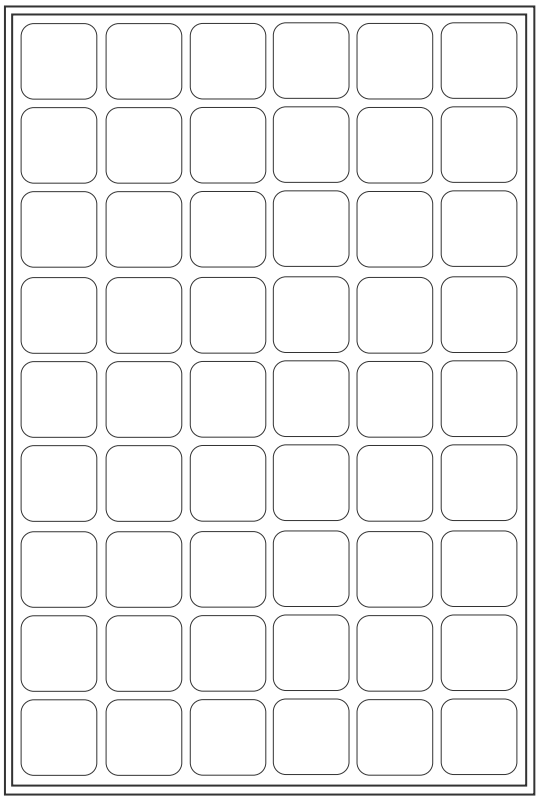
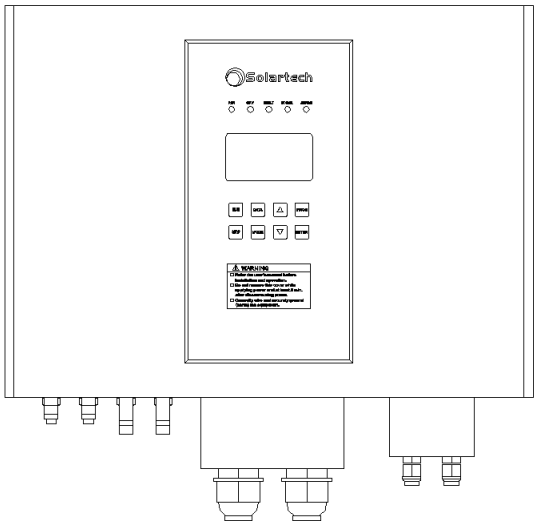
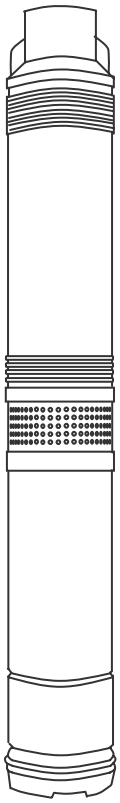
PB-G2 Solar Pumping Inverter

Operation Manual







Infinite Solar Energy

Shenzhen Solartech Renewable Energy Co., Ltd.

2015

Preface

Thank you very much for using the PB-G2 solar pumping inverter manufactured by Shenzhen Solartech Renewable Energy Co., Ltd.

To ensure safety of user and equipment, taking full advantage of product performance, please read this manual carefully before installation and usage.

In order to facilitate the routine inspection and maintenance of the inverter, and know the countermeasure of troubleshooting and reason of abnormity, please keep the manual properly.

If questions arise during usage or additional support and special request are needed, please contact our distribution agent or contact our technical support directly.

Content in this manual may change without prior notice..

Index

Safety Instruction

Safe operation is only achieved by correctly transport, install, operate and maintain the product. Before proceeding, please read through the following notices. There are three types of safe warning:

 DANGER: Misuse may cause fire, severe damage to human and animal bodies and may cause death.

 WARNING: Misuse may damage equipment or cause light to medium damage to human and animal bodies.

 NOTE: Useful information.

- Purchase Inspection

 Caution
1. Do not install the inverter if it is damaged or with missing parts. Otherwise may cause accidents.

- Installation

 Caution
1. To ensure a good convective cooling effect, the inverter must be installed vertically with at least 30 cm space left at the top and bottom. 2. Recommended for indoor installation where has ventilation equipment. Do not install it in direct sunlight. 3. Do not let the drilling dust fall into the inverter cooling fin or fan during installation to ensure good heat dissipation.

- Connection

 Warning
1. Wiring must be performed by qualified electric professionals, or else may cause electric shock or fire. 2. Please confirm input power has already been cut off before wiring and connection, or else may cause electric shock or fire. 3. Earth terminal must be reliably grounded, or else inverter enclosure may be electrified. 4. The selection of solar array, motor and inverter shall be reasonable.

Caution
1. Please use fasten terminal with specified torque, or else may cause fire. 2. Do not connect capacitor nor phase-advanced LC/RC noise filter with inverter output. It is recommended to use a reactor when the distance between the inverter and motor exceeds 200m.

- Running

Warning
1. Make sure all the wiring and connection are correct before powering on, or else may damage combiner box or cause fire. 2. While powered on, please do not change wiring and connection, or else may cause electric shock.

Caution
1. Before the first operation, please adjust the function parameters according to the steps indicated in manual. Do not change the function parameters of the inverter freely, or else it may cause damage to the equipment. 2. The temperature of radiator is high during running, do not touch it for a long time, or else it may cause burn. 3. In case of altitude over 2000m, the inverter should be derated for use, i.e. the output current will be derated by 10% for every 1500m increase in height.

- Others

Warning
1. Maintenance and inspection must be performed by a qualified electrician. 2. Do not dismantle the inverter during operation. The inverter must be powered off at least 5 minutes before conducting maintenance and inspection, this is to avoid the residual voltage of electrolytic capacitor in major loop causing personal injuries. 3. It is absolutely forbidden to reconstruct the inverter by oneself, as this can cause personal injury or equipment damage. 4. The inverter should be treated as industrial waste when being abandoned. During incineration, the electrolytic capacitor is possible to explode and some parts may produce toxic and harmful gas.

Chapter 1: Product Introduction

1.1 Introduction of Solar Pumping System

Solar pumping systems produced by Shenzhen Solartech Renewable Energy Co., Ltd can be applied to living water supply, agricultural irrigation, forestry irrigation, desert control, pasture animal husbandry, island water supply, wastewater treatment and so on. In recent years, with the promotion of the utilization of new energy resources, solar pumping systems are more and more applied in civil engineering, city squares, green parks, tourist destinations, resorts and hotels, as well as fountain landscape in residential areas.

The system consists of a solar array, a pump and a solar pumping inverter (see Fig. 1-1). Based on the design philosophy that it is better to store water than electricity, there is no energy storing device such as storage battery in the system.

