

CE 🗵

Instruction Book

LV SOLAR CONTROLLER(EASY TYPE)



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Application in 12V~110V DC pumps

Solar Panel selection

1. Solar Panel Connection Knowledge

Solar panel can be divided into mono-crystalline silicon solar cell, polycrystalline silicon solar cell and thin-film photocell. Mono type is the most efficient one but the price is highest; the thin-film photocell is the cheapest one. Normally, the power of solar cell is 150W per square meter. The open-circuit voltage (Voc) marked on solar cell means the max electromotive force before working. The voltage will decrease when working, its voltage called working voltage (Vmp). Common open-circuit voltage is 21V, 36V, 44V etc, it changes along with the change of area and temperature, the lower the temperature, the higher the voltage. Another important index is power. It is proportional to the panel area. There need some solar cell to connect in series if the voltage is not enough, total voltage equals to adding each panel's voltage.

The working voltage of solar cell need to select according to the controller's working voltage, and then to confirm the open-circuit voltage of solar panel. Then select the solar power according to the pump power after the voltage confirmed. The power of solar water pump is input power and the generating efficiency of solar panel is under 70% usually. In order to ensure the rated working time of 4hours at day, the solar panel power equals to input power multiply 1.5 which is also the minimum power. If the solar panel power is smaller than this value, the pump can not reach its rated flow and head even through it can still work normally. Using more panels for the pump is better if condition permits, because that is able to ensure more time for the pump to running and reach the rated flow and head.

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Wiring Diagram



- 1. DC input
- 2. Pump electric cable entrance.
- 3. Operation Panel
- 4. Water level sensor cable entrance.

Solar panel recommendation for 24V-110V DC solar pump

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	MODEL	SOLAR PANEL PARAMETER							control box parameter		
Control box Type		375W		400W		450W		545W			
		Working Voltage	Open Voltage	Working Voltage	Open Voltage	Working Voltage	Open Voltage	Working Voltage	Open Voltage	Best Working	Open
		34.20V	41.50V	38.6V	46.4V	41V	49V	41.80V	49.75V	- voitage	voitage
	100W-12V	1 pcs								30V-48V	<45V
	200W-18V	1 pcs								30V-48V	<45V
	120W-24V 180W-24V 210W-24V 210W-36V	1 pcs		1 pcs		1 pcs		1 pcs		30V-48V	<60V
	280W-24V 300W-24V	1 pcs		1 pcs		1 pcs		1 pcs		30V-48V	<60V
	400W-48V	2 pcs in series		2 pcs in series		2 pcs in series		2 pcs in series		60V-90V	<110V
	500W-48V 550W-48V	2 pcs in series		2 pcs in series		2 pcs in series		2 pcs in series		60V-90V	<110V
DC Type	600W-48V	2 pcs in series		2 pcs in series		2 pcs in series		2 pcs in series		60V-90V	<110V
	600W-72V	3 pcs in series		3 pcs in series		3 pcs in series		2 or 3 pcs in series		90V-120V	<170V
	750W-72V	3 pcs in series		3 pcs in series		3 pcs in series		3 pcs in series		90V-120V	<170V
	900W-72V	3 pcs in series		3 pcs in series		3 pcs in series		3 pcs in series		90V-120V	<170V
	750W-96V	3 pcs in series		3 pcs in series		3 pcs in series		3 pcs in series		110V-150V	<180V

Tips:

When it's series connection, the voltage is addded,

but the current is't changed; when it's parallel connection,

the voltage is unchanged, but the current is added.

Before the power is on, you must use the instrument to detect the open circuit voltage of solar panels, or apply for series, parallel knowledge to calculate the solar panel open circuit voltage. The open-circuit voltage of solar array must be less than the maximum input voltage of the controller, otherwise is will cause irreversible damage.

Wire the pump, panels to the control box as per the wiring diagram below. Please connect the pump to the controller making sure they do not touch each other. Later when we test the system if the wiring is incorrect the pump will run backwards and you will only have to swap over two wires to get it running correctly.

When connection with battery, ma ke sure the polarity is correct, plus to plus, minus to minus. Charge controllers generally have the following connections. Battery, Panel and Load either written or in pictorial form. The pump controller solar PV input is connected to the load terminals of the pump controller. As a safety margin we recommend the charge controller be able to supply at least 1.5 times the pump requirements. Selection way is mentioned above.

Caution. If wiring a battery be very careful not to reverse or short the terminals. We advise you remove all metal wrist bands or watches before you start. Solar PV panels when connected together can also produce a lot of energy so caution must also be exercised here as well. A dark cloth to shade the panels is a good precaution to reduce the power output.



internal wiring diagram

Tips1: Do not reverse the positive and negative of power, otherwise it will not work.

Tips2: Before you start wiring the controller box switch must be in the Off ppsition.

