage of the battery meets the specifications of our product.
- (2) Disconnect the DC breaker between the energy storage inverter and the battery.
- (3) Connect the battery cable to the battery port of the energy storage inverter.

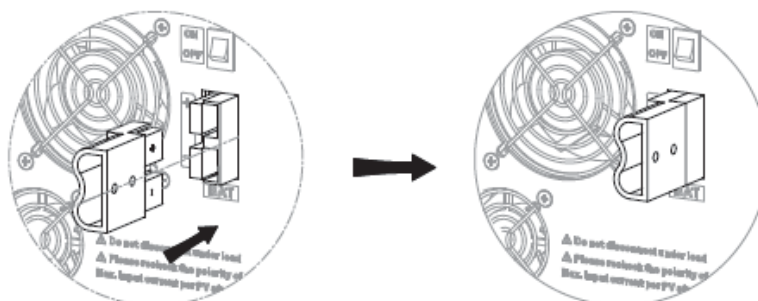


Figure 5.3 Battery wiring diagram

5.4 CAN communication connection

CAN communication interface of the inverter is used to connect li-ion battery and inverter communication (Li-ion battery CAN communication protocol should comply with the CAN communication protocol of our company). Wiring mode of CAN communication interface is presented as below.

Refer to Figure 5.4 for inverter CAN communication interface diagram

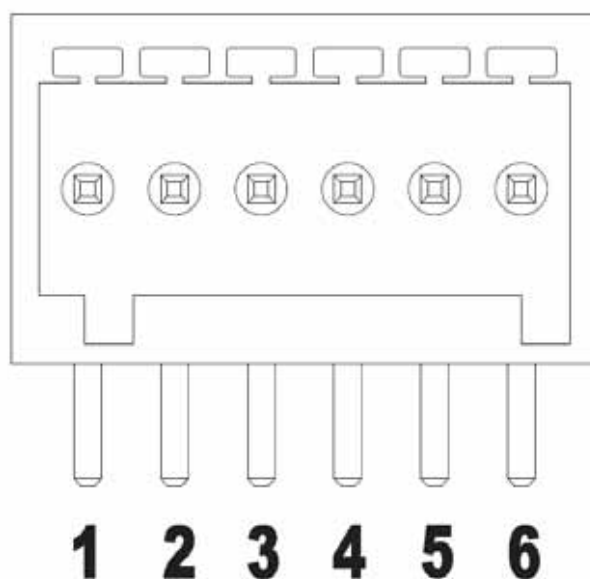


Figure 5.4 CAN communication interface diagram

Inverter CAN communication interface definition

Port no.	Port definition
1	GND
2	CANL1
3	CANH1
4	CANL2
5	CANH2
6	+5VDC

Connect li-ion battery CAN communication cable to the corresponding terminal of the inverter according to inverter CAN communication interface definition and li-ion battery CAN communication interface definition (refer to li-ion battery user manual for li-ion battery CAN communication interface definition). After communication cable is well connected, connect the

well-connected terminal to the inverter CAN communication interface and the connection between li-ion battery and inverter CAN communication interface is done.

5.5 RS-485 communication connection

The RS-485 communication of inverter is used for upper PC monitoring and monitoring of our company's WIFI200, GPRS200 communication. It can realize local monitoring, remote monitoring as well as mobile APP monitoring. The RS-485 communication interface of our energy storage inverter carries three-channel communications and the interface diagram is shown as Figure 5.5 and Figure 5.6.

