Operation Manual

Photovoltaic Grid-connected Inverter

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Preface

The manual is intended to provide detailed information of product information, installation, application, trouble shooting, precautions and maintenance of iMars series grid-tied solar inverters. The manual does not contain all the information of the photovoltaic 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 grid-tied solar 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.

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

Contents

1 Safety precautions

iMars series grid-tied solar 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 grid-tied solar inverters.

1.1 Icons

This manual provides relevant information with icons to highlight the physical and property safety of the user to avoid device damage and physical injury.

The icons used in this manual are listed below:

Icons	Name	Instruction	Abbreviation
 Danger	Danger	Serious physical injury or even death may occur if not follow the relative requirements	
 Warning	Warning	Physical injury or damage to the devices may occur if not follow the relative requirements	
 Do not	Do not	Damage may occur if not follow the relative requirements	
 Hot sides	Hot sides	Sides of the device may become hot. Do not touch	
Note	Note	The procedures taken for ensuring proper operation.	**Note**

1.2 Safety guidelines

	● The first thing after receiving is to check for any visible damage to the package or to the inverter. If there is something suspected, contact the shipping company and local dealer before installing. ● The installation and operation of PV 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. ● Do not carry out any wiring and inspection or changing components when the power supply is applied.
	● Ensure that there is no electromagnetic interference from other electrical and electronic equipment on the installation site. ● Do not refit the inverter unauthorized. ● All the electric installation needs to be compliance with the national or local laws and standards.

	● The temperature of individual parts or the enclosure of the inverter–especially the heat sink may become hot in normal operation. There is a danger of burning. Do not touch.
	● The inverter must be reliably grounded before operation.
	● Do not open the cover of inverters unauthorized. The electrical parts and components inside the inverter are electrostatic. Take measurements to avoid electrostatic discharge during relevant operation.
	● The inverter must be reliably grounded.
	● Ensure that DC and AC side circuit breakers have been disconnected and wait at least 5 minutes before wiring and checking.

Note: Technical personnel who can perform installation, wiring, commissioning, maintenance, troubleshooting and replacement of the iMars series grid-tied solar inverters must meet the following requirements:

- 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 grid-tied photovoltaic power generation system and related standards of the countries/regions in which the project is located.
- Operators must wear personal protective equipment.

1.2.1 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, otherwise, improper connection or no grounding may cause stop of the inverter. ● Ensure reliable installation and electrical connection.

Note: iMars series grid-tied solar inverters are only for crystalline silicon solar modules.

1.2.2 Grid-tied operation

	● 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.

1.2.3 Maintenance and inspection

	● 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, users must disconnect the breaker on grid side, then disconnect the breaker on PV side 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”.

1.2.4 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 grid-tied solar inverters.

2.1 Solar grid-tied power generation system

2.1.1 Application

The photovoltaic grid-tied power generation system consists of solar modules, grid-tied inverter, metering devices and public grid.

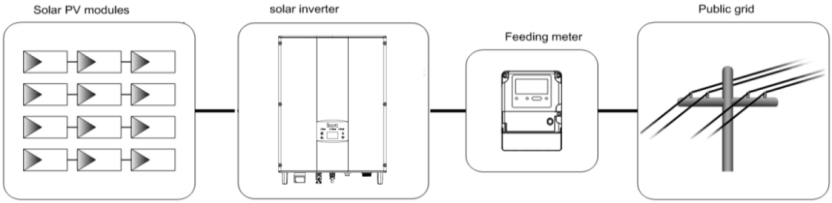


Figure 2.1 Application of iMars series grid-tied solar inverters

Grid-tied solar inverter is the core of photovoltaic power generation system. The solar energy can be converted into DC electric energy through solar modules and then be changed into sinusoidal AC energy which has the same frequency and phase with the public grid by grid-tied solar inverters, and then be fed to the grid.

iMars series grid-tied solar inverters are only applied in solar grid-tied power generation system and its DC input are only composed of crystalline silicon solar modules whose negative and positive poles are not grounded.

⚠	● The recommended solar modules need to comply with IEC61730 Class A rating.

2.1.2 Supported grid connection structure

iMars series grid-tied solar inverters support TN-S, TN-C, TN-C-S , TT and IT grid connection. When applied to the TT connection, the N-to-PE voltage should be less than 30V.

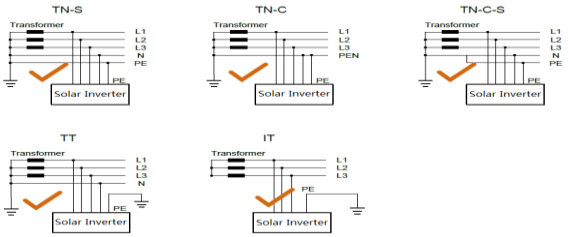


Figure 2.2 Type of grid

2.2 Products appearance

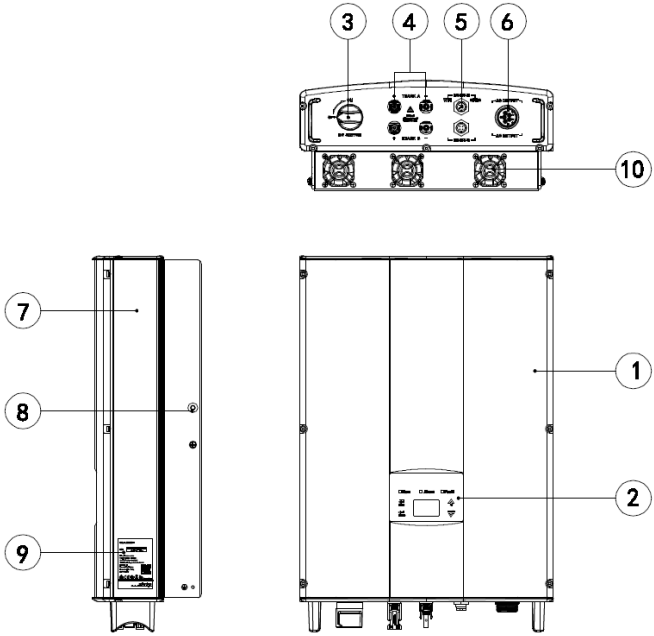


Figure 2.3 Products appearance

Table 2-1 Parts instruction

No.	Name	Instruction
1	Cover	
2	Operational panel	LED status light, LCD display, keypad
3	DC switch	On–off of the DC input (optional)
4	DC input port	For the connection of solar modules
5	Communication port	RS485 and EXT communication port
6	AC terminal	For the connection of AC output
7	Cooling chamber	
8	Back panel mounting screws	
9	Name plate	For rated parameters and safety precautions of the inverter
10	FAN	4~6kW(NO FAN) , 8~10kW(Air cooling)

2.3 Nameplate

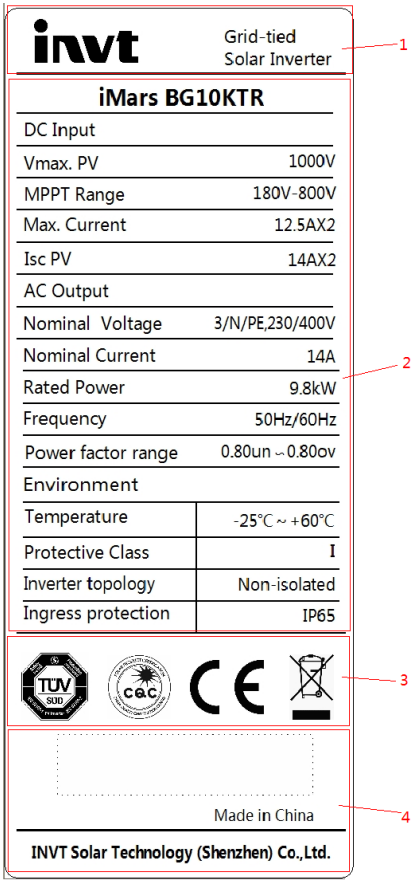


Figure 2.4 Inverter nameplate

（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
	● TUV certification mark. The inverter is certified by TUV.
	● CE certification mark. The inverter complies with the CE directive.
	● CQC certification mark. The inverter passed CQC certification.
	● EU WEEE mark. Cannot dispose of the inverter as household waste.

2.4 Products modules

Table 2-2 Models of iMars grid-tied solar inverter

Product name	Model	Rated output power （W）
Three-phase (L1,L2,L3,N,PE)		
Three-phase grid-tied solar inverter	4kW	4000
Three-phase grid-tied solar inverter	4kW-S	4000
Three-phase grid-tied solar inverter	5kW	5000
Three-phase grid-tied solar inverter	5kW-S	5000
Three-phase grid-tied solar inverter	6kW	6000
Three-phase grid-tied solar inverter	8kW	8000
Three-phase grid-tied solar inverter	10kW	10000

Note: Technical parameters of iMars series inverter refers to technical parameters.