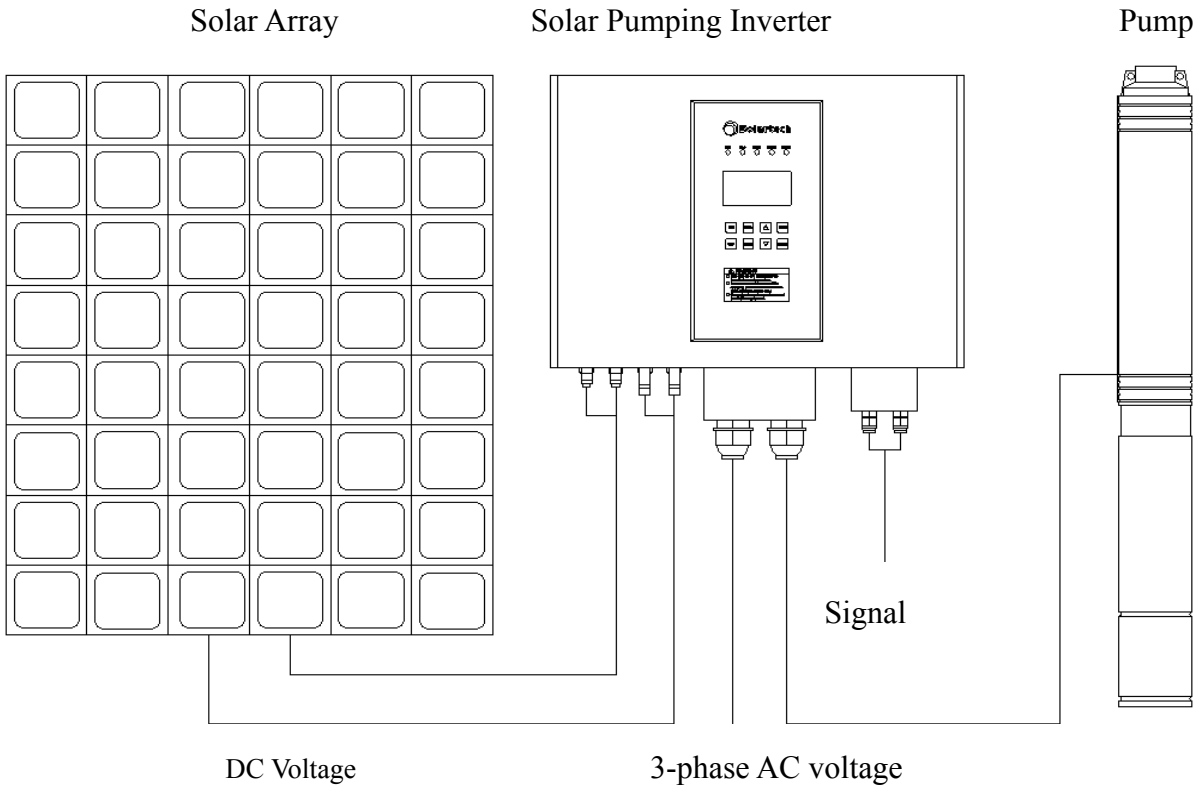


Fig. 1-1 Solar Pumping System Structure

The solar array includes many solar panels connected in series and in parallel, it absorbs sunlight radiation and converts it into electrical energy, providing energy source for the whole system. The solar pumping inverter controls and adjusts the system operation and converts the DC produced by

the solar array into AC in order to drive the pump, it adjusts the output frequency in real-time according to the solar radiation to implement the maximum power point tracking (MPPT). The pump, driven by 3-phase AC motor, can draw water from deep wells or river, lake to fill into the storage tank or reservoir, or directly connect to irrigation system, fountain system, etc. According to the actual system demand and installation condition, different types of pumps such as centrifugal pump, axial flow pump, mixed flow pump and deep well pump can be applied.

1.2 Product Features

Based on years of development and experiments, Solartech self-developed PB-G2 solar pumping inverters (Fig.1-2) have the following features:

- Compatible with submersible pumps, surface pumps, swimming pool pumps using 3-phase induction motors.
- Patented dynamic VI maximum power tracking (MPPT) algorithm, fast response and good stability. MPPT efficiency reaches 99%.
- Fully automatic operation. Pump operation frequency range can be set based on project requirement. 8 years storage capacity for operation data.
- Intelligent power module used in main circuit. High reliability. Up to 98% conversion efficiency.
- ab capable of adjusting pump speed range according to the actual condition, and support 8 years of running data storage.
- High efficiency intelligent module used in main circuit. High reliability. Up to 98% conversion efficiency.
- Support soft start of pump. Full motor protections. Optional water level switch to protect overflow and dry running.
- Multiple DC input strings can implement solar combiner function, anti-reverse circuit at each input string.
- Good sealing, IP65 protection grade. Ambient temperature: -20~+60℃. Ambient humidity ≤ 95%. Suitable for harsh outdoor installation environment.
- Using high standard components. Wide input voltage range, low voltage models with built-in boost circuits, flexible options for solar array design.
- LCD display, user friendly interface, rich display information.
- Optional grid/diesel back-up, meeting running requirement for day and night.
- Intelligent recognition of input voltage, automatic operation without manual debugging on the

voltage parameters in advance.

- Optional RS485/GPRS interface to implement system remote monitoring.
- Optional advanced functions: encryption for installment payment, analog input control, timing control, alarm output.

Fig. 1-2 PB-G2 Solar Pumping Inverter

1.3 Solar Pumping Inverter Specifications

Nameplate and Type Description

The product's nameplate is located under lower right of the inverter, which contains the important information such as product series, voltage, power grade, software version and hardware version that will provide important basis for product application, maintenance and after service.

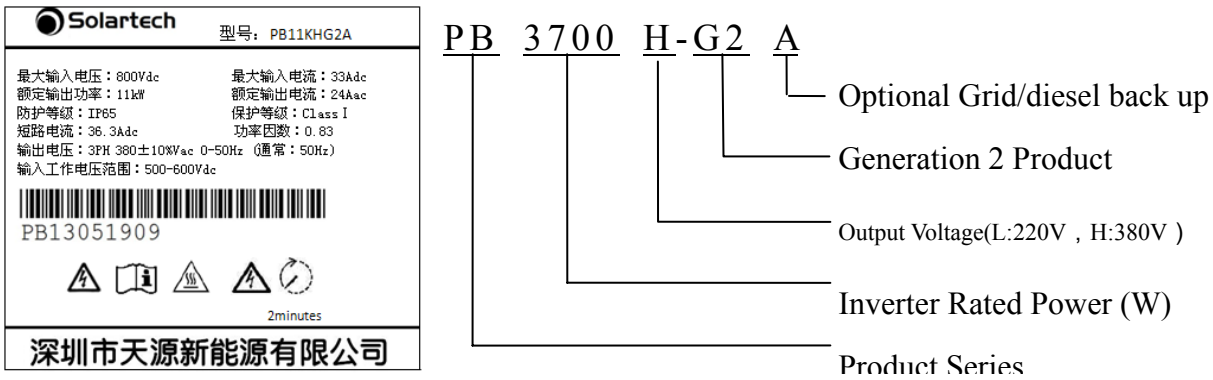


Fig. 1-3 Product nameplate and type description

Caution: Do not tear off the product's nameplate label.

Product Specification and Technical Index

Model	Adapting Pump Motor		Max. DC Input Power (kW)	Max.DC Input Voltage (V)	Recommended MPP Voltage (V)	Rated Output Current (A)	Output Frequency (Hz)
	Rated Power (kW)	Rated Voltage (V)					
PB750L-G2	0.37 ~ 0.75	200 ~ 240	1.1	450	150 ~ 360	5	0 ~ 50/60
PB1500L-G2	0.75 ~ 1.5	200 ~ 240	2.2	450	150 ~ 360	7	0 ~ 50/60
PB2200L-G2	1.5 ~ 2.2	200 ~ 240	3.3	450	150 ~ 360	11	0 ~ 50/60
PB3700L-G2	2.2 ~ 3.7	200 ~ 240	5	450	280 ~ 360	17	0 ~ 50/60
PB3700H-G2	2.2 ~ 3.7	380 ~ 440	5	850	500 ~ 700	9	0 ~ 50/60
PB5500H-G2	4 ~ 5.5	380 ~ 440	8	850	500 ~ 700	13	0 ~ 50/60
PB7500H-G2	5.5 ~ 7.5	380 ~ 440	11	850	500 ~ 700	18	0 ~ 50/60
PB11KH-G2	9.2 ~ 11	380 ~ 440	16	850	500 ~ 700	24	0 ~ 50/60
PB15KH-G2	13 ~ 15	380 ~ 440	22	850	500 ~ 700	30	0 ~ 50/60
PB18KH-G2	18.5	380 ~ 440	28	850	500 ~ 700	39	0 ~ 50/60

Caution: Please be sure to select the appropriate model according to solar array and motor load.

Caution: The maximum input current in above table is the total current of multiple inputs, and the maximum current of each input should not exceed 15A.

Chapter 2 Installation and Wiring

2.1 Purchase Inspection

Solartech has rigid quality assurance system in product manufacturing and packing. If any abnormity is found, please contact the distributors of our company immediately or directly keep in touch with our technology service center. We will solve the problems for you as early as possible. Once you get the product, please confirm the following items:

Inspection items	Inspection methods
Consistency with ordered product	Inspect the product's nameplate label
Damage or exfoliation phenomenon	Inspect whole appearance
Completeness of main machine and accessories	Check carefully according to the product list
Looseness of fastening parts such as screw	Check with screwdriver when necessary

2.2 Dimension and Weight

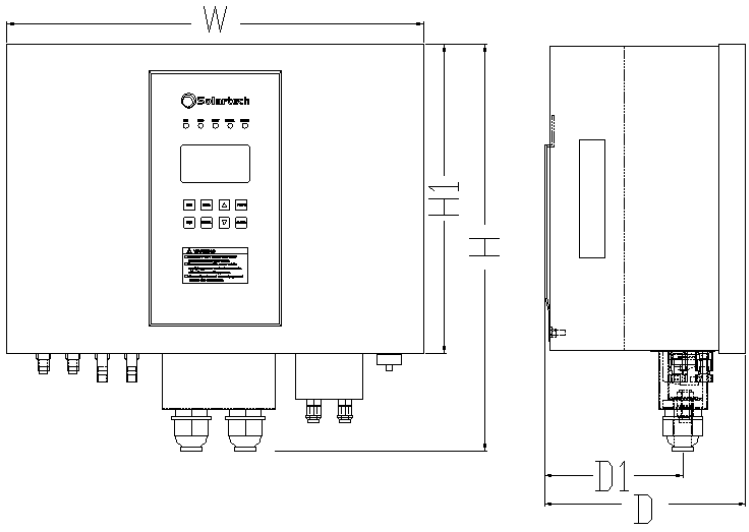


Fig. 2-1 Product appearance and installation dimension

Model	Appearance and installation dimension (mm)					Weight
	W	H	D	H1	D1	(kg)
PB750L-G2 ~ PB3700L-G2 PB3700H-G2	335	335	175	255	115	10 ~ 11.5
PB5500H-G2 ~ PB18KH-G2	425	415	205	315	140	14 ~ 15

Caution: PG-G2 solar pumping inverters are for wall mount installation. Please ensure that the mounting back can support the weight of the inverter.