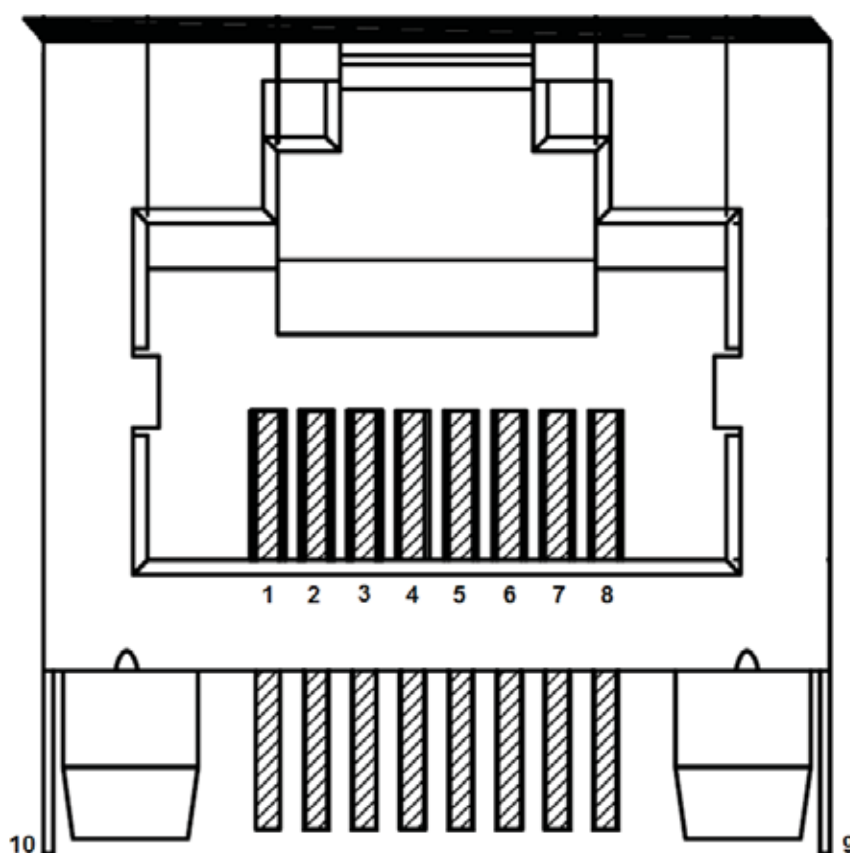


Figure 5.6 Diagram of RS-485 1/2 interface

RS-485 1/2 communication interface definition

Port no.	Port definition
1	RS1485+
2	RS1485-
3	RS2485+
4	+5VDC

Port no.	Port definition
5	
6	RS2485-
7	GND
8	
9	PE
10	



Figure 5.6 RS485 3 standard connector

RS-485 communication interface definition

Connector pin of inverter communication	Pin definition
1	+5VDC
2	A (RS3485+)
3	B (RS3485-)
4	GND

Users can select RS-485 1/2/3 to communicate during RS-485 communication. If selecting our company's WIFI200, GPRS 200 for monitoring, users only need to connect WIFI200 and GPRS200 to RS-485 3 to communicate.

5.6 USB connection (reserved)

USB communication interface is used for software update only!

During software update, please connect USB cable to USB interface of inverter.

5.7 DRM ports

Table 7-3 DRM Pins on inverter instruction

Pin on inverter	Definition
1	DRM1/5
2	DRM2/6
3	DRM3/7
8	DRM4/8
9	REFGEN
12	Com/DRM0