2.5 Dimensions and weight

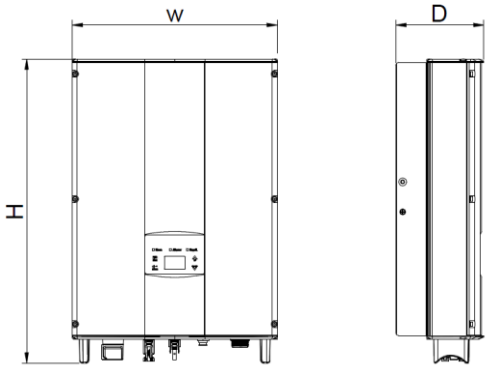


Figure 2.5 Inverter dimensions

Table 2-3 Inverter dimension and net weight

Model	H (mm)	W (mm)	D (mm)	Net weight (kg)
4kW / 4kW–S / 5kW / 5kW-S / 6kW	530	360	150	20
8kW / 10kW	575	360	150	23

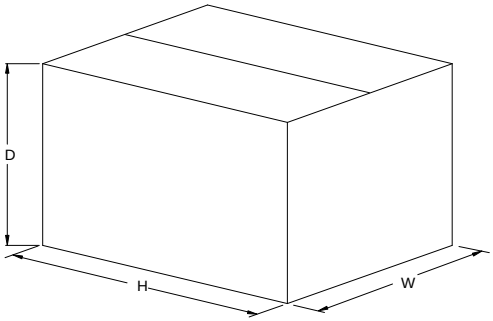


Figure 2.6 Paper packages dimension

Table 2-4 Packages dimension and gross weight

Model	H (mm)	W (mm)	D (mm)	Weight (kg)	Packaging Material
4kW / 4kW–S / 5kW / 5kW-S / 6kW	630	470	284	22	Paper
8kW / 10kW	675	470	284	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 -40°C~+70°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 packaging 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 how to install the inverter and connect it to the grid-tied solar system (including the connection between solar modules, public grid and 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.

Standard deliverables of inverter:

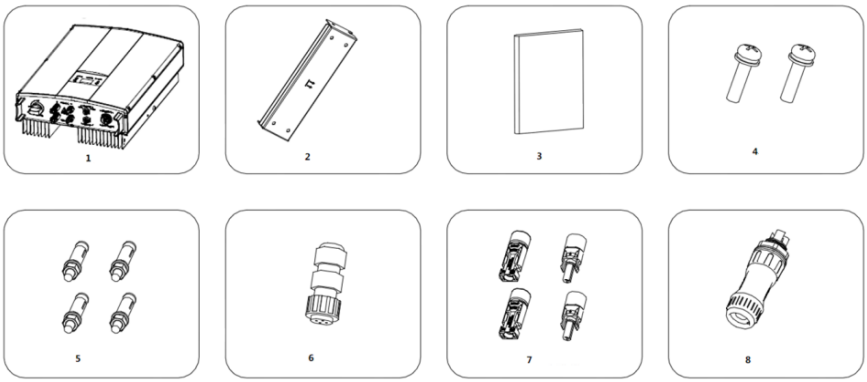


Figure 4.1 Delivery content

Table 4-1 Detailed delivery list of three-phase inverter

No.	Name	Quantity
1	4kW / 4kW-S / 5kW / 5kW-S / 6kW / 8kW / 10kW inverter	1
2	Installation bracket	1
3	Operation manual	1
4	Assembling bolts M5*20	2
5	Expansion bolts M6*50	4
6	Communication connector	1
7	DC connector	2 pairs / 1 pair（4kW-S、5kW-S）
8	AC connector	1

4.2 Before installation

4.2.1 Installation tools

Table 4-2 Tools list

No.	Installation tools	Instruction
1	Marker	Mark the installation hole
2	Electric drill	Drill holes on the bracket or on the wall
3	Hammer	Knock on the expansion bolt
4	Adjustable wrench	Fix the installation bracket
5	Inner hex screwdriver	Tighten the anti-theft screw and disassemble AC junction box
6	“Slotted” or “cross-head” screwdriver	AC wiring
7	Megameter	Measure the insulation performance and grounding impedance
8	Multimeter	Check the circuit and measure AC/DC voltage
9	Electric soldering iron	Solder the communication cable
10	Wire crimper	Crimp DC terminal

4.2.2 Installation site

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.

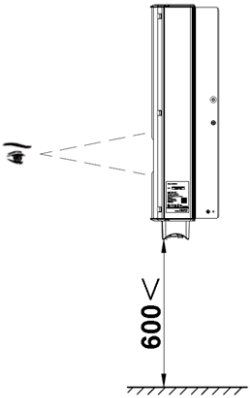


Figure 4.2 Optimal mounting height

(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 4.3.

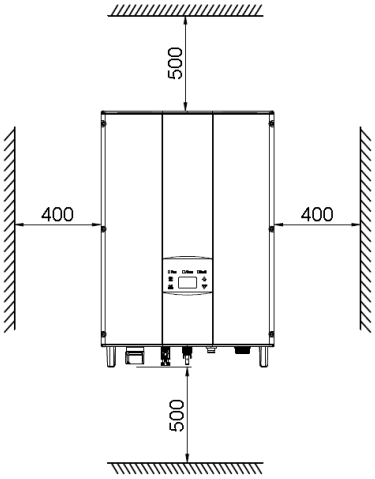


Figure 4.3 Installation spacing

(4) The ambient temperature of installation should be -25°C~60°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 4.4.

(8) The installation should ensure that the inverter is reliably grounded, and the material of grounded metal conductor should be consistent with the metal material reserved for the grounding of the inverter.

Install the inverter vertically or backward $\leqslant$ 15° to facilitate heat dissipation.

Do not tilt the inverter forward, horizontal, upside down, over- backward, and roll when install the inverter.

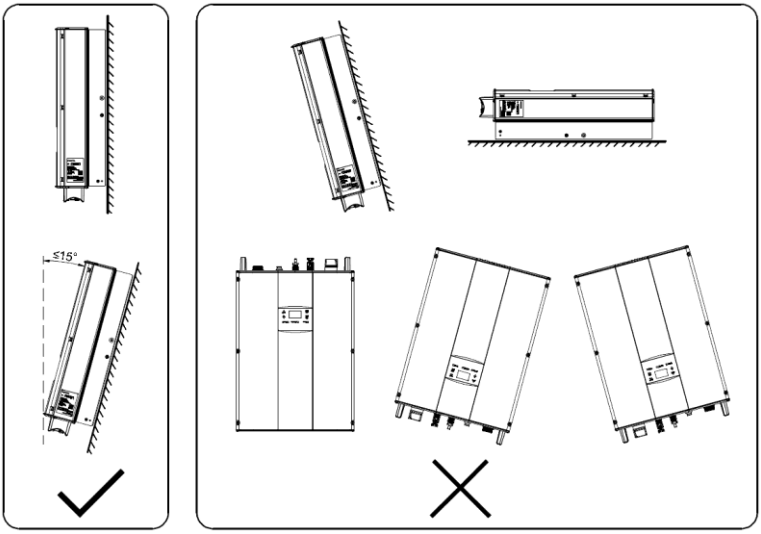


Figure 4.4 Installation position of the inverter

	● 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.

4.2.3 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:

Table 4-3 Cable specification

Inverter model	DC side		AC side	
	Min cross-section area mm²(length≤50m)	Min cross section area mm² (Length>50m)	Min cross section areamm² (Length≤50m)	
			L	N/PE
4kW / 4kW-S / 5kW / 5kW-S / 6kW / 8kW / 10kW	4	6	4	4

4.2.4 Micro breaker

In order to ensure safe operation of the inverter and circuits, it is recommended to configure corresponding micro breaker or fuse on the DC input side and AC output side of the inverter. Table 4-4 is the requirements recommended for micro breaker:

Table 4-4 Specification of micro breaker

Inverter model	DC side	AC side
	Recommended breaker specification	Recommended breaker specification
4kW / 4kW-S / 5kW / 5kW-S / 6kW	DC1000V, C16A, 2P	AC400V, C16A, 4P
8kW / 10kW	DC1000V, C25A, 2P	AC400V, C25A, 4P

4.3 Mechanical installation

The material for fixing the inverter and the installation mode vary with the different installation sites. It is recommended to install the inverter vertically to the firm wall or metal bracket. Here we take wall installation as an example to introduce the installation matters of the inverter.

As shown in the Figure 4.4, the installation of the inverter should be vertical to the horizontal surface.

4.3.1 Installation of inverter

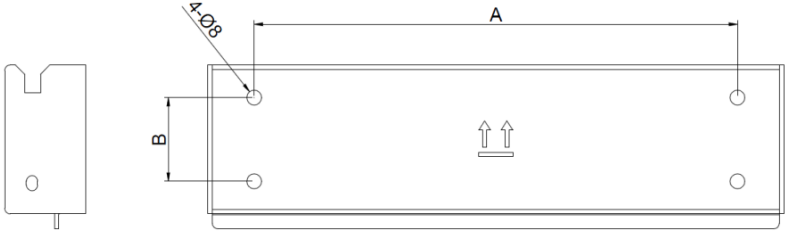


Figure 4.5 Installation bracket of inverter

Table 4-5 Dimension of installation bracket

Inverter model	Spacing of installation hole
	A(mm)*B(mm)
4kW / 4kW-S / 5kW / 5kW-S / 6kW / 8kW / 10kW	260*45

The procedures for installation of inverter are listed below:

(1) Use the punch positioning plate in the packaging box to determine the punch position. As shown in Figure 4.6. Level the holes with a level ruler and mark it with a marking pen.

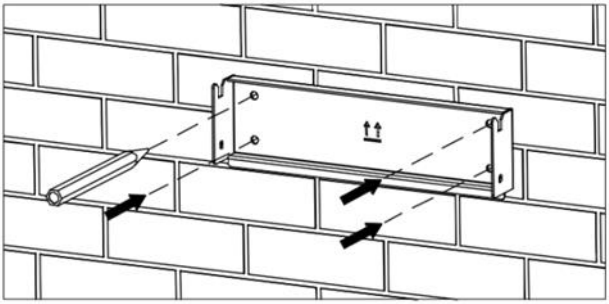


Figure 4.6 Determine the punch position

(2) Drill 4 installation holes on the wall with electric drill. As shown in Figure 4.7.

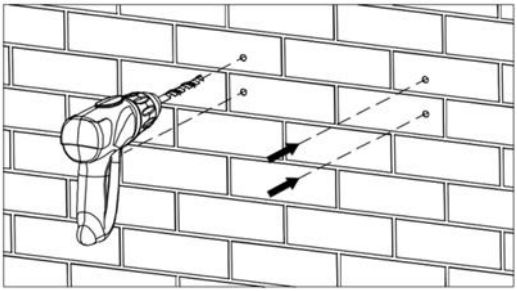


Figure 4.7 Drilling

(3) Fix the expansion bolts to the 4 installation holes with hammer, as shown in Figure 4.8.

