



Operation **Manual**

iMars MG Series **Grid-tied Solar Inverter**



SHENZHEN INVT ELECTRIC CO., LTD.

Preface

Thank you for purchasing iMars series grid-tied solar inverters.

iMars series grid-tied solar inverters is mainly used in solar photovoltaic grid system. As a non-isolation and high-efficiency string photovoltaic grid-tied inverter, it transfers DC energy generated by solar modules to sinusoidal AC energy and feedback to public grid. The energy has the same frequency and phase with the utility grid.

The manual is intended to provide detailed information of installation, application, trouble shooting, precautions and maintenance of iMars series grid-tied solar inverters. 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.

Configured monitoring and design software for iMars series grid-tied solar inverters are also provided. Download the software installation package and use instructions.

The inverter complies with local regulations and laws on grid feeding.

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.

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1 Safety precautions

This chapter describes various warning symbols in the operation manual of iMars series inverters. It is intended to provide the installers and the users with all safety information about installation, operation, and use of the inverter.

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	Physical hurt may occur if not follow the relative requirements	Note

1.2 Safety guidelines

	<ul style="list-style-type: none"> ● 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. ● Only qualified electricians are allowed to operate on the inverter. ● Do not carry out any wiring and inspection or changing components when the power supply is applied. Hazardous voltages may still be present in the inverter even if the AC and DC main switches are switched off. Wait at least 5 minutes after switching off the inverter. This ensures that the capacitors are electrically discharged.
	<ul style="list-style-type: none"> ● This product can cause a d c current in the external protective earth conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is strongly recommend to used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product;

	<ul style="list-style-type: none"> ● Ensure that there is no electromagnetic interference from other electrical and electronic equipments 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.
	<ul style="list-style-type: none"> ● 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.
	<ul style="list-style-type: none"> ● Do not open the cover of inverters unauthorizedly. The electrical parts and components inside the inverter are electrostatic. Take measurements to avoid electrostatic discharge during relevant operation.

1.2.1 Delivery and installation

	<ul style="list-style-type: none"> ● 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. ● Remove the metal jewelry such as ring and bracelet before installation and electrical connection to avoid electric shock. ● Do cover solar modules with light-tight materials. Exposed to sunlight, solar modules will output dangerous voltage. ● The inverter input voltage does 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.
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| | <ul style="list-style-type: none"> ● When the photovoltaic generator cells are exposed to light (even if it is dim), the generator supplies DC voltage to the inverter. |
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Note: iMars series grid-tied solar inverters are only for crystalline silicon solar modules.

1.2.2 Grid-tied operation



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|--|---|
| | <ul style="list-style-type: none"> ● Only qualified electricians are allowed to operate the inverter under the permission of local power departments. ● 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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1.2.3 Maintenance and inspection



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|--|--|
| | <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. ● Firstly disconnect all power supplies of the grid to the inverter before any maintenance, and then disconnect the breakers and wait for at least 5 minutes until the inverter is discharged before maintenance. ● 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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1.2.4 What to do after scrapping



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| | <ul style="list-style-type: none"> ● Deal with the inverter as industrial effluent. |
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2 Product overview

This chapter mainly describes the appearance, packaging accessories, name plate, technical parameters and other information of iMars series grid-tied solar inverters.

2.1 Solar grid-tied power generation system

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

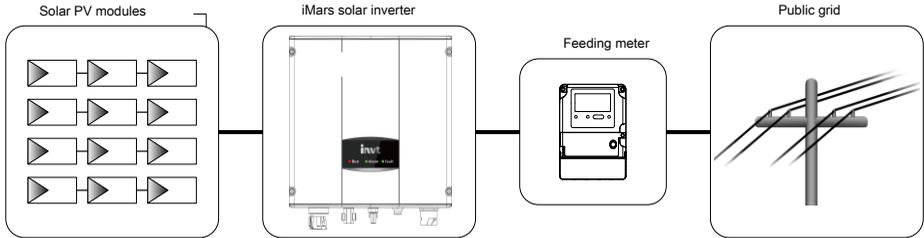


Figure 2.1 Application of iMars series grid-tied solar inverters

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. Do not connect any AC loads between the inverter and breakers which is shown as the figure below:

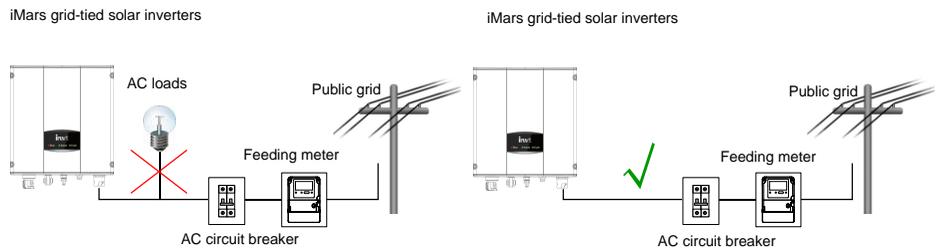


Figure 2.2 Connection of inverters and AC breakers

	<ul style="list-style-type: none"> ● The recommended solar modules need to comply with IEC61730 Class A rating. ● iMars series grid-tied solar inverters are only for crystalline silicon solar modules.
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2.2 Products appearance

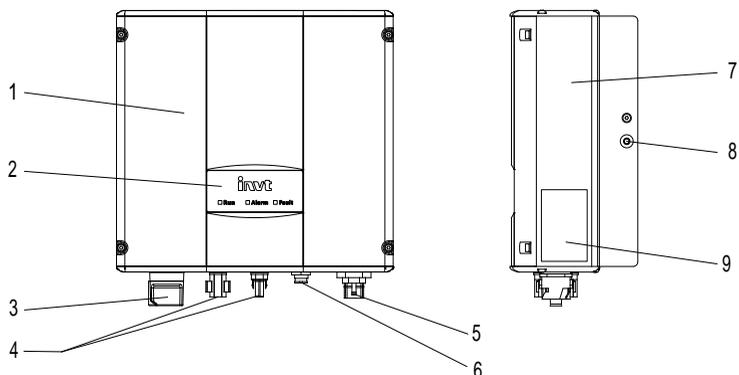


Figure 2.3 Products appearance

Table 2-1 Parts instruction

No.	Name	Instruction
1	Cover	
2	Operational panel	LED indicators
3	DC switch	On –off of the DC input
4	DC input port	For the connection of solar modules
5	AC terminal	For the connection of AC output
6	Communication port	RS485 and EXT communication port
7	Cooling chamber	
8	Radiator	
9	Name plate	For rated parameters and safety precautions of the inverter

2.3 Products modules

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

Product name	Model	Rated output power
Single-phase (L, N, PE)		
Single-phase grid-tied solar inverter	iMars MG750TL	750
Single-phase grid-tied solar inverter	iMars MG1KTL	1000

Product name	Model	Rated output power
Single-phase grid-tied solar inverter	iMars MG1K5TL	1500
Single-phase grid-tied solar inverter	iMars MG2KTL	2000
Single-phase grid-tied solar inverter	iMars MG3KTL	3000
Single-phase grid-tied solar inverter	iMars MG4KTL	3680
Single-phase grid-tied solar inverter	iMars MG4K6TL	4200
Single-phase grid-tied solar inverter	iMars MG5KTL	4600
Single-phase grid-tied solar inverter	iMars MG3KTL-2M	3000
Single-phase grid-tied solar inverter	iMars MG4KTL-2M	3680
Single-phase grid-tied solar inverter	iMars MG4K6TL-2M	4200
Single-phase grid-tied solar inverter	iMars MG5KTL-2M	4600
Three-phase (3L, N, PE)		
Three-phase grid-tied solar inverter	iMars BG4KTR-2M	4000
Three-phase grid-tied solar inverter	iMars BG5KTR-2M	5000
Three-phase grid-tied solar inverter	iMars BG6KTR-2M	6000

Note: Refer to the product specifications in section 2.3 for detailed information.

2.4 Technical parameters

Table 2-3 Technical parameters

Model		Single phase											Three phase				
		MG750TL	MG1KTL	MG1K5TL	MG2KTL	MG3KTL	MG4KTL	MG4K6TL	MG5KTL	MG3KTL-2M	MG4KTL-2M	MG4K6TL-2M	MG5KTL-2M	BG4KTR-2M	BG5KTR-2M	BG6KTR-2M	
DC	Max. DC voltage (V)	400	450	450	450	500	600	600	600	600	600	600	600	600	900	900	900
	Starting voltage (V)	60	80	80	120	120	120	120	120	120	120	120	120	120	220	220	220
	MPPT voltage(V)	60-400	60-400	80-410	100-410	120-450	120-500	120-500	120-500	120-500	120-500	120-500	120-500	120-500	200-800	200-800	200-800
	Operation voltage (V)	100-320	121-360	165-360	180-360	210-400	240-500	240-500	250-500	180-500	200-500	220-500	250-500	210-800	260-800	300-800	
	MPPT/strings per MPPT	1/1	1/1	1/1	1/1	1/2	1/2	1/2	1/2	2/1	2/1	2/1	2/1	2/2	2/2	2/2	
	Max. DC power (W)	900	1200	1700	2200	3300	4000	4600	5000	3200	4000	4600	5000	4200	5200	6300	
	Max. input current (A)	9x1	9x1	10x1	12×1	15×1	18×1	18×1	20×1	9×2	10×2	11×2	12×2	10×2	10×2	10×2	
DC switch	Optional			Optional			Optional			Optional			Optional				
AC	Rated output power	750	1000	1500	2000	3000	3680	4200	4600	3000	3680	4200	4600	4000	5000	6000	
	Voltage(V)/frequency(Hz)	180-270Vac, 50Hz(47-51.5Hz) / 60Hz(57-61.5Hz)											320-460Vac, 50Hz(47-51.5Hz) / 60Hz(57-61.5Hz)				
	Max. AC current (A)	VDE0126& AR-N4105, AS4777.2/AS4777.3, QC, G83-2, G59-3, C10/11, TF3.2.1, PEA															
	Power factor	3.6	4.5	6.5	9	13	16	18.3	20	14	16 ³	18.3	20	10	10	10	
	Harmonic distortion	-0.9~+0.9 (adjustable) < 3% (rated power)															
System	Cooling	Natural cooling					Natural cooling					Natural cooling					
	Maximum efficiency	96.90%	97.20%	97.30%	97.40%	97.60%	97.60%	97.40%	97.50%	97.60%	97.30%	97.40%	97.40%	98.10%	98.10%	98.20%	
	European efficiency	96.00%	96.10%	96.30%	96.50%	96.50%	96.50%	96.50%	96.50%	96.50%	96.40%	96.50%	96.50%	97.50%	97.60%	97.70%	
	MPPT efficiency	99.9%															
	Protection degree	IP65															
	Power consumption	< 1W															
	Isolation mode	Transformerless															
	Operation temperature	(-25℃~+60℃) . derate after 45℃															
	Relative humidity	0-95%, no Condensation															
	Max. altitude(m)	<2000 (derate if the altitude > 2000)															
	Displaying	LED/ LCD, backlight display											LCD, backlight display				
	System language	English, Chinese, German, Dutch															
	Communication	RS485 (standard); handheld keypad; WiFi (optional)															
	DC terminal	SUNCLIX water-proof terminal															
	Noise dB(A)	≤25															
Installation mode	Wall installation																
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																
Remarks	(1) G83: the maximum output current is 16A; others: the maximum output current is 18A.																