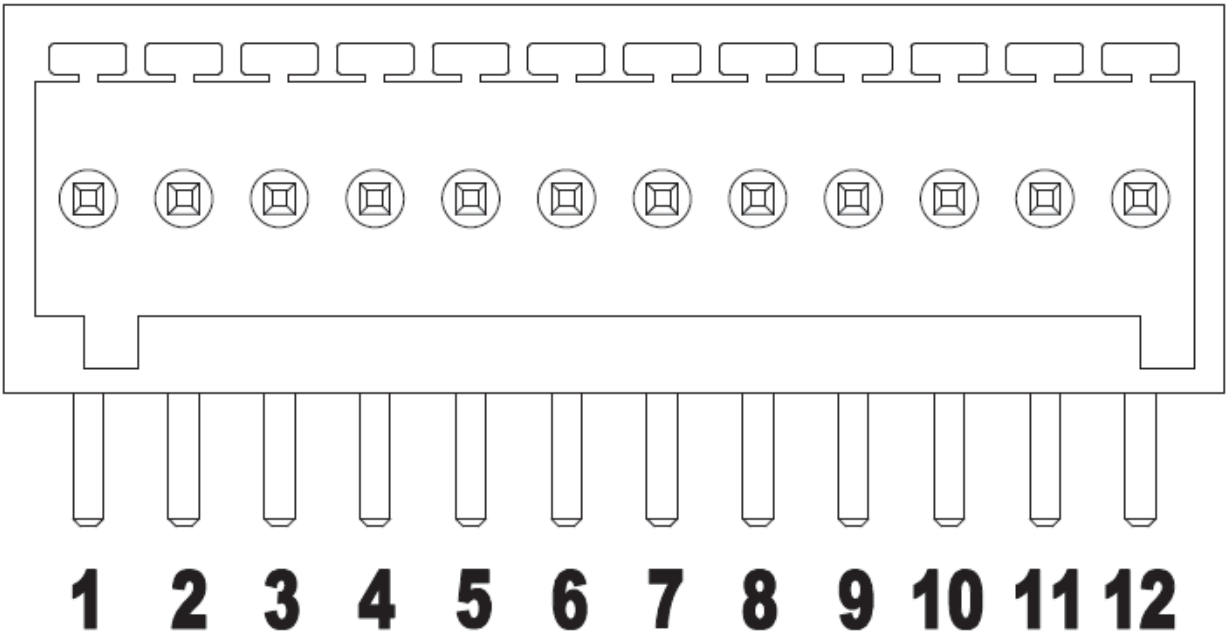


Figure 7.5 DRM pins on inverter

DRM connection steps:

- (1) An external terminal is provided, the communication cable should be prepared by users.
- (2) The definitions of the pins of DRM terminal in the inverter show as Table 7.3, connect the communication cable from the user's device to the external terminal according to Table 7-3, put the external terminal into inverter and fix it.

6 LCD operation instructions

6.1 LED indicator instruction

LED indicator	Inverter state	State description
Green indicator flashes	STANDBY MODE	DC input and AC grid input meet relevant conditions and self-test starts, stand-by state after self-test is done.
Green indicator is ON and other indicators are OFF	RUNNING MODE	No fault
Green indicator is ON Yellow indicator is ON Red indicator is OFF		Inverter working state, there is fault but the fault will not affect operation of the inverter
Red indicator is ON Other indicators are OFF		Inverter stops working, inverter has serious fault (relay fault)
Yellow indicator is ON Other indicators are OFF	FAULT MODE	Inverter stops working, inverter has other fault which can affect the operation of the inverter

6.2 LCD display instruction

6.2.1 Key instruction

“ESC”: Return and back

“^”: Page up, used for pageup, menu selection and value addition

“V”: Page down, used for pagedown, menu selection and value reduction;

“ENT”: Confirmation, used for menu accession, entry or exit edition.

6.2.2 Instruction for main page






After the inverter enters working state, the main page displays energy flow diagram according to inverter state as shown in fig 6.2.2, in which the blue arrow indicates energy flow generated by




power generation eg energy flow outputted by PV battery panel and grid-connected energy flow; red arrow indicates the consumed energy flow eg battery discharge and energy flow consumed by load.



Figure 6.2.2 Main interface of LCD display

6.2.3 Icon instruction

Icon	Instruction
	PV information, display parameters related to battery panel, switch pages via UP/DOWN key.
	Inverter information, display inverter working state
	Grid information, display parameters related to the grid, switch pages via UP/DOWN key
	Fault information, display current fault and history fault, switch current fault page and history fault page via UP/DOWN key.
	Power curve, display PV power curve, grid power curve and battery power curve.

Icon	Instruction
	Battery information, display parameters related to the battery
	Load information, display parameters related to the load, switch pages via UP/DOWN key.
	Set parameter, parameter setup entry menu of the inverter.

6.3 Display menu

Icon name	No.	Parameter name
PV information (switch pages via UP/DOWN key)	1	PV1 voltage
	2	PV2 voltage
	3	PV1 current
	4	PV2 current
	5	PV1 power
	6	PV2 power
	7	Riso
Inverter information (switch pages via UP/DOWN key)	1	INV working mode
Grid information (switch page via UP/DOWN key)	1	Grid voltage
	2	Grid current
	3	Grid frequency
	4	Active power
	5	Reactive Power
	6	Grid PF
	7	Gfci
	8	Grid DC current
	9	Energy to grid today

Icon name	No.	Parameter name
	10	Energy to grid this month
	11	Energy to grid this year
	12	Energy to grid accumulate
Current fault (switch page via UP/DOWN key)	1	Current alarm page
	2	Fault history page
Power curve	1	Grid power
	2	Battery power
	3	Load power
Battery information	1	Battery type
	2	Battery voltage
	3	Battery current
	4	Battery power
	5	Battery temperature
	6	Battery SOC
Load information	1	Load voltage
	2	Load current
	3	Load active power
	4	Load reactive power
	5	Consume energy today
	6	Consume energy this month
	7	Consume energy accumulate