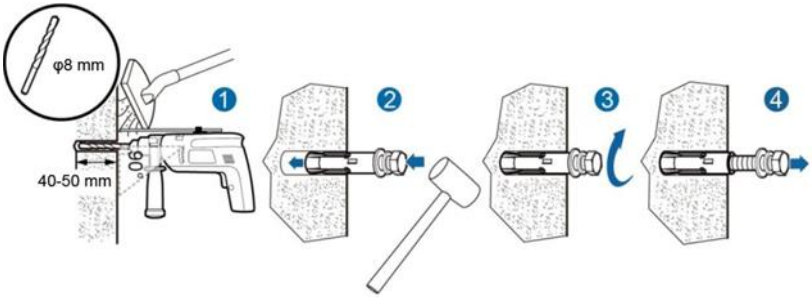


Figure 4.8 Install expansion bolts

(4) Fix the installation bracket onto the expansion bolts and ensure the installation is firm enough(tightening torque is 13N•m) . As shown in Figure 4.9.

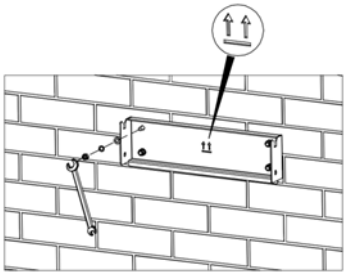


Figure 4.9 Fix the installation bracket

(5) Hang the inverter onto the installation bracket and ensure the installation is firm enough. As shown in Figure 4.10.

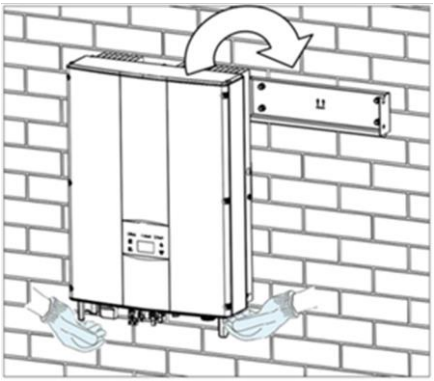


Figure 4.10 Installation of inverter

(6) Ensure the inverter is installed properly and tighten the M5X20 bolts into the screw holes on the left and right side of inverter(tightening torque is 3N•m). As shown in Figure 4.11.

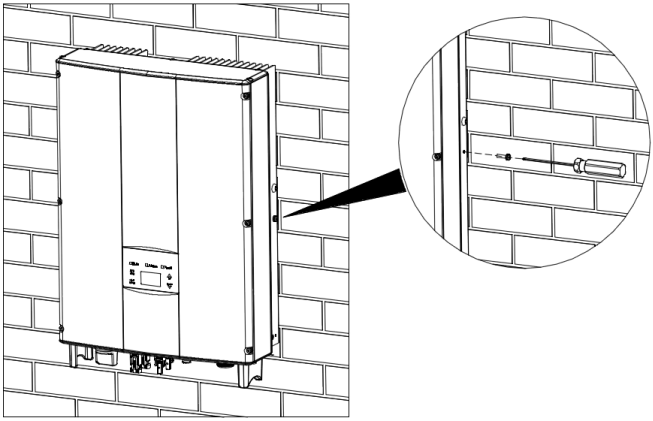


Figure4.11 Installation of M5X20 bolts

4.4 Electrical connection

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

Fig 4.13 is the connection diagram for PV grid-connected system.

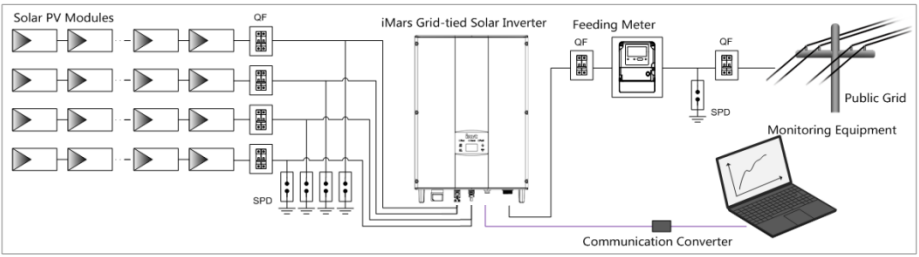


Fig 4.12 Connection diagram for PV grid-connected system

⚠	● 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	● 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.

4.4.1 Connection of photovoltaic string

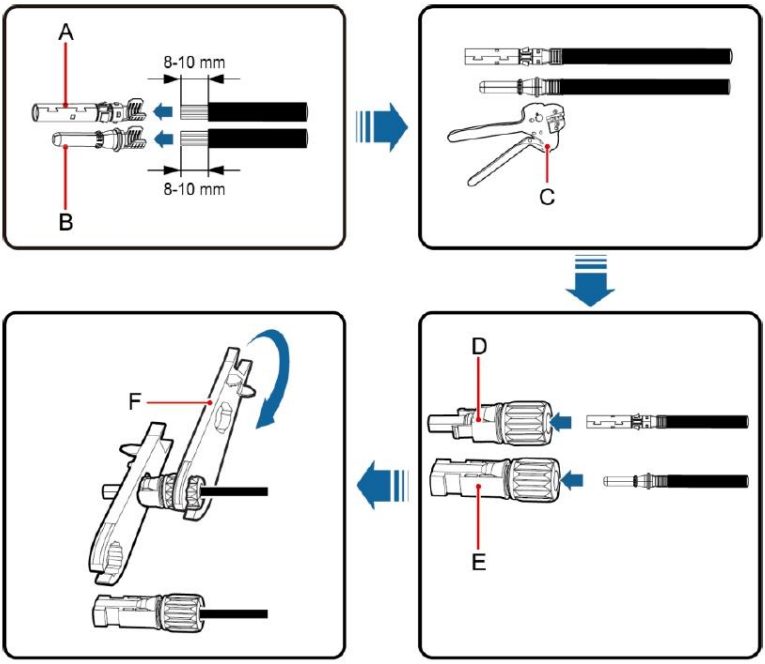


Figure 4.13 MC4 DC connector and PV string connection

The procedures for connecting PV string t to the inverter DC input are shown below：

(1) Before connecting PV string to inverter, ensure proper measures against lightening and short circuit have been taken;

⚠	● 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.

(2) Connect the output cables of solar modules to the DC connector of inverter as Figure 4.13 shows. Remove the isolation layer of the DC cable for about 8-10mm. Insert the conductor part into the appropriate position of the connector, crimp the MC4 DC terminal and tighten the nut with a torque of 2.5-3Nm. Ensure the poles of solar modules are correctly and well connected with the connectors

(3) After the DC connector is connected, 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, as shown in Figure 4.14.

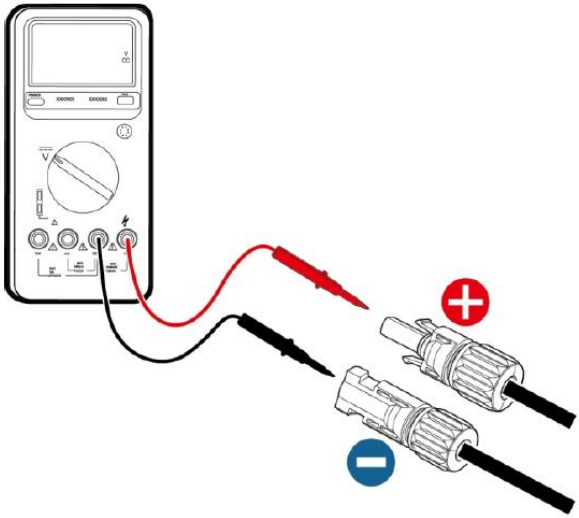


Figure 4.14 DC input voltage measuring

⚠	● The PV string connected to iMars series 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.

(4) Connect PV string to the inverter and ensure tightly-fastened

(5) 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.

4.4.2 Grid connection

Table 4-6 Description of AC connector.

Inverter AC connector	Three phase grid	Note
1	L1（A）	
2	L2（B）	
3	L3（C）	
N	N	
⏚	PE	Must be connected

The steps to access the grid are as follows:

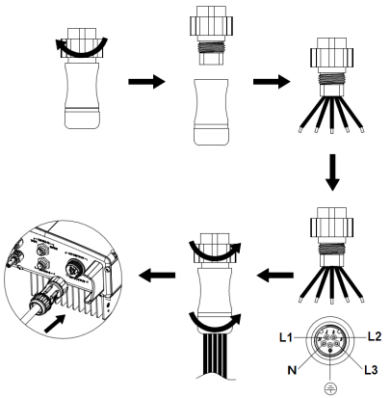


Figure 4.15 Wiring of AC connector

(1) Before connect the three-phase AC grid cable to the inverter, take lightning and short circuit protection measures in accordance with the local electrical safety codes

(2) As shown in Figure 4.15, connect and fasten L1, L2, L3, N and PE conductors of the three-phase grid to AC terminal with 0.5 Nm torque. Tighten the terminal with tightening torque of 2.5-3 Nm, and then connect the terminal to the AC port of the inverter.

⚠	• 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.

5 Operation

This chapter describes detailed operation of the inverter which involves the inspection before operation, grid-tied operation, stopping and daily maintenance of the inverter.

5.1 Inspection before operation

The following items must be checked strictly before running the PV grid-connected inverter (including but not limited to the following items):

(1) Ensure the installation site meet the requirement mentioned in section 4.2.2 for easy installation, removing, operation and maintenance.

(2) Ensure the mechanical installation meet the requirement mentioned in section4.3.

(3) Ensure the electrical installation meet the requirement mentioned in section 4.4.