2.5 Dimensions and weight

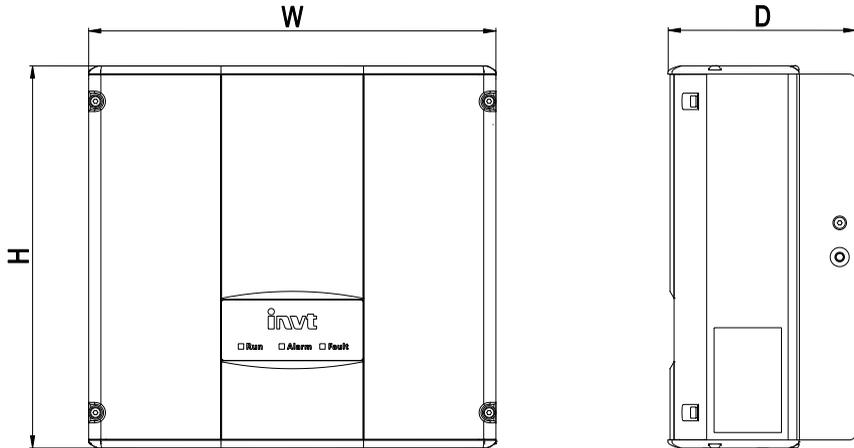


Figure 2.6 Inverter dimensions

Table 2-4 Inverter dimension and net weight

Model	H (mm)	W (mm)	D (mm)	Net weight (kg)
MG750TL/MG1KTL / MG1K5TL / MG2KTL /MG3KTL	280	300	138	9.5
MG4KTL /MG5KTL	365	360	150	15
MG3KTL-2M/ MG4K6TL/ MG4KTL-2M/MG4K6TL-2M/ MG5KTL-2M	420	360	150	17
BG4KTR-2M/BG5KTR-2M/ BG6KTR-2M	530	360	150	22

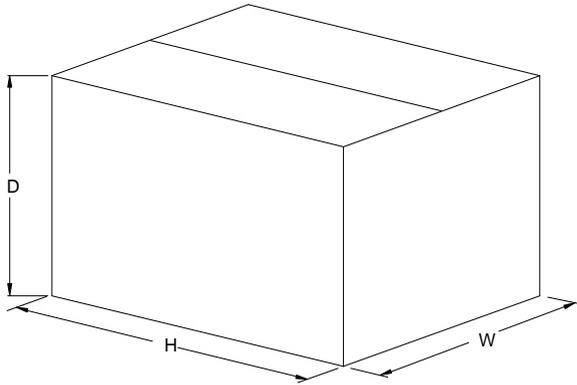


Figure 2.7 Paper packages dimension

Table 2-5 Packages dimension and gross weight

Model	H (mm)	W (mm)	D (mm)	Gross weight (kg)	Packaging Material
MG750TL/MG1KTL/MG1K5TL / MG2KTL/MG3KTL	411	418	251	11	Paper
MG4KTL/MG4K6TL	518	480	284	17	Paper
MG3KTL-2M/ MG4K6TL/ MG4KTL-2M/MG4K6TL-2M/ MG5KTL-2M	573	480	284	19	Paper
BG4KTR-2M/BG5KTR-2M/ BG6KTR-2M	650	480	284	23	Paper

3 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.

3.1 Unpacking inspection

Inspect the information of the order and the name plate to ensure the product are the ordered one and no damage to the package. If any problem, contact the supplier as soon as possible.

Put the inverter into the package if not used and protect it from humidity and dust.

Check as following after unpacking:

- (1) Ensure no damage to the inverter unit;
- (2) Ensure the operation manual, port and installation accessories in the package;
- (3) Ensure no damage or loss to the items in the package;
- (4) Ensure the information of the order are the same as that of the name plate;
- (5) The delivery list of single-phase inverter is different from that of three-phase inverter.

Below are the detailed lists:

Packing list:

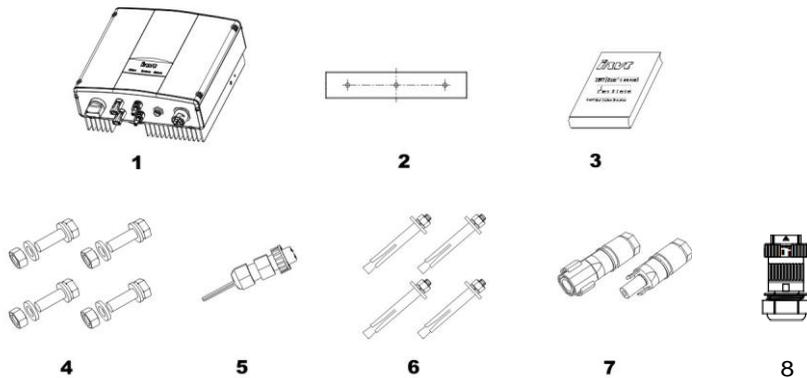


Figure 3.1 Packing list

Table 3-1 Detailed delivery list of single-phase inverter

No.	Name	Quantity
1	MG750TL/MG1KTL/MG1K5TL / MG2KTL/MG3KTL/ MG4KTL/MG4K6TL/MG5KTL/ MG3KTL-2M/MG4KTL-2M/ MG4K6TL-2M/MG5KTL-2M BG4KTR-2M/BG5KTR-2M/ BG6KTR-2M inverter	1

No.	Name	Quantity
2	Installation bracket	1
3	operation manual	1
4	Hexagon assembling bolt M5*20	2
5	Communication connector	1
6	Expansion bolts M6*60	MG750TL/MG1KTL/MG1K5TL / MG2KTL/MG3KTL:3 MG4KTL/MG4K6TL/MG5KTL/ MG3KTL-2M/MG4KTL-2M/ MG4K6TL-2M/MG5KTL-2M:4 BG4KTR-2M/BG5KTR-2M/ BG6KTR-2M: 4
7	DC connector	MG750TL/MG1KTL/MG1K5TL / MG2KTL:1 pair MG3KTL/MG4KTL/MG4K6TL/MG5KTL /MG3KTL-2M/MG4KTL-2M/ MG4K6TL-2M/MG5KTL-2M:2 pairs BG4KTR-2M/BG5KTR-2M/ BG6KTR-2M: 2 pairs
8	AC connector	1

3.2 Before installation

3.2.1 Installation tools

Table 3-2 Tools list

No.	Installation tools	Instruction
1	Marking pen	Mark the installation hole
2	Electrodrill	Drill in the bracket or wall
3	Hammer	Hammer on the expansion bolts
4	Monkey wrench	Fix the installation bracket
5	Allen driver	Fasten the screws, remove and install AC wiring box
6	Straight screwdriver	For AC wiring
7	Megger	Measuring insulation performance and impedance
8	Multimeter	Check the circuit and AC and DC voltage
9	Electric iron	Weld communications cable

3.2.2 Installation place

Select installation place based on the following considerations:

- (1) Height from ground level should be enough to ensure that display and status LEDs are easy to read.
- (2) Select a well ventilated place sheltered from direct sun radiation and rain.
- (3) Allow sufficient space around the inverter to enable easy installation and removal from the mounting surface. Refer to Figure 3.2.
- (4) The environment temperature is between -25°C ~ 60°C .
- (5) The installation position keeps away from the interface of other electrical devise.
- (6) The inverter needs to be installed on a firm and sturdy surface, such as wall and metal bracket and so on.
- (7) The installation surface should be perpendicular to the horizontal line. Refer to Figure 3.3.

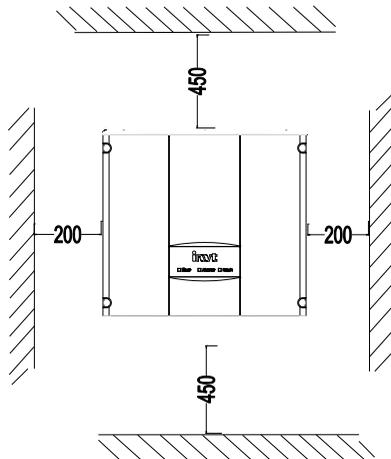


Figure 3.2 Installation space

Ensure there is sufficient space for heat-releasing. In generally, below space requirement should be met:

Table 3-3 Detailed installation space

	Minimum clearance
Lateral	200mm
Top	450mm
Bottom	450mm

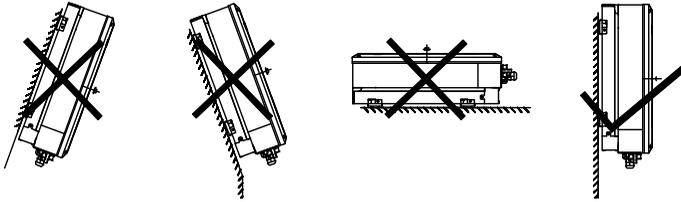


Figure 3.3 Installation position



- Do not remove any part and component of the inverter unintended; otherwise damage to the device and physical injury may occur.

3.2.3 Connection cables

The user can select connection cable according the table below:

Table 3-4 Cable specifications

Model	DC side		AC side	
	Cross-section (length ≤50m) mm ²	Cross-section (length >50m) mm ²	Mini cross-section mm ²	
			L	N/PE
MG750TL/MG1K1TL / MG1K5TL / MG2KTL /MG3KTL/ BG4KTR-2M/BG5KTR-2M/ BG6KTR-2M	4	4	4	
MG4KTL/MG4K6TL/ MG5KTL/MG3KTL-2M /MG4KTL-2M/MG4K6TL -2M/MG5KTL-2M	4	4	6	

3.2.4 Miniature circuit breakers

It is recommended strongly to install circuit breakers or fuses at the DC input and AC output to ensure safe installation and running.



- In order to protect the PCE, user and installer, external DC and AC circuit breaker shall be equipped at the end-use application;
- The wiring shall be according local electric code. Choose proper cable for power input and output lines. Input and output cable shall be PV private cables suitable for outdoor use.

Table 3-5 Breakers specifications

Model	DC input	AC output
	Recommended DC breakers (optional for length >100m)	Recommended AC breakers
MG750TL/MG1KTL/ MG1K5TL	DC500V, C10A, 2P	AC240V, C10A, 2P
MG2KTL	DC500V, C16A, 2P	AC240V, C16A, 2P
MG3KTL/ MG3KTL-2M	DC500V, C16A, 2P	AC240V, C20A, 2P
MG4KTL/ MG4KTL-2M	DC600V, C16A, 2P	AC240V, C25A, 2P
MG5KTL/ MG4K6TL /MG4K6TL-2M/MG5KTL-2M	DC600V, C16A, 2P	AC240V, C32A, 2P
BG4KTR-2M/BG5KTR-2M/ BG6KTR-2M	DC1000V, C16A,2P	AC380V, C16A, 4P

3.3 Mechanical installation

Since the installation place can be made by different construction materials, the inverter can be installed by different mounting methods. Take the typical installation environment as the example, the manual describes how to install the inverter on concrete wall. And because of different structure, the single-phase and three-phase inverter has different installation modes.

The inverter should be mounted in a vertical position of 90° to the horizontal line as shown in figure 3.3.

3.3.1 Installation of single-phase inverter

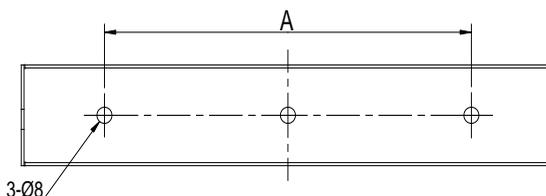


Figure 3.4 Installation bracket of 0.75~3kW inverter

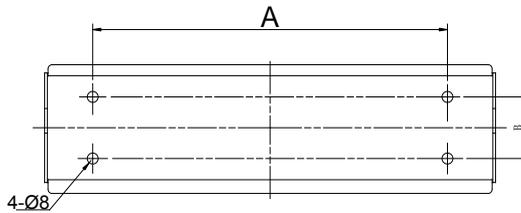


Figure 3.5 Installation bracket of 4~6kW inverter

Table 3-6 Size of installation bracket

Model	Installation hole
	A(mm)*B(mm)
MG750TL/MG1K1TL / MG1K5TL /MG2KTL /MG3KTL	195
MG4KTL/MG4K6TL/MG5KTL/MG3KTL-2M/ MG4KTL-2M/MG4K6TL	260*45
BG4KTR-2M/BG5KTR-2M/ BG6KTR-2M	260*45

Table 3-7 Instruction of installation bracket

No.	Structure instruction
1	Installation hole $\Phi 8$
2	Hexagon assembling bolt hole M5

Installation steps:

- (1) At first, take down the installation bracket from the machine by only removing M5 hex socket cap screws;
- (2) Then use expansion bolts to fix the installation bracket at the proper location of the walls;
- (3) Lift the inverter to suspend it on the installation bracket through M8 hex socket cap screws;
- (4) Finally, fasten M5 hex socket cap screws connecting the inverter with the bracket. For firm installation, the operators cannot release the device until the inverter is installed on the bracket firmly.

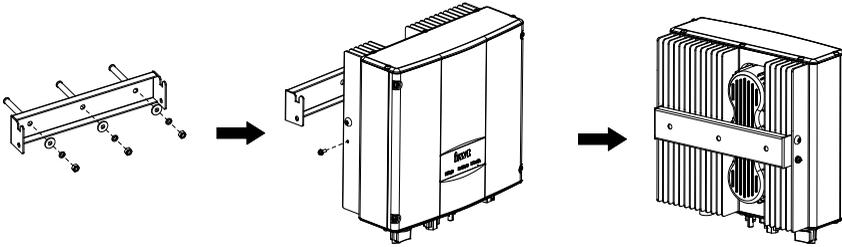


Figure 3.6 Installation inverter

3.4 Electrical installation

This section proposes to describe detailed electrical installation and related safety instructions.