6.4 Inverter parameter setup

Select parameter setup icon via UP/DOWN key in the main page, then press “ENT” key and enter password validation interface. In password validation interface, there are two kinds of rights to select, namely “user” and “admin”, select “Access as user” will enter parameter classification interface directly, however, the menu of “admin” will not be displayed under user rights, or you can select “Access as admin” menu and press “ENT” to enter password validation interface, input factory password and go to parameter classification interface. All setup menus will be displayed under admin rights.

6.4.1 Parameter classification page

The parameter classification page has six menus, corresponding to six groups of setup parameters. Instruction for each group of menu is shown as below:

Menu
PV parameter
INV parameter
Grid parameter
Battery parameter
Load parameter
Other parameter

Select a menu in parameter classification page and press “ENT” key to enter corresponding parameter selection page, select the parameter to be edited and press “ENT” key to access edition page.

6.4.2 Parameter edit mode

First, select parameters to be edited via UP/DOWN key in password setup or parameter edit page. For example, select password bit via UP/DOWN key in password validation page, and the object pointed by the black arrow is the one requires editing, however, this step can be neglected if there is only one parameter in parameter edit page. After selecting the target object, press “ENT” key to enter value edit state while the black arrow start flashing, then you can adjust the parameter value via UP/DOWN key. Finally, after parameter value is adjusted, press “ENT” key to finish editing, the inverter will save parameters automatically and exit from edit state.

6.4.3 Instruction for setup parameter

Name of parameter group	No	Menu	Name of setup parameter	Instruction/Range of the set value
PV parameter	1	Connect mode	PV connect mode:	PV connection mode: (0: Independent; 1:Parallel)
Inverter parameter	1	Inverter voltage	Inverter voltage setup:	Inverter voltage setup (valid in off-grid state), range: 208/220/230/240V
	2	Inverter frequency	Inverter frequency setup:	Inverter frequency setup (valid in off-grid state), range: 50/60Hz Hz
Grid parameter	1	PF setup	PF setup:	PF value setup, range: -1.000~1.000
Battery parameter	1	Battery type	Battery type:	Battery type: 0: Li-ion battery 1: Lead acid battery
	2	Battery protocol	Battery protocol	Battery protocol: 0: Reserved 1: PYLON 2:Sunwoda 3: YinLong 4:XingMei
	3	Charge voltage	Charge voltage	Charge voltage range:0~60V
	4	Charge current	Charge current	Charge current range:0~200A
	5	Discharge critical voltage	Discharge critical voltage	Range:40~55V
			Critical recovery voltage	Range:40~55V(Recovery voltage must be greater than the critical voltage)
	6	Charge/Discharge enable	Charge enable	0: Disable; 1: Enable(Charging time setting is effective after charging is enabled)

Name of parameter group	No	Menu	Name of setup parameter	Instruction/Range of the set vaule
			Discharge enable	0: Disable; 1: Enable (Discharging time setting is effective after discharging is enabled)
	7	Charge time section1	Charge time start1	Starting time of charging, range: 0~24:00H
			Charge time end1	Ending time of charging, range: 0~24:00H
	8	Discharge time section1	Discharge time start1	Starting time of discharging, range: 0~24:00H
			Discharge time end1	Ending time of discharging, range: 0~24:00H
	9	Charge time section2	Charge time start2	Starting time of charging, range: 0~24:00H
			Charge time end2	Ending time of charging, range: 0~24:00H
	10	Discharge time section2	Discharge time start2	Starting time of discharging, range: 0~24:00H
			Discharge time end2	Ending time of discharging, range: 0~24:00H
Load parameter	1	Load connect mode	Load connect mode	Reserved
Other parameter	1	Control	ON/OFF	Shutdown operation (after shutdown, the device enters standby mode). Starting up operation (after starting up, the device starts self-test, power on)
	2	Date time setup	Date/time setup	Data/time setup
	3	Machine setup	Machine Version	Machine Version
			Load power priority	1: Battery first; 2:Grid first
			Charge supply	0:None, 1: PV, 2: PV+grid