(4) Ensure all switches are “off”.

(5) Ensure the open-circuit voltage of PV module conforms to the parameter requirements of inverter DC side in Technical parameters;

(6) Ensure all electrical safety precautions are clearly-identified on the installation site.

	● In order to ensure a safe, normal and stable operation of the PV power generation system, all the newly installed, renovated and repaired PV grid-connected power generation system and its grid-connected inverter must undergo inspection before running.

5.2 Inverter grid-connected running

Start the inverter according to below steps to achieve grid-connected operation of the inverter:

Note	● ***It is a must to select the country to set grid-connected standard during the initial operation of the inverter, see details at section 6.5.*** ● Keep the power-on state of the inverter for at least 30 minutes, and complete the charging of built-in clock battery of the inverter to ensure the clock can run normally!

(1) Confirm the requirements in section 5.1 are fulfilled;

(2) Close the breaker on inverter public grid AC side;

(3) Close the integrated DC switch of the inverter;

(4) Close the circuit switch on PV string DC input side;

(5) Observe the LED indicator state of the inverter and the information displayed by LCD. Refer to chapter 5 for LED state indicator and LCD display information.

◐ Run green indicator flickers, other indicators are off: inverter is powered on and under self-inspection, wait for enough light to fulfill grid-connected condition

● Run green indicator is on and other indicators are off: inverter self-inspection has passed and grid-connected power generation is on – pilot run succeeded.

"Warn" or "Fault" indicator is on or flickers: inverter is powered on but system fault occur. Refer to section 6.3 to check the fault code in LCD display, stop the inverter as per section 5.3, and rule out faults according to chapter 8. After all the faults are removed, repeat the operations in chapter 5.

(6) Set the inverter time according to local time, refer to section 6.4.4 to complete time setup.
(7) The default DC input mode of inverter is "independent" mode; refer to section 6.4.4 to check and set DC input mode.

5.3 Inverter stop

When it is necessary to carry out power-off maintenance, inspection and fault elimination on the inverter, stop the inverter according to the following steps:

(1) Disconnect the breaker on inverter public grid AC side;
(2) Disconnect the integrated DC switch of the inverter;
(3) Disconnect the switch on PV string DC input side;
(4) Wait for at least 5 minutes until the internal parts of the inverter are fully discharged, and complete the stop operation.

5.4 Daily maintenance and inspection

In solar PV grid-connected power generation system, iMars series grid-connected inverter can realize grid-connected power generation and stop/start operations automatically day and light in whatever seasons. In order to safeguard and prolong the service life of the inverter, it is necessary to carry out daily maintenance and inspection on the inverter besides using the inverter strictly according to this manual.

5.4.1 Periodic maintenance on the inverter

Item	Inspection mode	Maintenance period
Save the inverter running data	Adopt monitoring software to read the inverter data in real time, and backup the data recorded by monitoring software periodically. Save the inverter running data, parameters and logs into the file, check the monitoring software and various parameter setup of the inverter.	Once per quarter
Inverter running state	Observe whether the inverter is installed firmly, damaged or deformed. Listen for abnormal noise during inverter operation. Check the variables during system grid-connected running. Check whether the temperature of inverter enclosure is normal and monitor the heating condition with thermal imager.	Once per half a year
Clean the inverter	Check the RH and dust around the inverter, and clean the inverter when necessary. Refer to section 5.4.2.	Once per half a year
Electrical connection	Check whether system cable connection and inverter terminal block are loosened, if yes, secure them again in the manner specified in section 4. Check whether the cable is damaged, and whether the cable skin touched by the metal surface is cut.	Once per half a year
Maintenance and replacement of cooling fan	Observe whether the air inlet/outlet is normal; check whether there are cracks on the fan leaf. Listen for abnormal noise during fan rotation. Clean the air inlet/outlet if necessary; If any abnormity occurred to the fan, replace the fan immediately .Refer to section 5.4.2.	Once per half a year
Safety function	Check the inverter LCD and stop function of the system. Simulate stop operation and check the stop signal communication. Check the warning marks and replace them if necessary.	Once per half a year

5.4.2 Maintenance guidance

Clean the inverter

The cleaning steps are listed below:

(1) Disconnect the connection on input and output side;

(2) Wait for ten minutes;

(3) Clean the surface and air inlet/outlet of the inverter with soft brush or vacuum cleaner;

(4) Repeat the operations in section 5.1;

(5) Restart the inverter.

Clean the fan (for 8kw and 10kw inverter)

The cleaning steps are listed below:

(1) Disconnect the connection on input and output side;

(2) Wait for ten minutes;

(3) Disassemble the inverter in the same process with the installation procedures in section 4, but in reverse order;

(4) Remove the screws and covers of cooling bin or fan box, as shown in Figure 5.1 and 5.2

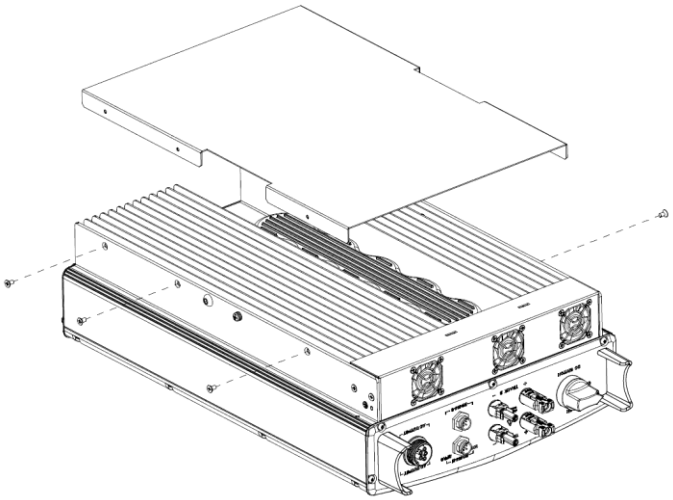


Fig 5.1 Disassemble the cooling bin

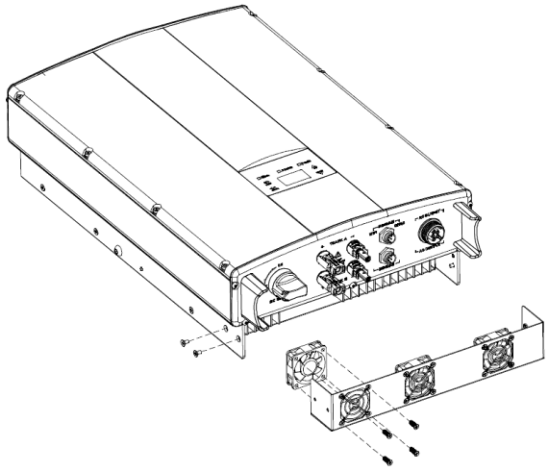


Fig 5.2 Disassemble the fan box

(5) Clean the inverter cooling bin and fan with soft brush or vacuum cleaner.

(6) Install the screws and covers of cooling bin or fan box to their original place.

(7) Install the inverter to its original place again according to section 4.

(8) Repeat the operations in section 5.1.

(9) Restart the inverter.

Fan replacement

If high temperature occurred to the inverter or abnormal noise occurred during fan rotating, replace the fan. Note that the fan should be replaced by professionals only.

⚠	● Stop the inverter before maintenance operation, and disconnect all the power inputs of the inverter. ● Before carrying out maintenance operation, wait for at least 10 minutes until the internal capacitors of the inverter are fully discharged, ● The fan can be maintained and replaced by professional electricians only.

How to replace the fan:

(1) Disconnect AC breaker;

(2) Turn the DC switch to “OFF” position;

(3) Wait for at least 10 minutes;

(4) Disconnect all the electrical wirings at the bottom of the inverter;

(5) Lift up the inverter with the help of others and take the inverter off the wall;

(6) Place the inverter on the operation platform;

(7) Disassemble the fan box as shown in Fig 5.2;

(8) Disassemble the damaged inverter fan as shown in Fig 5.3, then install the new fan back to its original position, and connect the fan power and control cable;

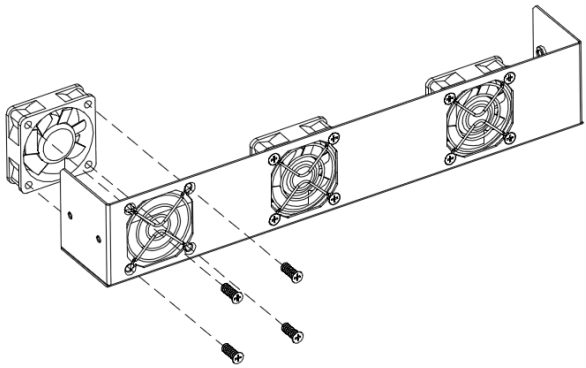


Fig 5.3 Replace the fan

(9) Install the screws and covers of cooling bin or fan box to their original position;

(10) Install the inverter to its original position again according to section 4;

(11) Repeat the operations in section 5.1;

(12) Restart the inverter.

Note	● Do not start the inverter immediately if it alarms and stops. Figure out the cause according and confirm all the faults are removed before starting again. Inspections should be carried out in strict accordance with the procedures in Section 5.1.

6 Display and operation panel

This chapter describes the panel displaying and how to operate on the panel, which involves the LCD display, LED indicators and operation panel.

6.1 LED indicators

There are three LED indicators on the panel:

(1) “Run”, operation indicator, green;

(2) “Warn” recoverable fault indicator, yellow;

(3) “Fault”, unrecoverable fault indicator, red.

The inverter state includes 6 states of stand-by, self-inspection, power generation, recoverable fault and unrecoverable fault; LED indicators are on, off and blinking. Please refer to table 6-1 for detailed state of inverter and LED indicators state.