2.3 Inverter Installation

2.3.1 Installation Site Requirement

The inverter installation site environment has great influence to inverter's operation safety, performance and lifetime. The inverter installation shall be implemented in proper installation site.

1. All installations must be in accordance with local installation standards
2. Do not install the inverter in inflammable or explosive places or where stores inflammable or explosive materials.
3. Do not install the inverter in the places where have explosive danger.
4. Do not install the inverter in the places where have lightning stroke danger.
5. Do not install the inverter in the places where have heavy salt fogs.
6. Make sure installation site is well-ventilated, do not install the inverter in sealed box, or else inverter will not work properly.
7. When use outdoor installation, the inverter is recommended to install under the roof or a shielding to prevent direct sunshine, rain and snow as much as possible.
8. When use indoor installation, the inverter is recommended to install far away from the window to prevent lightning stroke.
9. The installation sites needs to be firm enough to hold the weight of inverter for a long time.
10. Installation site needs to be clean and tidy, the ambient environment temperature

should be kept in -20□~+60□.

11. Ambient humidity should be less than 95%, due to water vapour can corrode the inverter and damage the internal components.
12. Installation site should be convenient for data observation and maintenance.
13. Do not install the inverter in living area to prevent noises to daily life.

2.3.2 Installation Direction Requirement

1. Vertical installation or lean back installation with max 10° tilt angle shall be used.
2. It's forbidden to use forward lean installation of the inverter.
3. Horizontal installation is forbidden for the inverter.
4. Installation height shall be convenient for data reading and operation on the LCD screen.
5. Do not install the inverter in places where children can reach.
6. Leave enough mounting space between inverter and other objects nearby to ensure good ventilation and heat dissipation
7. Leave enough space in front of inverter to facilitate data reading on the LCD screen.

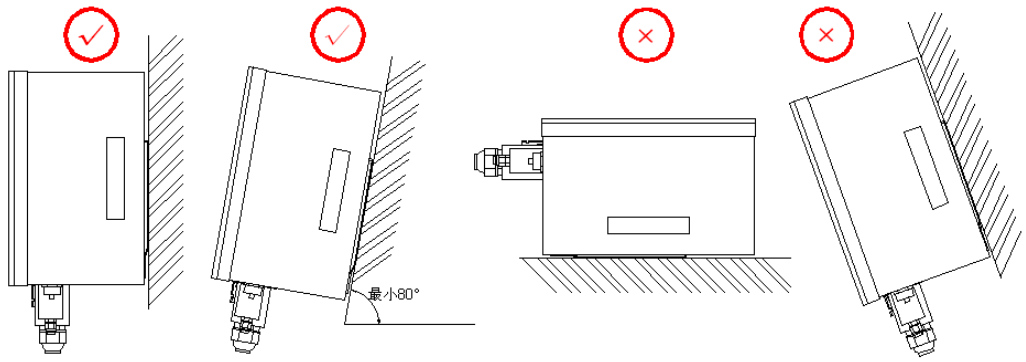


Fig. 2-2 Installation direction diagram

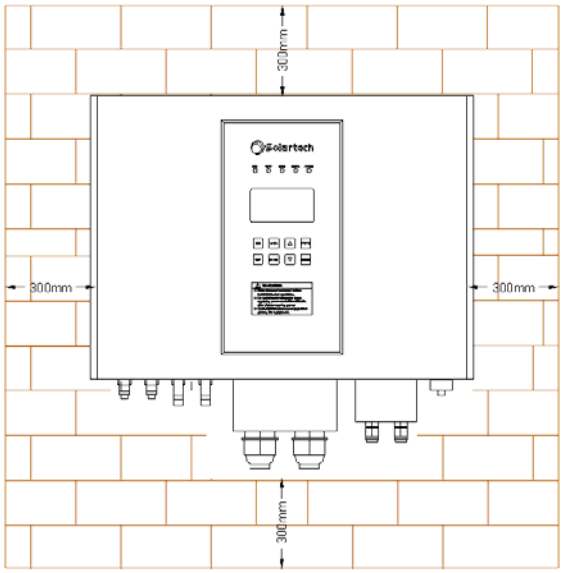


Fig. 2-3 Min. inverter installation space diagram

2.3.3 Inverter Installation Steps:

Step 1: Choose the installation place and drill holes according to the size and shape of support plate, the recommended diameter of holes is 8±1mm with 60±5mm depth.

Step 2: Fasten the inverter support plate on the wall with 35Nm tightening torque expansion bolt.

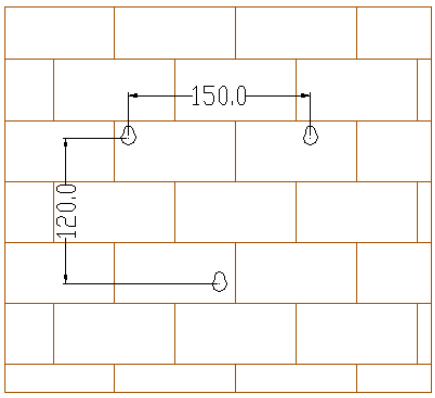


Fig. 2-4 Installation hole diagram

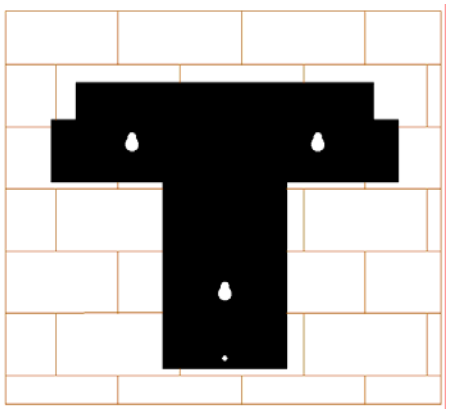


Fig. 2-5 Support plate installation diagram

Step 3: Hang the mounting groove in inverter back on the support plate, when inverter is reliably hung up, fasten the screw nuts between the support plate and inverter.

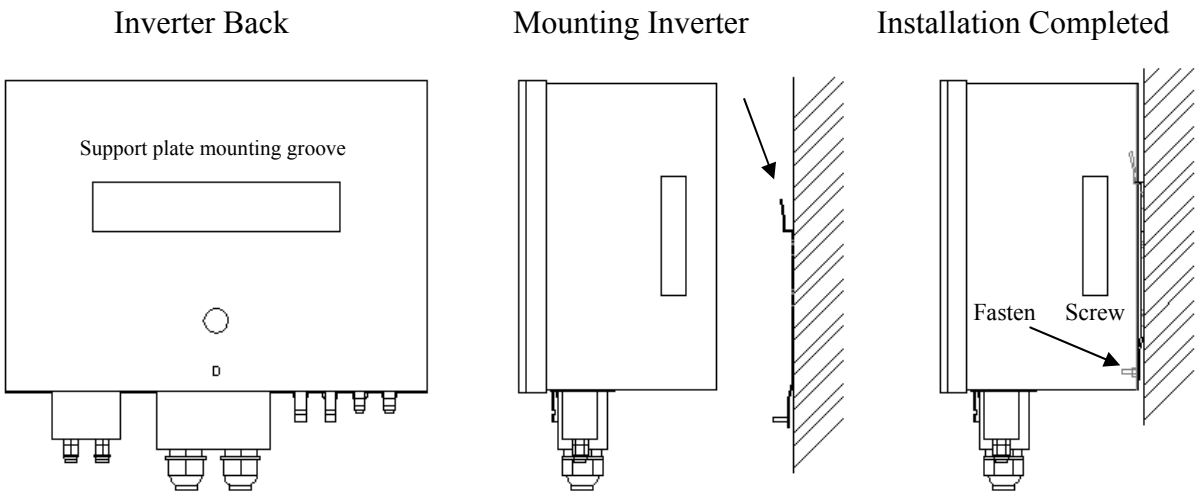


Fig.2-6 Hang up the inverter and fasten the screw nuts

Note: Do not install the inverter on rock or thin wooden panel with toggle bolts.