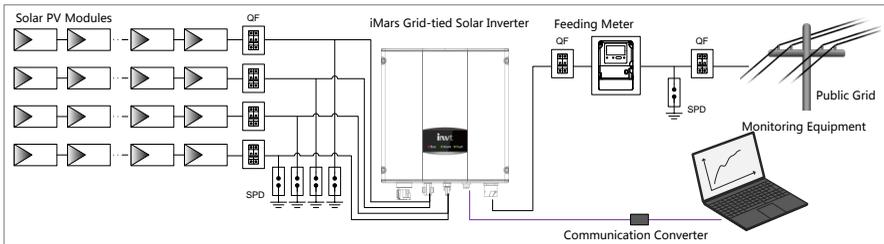


Figure 3.7 Block diagram of the grid-tied solar system

	<ul style="list-style-type: none"> ● Improper operation during the wiring process can cause fatal injury to operator or unrecoverable damage to the inverter. Only qualified personnel can perform the wiring work. ● All electrical installations must be in accordance with local and national electrical codes. ● All cables must be firmly attached, undamaged, properly insulated and adequately dimensioned.
<p>Note</p>	<ul style="list-style-type: none"> ● Read and follow the instructions provided in this section while observing all safety warnings. ● Always note the rated voltage and current defined in this manual. Never exceed the limits.

3.4.1 Connection of solar modules

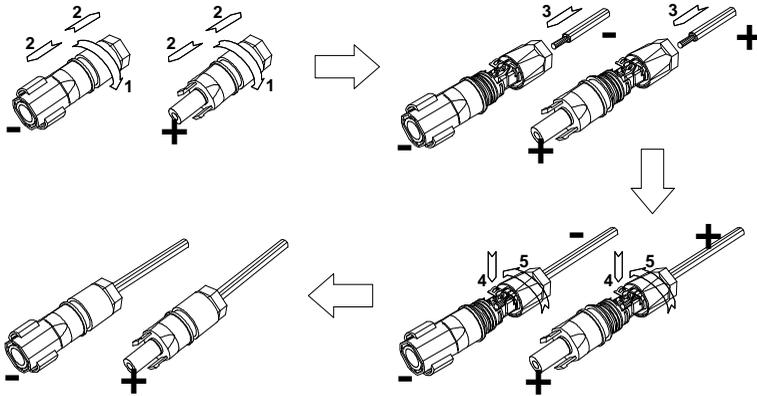


Figure 3.8 Connection between DC connector and solar modules

Connection steps:

- (1) Lighting, short-circuit and other protection measures which meet the local electrical safety laws and regulations are needed before the AC connection;



- Only qualified cables under the local electrical safety laws and regulations are allowed to connect.

- (2) Connect the output cables of solar modules to the DC connector as figure 3.8 shows. Loosen the nut of connector and remove the isolation layer of the DC cable for about 15mm. Insert it into the connector and press until hear the lock sound. Finally fasten the nut. The wiring of negative pole is the same as that of the positive pole. Ensure the poles of solar modules are well connected with the connectors;



- The solar modules connected with the inverter needs to be the configured ones other than some connecting devices without authorized. Otherwise, device damage, unstable operation or fire may occur.

- (3) Connect the DC connector with the inverter and ensure tightly-fastened;
- (4) Insert the screw-driver into the hole of the connector to remove the connector form the inverter.
- (5) Unclench the pressed cover with screw-driver to remove the cables from the connector.

3.4.2 AC connection

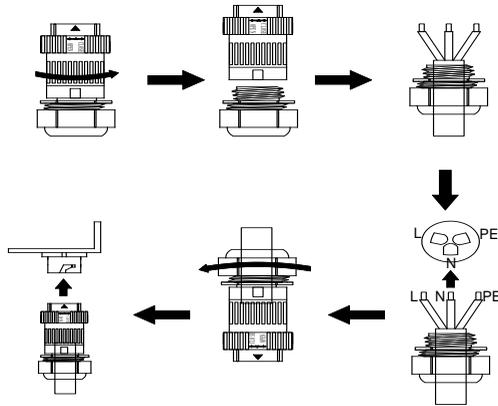


Figure 3.9.1 AC connection of single-phase inverter

Connection steps of single-phase inverter:

- (1) Before connecting the single-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 3.9.1, connect and fasten L, N and PE conductors of the single-phase common grid to AC terminal, and then connect the terminal to the AC port of the inverter;
- (3) Fix and connect the DC output cables of PV board with the matched DC connectors, and then connect the connectors to the DC port of the inverter.

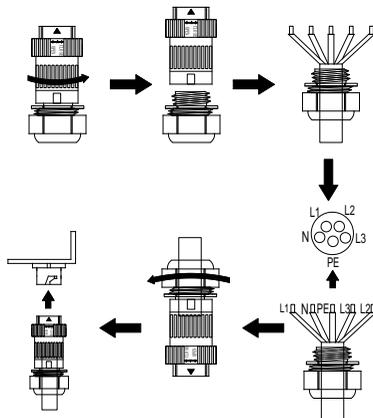


Figure 3.9.2 AC connection of three-phase inverter

Connection steps of three-phase inverter:

- (1) Before connecting 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 3.9.2, connect and fasten 3L, N and PE conductors of the three-phase common grid to AC terminal, and then connect the terminal to the AC port of the inverter;
- (3) Fix and connect the DC output cables of PV board with the matched DC connectors, and then connect the connectors to the DC port of the inverter.



- Only qualified cables under the local electrical safety laws and regulations are allowed to connect.

4 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.

4.1 Inspection before operation

Check as follows before operation (including but not limited to):

- (1) Ensure the installation site meet the requirement mentioned in section 3.2.2 for easy installation, removing, operation and maintenance;
- (2) Ensure the mechanical installation meet the requirement mentioned in section 3.4;
- (3) Ensure the electrical installation meet the requirement mentioned in section 3.5;
- (4) Ensure all switches are “off”;
- (5) Ensure the voltage meet the requirement mentioned in section 2.4;
- (6) Ensure all electrical safety precautions are clearly-identified on the installation site.



- Do check as above before any operation if the system or inverter needs to be installed, refitted and maintained.

4.2 Grid-tied operation

Note

- When power on the inverter for the first time, please refer to section 5.5 to complete grid certification choice.
- Keep the inverter power on at least 30 minutes to charge for the internal clock battery.

Please start the inverter as follows:

- (1) Ensure the requirements mentioned in section 4.1 are met;
- (2) Switch on the breakers at the AC side;
- (3) Switch on the integrated DC switch;
- (4) Switch on the switch on the DC side;
- (5) Observe the LED indicators and information displayed on the screen. Refer to chapter 5 for detailed information.

 Run Green indicator blinks, others off: the inverter is power on and in self-inspection;

 Run Green indicator on, others off: the inverter is in power generation after self-inspection---successful commissioning.

“Warn” or “Fault” indicators are on or blinking: the inverter is power on, but fault occurs. Please refer to section 5.3 for detailed information, and then stop as the section 4.3 mentioned, finally settle the problems as chapter 7. If all faults are solved, do as chapter 4 mentioned.

4.3 Stopping

Stop the inverter as follows it needs maintenance, inspection and troubleshooting:

- (1) Switch off the breakers at the AC side;
- (2) Switch off the integrated DC switch;
- (3) Switch off the switch on the DC side;
- (4) Wait at least 5 minutes until the internal parts and components are discharged. And then stop the inverter.

4.4 Daily maintenance

The inverter can perform power generation, start and stop automatically even the day and night shifts and seasons change in one year. In order to prolong the service life, daily maintenance and inspection are needed besides following the instructions mentioned in this manual seriously.

4.4.1 Regular maintenance

Maintenance contents	Maintenance methods	Maintenance cycle
Store the operation data	Use real-time monitoring software to read inverter running data, regularly back up all inverter running data and stats. Check the monitoring software and inverter LCD screen to make sure the parameters are set correctly.	Once each quarter
Check inverter operation status	Check to make sure the inverter installation is solid, no damage or deformation. When inverter running, check to make sure the sound and variables are normal. When inverter running, use thermal imager to check whether the case cooling is normal.	Every six months
Clean the surface	Check the ambient humidity and dust around inverter, clean the inverter when necessary. See Section 4.4.2.	Every six months
Check electrical connection	Check the cable connection and inverter terminals, make sure they are connected reliably, not loose, and no damage, insulation reliable.	Every six months

Maintenance contents	Maintenance methods	Maintenance cycle
Check the security features	Check the off-on feature of inverter: use monitoring software or LCD and keyboard on the inverter, do "off" and "on" operation, to confirm its off-on feature intact. At the same time, make sure monitoring software can normally communicate with the inverter. Check the warning label on or around the inverter, if necessary replaced.	Every six months

4.4.2 Maintenance guide

Clean the inverter

Cleaning procedure is as follows:

- (1) Disconnect the input and output switches.
- (2) Wait ten minutes.
- (3) Use a soft brush or a vacuum cleaner to clean the surface and the inlet and outlet of the inverter.
- (4) Repeat Section 4.1 operating content.
- (5) Restart the inverter.

5 Display panel

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

5.1 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 5-1 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 5-1 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
	<ul style="list-style-type: none"> ○ 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	<ul style="list-style-type: none"> ○ 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
	<ul style="list-style-type: none"> ○ 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	<ul style="list-style-type: none"> ● Run ● Warn ● Fault 	Stop after the communication or panel command. All indicators are on.
Note	Please refer to chapter 5 and 7 for detailed fault information and troubleshooting.	

5.2 Operation panel

There are 4 buttons on the panel:

- (1) “ESC”, exit and return ;
- (2) “^”, back to the front page and data increasing;
- (3) “v”, to the next page and data decreasing;
- (4) “ENT”, enter.

The machine can be turned on and off by pressing the buttons: press "ESC" and "ENT"(about 3 seconds) at the same time, and then the quick start-up and stop is available.

5.3 LCD screen

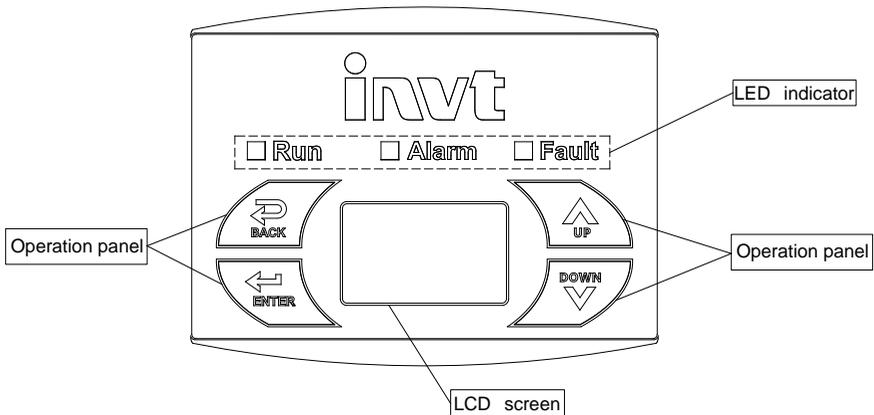


Figure 5.1 Operation panel

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.

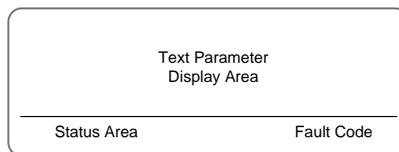


Figure 5.2 Main interface

The main interface of the LCD screen is shown as the figure above:

- (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 “v” to look up the

- information freely;
- (3) 5 states of the inverter are displayed on the screen;
 - (4) If the inverter is in fault or warning state, up to 8 corresponding fault codes can be displaying on the screen.

5.4 Functions operation

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

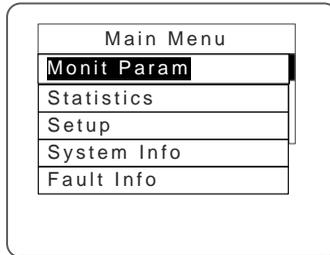


Figure 5.3 Main interface

5.4.1 Monitoring parameters

Press “^” and “v” in the main interface to select “Monit Param”, and then press “ENT” to view the parameters which is shown in figure 5.4. Go the front or next page through “^” and “v” and return through “ESC”.

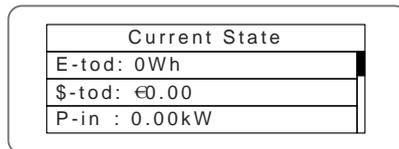


Figure 5.4 Monitoring parameters

5.4.2 History

Press “^” and “v” in the main interface to select “History”, and then press “ENT” to view the parameters which is shown in figure 5.5.

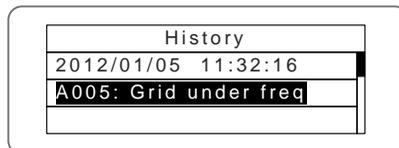


Figure 5.5 History parameters

There are 32 history records in total. Press “^” and “v” to review the history record and press

“ESC” to exit. The numbers on the top right is the serial No. of the record and the numbers in the second line display date when faults occur and settled. If the color of the third line illuminates, the fault occurs, if not, the fault is solved.

5.4.3 Statistics

Press “^” and “v” in the main interface to select “Statistics”, and then press “ENT” to view the parameters which is shown in figure 5.6.

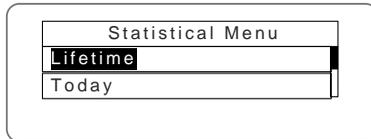


Figure 5.6 Statistic information

The information in table 5-2 can be viewed in the statistical menu.