Name of parameter group	No	Menu	Name of setup parameter	Instruction/Range of the set vaule
			Battery line enable	0: Disable; 1: Enable (allow the battery to discharge to the grid after enabling)
	4	Machine information		Energy storage inverter system information: CPU1 software version, CPU2 software version, LCD version, serial number, Production date, grid standard, etc.
	5	Lcd setup	LCD backlight setup:	LCD backlight, range:0~100%
			LCD buzzer switch:	Buzzer switch: 0: OFF 1: ON
	6	Cash setup	Currency name:	Currency: A~Z, A: US Dollar, R: RMB
			Exchange rate	Range: 0~655.35
	7	Language setup	Language setup	Switch between Chinese and English
	8	RS485 address	Address of RS485	Range: 1~254

7 Working mode

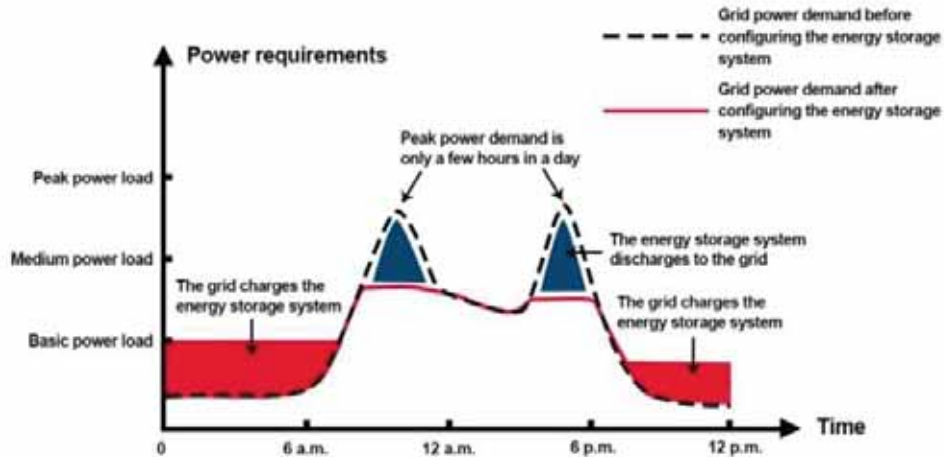
The energy storage inverter is equipped with the following working modes based on differing working conditions:

7.1 Mode 1(Self-consumption)



- The energy generated by PV panel is used in local load first and then in battery charging, finally, the residual energy will be transmitted to the grid.
- If PV carries no energy, the energy stored by battery will be used in local load first. When battery energy is insufficient, the grid will supply power to local load in the meantime;

7.2 Mode 2(Peak- shaving and valley-filling)



This mode is suitable for use in areas with peak and valley electricity price. According to the electricity price at different time periods, the corresponding time can be set to charge and discharge from the grid.

- 0:00-6:00 electricity price is low, the grid will charge the battery.
- 9:00-13:00, 17:00-19:00 electricity price is high, the battery supplies power to the load.
- 21:00-0:00 electricity price is low, the grid will charge the battery.

7.3 Mode 3(EPS)



- If grid fault or abnormality occurred, PV and battery can supply power to the load.

8 Fault code

- This chapter mainly introduces fault alarms and fault codes for users to quickly identify the inverter fault
- Table 7-1 Fault code for energy storage inverter

Fault code	Alert	Instruction
00		
01	Ac voltage high1	Grid voltage is higher than protection point 1
02	Ac voltage high2	Grid voltage is higher than protection point 2
03	Ac voltage low1	Grid voltage is lower than protection point 1
04	Ac voltage low2	Grid voltage is lower than protection point 2
05	Ac freq. high1	Grid frequency is higher than protection point 1
06	Ac freq. high2	Grid frequency is higher than protection point 2
07	Ac freq. low1	Grid frequency is lower than protection point 1
08	Ac freq. low2	Grid frequency is lower than protection point 2
09	Ac over currhw	Output hardware overcurrent
10	Ac over currsw	Output software overcurrent
11	Bus over volt hw	Software bus overvoltage
12	Bus over volt sw	Hardware bus overvoltage
13	Gfci over	Leakage current exceeded
14	Gfci sensor fault	Leakage current sensor fault
15	Relay fault	Relay fault
16	Iso low	Insulation impedance is low
17	Ac dc over	DC component exceeded
18	DSP communication error	DPS communication fault
19	PV soft fault	PV soft start fail
20	Ac zero error	Large sampling offset error
21	Temperature high1	Overtemp 1
22	LLC soft fault	LLC soft start fail
23	LLC over voltage	LLC overvoltage