Note: Expansion bolts provided with inverter by Solartech are suitable for installation on concrete walls. If mounted on wooden walls, please select the expansion bolt suitable for wooden wall mounting, and ensure the length of expansion bolts is enough to penetrate 1/2 of the wall thickness.

2.4 Wiring Diagram

◆ Enclosure Sockets

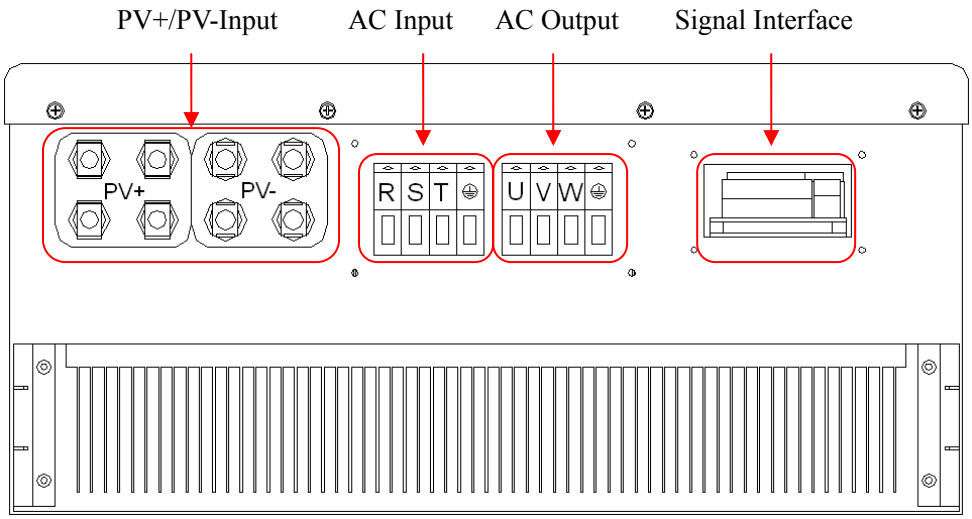


Fig. 2-7 PB-HG2 models wiring diagram

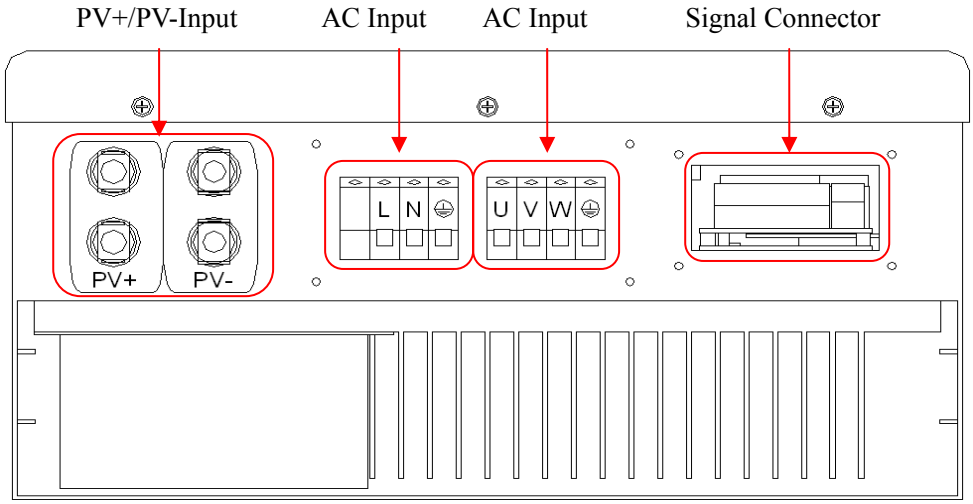


Fig. 2-8 PB-LG2 models wiring diagram

Socket	Terminal Description	Connection Description
DC Input	PV+	Connected to positive side of solar array
	PV-	Connected to negative side of solar array
PB-HG2 AC Input	R	Connected to R phase of grid
	S	Connected to S phase of grid
	T	Connected to T phase of grid
	⏚	Connected to ground wire

PB-LG2 AC Input	L	Connected to L phase of grid
	N	Connected to N phase of grid
	⏚	Connected to ground wire
AC Output	U	Connected to U phase of motor
	V	Connected to V phase of motor
	W	Connected to W phase of motor
	⏚	Connected to ground wire

Caution: AC input sockets are different according to inverter models, please subject to the wordings on the inverter sockets.

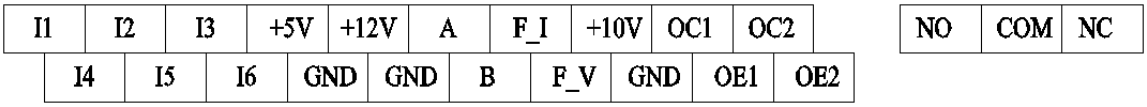


Fig. 2-9 Signal interface diagram

Terminal Symbol	Terminal Name	Function Description
I1 - GND	Multi-function terminal1	Tank signal wire 1
I2 - GND	Multi-function terminal 2	Tank signal wire 2
I3 - GND	Multi-function terminal 3	Well signal wire 1
I4 - GND	Multi-function terminal 4	Well signal wire 2
I5 - GND	Multi-function terminal 5	Run-stop control signal wire 1
I6 - GND	Multi-function terminal 6	Run-stop control signal wire 2
+5V - GND	+5V power supply	5V power supply, max. output current :200mA
+10V - GND	+10V power supply	10V power supply, max. output current:10mA; can be used as power supply of an external potentiometer with resistance value range of 1kΩ~5kkΩ.
+12V - GND	+12V power supply	12V power supply, max. output current 300mA; can be used as power supply of GPRS DTU device (optional), or external sensor, miniature relay.
A - B	RS485 communication interface	RS485 interface wire

F_I - GND	Analog input terminal 1	Input current range：DC 0~20mA
F_V - GND	Analog input terminal 2	Input voltage range：DC 0~10V
OC1 - OE1	Open collector output terminal	Opto-couplers isolation, driven by external power supply; output voltage range: 0 ~ 24V; output current range: 0 ~ 50mA
OC2 - OE2	Open collector output terminal	
NO - COM	Normal open relay contact (connected when in a failure)	Contact drive capacity: AC250V 3A cosφ=0.4 DC30V 1A
NC - COM	Normal close relay contact of relay (disconnected when in a failure)	

Note: To ensure communication quality, please adopt shielded twisted pair cable as communication cable because single-strand wire has poor interference ability which can result in bad communication when disturb occurs.

◆ Electrical Connection

Below is the electrical connection diagram of a solar pumping system with solar array, solar pumping inverter and 3 phase AC pump. Water level switches can be applied for water level monitoring and control. Communication device can be connected for remote monitoring and control.