Table 5-2 Statistic 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

5.4.4 Parameter settings

Press “^” and “v” in the main interface to select “Setup Menu”, and then press “ENT” to view the parameters which is shown in figure 5.7.

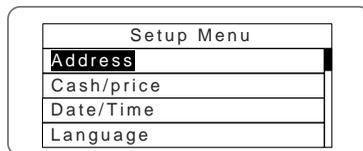
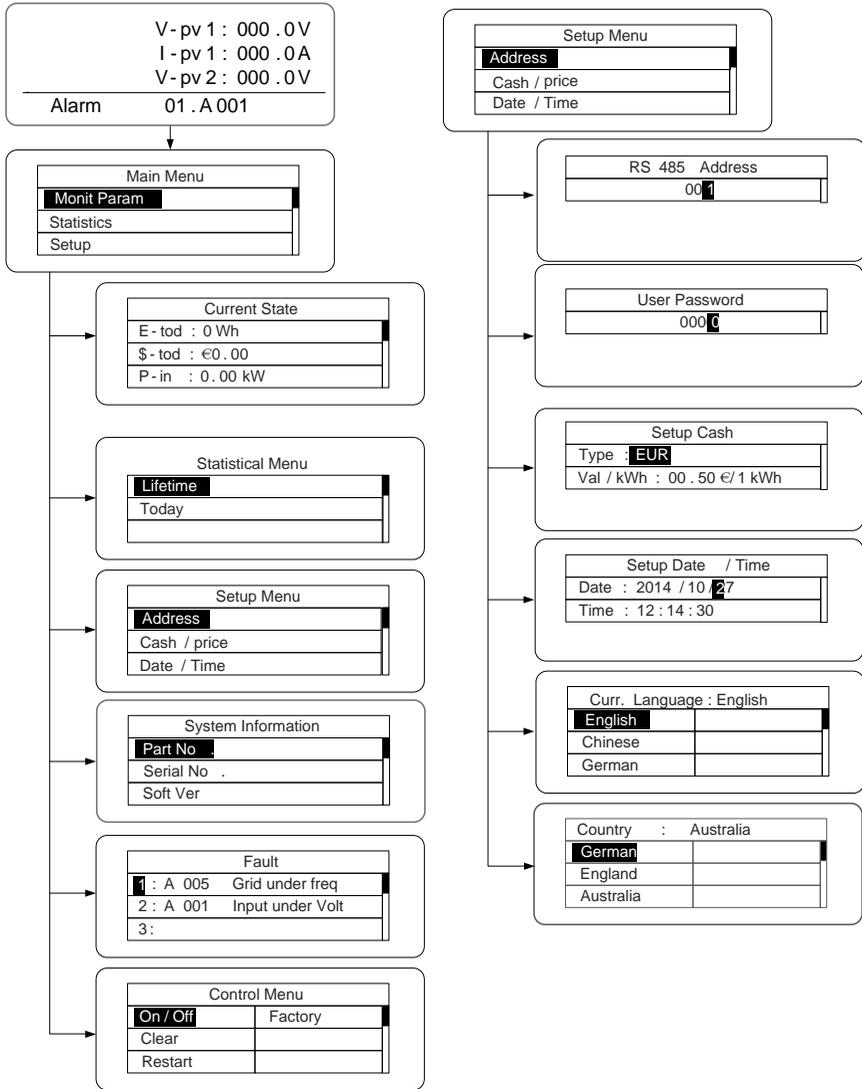


Figure 5.7 Setting information

Parameters can be set in this interface.

LCD menus:



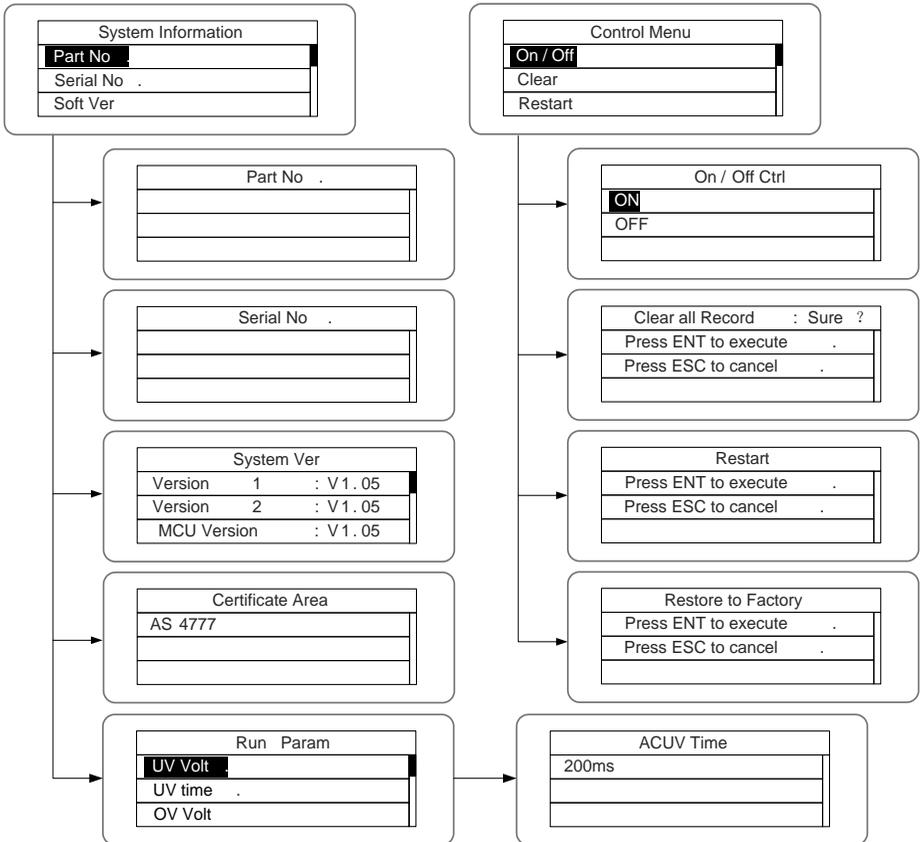
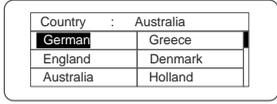
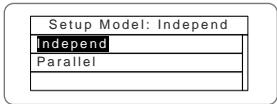


Table 5-3 Parameters setting

Setting item	LCD display	Instruction
RS485 Address		Enter into the interface and edit the data through “^” or “v”. 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		Enter into the interface and edit the data through “^” or “v”. And then press “ENT” again to the next bit. After editing the four bits, press “ENT” to save the

Setting item	LCD display	Instruction
		<p>edition and press “ESC” to exit.</p> <p>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.</p>
Setup Cash		<p>Enter into the interface and edit the currency type and cash through “^” or “v”. 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.</p> <p>The currency types include EUR, POD, CNY and USD.</p>
Setup Date/Time		<p>Enter into the interface and edit the date and time through “^” or “v”. 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.,</p>
Language		<p>Enter into the interface and edit the language through “^” or “v”. And then press “ENT” again to save the edition and press “ESC” to exit.</p> <p>The default language is English.</p>
Select Country		<p>Enter into the interface and select country through “^” or “v”. And then press “ENT” again to save the edition and press “ESC” to exit.</p>
Setup mode		<p>The DC input mode includes “independent” and “parallel”: “independent mode” is the independent</p>

Setting item	LCD display	Instruction
		<p>MPPT of Track A and Track B; “parallel mode” is the parallel MPPT of Track A and Track B.</p> <p>The default mode is “independent”.</p> <p>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.</p> <p>Press “^” or “v” to select the setting mode and press “ENT” to save the setting or “ESC” to return.</p> <p>If the situation of section 5.4.8 occurs, it is necessary to switch the DC input to “parallel” mode.</p>

Setting item	LCD display	Instruction						
<p>Run Param</p>	<p>The LCD display sequence is as follows:</p> <ul style="list-style-type: none"> Input password screen: Shows "Input password" at the top and "0000" in the input field. Run Param menu screen: Shows "Run Param" at the top and a menu with the following items: <table border="1" data-bbox="292 443 460 523"> <tr> <td>UV Volt</td> <td>OV time</td> </tr> <tr> <td>UV time</td> <td>UF Freq</td> </tr> <tr> <td>OV Volt</td> <td>UF time</td> </tr> </table> ACUV Volt(phase volt) screen: Shows "ACUV Volt(phase volt)" and "184V". ACUV Time screen: Shows "ACUV Time" and "0.20s". ACOV Volt(phase volt) screen: Shows "ACOV Volt(phase volt)" and "263V". ACOV Time screen: Shows "ACOV Time" and "0.20s". ACUF Frequency screen: Shows "ACUF Frequency" and "47.6Hz". ACUF Time screen: Shows "ACUF Time" and "0.20s". ACOF Frequency screen: Shows "ACOF Frequency" and "51.4Hz". ACOF Time screen: Shows "ACOF Time" and "0.20s". 	UV Volt	OV time	UV time	UF Freq	OV Volt	UF time	<p>Password is required when enter into the interface of “Run Param”. Get the password from the supplier if necessary (supplier password: 2678). Set ACUV Volt, ACUV time and others under the related submenus, and then press “^” and “v” to modify, and finally press “ENT” to confirm.</p>
UV Volt	OV time							
UV time	UF Freq							
OV Volt	UF time							

Setting item	LCD display	Instruction
<p>Run Param*</p>		<p>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 “v” to modify, and finally press “ENT” to confirm. Generally, it is only necessary to set ACUV and ACUF value for ACUV and ACUF protection. And it is necessary to set ACOF1 and ACOF2 together for ACOF protection.</p>

5.4.5 System Information

Press “^” and “v” in the main interface to select “System Information”, and then press “ENT” to view the parameters which is shown in figure 5.8.

System Information	
Part No	
Serial No	.
Soft Ver	

Figure 5.8 System information

The system information include “product model”, “serial No.”, “software version” and “certificate version”.

System Ver	
Version1	: V1.05
Version2	: V1.05
MCU Version	: V1.05

Figure 5.9 System version

5.4.6 Faults

Press “^” and “v” in the main interface to review the fault history, and then press “ENT” to view the sub-menu which is shown in figure 5.10.

Fault	
1:	A005 Grid under freq
2:	A001 Input under Volt
3:	

Figure 5.10 Fault information

There are 8 pieces of fault information in the record which is shown in figure 5.10; otherwise it will display “No Fault!” Refer to section 5.4.2 for more detailed information.

5.4.7 Inverter control

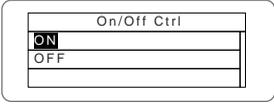
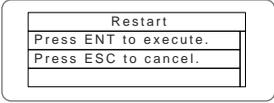
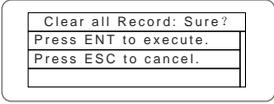
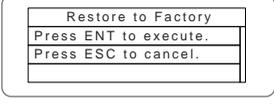
Press “^” and “v” in the control interface, and then press “ENT” to view the sub-menu which is shown in figure 5.11.

Control Menu	
On/Off	Factory
Clear	
Restart	

Figure 5.11 Control interface

Refer to the table below for detailed information.

Table 5-4 Inverter control

Control item	LCD display	Instruction
On/Off control	 <p>The LCD display shows the menu 'On/Off Ctrl' with two options: 'ON' and 'OFF'. The 'ON' option is currently selected and highlighted.</p>	<p>Control the “On/Off” through the panel.</p> <p>Press “^” and “v” in the control interface to select the operation. Press “ENT” to ensure the operation and press “ESC” to return.</p>
Restart	 <p>The LCD display shows the menu 'Restart' with the following instructions: 'Press ENT to execute.' and 'Press ESC to cancel.'</p>	<p>Restart the inverter through the panel.</p> <p>And save the all settings and operation record.</p> <p>Press “ENT” to ensure restarting and the inverter will begin to self-inspect or press “ESC” to return.</p>
Record clear	 <p>The LCD display shows the menu 'Clear all Record: Sure?' with the following instructions: 'Press ENT to execute.' and 'Press ESC to cancel.'</p>	<p>Press “ENT” to ensure clear all records or press “ESC” to return.</p> <p>“Record clear” is to clear all setting parameters through the panel, restore to the factory setting and save all history operation records.</p>
Restore to factory	 <p>The LCD display shows the menu 'Restore to Factory' with the following instructions: 'Press ENT to execute.' and 'Press ESC to cancel.'</p>	<p>“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.</p>

5.4.8 Mode settings

The default mode of series grid-tied solar inverter is “independent”. But if the current of solar modules are joined into the inverter as figure 5.12 shows, it is necessary to switch the mode into “parallel”.