“◯”: LED indicator is off;

“◐” (green), “◐” (yellow), “◐” (red): LED indicator is blinking at every 0.25S or 0.5S;

“●(Green), “●” (yellow), “●” (red): LED indicator is on.

Table 6-1 Inverter state and LED indicators

Inverter state	LED indicators	Description
Stand-by	◯ Run ◯ Warn ◯ Fault	No power on. All indicators off.
Self-inspection	◐ Run ◯ Warn ◯ Fault	Green indicator blinks in every 0.25s, others off. Power on and ready for self-inspection
Power generation	● Run ◯ Warn ◯ Fault	Green indicator keeps on, others off. Grid-tied power generation.
	● Run ● Warn ◯ Fault	(1) Grid-tied power generation, but clock fault (A007); (2) Grid-tied power generation, but DC input fault (A001 or E001); (3) Grid-tied power generation，but fan fault(E006 or E012); Green and yellow indicator keeps on, others off.
Recoverable fault	◯ Run ◐ Warn ◯ Fault	Inverter stand-by. The public grid fault(A001, A003, A004, A005or A006); Yellow indicator blinks in every 0.5s, others off

Inverter state	LED indicators	Description
	○ Run ● Warn ○ Fault	(1) Inverter stand-by. Temperature abnormal(E006); (2) Inverter stand-by. DC input fault (E001); Yellow indicator keeps on, others off
Unrecoverable fault	○ Run ○ Warn ◐ Fault	Hardware or software fault (E003, E004, E005, E008, E009, E011, E013 or E015). De-couple the inverter from the system before maintenance. Red indicator blinks in every 0.5s, others off
	○ Run ○ Warn ● Fault	Current-leakage or unqualified output power energy of the inverter (E007, E010, E014, E017, E018 or E020). De-couple the inverter from the system before maintenance. Red indicator keeps on, others off
Artificial turned off	● Run ● Warn ● Fault	Stop after the communication or panel command. All indicators are on.
Note	Please refer to chapter 6 and 8 for detailed fault information and troubleshooting.	

6.2 Operation panel

There are 4 buttons on the panel:

(1) “ESC”, exit and return ;

(2) “∧”, back to the front page and data increasing;

(3) “∨”， to the next page and data decreasing;

(4) “ENT”, enter.

6.3 LCD screen

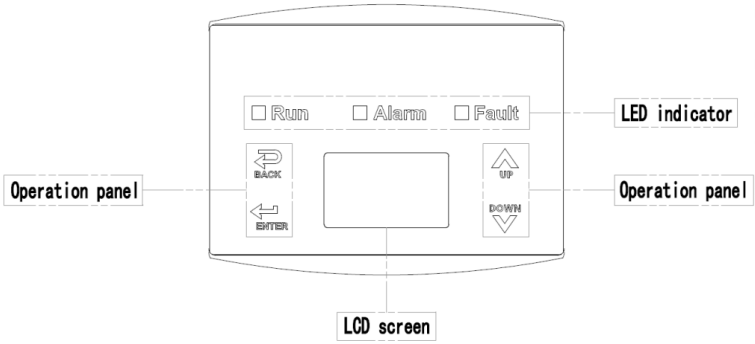


Figure 6.1 Operation panel

All information is displayed on the LCD screen. The background illumination of LCD screen will go out to save power if there is not button operation in 15 seconds. But it can be activated by pressing any button. Press “ENT” to enter into the main interface if the background illumination is on. All parameters can be viewed and set on the interface.

There are main interface and menu interfaces on the LCD screen, of which the main interface is the default one after power on, while the menu interfaces are used to watch and set parameters or other manual operation, such as viewing the monitoring parameters, history record, system information, statistics and fault information and setting the displayed language, time, communication address, password and factory defaults.

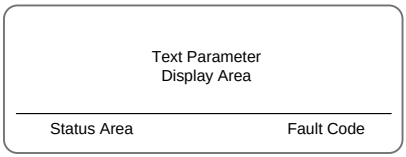


Figure 6.2 Main interface

The main interface of the LCD screen is shown as the Figure6.2:

(1) The curve displays the power changing at the current day;

(2) The words on the screen display the current key parameters of the inverter. Three lines of words are displayed at a time, but if the inverter is in operation or stand-by state, the words are rolling forward at every 3s. And the user can press “ ∧ ” or “ ∨ ” to look up the information freely;

(3) State display area displays current running state of the inverter, which can display "self-inspection", "grid-connected power generation", "alarm", "fault" and "OFF" state;

(4) Dynamic fault code and menu entrance. When the state display area displays "alarm" or "fault", the dynamic fault code area will display corresponding fault code (display up to 8 fault codes).

6.4 Functions operation

Most of the parameters can be viewed and set through the LCD screen and operation panel.

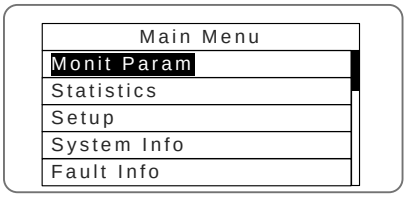


Figure 6.3 Main menu interface of LCD

6.4.1 Monitoring parameters

Press "∧" and "∨" in the main interface to select "Monit Param", and then press "ENT" to view the parameters which is shown in Figure 6.4. Go the front or next page through "∧" and "∨" and return through "ESC".

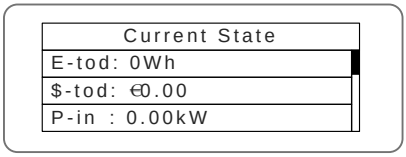


Figure 6.4 Monitoring parameters

6.4.2 History

Press "∧" and "∨" in the main interface to select "History", and then press "ENT" to view the parameters which is shown in Figure 6.5.

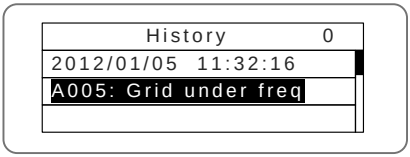


Figure 6.5 History parameters

"Historical record" can display 32 pieces of historical information, press "∧" or "∨" key to look through the historical information, press "ESC" to return. The number on the upper right corner of the first row is the number of historical record, the 2nd row (as shown in Fig 6.5) displays the date and time when fault occurred or restored, and the 3rd row displays detailed information of fault code. When the 3rd row displays in inverse color, it indicates fault occurred, otherwise it is fault restored.

6.4.3 Statistics

Press "∧" and "∨" in the main interface to select "Statistics", and then press "ENT" to view the parameters which is shown in figure 6.6.

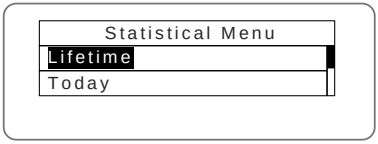


Figure 6.6 Statistic information

The information in table 6-2 can be viewed in the statistical menu.

Table 6-2Statistic information

Content	Detailed
Lifetime	Total operation time, total power produced, total power saved, total CO_2 reduction in lifetime
Day statistics	Total power produced, total power saved, peak power and total CO_2 reduction in current day

6.4.4 Parameter settings

Press "∧" and "∨" in the main interface to select "Setup Menu", and then press "ENT" to view the parameters which is shown in Figure 6.7.

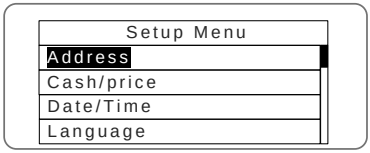
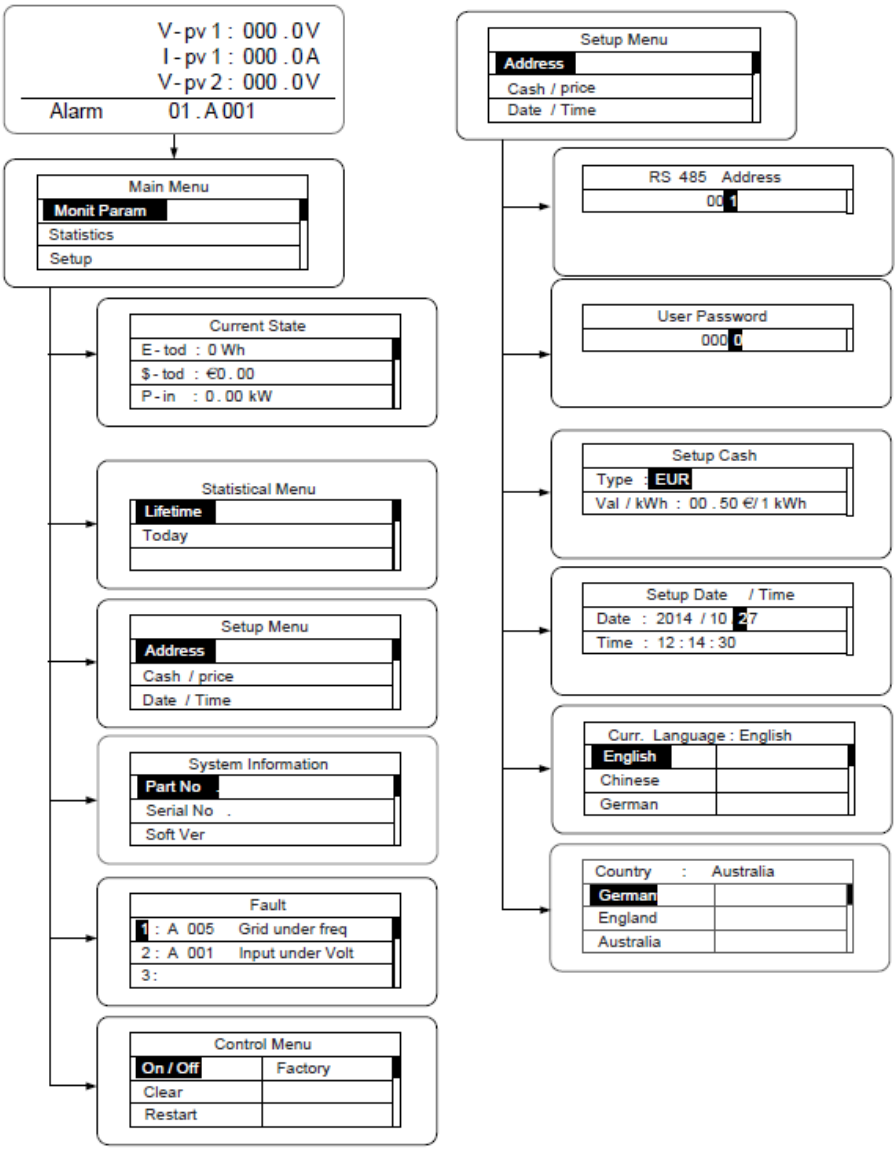


Figure 6.7 Setting information

Parameters can be set in this interface..