Controller and Pump Matching Method						
Controller Model	Adaptable Pump	Max. Input Current (A)	Max. Open Voltage (V)	MPPT Voltage Range (V)	Working Temperature (℃)	
HD-12	Rated12V	12	<45	18-35	-15-60	
HD-18	Rated18V	12	<45	18-35	-15-60	
HD-24	Rated24V Pump	12	<60	30-48	-15-60	
HD-36	Rated36V Pump	12	<60	30-48	-15-60	
HD-48	Rated48V Pump	12	<110	60-90	-15-60	
HD-72	Rated72V Pump	12	<170	90-120	-15-60	
HD-96	Rated96V Pump	12	<180	96-120	-15-60	
HD-110	Rated110V Pump	12	<220	110-150	-15-60	

Working Environment and Electrical Property

The controller will be burned out when the open circuit voltage higher than our setting. ตัวควบคุมจะถูกเผาไหม้ออกเมื่อแรงดันไฟฟ้าวงจรเปิดสูงกว่าการตั้งค่าของเรา

El controlador se quemará cuando el voltaje del circuito abierto sea mayor que nuestro ajuste.

سيتم حرق وحدة التحكم عندما يكون الجهد الكهربي المفتوح أعلى من إعدادنا.

WARNING

The controller must match with the recommended solar pumps. Please do not use the controller for other pumps. If cause any problems because of this reason. We do not bare any responsibility. For the perfect performance and long-life working, the controller should be kept away from strike, shake, sunshine, salt mist, oil mist and etc. Because of the power loss from cable, please try to use the shortest cable. While use longer cable, the cable connecting controller and solar panels should be over 4mm² (Do not use single wire kind). While the cable between controller and pump within 30m,the cable should be at least 2mm². While over 30m, the cable should be at least 4mm².

CABLE					
POWER (W)	2	2.5	4		
200W-18V,100W-12V	30	40			
300W-24V, 210W-36V, 120W-24V	30	50	100		
400W-48V, 600W-48V, 750W-48V	30	50	100		
750W-72V	70	100	150		
1100W-72V		100	150		
750W-96V,1100W-110V		150	200		
1300W-110V,1500W-110V		150	200		

Operation Panel



1. LED Indicator Light

POWER(GREEN): When the motor is running, the indicator light is steady on; When the motor is on standby, the indicator blinks.

Malf

ON/OF

MALFUNCTION(RED): Steady on in the speed display mode, otherwise off.

2.Key Operation



ON/OFF

Test Running

Before you testing the pump, the controller box switch must be in the off position. The pump must be under water at all times and should have been pre-conditioned forat least 15 minutes. Water is the lubrication for the pump and if it is not"preconditioned" properly the bearings will not be adequately lubricated. Do not attempt to test the pump if even for a moment without it being submerged, or permanent damage will occur. You will need a large container so the pump does not pump it dry in seconds. is used to raise and lower the pump. Never use the power cable to do this.

1.Attach a durable rope or stainless steel cable to the top of the pump using the mounting hole. Make sure the rope or cable is longer than the depth at which you want to install the pump. This is used to raise and lower the pump. Never use the power cable to do this.

2.Attention

Do keep the pump under water at all times when operating Do be careful with wiring Do remove the pump if not used for a long time and wipe the screw and body. Wipe with vegetable oil. Do make sure the pump has adequate water around it during pumping. don't run without water. Do put your solar PV panels in a sunny position facing true north(southern hemisphere)or true south (northern hemisphere). If the panel angle is fixed then an angle equal to your latitude will be a good compromise. Dont run the pump out of the water, even momentarily. It will void the warranty Dont use the pump in dirty water Premature wear will not be covered by warranty. Don't disassemble the pump and control box.

Operation Mode

1. Pump Start

1) Power on to start

Every time it connect with electricity, the system default boot, and pump start

immediately without testing water tank (without any Shutdown conditions).

In shutdown state, press the button to turn on the pump, without testing water tank (without any Shutdown conditions).

3) Water Shortage to Start

If the system boot but the pump stop and water shortage switch is closed, the pump immediately starts. (TL signal terminal of the main control board is shorted to the COM terminal).

2. Pump Stop

1) Float Switch Mode

In running state, when the water full switch is closed, the pump immediately stops. (TH signal terminal of the main control board is shorted to the COM terminal, and the FULL is on)

In running state, when the water shortage switch is closed, the pump immediately stops. (WEL signal terminal of the main control board is shorted to the COM terminal, and the P48 is on)

2) Dry Pumping Shut Down

If the water pump continuous work for a period of time, and the power is less than the set power at the current speed and continues for 20s, the pump will stop immediately and report P48 fault. After 10 minutes, the fault is cleared.

3) Button to Stop,

In running state, press the button to turn off the pump.

3. Pump Operation

Every time the pump starts, it will recognize the DC (battery) and PV (solar) power supply mode for 10 second, and then switch to the corresponding mode to run. The setting speed is invalid during the identification process.