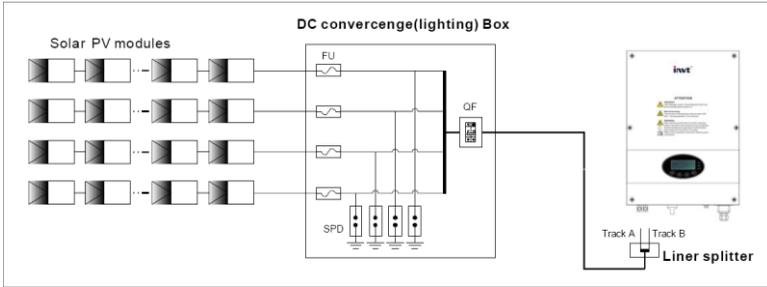


Figure 5.12 "Parallel" input mode

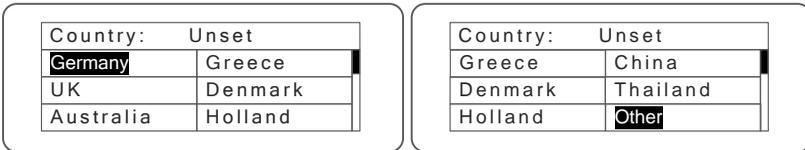
Note ● Only where there is more than 100V DC voltage input, LCD display working, and AC switch off, can query and modify the inverter DC input mode via the LCD screen and keypad.

5.5 Grid Certification Choice

Power on the inverter by DC input for the first time or after Restore factory settings, it will appear on the LCD screen prompts as follows:



Waiting a few seconds later, in the LCD screen will appear a list of countries as follows, requiring the user to choose what country of use. As shown below:

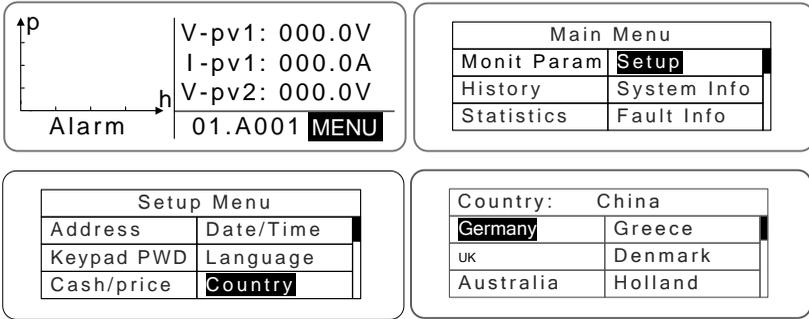


Press the “^” or “v” button to navigate the country, press the ENT button to complete the setting.

After determine the location, please follow the user manual required with the proper use of inverter.

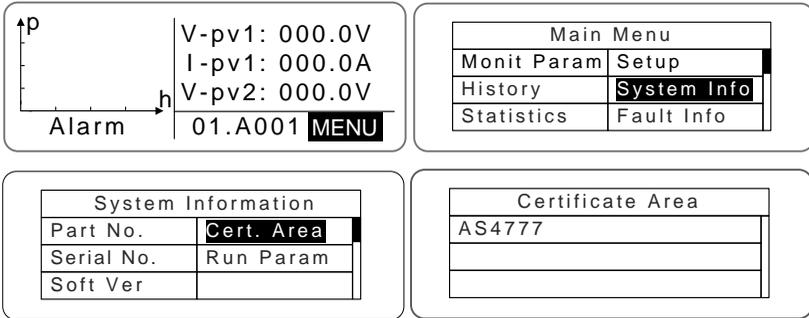
The user can change the location through the following ways:

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



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	TF321	
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	Single-phase voltage	Three-phase voltage	Grid frequency
1	Germany	VDE0126& AR-N4105	220~230V	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	240V	415V	50Hz
13	Australia	AS4777.2&AS4777.3 AS/NZS3100	230~240V	400~415V	50Hz
14	Singapore				
15	New Zealand				
16	Belgium	C10/C11	220~230V	380~400V	50Hz
17	Luxembourg				
18	Holland				
19	Denmark	TF3.2.1	220~230V	380~400V	50Hz
20	Thailand	PEA	220V	380V	50Hz
21	China	CGC/CF001	220V	380V	50Hz
22	Italy	ENEL	230V	400V	50Hz

6 Monitoring communication

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

The standard communication mode of iMars grid-tied solar inverter is RS485 which includes “RS485-M” and “RS485-S” ports. The two ports can both communicate with private computers, smart phones and so on. The system monitoring solution is shown as figure 6.1.

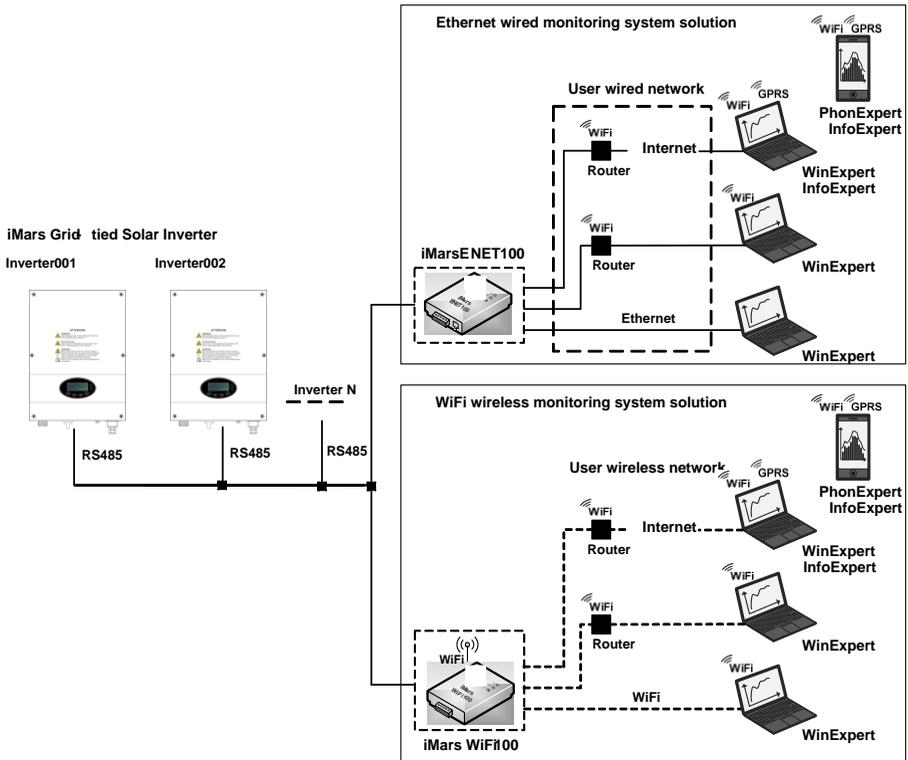


Figure 6.1 Monitoring system of inverter

6.1 Standard communication

Table 6-1 Pins on inverter instruction

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

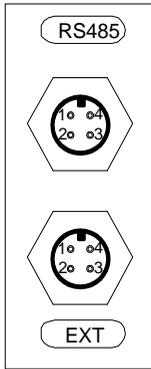


Figure 6.2 RS485 pin on inverter



Figure 6.3 Communication connector

Connection steps:

- (1) Weld communication cables to the RS485 terminals of the inverter as figure 6.4 shows; Ensure the cable corresponds to the pin as table 6-1 shows and the welding is tight enough.

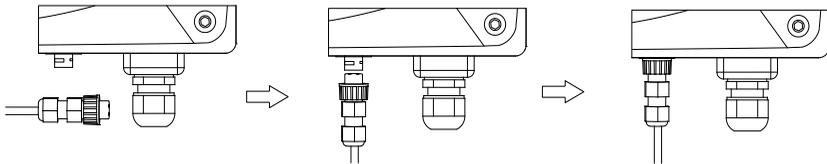


Figure 6.4 Detailed connection

- (2) According to Table 6-1, connect the communication connector pinout and the user's device, make sure the connection is correct;
- (3) Please download the monitoring software "iMars WinExpert" and its operation instruction.

6.2 Optional communication

The optional communication modes include the handheld terminal, WiFi, ENET and GPRS, which also need corresponding communication parts and components. All operation parameters of the inverter are output from port "RS485-M", and then to the communication devices, finally after converting, to the monitoring system of upper PC as standard the handheld terminal, WiFi, ENET and GPRS signal. See figure 6.1.

Table 6-2 Optional accessories

Optional accessories	Inverter port	Port of upper PC
The handheld terminal	RS485-M	Panel
WiFi converter	RS485-M	WiFi signal
ENET converter	RS485-M	Internet access
GPRS converter	RS485-M	GPRS module

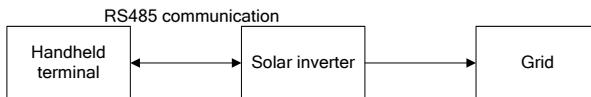
Please download the connection instruction, operation manual and commissioning tools on website.

Note: the optional accessories are not standard-configured.

6.2.1 Handheld terminal

6.2.1.1 Product overview

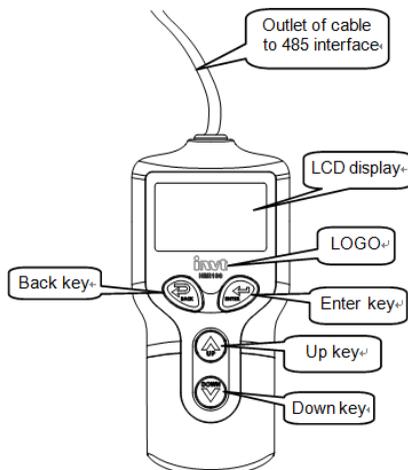
The handheld terminal is the medium for users to exchange information and interact with the inverter. The product is optional and it is fitted with RS485 communication interface of INVT solar inverter. It can display the running states of the inverter in real time and set the inverter.



6.2.1.2 Appearance and electric connection

Appearance

The device consists of LCD screen and operation panel.



Operation panel

The handheld terminal has four keys:

“BACK”, back key;

“^”, up key, back to the front page or data increasing;

“v”, down key, to the next page or data decreasing;

“ENTER”, enter key.

The machine can be turned on and off by pressing the buttons: press “BACK”+“ENTER” (for 3s) at the same time, and then the quick start-up and stop is available.

Electric connection

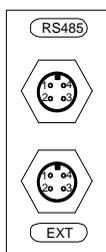


Figure 6.5 RS485 interface of 3PH inverter Figure 6.6 RS485 interface of handheld terminal

Connect the RS485 interface of handheld terminal to the RS485 interface of 3PH inverter, as shown in Figure 2.4:

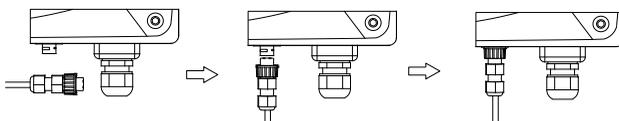


Figure 6.7 The handheld terminal connected to the inverter

6.2.2 WiFi200 converter

6.2.2.1 WiFi200 Product Introduction

iMars WiFi200 communication converter has 1 RS485 and 1 WiFi communication port for the data transmission. This product is based on the embedded module with general serial port which meets the network standard, has built-in TCP/IP protocol stack for the transformation between the user serial port and WiFi port. The traditional serial device can transfer the data through Internet without any configuration modification. WiFi200 provides a complete and rapid solution of data

transmission for serial devices.

Table 6-3 iMars WiFi200 has the following features:

Interface	Parameters function
RS485 interface	<ol style="list-style-type: none"> 1. Automatic control of data flow, automatic identification and transmission direction of control data and no handshake signal is needed 2. Transmission speed 300~115200Baud 3. Up to 32 devices of RS485 4. the maximum transmission distance 1200m 5. Flow indicator 6. Half duplex mode
WiFi interface	<ol style="list-style-type: none"> 1. Support data exchange between RS485 - WiFi interface 2. Meet the 802.11 b/g/n wireless standard 3. Wireless network AP/STA 4. Security mechanism WEP/WPA-PSK/WPA2-PSK/WAPI 5. Barrier-free transmission distance 100m
Others	<ol style="list-style-type: none"> 1. TCP Server, TCP Client, UDP mode and UDP Server mode 2. Operation interface, target IP address and interface can be set in random 3. Disconnect automatically after the network disconnection, ensure the reliable TCP connection of the whole network 4. Support TCP/IP/UDP network protocol stack 5. IE configuration interface 6. Operation mode, Transparent data transmission or agreement transfer mode 7. Input power supply: 5VDC~12V/170mA~300mA and the power is provided by the inverter directly 8. Working temperature: -20~70°C 9. Working humidity: 10%-90%RH (no condensation) 10. Storage temperature: -40-80°C 11. Storage humidity: 5%-90%RH (no condensation) 12. Other frequency: 20MHz, 40MHz and automatic

WiFi200 is AP mode in the factory. It can be connected with the 485 communication interface of inverters and visited by computer or mobile software.

6.2.2.2 Monitoring solutions

WiFi200 communication converter has 3 monitoring solutions to establish the solar power generation system for different requirements:

The first solution: direct connection. Short distance site control is available.