LCD menus:


V-pv 1 : 000 .0V
I-pv 1 : 000 .0A
V-pv 2 : 000 .0V
Alarm 01 .A 001
Main Menu
Monit Param
Statistics
Setup
Current State
E-tod : 0 Wh
$-tod : €0. 00
P-in : 0. 00 kW
Statistical Menu
Lifetime
Today
Setup Menu
Address
Cash / price
Date / Time
System Information
Part No .
Serial No .
Soft Ver
Fault
1 : A 005 Grid under freq
2 : A 001 Input under Volt
3 :
Control Menu
On / Off
Factory
Clear
Restart
Setup Menu
Address
Cash / price
Date / Time
RS 485 Address
001
User Password
000 0
Setup Cash
Type : EUR
Val / kWh : 00 .50 €/ 1 kWh
Setup Date / Time
Date : 2014 / 10 27
Time : 12 : 14 : 30
Curr. Language : English
English
Chinese
German
Country : Australia
German
England
Australia

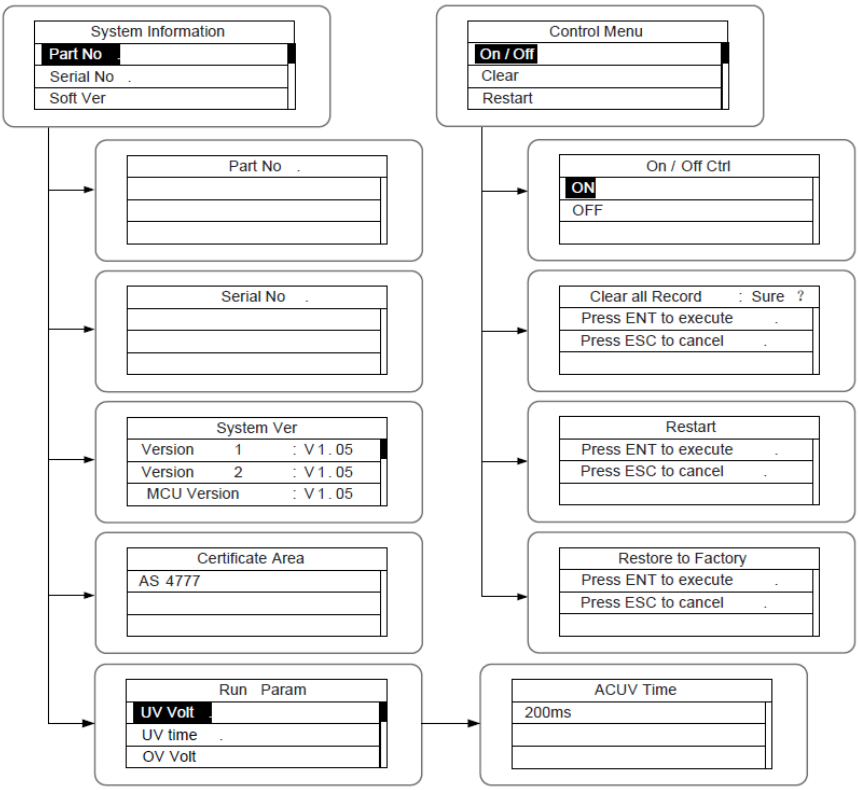
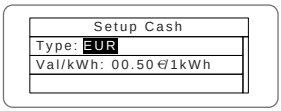
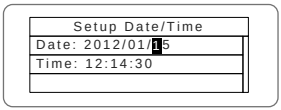
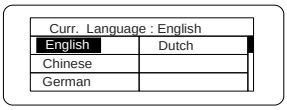
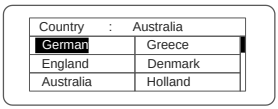
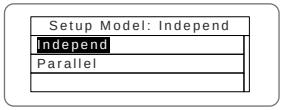
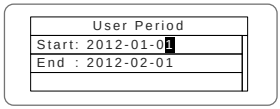
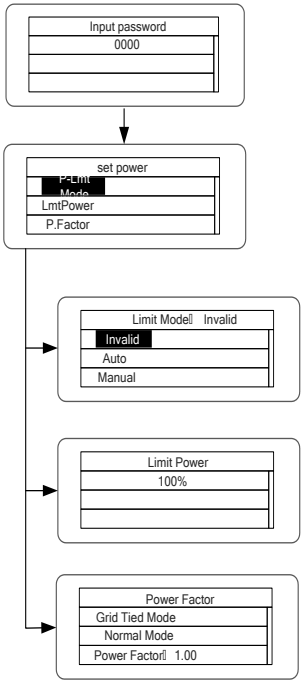
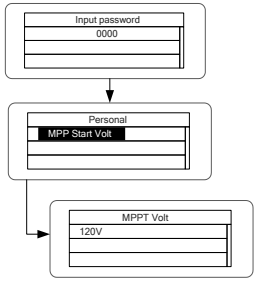


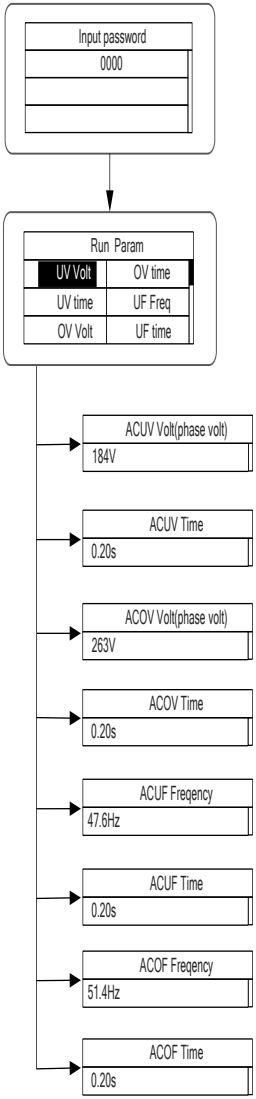
Table 6-3 Parameters setting

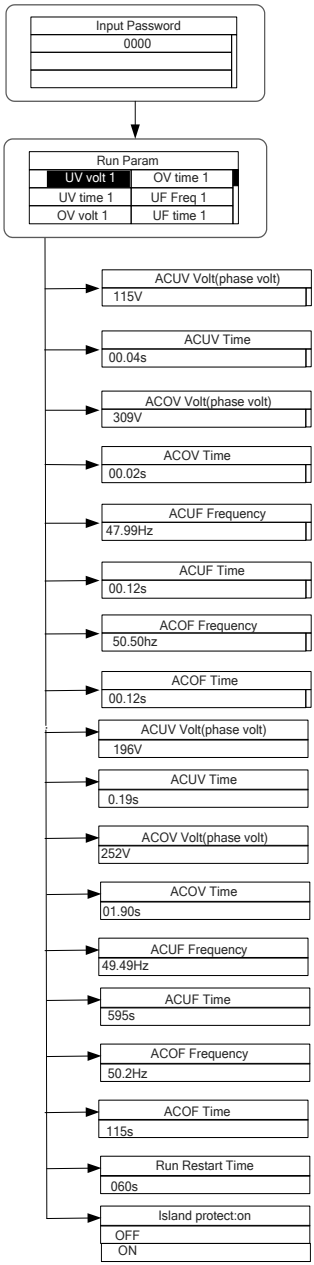
Setting item	LCD display	Instruction
RS485 Address	RS485 Address 001	Enter into the interface and edit the data through "∧" or "∨". And then press "ENT" again to the next bit. After editing the three bits, press "ENT" to save the edition and press "ESC" to exit.
User password	User Password 0000	Enter into the interface and edit the data through "∧" or "∨". And then press "ENT" again to the next bit. After

Setting item	LCD display	Instruction
		editing the four bits, press “ENT” to save the edition and press “ESC” to exit. The default password is“0000”; the user can enter into the setting interface without password. If the password is not “0000”, the user can enter into the setting interface with password.
Setup Cash		Enter into the interface and edit the currency type and cash through “∧” or “∨”. And then press “ENT” again to the next line. After editing the four bits, press “ENT” to save the edition and press “ESC” to exit. The currency types include EUR, POD, CNY and USD.
Setup Date/Time		Enter into the interface and edit the date and time through “∧” or “∨”. And then press “ENT” again to the next line. After editing the four bits, press “ENT” to save the edition and press “ESC” to exit.，
Language		Enter into the interface and edit the language through “∧” or “∨”. And then press “ENT” again to save the edition and press “ESC” to exit. The default language is English.
Select Country		Enter into the interface and select country through “∧” or “∨”. And then press “ENT” again to save the edition and press “ESC” to exit.