Fault code	Alert	Instruction
24	LLC over current	LLC overcurrent
25	PV1 voltage high	PV1 overvoltage
26	PV1 voltage low	PV1 undervoltage
27	PV2 voltage high	PV2 overvoltage
28	PV2 voltage low	PV2 undervoltage
29	PV1 over current	PV1 overcurrent
30	PV2 over current	PV2 overcurrent
31	RTC error	
32	Eeprom error	Storage abnormal
33	Inv soft fault	Inverter soft start fault
34	Fan fault	Fan fault
35	Cmd shut down	Shutdownmanually
36	Grid loss	Grid loss
37	PFC soft fault	PFC soft start fault
38	Battery over current	Battery overcurrent
39	Battery volt high	Battery overvoltage
40	Battery volt low	Battery undervoltage
41	Quik stop	E-stop
42	Pv1 over current hw	PV1 hardware overcurrent
43	Pv2 over current hw	PV2 hardware overcurrent
44	Bat over current hw	Battery hardware overcurrent
45	LLC over current hw	LLC hardware overcurrent
46	LLC over voltage hw	LLC hardware overvoltage
47	CAN comm error	CAN communication abnormal
48	Load over power	Load over power
49	Extern Battery Alarm	Extern Battery Alarm
50	Load error hw	Power grid reverse connection

9 Technical parameter

Model	iMars-BD3KTL	iMars-BD5KTL
PV DC input parameter (PV side)		
Max. input power	3300W	6600W
Max. input voltage	500VDC	
Start voltage/min. working voltage	100V/80V	
MPPT voltage range	120~450V	
Number of MPPT / Strings per MPPT	1/1	2/1
Max. input current	13A	13A×2
Maximum Input Short Circuit Current	15.6A	15.6A×2
Maximum backfeed current to PV array	0A	
Grid output parameter (ACside)		
Rated AC output power	3000W	4600W
Max. AC output current	13A	20A
Maximum output short circuit current	20A	30A
Maximum output overcurrent protection	20A	30A
Rated grid voltage/grid voltage range	230Vac/180-270Vac	
Rated grid frequency/frequency range	50Hz(45~54Hz) / 60Hz(55~65Hz).	
AC output type	Single phase (L、N、PE)	
Power factor	≥0.99 (±0.95 adjustable)	
THDi	≤3%(rated power)	
Off-grid parameter		
Rated output voltage	220Vac/230Vac/240Vac	
Frequency	50Hz/60Hz	
Max. output power	3000VA/3000W	4600VA/4600W
Time of switching between grid-connected and off-grid	20ms	
THDv	≤3%(rated power)	
Maximum output short circuit current	20A	30A
Maximum output power/time	150%/10S	
Allowable reverse current	0A	

Model	iMars-BD3KTL	iMars-BD5KTL
Battery side		
Battery type	Li-ion/Lead acid	
Battery voltage（nominal）	48V	
Battery voltage（range）	42-58V	
Max. charging current	60A	100A
Max. discharging current	60A	100A
Charging curve	Three-stage	
System		
Max. efficiency	97.3%	97.6%
PV-AC Euro efficiency	96.5%	96.8%
MPPT efficiency	99.9%	
Isolation mode (PV side)	No isolation	
Isolation mode (battery side)	High frequency isolation	
Protection level	IP20	
Dimension (W*D*H)	610*425*190mm	
Protection function	DC insulation monitoring, DC monitoring, grid monitoring, islanding protection, short-circuit protection, overheat protection, PV anti-reverse connection protection, battery anti-reverse connection protection	
Working temp range	-10°C to +40°C	
Cooling mode	Fan	
RH	0~95%, no condensation	
Display	LCD	
Communication	RS485 (standard configuration),Wifi, (optional), CAN-BUS(internal communication)	
Certification	VDE-AR-N4105, AS4777/3100	
Warranty	1 year(10 years optional)	
Note: As our products are under continuous improvement and update, the final product and data information are subject to the physical product.		

10 Contact us

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