The second solution: router LAN. Remote LAN monitoring is available.

The third solution: router internet. Remote access internet control is available.

1. Direct connection

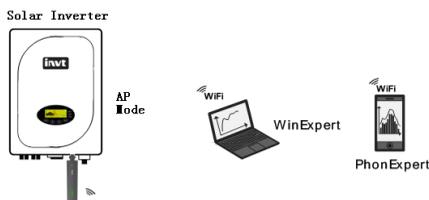


Figure 6.8 Direct connection solution

Direct connection solution is suitable for short distance monitoring. The wiring is as the figure above. Hardware and software devices such as iMars series solar inverters, WiFi200 communication converters, computers with the function of WiFi signal receiving), and WinExpert solar monitoring software are needed in the establishment of direct solar monitoring. WiFi200 operates in AP mode which is also the default mode of the module. The monitoring device can visit the inverter through wireless and wire modes. Refer to 6.2.1.3 for the configuration of WiFi200 communication converter and computers.

2. Router LAN



Figure 6.9 Router LAN solution

Router LAN is suitable for remote LAN monitoring. The wiring is as the figure above. Hardware and software devices such as iMars series solar inverters, WiFi200 communication converters, routers, devices with the function of WiFi signal receiving (such as computers and mobile phones)

are needed in the establishment of router internet monitoring. WinExpert solar monitoring software or mobile phone APP are needed for the operation and data viewing.

Different configurations are needed in the wire or wireless connection between WiFi200 and routers, monitoring devices and routers. Refer to 6.2.1.3 for detailed operation.

3. Router internet

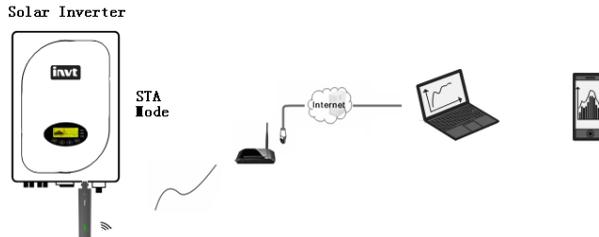


Figure 6.10 Router internet solution

Router internet is suitable for internet monitoring without distance limit. But the servers of solar monitoring system are needed. The wiring is as the figure above. Hardware and software devices such as iMars series solar inverters, WiFi200 communication converters, devices with the function of WiFi signal receiving (such as computers and mobile phones) are needed in the establishment of router internet monitoring. Websites or mobile phone APP are needed for the operation and data viewing.

Different configurations are needed in the wire or wireless connection between WiFi200 and routers, monitoring devices and routers. Refer to 6.2.1.3 for detailed operation.

6.2.2.3 Installation and commissioning

1. Computer network configuration

Take the computer configuration as the example. The user needs to ensure there is wireless network card in the computer and the card can access the IP address automatically.

After power on, the factory default value is AP hotspot mode. Please connect the hotspot through the wireless network and then the computer can access the IP address automatically.

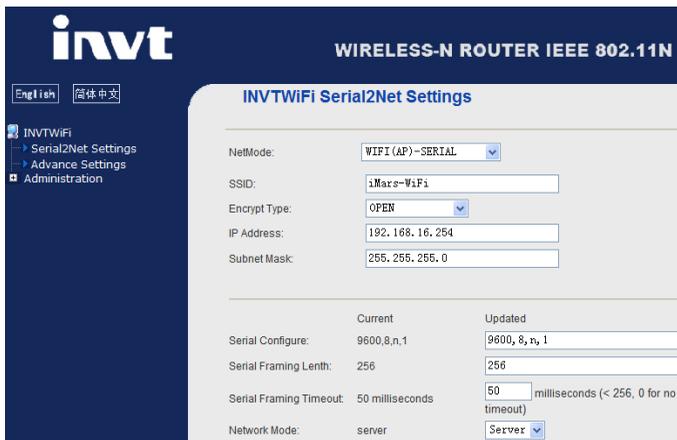
2. Parameters setting

(1) Log in the Web

Open the web browser (need to use more than IE7.0 browser or Google Chrome browser), input <http://192.168.16.254> in the address bar. Input the user name: admin; Password: admin in the pop-up login window and then click "Ok".



Enter into the main interface:



There are 3 areas in the main Web interface: 1 Network configuration; 2 Serial port configuration; 3 Configuration submitting

Network modes (NetMode):

- Default – default operation mode
- ETH-SERIAL – serial port to Ethernet
- WIFI (CLIENT)-SERIAL – serial port to WIFI CLIENT
- WIFI (AP)-SERIAL – serial port to WIFI AP

Different operation modes display different interface. The precious two modes can not be supported by WiFi200, so mode (3) and (4) is introduced in this manual.

Serial port to WIFI CLIENT (STA mode):

NetMode:

SSID:

Encrypt Type:

IP Type:

Serial port to WIFI AP:

NetMode:

SSID:

Encrypt Type:

IP Address:

Subnet Mask:

Serial port configuration:

	Current	Updated
Serial Configure:	9600,8,n,1	<input type="text" value="9600, 8, n, 1"/>
Serial Framing Lenth:	256	<input type="text" value="256"/>
Serial Framing Timeout:	50 milliseconds	<input type="text" value="50"/> milliseconds (< 256, 0 for no timeout)
Network Mode:	server	<input type="text" value="Server"/>
Remote Server Domain/IP:	192.168.200.1	<input type="text" value="192.168.200.1"/>
Locale/Remote Port Number:	8011	<input type="text" value="8011"/>
Network Protocol:	tcp	<input type="text" value="TCP"/>
Network Timeout:	0 seconds	<input type="text" value="0"/> seconds (< 256, 0 for no timeout)
Keepalive Interval:	120 seconds	<input type="text" value="120"/> seconds
ID:	T12345678	
Reserved Bytes:	000000000	

Generally, above parameters does not need to be modified, and it can be adjusted during special requirements.

Current: display the current configuration; Updated: display the current parameters to be modified.

Serial Configure: serial port configuration. The format is as below: baud rate, parity check, data bits, stop bit, for example, “9600,8,n,1”

Serial Framing Lenth: framing length of the serial port

Serial Framing Timeout: framing time of the serial port

Network Mode: network mode, select Client, Server or none

Remote Server Domain/IP: The remote server domain name or IP address. For example,

192.168.200.1

Locale/Remote Port Number: Local or remote port number. Different network mode designates different parameters. In the Client mode, it designates the remote port number and in Server mode, it designates the local port number.

Network Protocol: Network Protocol type, use tcp or udp protocol

Network Timeout: Network Timeout. In Server mode, there is no data during the timeout

Configuration submitting:



Click "Apply" to submit the current interface. If the network parameters are modified, it needs 25 seconds to submit. If only modifying the function of serial port, the submitting will be finished soon.

Click "Cancel" to download the interface and the modified configuration will be lost.

(2) Configuration of direct monitoring

Select AP hotspot mode as the operation mode. SSID is the hotspot name and can be modified by the user. The authenticated encryption is OPEN, WEP, WPA and so on. The user can set the security according to the needs.

 A screenshot of a configuration form for "NetMode". The form has a light gray background. The "NetMode" dropdown menu is highlighted with a red dashed box and shows "WIFI (AP)-SERIAL". Below it are text input fields for "SSID" (iMars-WiFi), "Encrypt Type" (OPEN), "IP Address" (192.168.16.254), and "Subnet Mask" (255.255.255.0).

Select TCP Server in the configuration of the serial port.

 A screenshot of a configuration table for "Serial Configure". The table has two columns: "Current" and "Updated". The "Updated" column contains input fields for various parameters. The "Network Mode" dropdown is set to "Server" and is highlighted with a red dashed box. The "Locale/Remote Port Number" input field is set to "8011" and is also highlighted with a red dashed box. The "Network Protocol" dropdown is set to "TCP" and is highlighted with a red dashed box.

(3)Configuration of router LAN monitoring

Select STA station spot mode as the operation mode. SSID is the hotspot name and the user needs to modify it as the router name.

NetMode:

SSID:

Encrypt Type:

IP Type:

The user can use the button “Scan” to scan the wireless hot spots information and then the router list can be found. The password and authentication encryption need to be set according to the attribute of the wireless router.

Ch	SSID	BSSID	Security	Signal(%)	W-Moe	ExtCh	NT
<input type="radio"/> 1	imv-erp	68.86.a7.b0.ae:11	WPA2PSK/AES	29	11b/g/n	NONE	In
<input type="radio"/> 1	imv-produce	68.86.a7.b0.ae:17	NONE	29	11b/g/n	NONE	In
<input checked="" type="radio"/> 6	TP-LINK_firecat	c8.61.18.40.f9.74	NONE	100	11b/g/n	BELOW	In

Select TCP Server in the configuration of the serial port.

	Current	Updated
Serial Configure:	9600,8,n,1	<input type="text" value="9600, 8, n, 1"/>
Serial Framing Lenth:	256	<input type="text" value="256"/>
Serial Framing Timeout:	50 milliseconds	<input type="text" value="50"/> milliseconds (< 256, 0 for no timeout)
Network Mode:	server	<input type="text" value="Server"/>
Remote Server Domain/IP:	192.168.200.1	<input type="text" value="192.168.200.1"/>
Locale/Remote Port Number:	8011	<input type="text" value="8011"/>
Network Protocol:	tcp	<input type="text" value="TCP"/>
Network Timeout:	0 seconds	<input type="text" value="0"/> seconds (< 256, 0 for no timeout)
Keepalive Interval:	120 seconds	<input type="text" value="120"/> seconds
ID:	T12345678	
Reserved Bytes:	0000000000	

(4)Configuration of router server

Select STA station spot mode as the operation mode. SSID is the hotspot name and the user needs to modify it as the router name.

NetMode:

SSID:

Encrypt Type:

IP Type:

The user can use the button “Scan” to scan the wireless hot spots information and then the router list can be found. The password and authentication encryption need to be set according to the attribute of the wireless router.

Ch	SSID	BSSID	Security	Signal(%)	W-Mode	ExtCh	NT	
<input type="radio"/>	1	int-4ep	68:86:a7:b0:ae:11	WPAPSK/AES	29	11b/g/n	NONE	In
<input type="radio"/>	1	int-produce	68:86:a7:b0:ae:17	NONE	29	11b/g/n	NONE	In
<input checked="" type="radio"/>	6	TP-LINK_firecat	c8:61:18:40:b9:74	NONE	100	11b/g/n	BELOW	In

Buttons: Cancel, Rescan, Apply

Select TCP Server in the configuration of the serial port. Input the remote IP address according to the actual. For example, “192.168.200.1”.

	Current	Updated
Serial Configure:	9600,8,n,1	<input type="text" value="9600, 8, n, 1"/>
Serial Framing Lenth:	256	<input type="text" value="256"/>
Serial Framing Timeout:	50 milliseconds	<input type="text" value="50"/> milliseconds (< 256, 0 for no timeout)
Network Mode:	server	<input type="text" value="Client"/>
Remote Server Domain/IP:	192.168.200.1	<input type="text" value="192.168.200.1"/>
Locale/Remote Port Number:	8011	<input type="text" value="8011"/>
Network Protocol:	tcp	<input type="text" value="TCP"/>
Network Timeout:	0 seconds	<input type="text" value="0"/> seconds (< 256, 0 for no timeout)
Keepalive Interval:	120 seconds	<input type="text" value="120"/> seconds
ID:	T12345678	
Reserved Bytes:	0000000000	

3. Commissioning

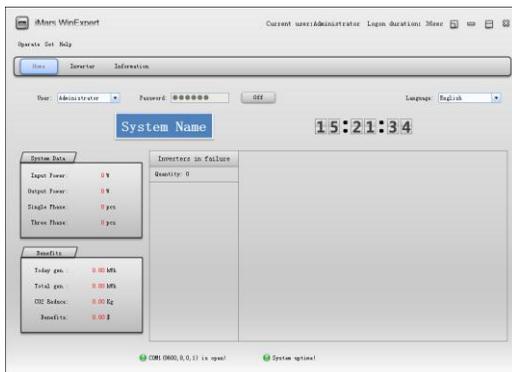
The software of iMars WinExpert can check the configuration of WiFi200 and this method can be used in the direct monitoring and router LAN monitoring.

Please download the monitoring software of iMars WinExpert and the operation instruction.

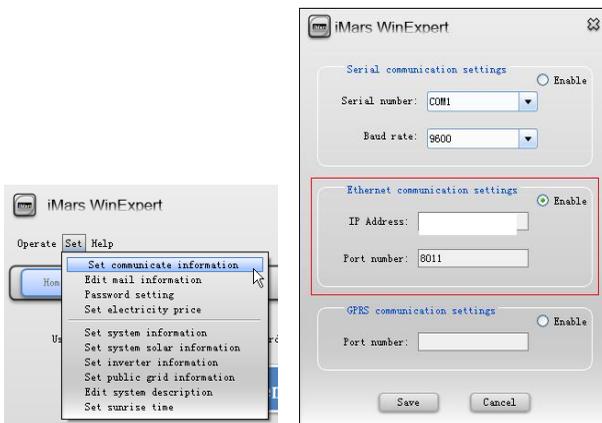
WinExpert software introduction: WinExpert software can support two kinds of communication mode of serial port and network. When WiFi200 monitors the inverter, it is necessary to select network monitoring.