Setting item	LCD display	Instruction
Setup mode		The DC input mode includes “independent” and “parallel”: “independent mode” is the independent MPPT of Track A and Track B; “parallel mode” is the parallel MPPT of Track A and Track B. The default mode is “independent”. The input mode setting is invisible if the inverter is in power generation. It is only available during DC power on and AC power off. Press “∧” or “∨” to select the setting mode and press “ENT” to save the setting or “ESC” to return. If the situation of section 6.4.8 occurs, it is necessary to switch the DC input to “parallel” mode.
User period		Enter into the interface and edit the user period through “∧” or “∨”. And then press “ENT” again to the next bit. After editing, press “ENT” to save the edition and press “ESC” to exit. Of which, the setting time and date needs to be later than the system setting, and the start time needs to be earlier than the end time. The setting date and time is used for the statistical information.

Setting item	LCD display	Instruction
Set power		The password is needed when enter into the interface of “Set power”. Get the password from the supplier if necessary. There are 3 submenus: ① P-Lmt Mode: invalid (limited power function is invalid),auto ,manual (set the limit of output value manually); ② LmtPower: this function is only valid when the P-Lmt Mode is manual, the percentage is that of the rated power and the setting range is from 10% to 100%; ③Power factor: includes normal model (default value “1”), current advanced mode and current hysteresis mode and the setting rage is -0.9-0.99.
Personal		The password is needed when enter into the personal interface. Get the password from the supplier if necessary. It can set MPPT starting voltage from 120V to 160V under the submenu of MPPT start volt.

Setting item	LCD display	Instruction
Run Param		Password is required when enter into the interface of “Run Param”. Get the password from the supplier if necessary. Set ACUV Volt, ACUV time and others under the related submenus, and then press “ ∧ ” and “ ∨ ” to modify, and finally press “ENT” to confirm.

Setting item	LCD display	Instruction
Run Param		There are 2 protections under G83/G59(UK) and PEA(Thailand) standards, and there is only one protection under other grid tied standard. Set ACUV Volt, ACUV time and others under the related submenus, and then press “∧” and “∨” to modify, and finally press “ENT” to confirm. Generally, it is only necessary to set ACUV2, ACOV2 and ACUF2 value for ACUV, ACOV and ACUF protection. And it is necessary to set ACOF1 and ACOF2 together for ACOF protection.

6.4.5 System Information

Press "∧" and "∨" in the main interface to select "System Information", and then press "ENT" to view the parameters which is shown in Figure 6.8.

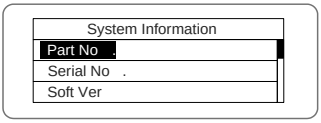


Figure 6.8 System information

The system information include "product model", "serial No.", "software version" and "certificate version". If select "Software Version" in the "System Version", can view the inverter Version 1, Version2, MCU Software Version, RS485 protocol and other information, as shown in Figure 6.9.

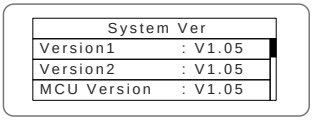


Figure 6.9 System version

6.4.6 Current faults

Press "∧" and "∨" in the main interface to review the fault history, and then press "ENT" to view the sub-menu which is shown in Figure 6.10.

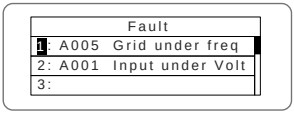


Figure 6.10 Fault information

User can press "∧" or "∨" key in the "fault information" interface to view the fault records. "Fault information" records the latest 8 pieces of fault information of the inverter, as shown in fig 6.10. When there is no fault currently, it will display "No fault!". See chapter 6.4.2 for more information on fault records or fault time.

6.4.7 Inverter control

Press "∧" and "∨" in the control interface, and then press "ENT" to view the sub-menu which is shown in Figure 6.11.

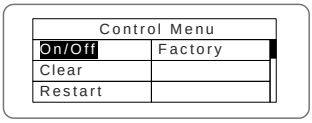
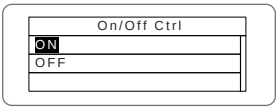
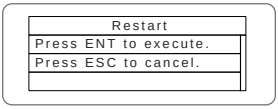
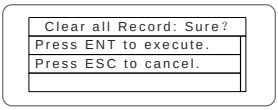
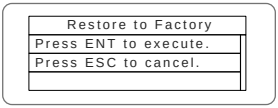


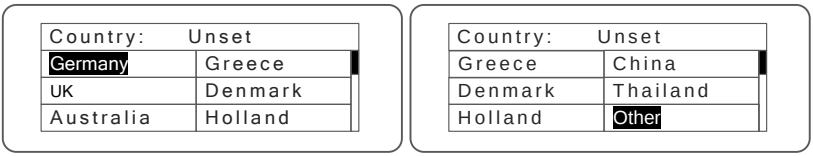
Figure 6.11 Control menu

Table 6-4 Inverter control

Control item	LCD display	Instruction
On/Off control		Control the “On/Off” through the panel. Press “∧” and “∨” in the control interface to select the operation. Press “ENT” to ensure the operation and press “ESC” to return.
Restart		Restart the inverter through the panel. And save the all settings and operation record. Press “ENT” to ensure restarting and the inverter will begin to self-inspect or press “ESC” to return.
Record clear		Press “ENT” to ensure clear all records or press “ESC” to return. “Record clear” is to clear all setting parameters through the panel, restore to the factory setting and save all history operation records.
Restore to factory		“Restore to factory” is to clear all setting parameters and history operation records through the panel, restore to the factory setting. Press “ENT” to ensure clear or press “ESC” to return.

6.5 Grid certification choice

Power on the inverter by DC input for the first time or after restore factory settings, the LCD screen will appear a list of countries, requiring the user to choose what country of use. As shown below:



Press the "∧" or "∨" button to select the country (refer to the below table), press the ENT button to complete the setting.

After finish the country setting, please follow the user manual required with the proper use of inverter.

Comparison Table: Available countries and their grid certification

No.	Country	Certification	Remark
1	Germany	VDE0126& AR-N4105	
2	UK	G83/G59	
3	Australia	AS4777	
4	Greece	VDE0126	
5	Denmark	TF3.2.1	
6	Holland	C10/C11	
7	China	CQC	
8	Thailand	PEA	
9	Other	VDE0126	

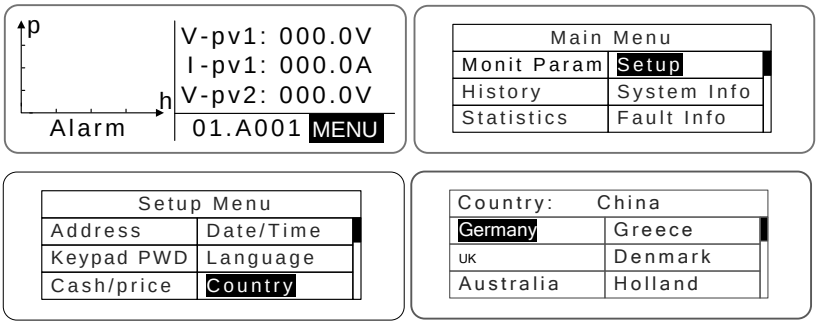
Reference Table: Grid certification and grid voltage and frequency of some countries

No.	Country	Certification	Three-phase voltage	Grid frequency
1	Germany	VDE0126& AR-N4105	380~400V	50Hz
2	France			
3	Greece			
4	Turkey			
5	Romania			
6	Slovakia			
7	Portugal			
8	Poland			
9	Hungary			
10	Switzerland			
11	Austria			
12	UK	G83-2/G59-3	415V	50Hz
13	Australia	AS4777.2&AS4777.3 AS/NZS3100	400~415V	50Hz
14	Singapore			

No.	Country	Certification	Three-phase voltage	Grid frequency
15	New Zealand			
16	Belgium	C10/C11	380~400V	50Hz
17	Luxembourg			
18	Holland			
19	Denmark	TF3.2.1	380~400V	50Hz
20	Thailand	PEA	380V	50Hz
21	China	CGC/CF001	380V	50Hz
22	Italy	ENEL	400V	50Hz

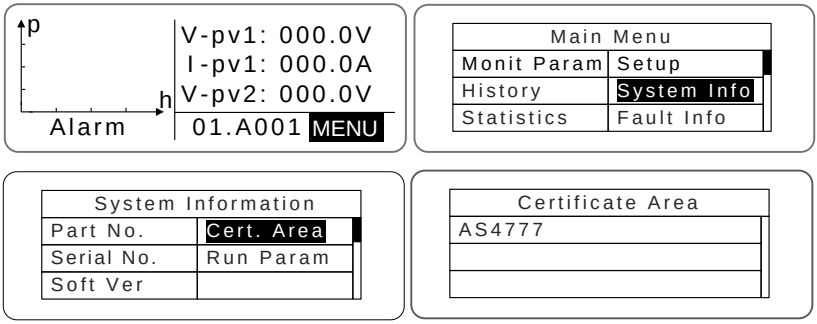
The user can change the country setting through the following ways:

LCD screen：MENU→Main Menu: Setup→Setup Menu: Country→Country:



The user can query the grid certification which has been set through the following ways:

LCD Screen：MENU→Main Menu: System Info→System Information: Cert. Area→Certificate Area



7 Monitoring communication

This chapter describes the communication connection of inverter and monitoring system (Industrial master, private computers, smart phones and so on).

7.1 Standard communication

The standard communication mode of iMars grid-tied solar inverter is RS485 which includes “RS485-M” and “RS485-S” ports. The RS485-M ports can communicate with private computers, smart phones and so on. The system monitoring solution is shown as Figure 7.1.