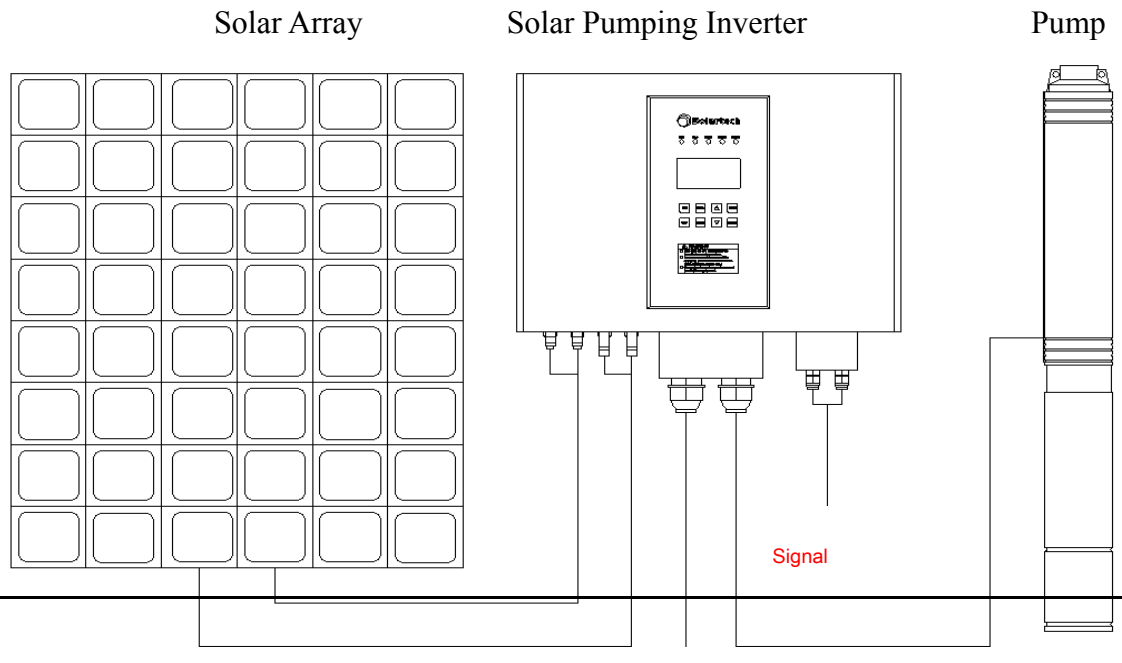


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Fig. 2-10 Electrical connection diagram

上面完整应该是 Signal Interface

Caution: To ensure stable operation of system, please choose cable size according to our recommendation as below.

Recommended Cable Size:

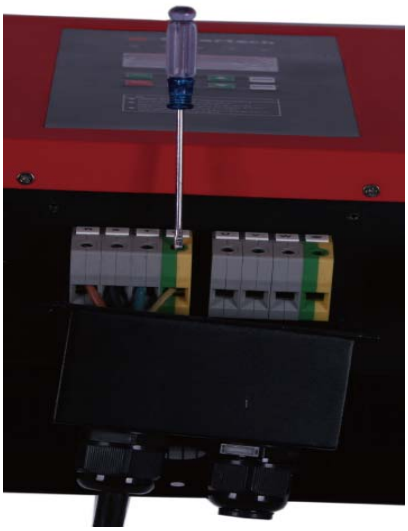
Model	Solar Array Cable (P, N) (mm^2)	Earth Wire (PE) (mm^2)	Pump Cable (U、V、W) (mm^2)	Signal Wire (S) (mm^2)
PB750L-G2	2	2.5	2.5	1.5
PB1500L-G2				
PB2200L-G2				
PB3700L-G2				
PB3700H-G2				
PB5500H-G2				
PB7500H-G2				
PB11KH-G2				
PB15KH-G2		4	4	
PB18KH-G2		6	6	

Note: Ambient temperature condition for the above-recommended wire size is ≤50°C.

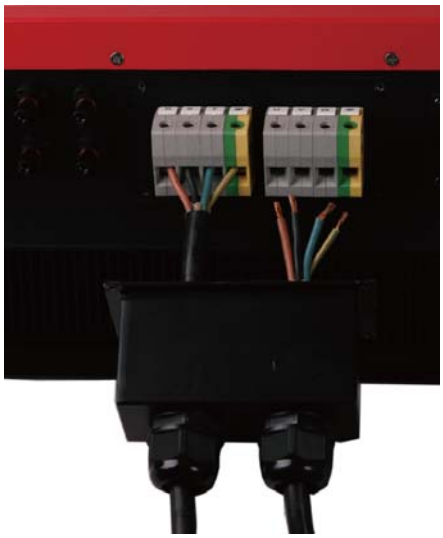
Note: High voltage models adopt multiple DC input strings, the cable size recommended above should be applied for all strings.

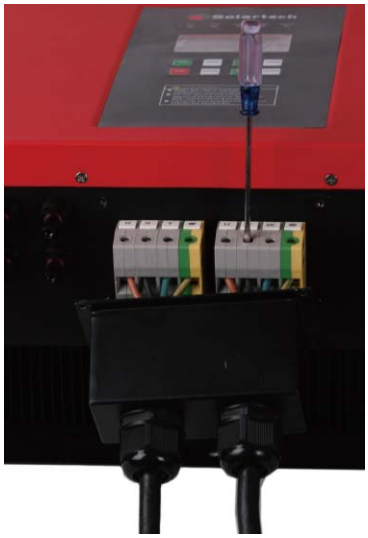
◆ AC Input and Output Installations

1. Open the box cover of AC input terminal, put the cable through the left waterproof PG terminal, use a slot type screwdriver to fasten the cable connector with 10Nm tightening torque.



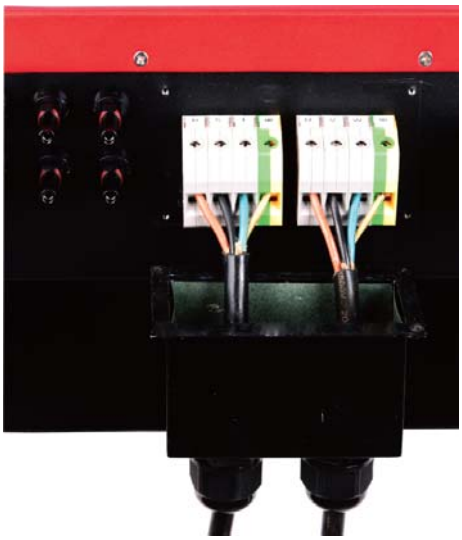
2. Put AC output cable through the right waterproof PG terminal, and use a slot type screwdriver to fasten the connector with 10Nm tightening torque.





3. Correct connection of AC input and output cables is as below images, lock the AC terminal box cover and fasten the waterproof PG terminal with 10Nm tightening

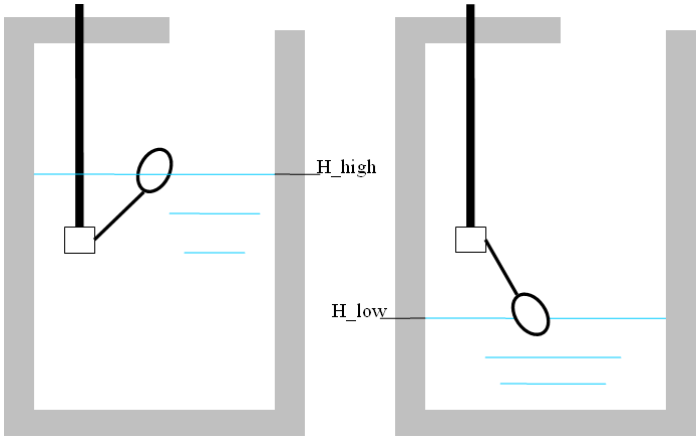
torque.



◆ Signal Interface Installation

Open the box cover of signal interface terminal, put the signal wire through waterproof PG terminal, use a slot type screwdriver to fasten the cable in corresponding data interface terminal with 7Nm tightening torque, then lock the box and fasten the waterproof PG terminal with 10Nm tightening torque.

◆ Water Level Switch



	Normally Open	Normally Close
Water level over H_high	Connected	Disconnected
Water level under H_low	Disconnected	Connected

Caution: Please connect the wires according to the instruction, incorrect connection may lead to abnormal operation of system.

Chapter 3 Operation Control

3.1 Panel Layout and Instruction

Solartech PG-G2 solar pumping inverter uses LCD display operation panel which is shown as the figure below, it includes 5 LED lights and 5-digit 8-SEG nixie tubes and 8 keys in 2 rows.