Note: because of 485 communication and the influence of the WiFi200 communication converter, at the same time only one computer or mobile phone can transmit data with the inverter through WiFi200 converter; otherwise there will be data conflict to make WinExpert or PhonExpert monitoring software display the wrong data, and even lead to monitor software has burst automatically and shut down.

Install WinExpert software on the computer (Microsoft XP or Win7 operating system).



Click "Set" menu to select "Set communicate information" menu.



Enable the “Ethernet communication settings” in the pop-up dialog box, fill in the IP address and port number. The port number needs to be the same as that of the “Network setting”.

(1)Communication verification of WiFi200 and terminal devices

Complete the "Communication setting" of WinExpert solar monitoring software according to the above description. As shown in figure, if the "green light" on the below of the home page is on and display “Online”, the communication between WiFi200 and monitoring devices is successful and it can go to the next step.



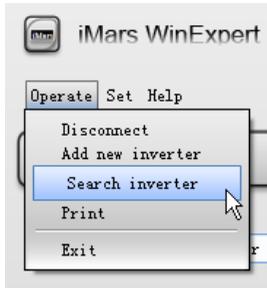
Otherwise, as shown in figure, if the "red light" on the below of the home page is on and display “Offline”, the communication between WiFi200 and monitoring devices is not successful, please

check WiFi200 network connections, network configuration and monitoring equipment again.

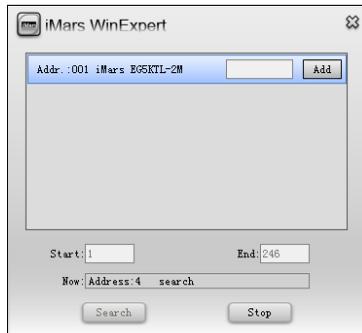


(2)Communication verification of WiFi200 and inverters

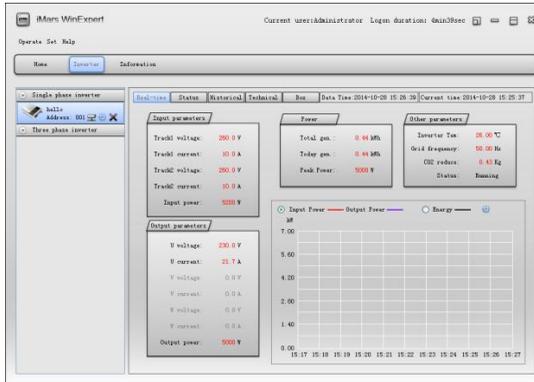
Ensure the successful communication between WiFi200 and monitoring devices, and then check the communication. As shown in the figure, select “Search inverter” in the operation menu of WinExpert software.



As shown in the figure, the inverter whose communication address in solar system is "001" inverter has been displayed in the search list, which means the "001" inverter has successfully establish communication with WiFi200. So on, when all the inverters in the solar system are displayed in the search list, the solar system has successfully established communication with WiFi200. Otherwise, please check the communication address and RS485 communication connection which are not listed and repeat the above operation.



And then, the real-time data of the inverter can be monitored by the software.



6.2.3 ENET200 communication converter

6.2.3.1 Product Introduction

iMars ENET200 communication converter is developed for serial-to-Ethernet through simple devices with 1 RS485 and 1 WiFi communication port for the data transmission. This product is based on the embedded module with general serial port which meets the network standard, has built-in TCP/IP protocol stack for the transformation between the user serial port and WiFi port. The traditional serial device can transfer the data through Internet without any configuration modification. iMars ENET200 provides a complete and rapid solution of data transmission for serial devices.

Table 1-1 iMars ENET200 has the following features:

Interface	Parameters function
<p style="text-align: center;">RS485 interface</p>	<ol style="list-style-type: none"> 1. Automatic control of data flow, automatic identification and transmission direction of control data and no handshake signal is needed 2. Transmission speed 300~115200Baud 3. Up to 32 devices of RS485 4. The maximum transmission distance 1200m 5. Flow indicator 6. Half duplex mode

Interface	Parameters function
WAN/LAN interface	<ol style="list-style-type: none"> 1. Support data exchange between RS485 - Ethernet interface 2. 10/100Mbps WAN/LAN interface
Others	<ol style="list-style-type: none"> 1. TCP Server, TCP Client, UDP mode and UDP Server mode 2. Operation interface, target IP address and interface can be set in random 3. Disconnect automatically after the network disconnection, ensure the reliable TCP connection of the whole network 4. Support TCP/IP/UDP network protocol stack 5. IE configuration interface 6. Operation mode, Transparent data transmission or agreement transfer mode 7. Input power supply: 5VDC~12V/170mA~300mA and the power is provided by the inverter directly 8. Working temperature: -20~70°C 9. Working humidity:10%-90%RH (no condensation) 10. Storage temperature: -40~80°C 11. Storage humidity: 5%-90%RH (no condensation) 12. Other frequency: 20MHz, 40MHz and automatic

ENET200 is Default mode in the factory. It can be connected with the 485 communication interface of inverters and visited by computer or mobile software.

6.2.3.2 Monitoring solutions

ENET200 communication converter has 2 monitoring solutions to establish the solar power generation system for different requirements:

The first solution: router LAN. Remote LAN monitoring is available.

The second solution: router internet. Remote access internet control is available.

1. Router LAN

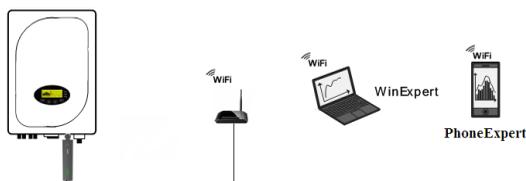


Figure 6.11 Router LAN solution

Router LAN is suitable for remote LAN monitoring. The wiring is as the figure above. Hardware and software devices such as iMars series solar inverters, ENET200 communication converters, routers, devices with the function of WiFi signal receiving (such as computers and mobile phones) are needed in the establishment of router internet monitoring. WinExpert solar monitoring software or mobile phone APP is needed for the operation and data viewing.

Different configurations are needed in the wire or wireless connection between ENET200 and routers, monitoring devices and routers. Refer to chapter 3 for detailed operation.

2. Router internet

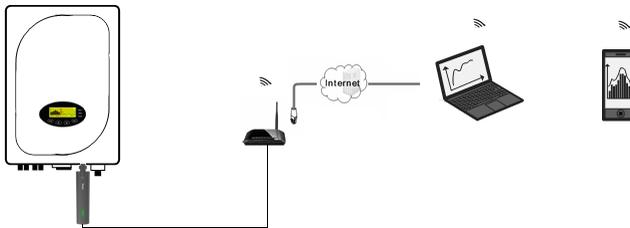


Figure 6.12 Router internet solution

Router internet is suitable for internet monitoring without distance limit. But the servers of INVT solar monitoring system are needed. The wiring is as the figure above. Hardware and software devices such as iMars series solar inverters, ENET200 communication converters, devices with the function of WiFi signal receiving (such as computers and mobile phones) are needed in the establishment of router internet monitoring. Websites or mobile phone APP is needed for the operation and data viewing.

Different configurations are needed in the wire or wireless connection between ENET200 and routers, monitoring devices and routers. Refer to chapter 3 for detailed operation.

6.2.3.3 Installation and commissioning

1. Computer network configuration

Take the computer configuration as the example. The user needs to ensure there is wireless network card in the computer and the card can access the IP address automatically.

Please connect the hotspot through the wireless network and then the computer can access the IP address automatically.

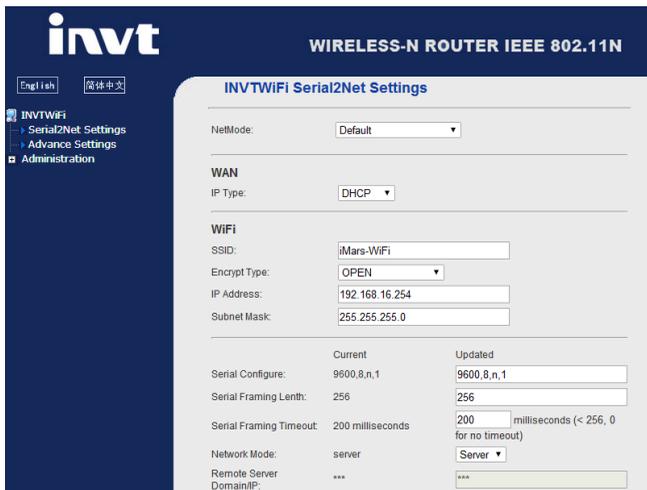
2. Parameters setting

1) Log in the Web

Open the web browser input the IP address in the bar. Input the user name: admin; Password: admin in the pop-up login window and then click "Ok".



Enter into the main interface:



There are 3 areas in the main Web interface: 1 Network configuration; 2 Serial port configuration; 3 Configuration submitting

Network modes (NetMode):

- (1) Default – default operation mode
- (2) ETH-SERIAL – serial port to Ethernet
- (3) WIFI (CLIENT)-SERIAL – serial port to WIFI CLIENT
- (4) WIFI (AP)-SERIAL – serial port to WIFI AP

Different operation modes display different interface. ENET200 only support Default mode.

Serial port configuration:

	Current	Updated
Serial Configure:	9600,8,n,1	<input type="text" value="9600, 8, n, 1"/>
Serial Framing Lenth:	256	<input type="text" value="256"/>
Serial Framing Timeout:	50 milliseconds	<input type="text" value="50"/> milliseconds (< 256, 0 for no timeout)
Network Mode:	server	<input type="button" value="Server"/> ▾
Remote Server Domain/IP:	192.168.200.1	<input type="text" value="192.168.200.1"/>
Locale/Remote Port Number:	8011	<input type="text" value="8011"/>
Network Protocol:	tcp	<input type="button" value="TCP"/> ▾
Network Timeout:	0 seconds	<input type="text" value="0"/> seconds (< 256, 0 for no timeout)
Keepalive Interval:	120 seconds	<input type="text" value="120"/> seconds
ID:	T12345678	
Reserved Bytes:	0000000000	

Generally, above parameters does not need to be modified, and it can be adjusted during special requirements.

Current: display the current configuration; Updated: display the current parameters to be modified.

Serial Configure: serial port configuration. The format is as below: baud rate, parity check, data bits, stop bit, for example, “9600,8,n,1”

Serial Framing Lenth: framing length of the serial port

Serial Framing Timeout: framing time of the serial port

Network Mode: network mode, select Client, Server or none

Remote Server Domain/IP: The remote server domain name or IP address. For example, 192.168.200.1

Locale/Remote Port Number: Local or remote port number. Different network mode designates different parameters. In the Client mode, it designates the remote port number and in Server mode, it designates the local port number.

Network Protocol: Network Protocol type, use tcp or udp protocol

Network Timeout: Network Timeout. In Server mode, there is no data during the timeout

Configuration submitting:

Click “Apply” to submit the current interface. If the network parameters are modified, it needs 25

seconds to submit. If only modifying the function of serial port, the submitting will be finished soon. Click “Cancel”to download the interface and the modified configuration will be lost.

Note: only one monitoring mode can be selected.

2) Configuration of router LAN monitoring

The NetMode is Default and the IP type is DHCP.

INVTWiFi Serial2Net Settings

NetMode:

WAN

IP Type:

Select TCP Server in the configuration of the serial port.

	Current	Updated
Serial Configure:	9600,8,n,1	<input type="text" value="9600,8,n,1"/>
Serial Framing Lenth:	256	<input type="text" value="256"/>
Serial Framing Timeout:	50 milliseconds	<input type="text" value="50"/> milliseconds (< 256, 0 for no timeout)
Network Mode:	server	<input type="text" value="Server"/>
Remote Server Domain/IP:	192.168.200.1	<input type="text" value="192.168.200.1"/>
Locale/Remote Port Number:	8011	<input type="text" value="8011"/>
Network Protocol:	tcp	<input type="text" value="TCP"/>
Network Timeout:	0 seconds	<input type="text" value="0"/> seconds (< 256, 0 for no timeout)
Keepalive Interval:	120 seconds	<input type="text" value="120"/> seconds
ID:	T12345678	
Reserved Bytes:	000000000	

3) Configuration of router server

The NetMode is Default and the IP type is DHCP.

INVTWiFi Serial2Net Settings

NetMode:

WAN

IP Type:

Select TCP Client in the configuration of the serial port. Input the remote IP address according to the actual. For example, “192.168.200.1”.