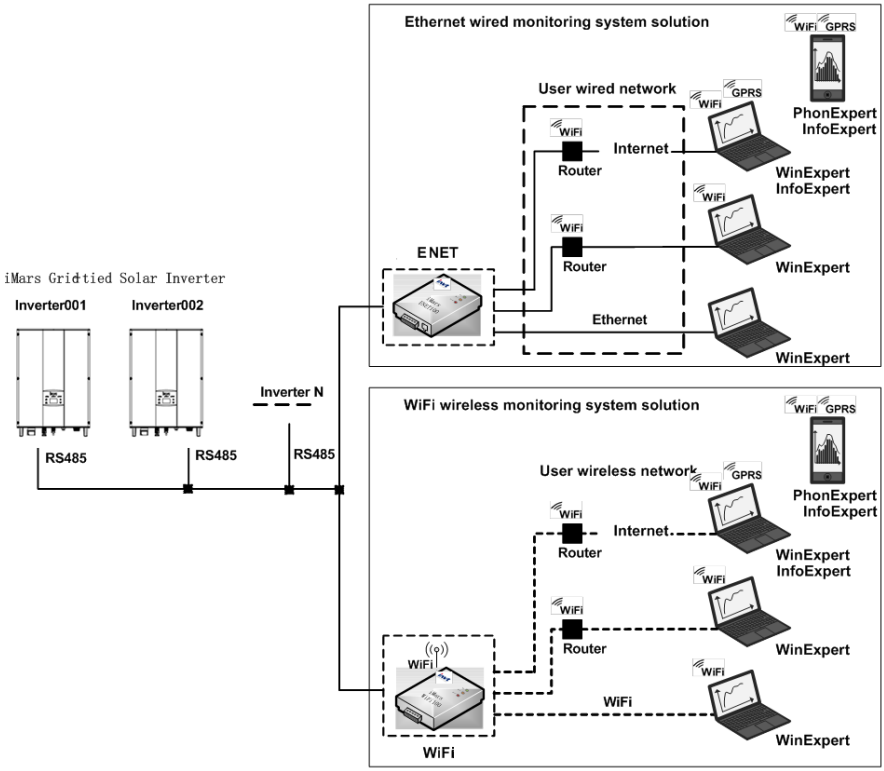


Figure 7.1 Monitoring system of inverter

Table 7-1 Pins on inverter instruction

Pin on inverter	Definition
1(Red)	+5VDC
2(Orange)	A (RS485+)
3(Brown)	B (RS485-)
4(Black)	GND

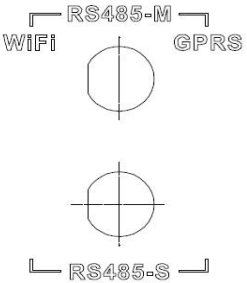


Figure 7.2 RS485 pin on inverter

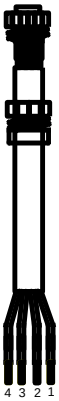


Figure 7.3 Communication connector

Connection steps:

(1) Connect the communication connector configured for the inverter to the RS485 terminal of the inverter, as shown in Fig 7.4;

(2) According to Table 7-1, connect the communication connector pinout and the user's device, make sure the connection is correct.

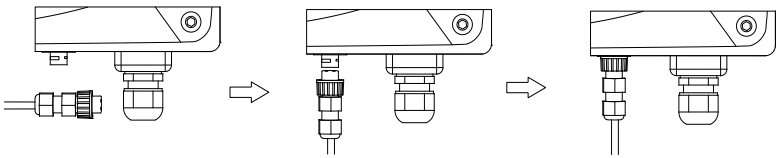


Figure 7.4 Communication cable connection

(3) Please download the monitoring software “iMars WinExpert” and its operation instruction from our website.

7.2 Optional communication

The optional communication modes include Ethernet and WIFI, which also need corresponding communication parts and components as shown in Table7-2. All operation parameters of the inverter are output from port “RS485-M” to the communication devices, finally transmitted to the monitoring system as standard Ethernet and WIFI signal. See Figure 7.1.

Table 7-2 Optional communication accessories

Optional accessories	Inverter port	Port of upper PC
Ethernet convert	RS485-M	RJ45 pin
WiFi converter	RS485-M	WiFi signal
GPRS converter	RS485-M	GPRS signal
ENET converter	RS485-M	Ethernet port

Please download the connection instruction, operation manual and commissioning tools on website.

Note: the optional accessories are not standard-configured, need to buy separately.

8 Troubleshooting

This chapter describes the fault alarm and fault code for quick troubleshooting.

Table 8-1 Fault code

Fault code	Message	Instruction	Fault analysis
A			
A001	Input UV	Input undervoltage	PV1 undervoltage PV2 undervoltage
A002	Bus UV	Bus undervoltage	DC input
A003	Grid UV	AC undervoltage	Low voltage of the public grid
A004	Grid OV	AC overvoltage	High voltage of the public grid
A005	Grid UF	AC underfrequency	Low frequency of the public grid
A006	Grid OF	AC overfrequency	High frequency of the public grid
A007	Clock Fail	Clock alarm	Wrong setting
A009	Cmd Shut	Manual stutdown	Stop by the operation panel or upper PC
A011	Grid Loss	The public grid disconnects.	Check if inverter AC connection is well
E			
E001	Input OV	Input overvoltage	DC input overvoltage
E003	Bus OV	Bus overvoltage	Internal bus voltage
E004	Boost Fail	Voltage-boost fault	Voltage-boost fault of the inverter
E005	Grid OC	AC overcurrent	Internal AC overcurrent
E006	OTP	Overtemperature	Internal overtemperature
E007	Riso Low	Low isolation impedance	Low isolation impedance of the external port system
E008	IGBT drv	IGBT drive protection	IGBT drive protection of the inverter
E009	Int Comm	Internal communication fault	Master-slave DSP communication disabled Error of master-slave DSP check bit
E010	ILeek Fail	Huge leakage current	Huge leakage current of the system or inverter
E011	Relay Fault	Relay fault	Internal relay fault
E012	Fan Fail	Fan fault	Internal fan fault
E013	Eeprom	Memory error	Internal memory error
E014	Dc inject	High DC injection	High DC injection during AC output
E015	OutputShort	Output short-circuit	Output short-circuit
E018	Input OC	Input overcurrent	DC input overcurrent
E019	Incnst	Data consistency fault	Inconsistent grid voltage, frequency, leakage current or AC/DC injection
E020	PowerReversed	DC power reversed	DC power reversed

If any problem, please contact with the supplier and provide following information:

- Model of the inverter:_____;
- Serial No. of the inverter:_____;
- System version:——version 1: _____;
  ——version 2: _____;
  ——MCU software version: _____;
- Fault code:_____;
- Fault description_____

9 Contact us

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INVT solar website:: www.invt-solar.com

10 Technical parameters

Table 10-1 Technical parameters of three phase grid-tied solar inverter

Model		Three-phase						
		BG4KTR	BG4KTR-S	BG5KTR	BG5KTR-S	BG6KTR	BG8KTR	BG10KTR
Input (DC)	Max. DC voltage (V)	900	900	900	900	1000	1000	1000
	Starting voltage (V)	200	200	200	200	200	200	200
	MPPT voltage range(V)	200-800	200-800	200-800	200-800	180-800	180-800	180-800
	Rated DC input voltage range(V)	220-800	360-800	260-800	430-800	300-800	300-800	320-800
	Number of MPPT /string per MPPT	2/1	1/1	2/1	1/1	2/1		
	Max. DC input power (W)	4200	4200	5200	5200	6300	8400	10400
	Max. DC current (A) X Number of MPPT	10x2	12	10×2	12	11x2	14x2	19x2
	Isc PV（A）	11x2	13	11×2	13	12.5x2	15.5 x2	21 x2
	Maximum backflow current (inverter backflow to PV array)	0	0	0	0	0	0	0
	DC switch	Optional						
Output (AC)	Rated output power(W)	4000	4000	5000	5000	6000	8000	10000
	Voltage(V)/ frequency(Hz) range	320~460Vac, 50Hz(47~51.5Hz) / 60Hz(57~61.5Hz)						
	Maximum output current(A)	6.4		8		9.6	12.8	16.1
	Maximum output fault current	265A @ 34ms						
	AC inrush current	Less than 10 A						
	Maximum output overcurrent protection(A)	12.7		15.8		19	25.3	31.8
	Power factor	-0.80~+0.80(Adjustable)						
	Harmonic distortion	< 3% (rated power）						
System	Cooling method	Natural cooling					Air cooling	
	Maximum efficiency	97.20%	97.30%	97.30%	97.4%	97.50%	97.60%	98.20%
	European efficiency	97.00%	97.00%	97.00%	97.00%	97.00%	97.00%	97.60%
	MPPT efficiency	99.9%						
	Protection degree	IP65						
	Power consumption at night	< 1W						
	Isolation mode	Transformerless						
	Safety class	I						
	Overvoltage protection class	AC:III,PV:II						
	Inverter topology	Non-isolated						
	Pollution degree	3						
	Operation temperature	(-25℃~+60℃), (Derate after 45℃）						
	Relative humidity	4~100%, Condensation						
	Max. altitude(m)	≤2000， (Derate if the altitude＞2000)						
	Display	LED/ LCD, backlit display						
	System language	English, Chinese, German, Dutch						
	Communication	RS485 (standard),Ethernet, WiFi (optional)						
	DC terminal	BC03A / BC03B						
	Noise dB(A)	≤30					<50	
	Installation mode	Wall installation						
Others	Grid standard	DIN VDE 0126-1-1：2013，VDE-AR-N 4105：2011，DIN VDE V 0124-100：2012，IEC 61727（IEC62116），AS/NZS 4777.2：2015，NB/T32004-2013，IEC 60068-2-1：2007，IEC 60068-2-2：2007，IEC 60068-2-14：2009，IEC 60068-2-30：2005，IEC 61683：1999，C10/11：2012						
	Safe certificate / EMC category	IEC 62109-1 ： 2010，IEC 62109-2 ： 2011，EN 61000-6-2: 2005 / EN 61000-6-3:2007/A1:2011						
Protection	Input overvoltage protection, input overcurrent protection, DC isolation monitoring, DC monitoring, grounding fault current monitoring, grid monitoring, island protection, short circuit protection, overheating protection etc.							