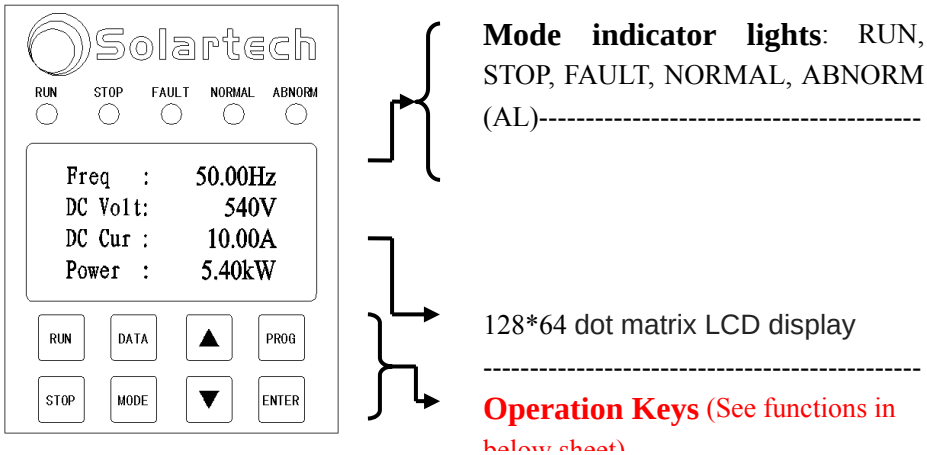


Fig. 3-1 Keyboard layout and name of each part

Indicator Light & Key	Name	Function Description	
RUN	Running indicator light	Green	On: Inverter is running.
STOP	Stopping indicator light	Red	On: Inverter is stopped.
FAULT	Fault indicator light	Red	On: System fault.
NORMAL	Normal indicator light	Green	On: system normal.
ABNORM	Abnormal indicator light	Red	On: Water level in tank or well is abnormal.
RUN	Run key	Control the start of the inverter.	
STOP	Stop key	Control the stop of the inverter.	
DATA	Data inquiry key	Enter or quit from the historical data display status.	
MODE	Mode switch key	1. Switch the contents to be displayed during data viewing.	

Indicator Light & Key	Name	Function Description
		2. Switch the digit to be modified during data modifying.
▲	Increasing key	1. Increase parameter number or its value in control parameter display status. 2. Change historical date upward and historical data content viewing in historical data display status. 3. Increase output frequency or display current running data upward in running data display status according to operation mode.
▼	Decreasing key	1. Decrease parameter number or its value in control parameter display status. 2. Change historical date downward and historical data content viewing in historical data display status. 3. Decrease output frequency or display current running data downward in running data display status according to operation mode.
PROG	Programming key	Enter or quit from the control parameter display status.
ENTER	Enter key	1. Confirm the content to be viewed or modified. 2. Confirm and save the parameter value when the parameter is modified.
▲ + ▼	Reset key combination	Press the key combination to restore normal operation in protection status

3.2 Panel Operation

◆ Instruction for Display Status

There are 3 display statuses on the operation panel: running data display, control parameter display, historical data display. The default status is running data display.

Press the PROG key to enter the status of control parameter display, and press the key again to return to the default status.

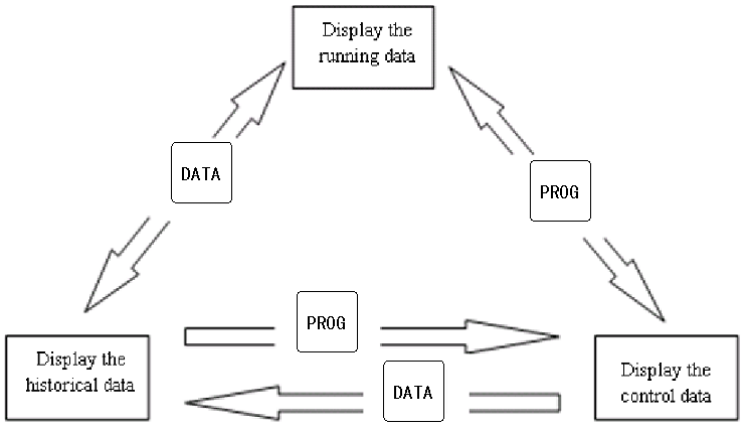
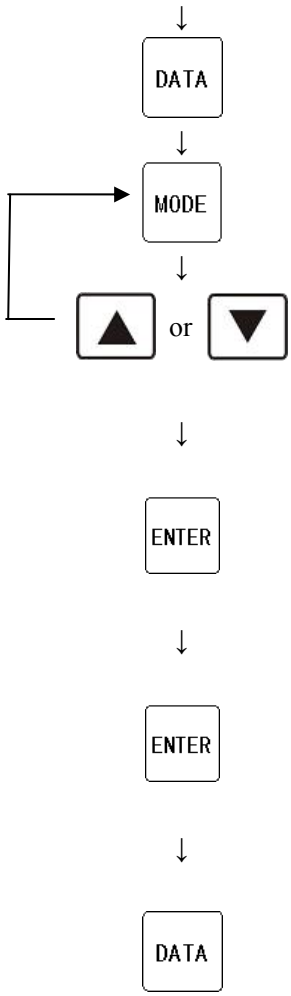


Fig. 3-2 Diagram of display status switching

◆ View Running Data

Operation	Description	Display
Initial status: Current running data ↓ MODE ↓ MODE ↓ MODE	Display current running data: Output frequency, DC input voltage, DC input current, input power of the inverter.	Freq : 50.00Hz DC Volt: 540V DC Cur : 10.00A Power : 5.40kW
	Display current running data: Output voltage, output current, generated power, module temperature of the inverter.	AC Volt: 380V AC Cur : 9.5A Energy : 500kWh Tempera: 55°C
	Display current running data: Date, time, input power supply mode, operation mode of the inverter.	Date : 2015-02-01 Clock : 12:00 Supply: PV Mode : AUTO
	Display fault page: Inverter fault type, abnormity, restart countdown, current status of the inverter.	Alert : Over Cur Abnorm: NO Delay : 29 sec Status : restart

◆ View Historical Data

Operation	Description	Display
Initial Status: non-historical data display:  		
	Enter the data inquiry interface: Date, starting time, stopping time, restart times of the inverter.	Date : 2015-02-01 Start : 08:00 Stop : 19:00 Restart: 10 Times
	Select the digit to be modified (year, month, day)	Date : 2015-02-■ Start : 08:00 Stop : 19:00 Restart: 10 Times
	Modify and confirm the date to inquiry	Date : 2015-02-11 Start : 08:00 Stop : 19:00 Restart: 10 Times
	Display historical data on inquired date: daily generated power, max. output power, max. MPP voltage, total daily operation time.	Energy : 30.0kWh MAX pwr : 5.30kW MPPT U : 540V Runtime : 7H.30M
	Quit from the display status of the historical data Display current running data	Freq : 50.00Hz DC Volt: 540V DC Cur : 10.00A Power : 5.40kW

◆ View or Modify Control Parameter

Operation	Description	Display
Initial status: non-control		

Operation	Description	Display
parameter display ↓ PROG ↓ ▲ or ▼ ↓ ENTER ↓ ▲ or ▼ ↓ ENTER ↓ PROG	Enter the parameter modification interface: Display menu type, parameter number, parameter value, parameter meaning of the inverter.	Menu : System Number : 0 ◄ Value : 0 Note : para set
	Select the parameter to be viewed and modified: Parameter number can be viewed or modified when the cursor is at the end of the parameter number.	Menu : System Number : 12 ◄ Value : 20.00 Note : set freq
	Confirm the parameter to view or modify: The cursor will move to the end of parameter value line.	Menu : System Number : 12 Value : 20.00 ◄ Note : set freq
	Modify the parameter value: When the cursor is at the end of parameter value line, the parameter value can be modified.	Menu : System Number : 12 Value : 30.00 ◄ Note : set freq
	Confirm and save the modification: Cursor moves to the end of parameter number line.	Menu : System Number : 12 ◄ Value : 30.00 Note : set freq
	Quit from the parameter display mode. Display current running data	Freq : 0.00Hz DC Volt: 540V DC Cur : 0.00A Power : 0.0kW

Note: When inverter is operating, the control parameters can only be read. The control parameters can only be modified after the inverter stops operation.

3.3 Function Parameter Description

Parameter Number	Name	Scope	Description	Factory Set Value
0	Mode of parameter setting	0 ~ 3	0: Parameters can be read and written. Other parameter values cannot be modified until Pr.0 is modified as 0. 1: All parameters can only be read. 2: Restores all parameters to factory values. 3: Time calibration, modify Pr.6~Pr.10 first, then set this parameter as 3 to save the change.	1
1	Maximum power point voltage	0 ~Pr.2–1	Maximum power point voltage of solar array.	310V 530V
2	Open circuit voltage	Pr.1+1 ~ 1000	Open circuit voltage of the solar array. Note: Interlock function between Pr.1 and Pr.2, if necessary, needs to modify both Pr.1 and Pr.2 values.	380V 650V
3	Rated voltage	1 ~ 1000	Rated voltage of the motor load.	220V 380V
4	Rated current	0.1 ~ 300.00	Rated AC output current.	According to pump
5	Start delay time	1 ~ 6000	Start delay time in seconds after power up or shutdown.	30s
6	Year	2000 ~ 2999	Year required to be corrected.	
7	Month	1 ~ 12	Month required to be corrected.	
8	Day	1 ~ 31	Day required to be corrected.	
9	Hour	0 ~ 23	Hour required to be corrected.	
10	Minute	0 ~ 59	Minute required to be corrected.	