	Current	Updated
Serial Configure:	9600,8,n,1	<input type="text" value="9600, 8, n, 1"/>
Serial Framing Lenth:	256	<input type="text" value="256"/>
Serial Framing Timeout:	50 milliseconds	<input type="text" value="50"/> milliseconds (< 256, 0 for no timeout)
Network Mode:	server	<input type="text" value="Client"/>
Remote Server Domain/IP:	192.168.200.1	<input type="text" value="192.168.200.1"/>
Locale/Remote Port Number:	8011	<input type="text" value="8011"/>
Network Protocol:	tcp	<input type="text" value="TCP"/>
Network Timeout:	0 seconds	<input type="text" value="0"/> seconds (< 256, 0 for no timeout)
Keepalive Interval:	120 seconds	<input type="text" value="120"/> seconds
ID:	T12345678	
Reserved Bytes:	0000000000	

6.2.3.4 Commissioning

The software of iMars WinExpert can check the configuration of ENET200 and this method can be used in the direct monitoring and router LAN monitoring.

Please download the monitoring software of iMars WinExpert and the operation instruction on www.invt-solar.com.

WinExpert software introduction: WinExpert software can support two kinds of communication mode of serial port and network. When ENET200 monitors the inverter, it is necessary to select network monitoring.

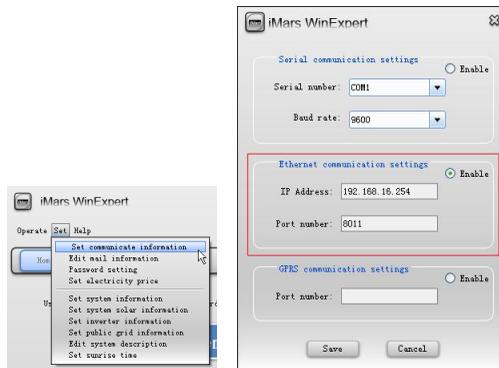
Note: because of 485 communication and the influence of the ENET200 communication converter, at the same time only one computer or mobile phone can transmit data with the inverter through ENET200 converter; otherwise there will be data conflict to make WinExpert or PhonExpert monitoring software display the wrong data, and even lead to monitor software has burst automatically and shut down.

Install WinExpert software on the computer (Microsoft XP or Win7 operating system).



Main interface

Click "Set" menu to select "Set communicate information" menu.



Communication setting

Enable the "Ethernet communication settings" in the pop-up dialog box, fill in the IP address and port number (the default is 8011). The port number needs to be the same as that of the "Network setting".

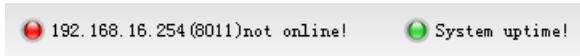
1. Communication verification of ENET200 and terminal devices

Complete the "Communication setting" of WinExpert solar monitoring software according to the above description. As shown in figure, if the "green light" on the below of the home page is on and display "Online", the communication between ENET200 and monitoring devices is successful and it can go to the next step.



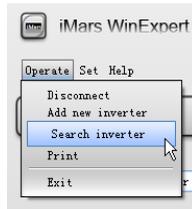
Otherwise, as shown in figure, if the "red light" on the below of the home page is on and display - 69 -

“Offline”, the communication between ENET200 and monitoring devices is not successful, please check ENET200 network connections, network configuration and monitoring equipment again.

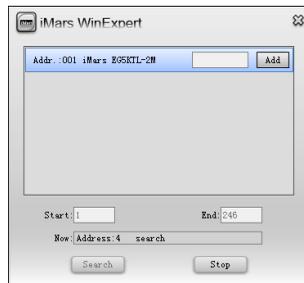


2. Communication verification of ENET200 and inverters

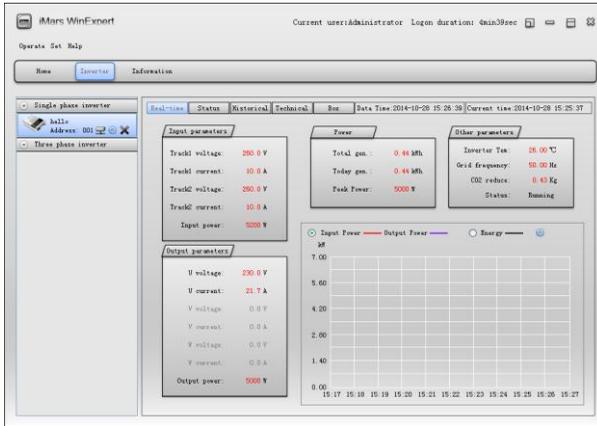
Ensure the successful communication between ENET200 and monitoring devices, and then check the communication. As shown in the figure, select “Search inverter” in the operation menu of WinExpert software.



As shown in the figure, the inverter whose communication address in solar system is "001" inverter has been displayed in the search list, which means the "001" inverter has successfully established communication with ENET200. So on, when all the inverters in the solar system are displayed in the search list, the solar system has successfully established communication with ENET200. Otherwise, please check the communication address and RS485 communication connection which are not listed and repeat the above operation.



And then, the real-time data of the inverter can be monitored by the software.



6.2.4 GPRS module

GPRS Internet monitoring solution

GPRS Internet monitoring solution is available for the Internet data monitoring without distance limit. INVT server, iMars series solar inverter and GPRS communication converter are needed for the GPRS Internet monitoring. The users apply Web browser or APP for the operation and data view.

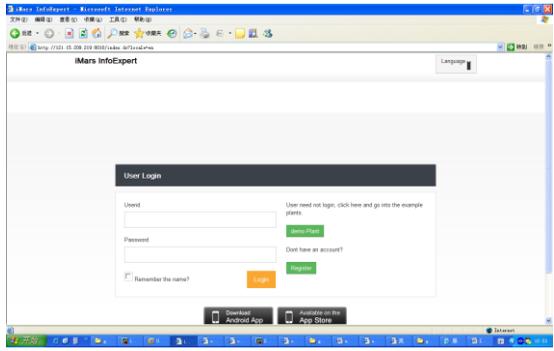


Configuration of GPRS Internet monitoring

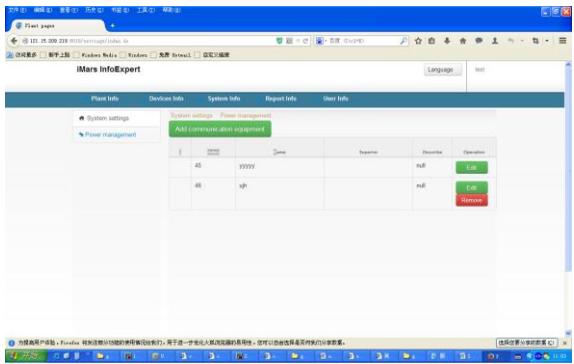
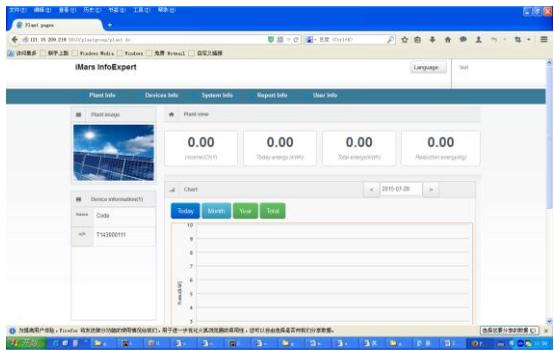
GPRS output is set in the factory. After the card insertion and power connection, it can be used.

Check the communication between GPRS and solar server

Open the observer and input <http://121.15.209.219:8010/index.do?locale=en> and then input the user name and log in.

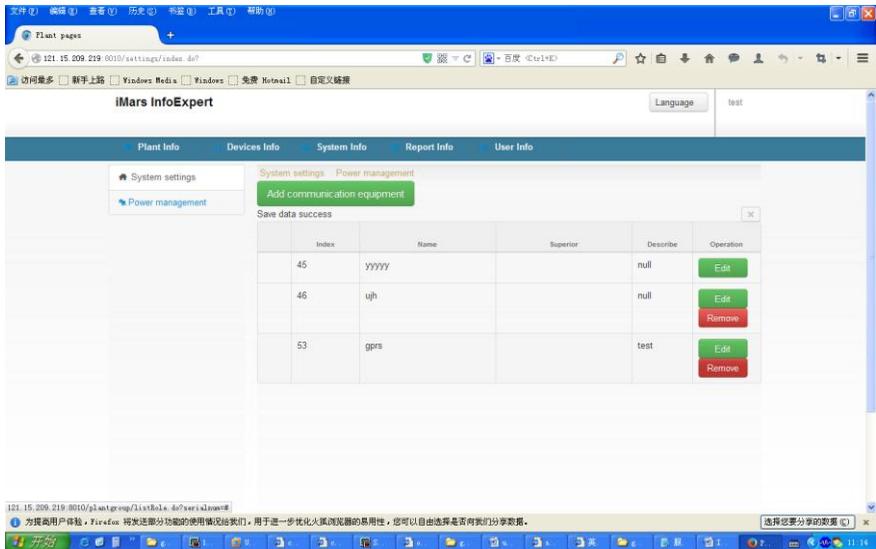
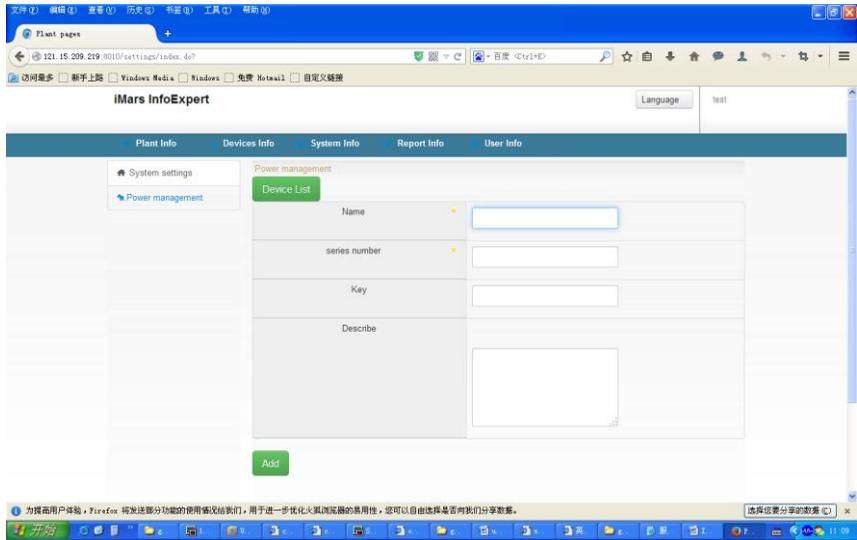


Above interface will pop up after the login, select system info and then click add communication equipment.

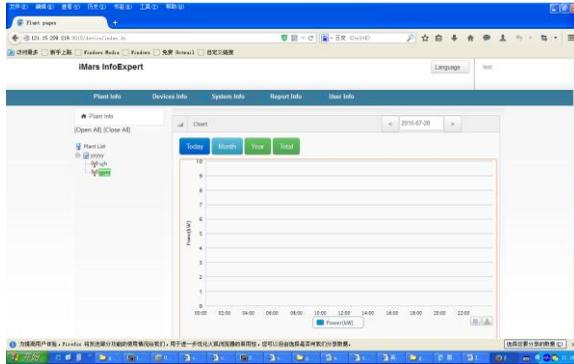


The equipment can be named by the user, but the series number and key are provided by the factory. Fill in the content in the describe block, such as add some equipments.

For example, fill in the serial number of t2234567890, name of GPRS in the figure below, and then click add.



After the adding, the device of GPRS is listed in the devices info as the figure below, and no device connection in the figure.

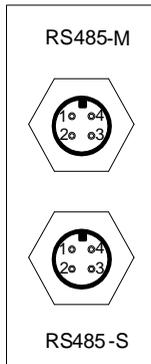


If the device is added, click twice to view the dropdown list.

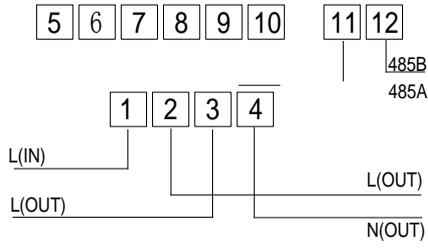
Anti-flow

The grid company requires the solar grid-tied system has the anti-flow function which means the generated power can only be consumed other than fed back to the upper grid through the transformer. If the system has this function, the voltage and current at the transformer side can be controlled to adjust the system power.

The wiring of the anti-flow system



Connect the 485 communication port: connect the upper PC with RS485-M and the meter with RS485-S.



Meter wiring

Connect the meter as the figure above, and then connect the meter with the RS485-S.

7 Troubleshooting

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

Table 7-1 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 shutdown	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



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Industrial Automation: Frequency Inverter Servo & Motion Control Motor & Electric Spindle PLC
 HMI Intelligent Elevator Control System Traction Drive
Electric Power: SVG Solar Inverter UPS Online Energy Management System



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