Parameter Number	Name	Scope	Description	Factory Set Value
11	Sources of frequency instruction	0 ~ 2	0: Press RUN key to run while the frequency is determined by Pr.12. 1: Full-automatic operation. 2: Press RUN key to run, adjust the frequency automatically according to the sunlight.	1
12	Reference frequency	0 ~ Pr.13	Target frequency when Pr.11 is 0.	20.00Hz
13	Maximum operating frequency	0.01 ~ 60.00	To protect the motor load, maximum operating frequency must be same as rated frequency of motor.	50.00Hz
14	Stopping frequency	0 ~ 60.00	Shutdown when the output frequency is less than the set value.	20.00Hz
15	Water tank setting 1 (connecting terminals: I1 & GND)	0 ~ 9	0：Not use water level switch. 6：Normal close water level switch. 7：Normal open water level switch. 8: Normal open water level switch coordinating with Pr.16. 9: Normal close water level switch coordinating with Pr.16. Caution: Other value setting is forbidden, or else it can cause abnormal operation Note: When set as 8 or 9, Pr.16 must be set as same value, or else the setting is invalid.	

Parameter Number	Name	Scope	Description	Factory Set Value
16	Water tank setting 2 (connecting terminals: I2 & GND)	0 ~ 9	0：Not use water level switch. 6：Normal close water level switch. 7：Normal open water level switch. 8: Normal open water level switch coordinating with Pr.15. 9: Normal close water level switch coordinating with Pr.15. Caution: Other value setting is forbidden, or else it can cause abnormal operation Note: When set as 8 or 9, Pr.15 must be set as same value, or else the setting is invalid.	0
17	Water well setting 1 (connecting terminals: I3 & GND)	0 ~ 9	0：Not use water level switch. 6：Normal close water level switch. 7：Normal open water level switch. 8: Normal open water level switch coordinating with Pr.18. 9: Normal close water level switch coordinating with Pr.18. Caution: Other value setting is forbidden, or else it can cause abnormal operation Note: When set as 8 or 9, Pr.18 must be set as same value, or else the setting is invalid.	0

Parameter Number	Name	Scope	Description	Factory Set Value
18	Water well setting 2 (connecting terminals: I4 & GND)	0 ~ 9	0：Not use water level switch. 6：Normal close water level switch. 7：Normal open water level switch. 8: Normal open water level switch coordinating with Pr.17. 9: Normal close water level switch coordinating with Pr.17. Caution: Other value setting is forbidden, or else it can cause abnormal operation Note: When set as 8 or 9, Pr.17 must be set as same value, or else the setting is invalid.	0
19	Total generated electricity	Read-only		0
20 ~ 24	Fault type record 1 ~ 5	Read-only	See chapter 5 about the descriptions of the last 5 fault codes.	No
25	Pump rated power	0.1~300.00	In order to enable the loss of load protection function for pump motor, Pr.25 must be set correctly, or else abnormal operation can happen, value is in kW.	According to pump
26	Pump motor pole pairs	1~10	Pump motor pole number is used to calculate the synchronous speed of pump.	2
27	Restart delay time of pump when well water level abnormal	1~30000	The delay time when well water level is abnormal or loss of load protection has started, specified in seconds (if countdown time is more than 999 seconds, the screen will still show 999 with the numbers blinking).	600s

Parameter Number	Name	Scope	Description	Factory Set Value
28	Loss of load protection	0~1	0：Invalid. 1：Valid (the restart time of loss of load protection is set by Pr.27). Note: When the loss of load protection is set to valid, the inverter will only determine the loss of load when output frequency is higher than the setting value of Pr.14 .	0
29	Restart delay time of pump when tank water level abnormal	1~30000	The delay time when tank water level is abnormal or loss of load protection has started, specified in seconds (if countdown time is more than 999 seconds, the screen will still show 999 with the numbers blinking).	600
30	Visit access code	0~30000	Advanced function parameter access password (optional when encryption for installment payment is needed).	0

Note: After modifying the parameter with shading in the table above, the next operation cannot be performed until the inverter has been reset.

Note: Under-voltage fault code caused by insufficient solar radiation is not recorded.

3.4 Initial Settings Before First Operation

To ensure the efficient, reliable and stable operation of the solar pumping system, professional electric technician must set some of the inverter's control parameters according to the system configuration as following steps before first operation (perform on a sunny day).

Step	Initial Setting Content	Operating Method
1	Modify all control parameters as read-write parameters	Modify Pr.0 value to 0
2	Modify date and time	1. Modify Pr.6~Pr.10 (year, month, day, hour, minute) according to local time 2. Modify the Pr.0 value to 3 to save the time update
3	Modify solar array parameter	Modify Pr.2 parameter (open circuit voltage) according to the solar array. Note: Inverter can also work without modifying Pr.2, but will work better after modifying Pr.2)
4	Modify the water level sensor settings	1．Set Pr.15, Pr.16 values to 8 if water tank switch is applied, or else set both to 0 2．Set Pr.17, Pr.18 values to 9 if water well switch is applied, or else set both to 0
5	Modify rated voltage of the pump	Modify Pr.3 (rated voltage) value according to the rated voltage of the pump
6	Modify the maximum operation frequency	Modify Pr.13 value (rated frequency) according to the pump rated frequency
7	Confirm the motor wiring	1. Modify Pr.11value as 0 2. Modify Pr.12 value as 30.00 (on a shining day) 3. Press RUN to run and observe water yield from the outlet 4. Press STOP to stop and exchange any pair of pump cable connections with the inverter 5. Press RUN to run and observe water yield from the outlet 6. Press STOP to stop, select the wiring method with bigger water yield to ensure the motor is rotated in forward direction
8	Modify the minimum operation frequency	1. Modify Pr.12 value as 10.00 2. Press RUN key to run 3. Observe if there's water flowing out of the outlet 4. If there is no water flow out, press ▲ to slowly

		increase the output frequency. 5. When there is water flowing out from the outlet, record the start operation frequency f0. 6. Modify the Pr.14 value as f0 (stopping frequency).
9	Set the operation mode of the inverter	User can set Pr.11 (operating mode) according to his requirement 0: Manual mode: Press RUN to operate, the initial frequency value is according to the value of Pr.12, the output frequency can be changed by pressing ▲ or ▼. 1: Full-automatic mode: the inverter can start automatically when solar radiation is strong enough, the inverter output frequency is in accordance with the solar radiation to control the solar array to output the maximum power. 2: Semi-automatic mode, Press RUN to run, the inverter output frequency is in accordance with the solar radiation to control the solar array to output the maximum power.
10	Modify the control parameters as read-only.	Modify Pr.0 parameter value to 1 before the inverter restart.

Caution: Please do not modify the inverter control parameters of the inverter freely, or else it can cause abnormal operation.

Chapter 4.Fault Diagnosis

4.1 Fault Code Description and Countermeasure

PB-G2 solar pumping inverter has complete protection functions. When system fault occurs, the inverter will take protection countermeasures: The general protection measure is stopping the driving signal output (jump stop) immediately and not allowing the inverter to restart in a while.

When fault or protection occurs, the inverter screen will automatically switch to the fault display page, the fault code will show on the 1st line and blink, and the 4th line will show “Status: Fault”, if the 4th line is showing “Status: Reset”, it means the fault or protection requires the inverter to reset to restore normal operation. User can shut off the power supply and then power on the inverter until the internal power supply is off, or press the “RESET” key combination to reset. If the fault still exists after resetting, please contact the manufacturer to report the fault and get a solution.

When the fault or protection has been cleared after resetting, the inverter will automatically proceed with the restart countdown, the 3rd line on screen will show the restart countdown time, when the countdown time reaches 0, fault display page will disappear automatically and then the inverter is in running data display status.

Fault Number	Warning Code	Code Description	Possible Cause	Countermeasure
1	Over volt	Over-voltage	High input voltage	Inspect solar array voltage
2	Low volt	Under-voltage	Low input voltage Weak sunlight intensity	Inspect solar array voltage
3	Over Cur	Over-current	Too large pump load Low solar array voltage Long pump cable	Change to low-power pump load Inspect solar array voltage Reduce the cable length between inverter and motor
4	Overload	Overload	Too large load	Reduce the highest operation frequency
5	IPM Prot	Over-current of internal module	Output short-circuit or grounding module damaged	Inspect the wiring Ask manufacturer for help

6	Boosterr	Boost circuit error	Device or circuit damaged	Ask manufacturer for help
8	Loss Load	Loss of load protection	Pump dry running Pump cables all disconnected Inverter size does not match the pump	Inspect water level, pump cable connections, and whether the inverter size is suitable for the pump or not
11	Para Err	Communication error	Device or circuit damaged	Reset Ask manufacturer for help
18	Too hot	Over-temperature of module	Air duct blocked Too high temperature	Clear the air duct or improve the ventilation condition
19	CT U Err	U phase CT fault	Device or circuit damaged	Ask manufacturer for help
20	CT W Err	W phase CT fault	Device or circuit damaged	Ask manufacturer for help
21	CT D Err	DC CT fault	Device or circuit damaged	Ask manufacturer for help
23	U lose	Output U phase lose phase	U phase cable disconnected Device or circuit damaged	Inspect pump cable connection Ask manufacturer for help
24	V lose	Output V phase lose phase	V phase cable disconnected Device or circuit damaged	Inspect pump cable connection Ask manufacturer for help
25	W lose	Output W phase lose phase	W phase cable disconnected Device or circuit damaged	Inspect pump cable connection Ask manufacturer for help
26	Date Err	Date error	Wrong time setting Device or circuit damaged	Check Pr.6~Pr.10 values about time setting Ask manufacturer for help
29	Lose phs	Lose phase protection	3 Phase AC power supply lose phase	Inspect AC power supply cable connections

4.2 Other Codes Description

Warning Code	Code Description	Explanation
Para ini	Parameter initialization	Return to normal after resetting

Warning Code	Code Description	Explanation
Para Chg	Important parameter modification	Return to normal after resetting
L-1.50	Inverter model	L: 220V series, 1.50, rated power is 1.5kW
ON 30	Restart delay	Countdown time of restart is 30 seconds.
Too dark	Solar radiation is too weak or Voc value is set too high	Wait the voltage on solar array reaches the trigger voltage Modify the Pr.2 value according to measured open circuit value of solar array at site

Abnormal Code	Code Description	Explanation
Tank 1	Water tank switch 1 abnormal	When water level returns normal, system will be normal automatically after restart countdown
Tank 2	Water tank switch 2 abnormal	When water level returns normal, system will be normal automatically after restart countdown
Well 1	Water well switch 1 abnormal	When water level returns normal, system will be normal automatically after restart countdown
Well 2	Water well switch 2 abnormal	When water level returns normal, system will be normal automatically after restart countdown
Tank	Water tank switch 1 and 2 working abnormal	When water level returns normal, system will be normal automatically after restart countdown
Well	Water well switch 1 and 2 working abnormal	When water level returns normal, system will be normal automatically after restart countdown

4.3 Fault Inquiry and Reset

PG-G2 solar pumping inverter records the last 5 fault codes, checking these fault codes can help to find the fault cause. Fault information is stored in the control parameters Pr.20 ~ Pr.24. Please refer to the keyboard operation method to check the fault code and find the countermeasure in this chapter.

When the inverter fault occurs, by pressing ▲ and ▼ rest key combination together, or cutting off the power supply to restore normal operation.

Caution: Before resetting, complete check up on the fault cause is required . If the inverter can not be reset or turns wrong after resetting, the fault cause shall be identified first, because continuous resetting can damage the inverter.

Caution: The protection restart countdown time is 5 minutes for overload and overheat.

Chapter 5 Service and Maintenance

5.1 Routine Inspection and Maintenance

Affected by ambient temperature, humidity, dust, vibration and aging internal device, the inverter may have some potential problems during operation. To make sure the inverter can run steadily for longer time, keeping at least a yearly inspection is necessary.

◆ **Requirement of Inspection and Maintenance**

1. The inspection must be performed by professional technician, the power supply of the inverter should be cut off when necessary.

2. Avoid leaving any extra metal parts in the inverter, or else it can cause damage to the equipment.

3. Electrical insulation test has been performed on the inverter before factory delivery, so user does not have to carry on a withstand-voltage test.

4. If it is necessary to conduct insulation test on the inverter, all the input and output terminals must have reliably short circuits. It is forbidden to conduct insulation test on a single terminal. Please use the 500V megohm meter to conduct the test.

5. It is forbidden to use the megohm meter to test the control circuit.

6. When conducting insulation test on motor, you have to dismantle the connections between motor and inverter.

◆ **Main Points for Inspection and Maintenance**

Please use the inverter in recommended environment of the manual. Inspection and maintenance shall be proceeded as the following table.

Inspect Frequency		Inspection Item	Inspection Content	Judgment Standard
Routine	Regular			
√		Operation environment	1. Temperature, humidity 2. Dust, air	1. Temperature <50°C 2. Humidity <95%, no dew condensation. 3. No peculiar smell, nor flammable and combustible gas
	√	Cooling system	1. Installation environment 2. Radiator	1. Installation environment with good ventilation 2. Radiator air duct has not been blocked
√		Inverter body	1. Vibration, temperature rise 2. Noise 3. Wire, terminal	1. Stable vibration, normal temperature of the shell 2. No abnormal noise and peculiar smell

Inspect Frequency		Inspection Item	Inspection Content	Judgment Standard
Routine	Regular			
				3. Fastening screw is not loose
√		Motor	1. Vibration, temperature rise 2. Noise	1. Steady running and normal temperature 2. No abnormal and uneven noise
√		Input and output parameter	1. Input voltage 2. Output current	1. Input voltage in the specialized range 2. Output current under the rated value

5.2 Inspection and Replacement of the Damageable Part

◆ **Filter Capacitor**

Pulsating current of the main circuit will influence on the performance of the aluminum electrolytic filter capacitor, the impact depends on the environment temperature and working condition. In normal condition, the inverter shall replace its electrolytic capacitor every 10 years. When the filter capacitor's electrolyte leaks, safety valve bursts out or the capacitor main body expands, it shall be replaced immediately.

◆ **Cooling Fan**

PB7500H-G2 and power above models have cooling fans inside the inverter. Service life of cooling fan is around 1,5000 hours, when the fan has noise or vibration, it shall be replaced immediately.

5.3 Storage and Warranty

◆ **Storage**

If the inverter is not used temporarily or to be stored for long time after purchasing, please pay attention to the following points:

1. Avoid placing the inverter in high temperature or humid place or where is vibration or with metal dust, ensure good ventilation.

2. When inverter is long time no used, the internal filter capacitor performance will decline. It is necessary to power on the inverter every 2 years to restore the performance of the filter capacitor, inverter inspection can be proceeded at the same time. When power on, it is necessary to increase the voltage through a DC power supply, and the power-on time should be not less than 5 hours.

◆ **Warranty**

The warranty of PB-G2 solar pumping inverter is 3 years counted from the factory delivery date. When any fault or damage occurs on the product, within the warranty period, our company will provide free maintenance. After the warranty time, we can provide lifetime paid warranty service.

Certain maintenance charge will be considered during warranty period if the fault is caused by the following reasons:

1. Operating against the manual or surpass the standard specification
2. Fix and modification without factory's permission.
3. Poor preservation
4. Using the inverter in an unusual way.
5. Machine damage caused by fire, salt corrosion, gas corrosion, earthquake, storm, flood, lightning, abnormal voltage or any other act of providence.

☞**Note**: Warranty only covers the body of the inverter.

Warranty Card

Client name		Contact person	
Client address		Telephone number	
Product model		Date of purchase	
Machine serial number		Warranty length (from the factory delivery date)	
Distributor (Seal)			

Packing list

1) Main machine, 1 PC
2) Operation manual (including warranty card), 1 PC
3) Plug of the positive side of the solar array, 1 PC
4) Plug of the negative side of the solar array, 1 PC
5) GPRS DTU 1 SET (Optional device)

Warranty Agreement

1. The warranty of the inverter is three years. When any fault or damage occurs on the product during normal use according to the manual, within the warranty period, our company will provide free maintenance. After the warranty time, we can provide lifetime paid warranty service.
2. The warranty time starts from the product's factory delivery date, the inverter serial number is the only reference to determine the warranty period.
3. Certain maintenance charge will be considered during warranty period if the fault is caused by the following reasons:

a) Operating against the manual or surpass the standard specification.
b) Fix and modification without factory's permission.
c) Poor preservation.
d) Machine damage caused by fire, salt corrosion, gas corrosion, earthquake, storm, flood, lightning, abnormal voltage or any other act of providence.

Please keep this card and show it to the maintenance service during the repair.

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