1) DC mode (battery)

In DC (battery) mode, the pump speed is adjustable, range of 1000-4000RPM. The default setting speed is 4000RPM.

With the pump running, DC (battery) supply voltage will continue to decline to prevent excessive discharge, when the voltage is lower than the corresponding electrical protection voltage, the pump stops working.

2) PV Mode

In PV mode, the pump setting speed is similar to DC mode, and the maximum speed (4000 RPM), limit is effective. Pump running speed is also determined by the current solar power. Maximum power point tracking. When the solar light enhances, the output power of solar panel increases, the pump speed increases, and vice versa.

In PV mode, the MPPT indicator flashes. If it flashes faster, it indicates that the current working point is closer to the maximum working point. If the flashing frequency is slower or not, it indicates that the maximum power point is being tracked.

Solar power is insufficient, the pump speed will continue to fall, when the speed drop to 600 RPM, pump stops, and report P46 faults after 3 second.

When solar power is too insufficient to maintain the current system of starting or running, the output voltage of solar panels will drop rapidly.

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When the minimum voltage drops to the lowest voltage of system and lasts for 10s, it will report "PL" fault. Try consecutively 5 times to restart, if it still appears "PL" fault, hold this state for 30 min, then try to start again.

4. Reverse connection protect

If the positive and negative of power supply is reversed, the controller will continue to alarm.

5. Dry-run protection

This function refers to the pump pumps out water on well, the system can automatically detect the anhydrous state, pump will stop working automatically by set program. Dry-run protection is effective all working modes, in manual mode, float switch model and solar mode. Pump will Standby for 30 minutes torestart the work (meet the start condition). Start to detect again whether there is water or not, if no water, stop working automatically; there is water, keep working, that cycle repeats.

Servicing and Maintenance

- After working 3000 hours, the easily damaged parts should be replaced (such as bearing, sealing ring, mechanical seal), or it may cause much more serious damage.
- 2. If the pump didn't use for long time, please scrub it, place at dry and ventilated place and keeping properly.

Fault Information and Troubleshooting Method

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Flicker Times	Fault Code	Fault Description	Reasons and Solutions	Recovery Procedure
1	PO	Hardware Over current	 Motor model is mismatch, please choose matching pumps UVW three-phase short-circuit connection, please rewiring to ensure the normal installation of UVW 	A delay of 30S after a fault occurs clears the fault code and restores startup. Accumulated 5 attempts
2	P51	High Voltage Protection	The input voltage is too low, please distribute power refer to the electrical characteristics.	
3	PL	low-voltage protection	 Voltage input is too low, refer to the electrical characteristics of the corresponding model for normal power distribution. Solar panel selection is wrong, refer to the recommendation for correct selection. 	After the voltage returns to normal, the delay is 30S to clear the fault code and startup is resumed.
4	P43	Phase Protection	➤UVW three-phase open circuit, please rewiring to ensure it reliable contact.	Delay 30S after the first 5 occurrences to clear the fault code and resume startup. After that, each time a fault occurs, there is a 30-minute delay to clear the fault code and resume startup.
5	P60	High Temperature Protection	➤The temperature of controller MCU is more than 90° C	Automatically clear after the temperature is normal
6	P44	Blocking protection	 Water pump bearing seized, clean the water pump bearing. Motor model mismatch, choose a matching water pump. 	After the first 5 occurrences of a fault there is a delay of 30S to clear the fault code and resume startup. After
7	P45	Motor out of step protection	 Water pump extension cord is too long, reduce the extension cord. Motor model mismatch, choose the matching water pump. 	each subsequent failure, a 30-minute delay clears the fault code and restores startup.
8	P47	Over speed protection	 Water pump extension cord is too long, reduce the extension cord. Motor model mismatch, choose the matching water pump. 	
9	P48	Dry pumping protection	 Pump air not drained empty, cut off power, wait 30 seconds for power to come back on and start pump. No water in well, wait for water source and restart. 	After the first 3 occurrences of a fault there is a delay of 60S to clear the fault code and resume startup. After each subsequent failure, a 10-minute delay clears the fault code and restores startup.
10	P46	Low Power protection	 Motor model is mismatch, please choose matching pumps Pump extension cord is too long, please reduce the extension cord " Power is too low, increase the power supply Pump bearing is stuck, please clean pump bearings" 	After the first 5 occurrences of a fault there is a delay of 30S to clear the fault code and resume startup. After each subsequent failure, a 10-minute delay clears the fault code and restores startup.
11	P48	Well water shortage protection	No water in the well, waiting for a water source, restarting.	Delay 60S after the first fault to clear the fault code and resume startup. After each subsequent failure, a 10-minute delay clears the fault code and restores startup.
12	FULL	Water tower full water protection	The water tower is full of water, wait for the water tower float signal to clear and restart.	Delay 60S after the first fault to clear the fault code and resume startup. After each subsequent failure, a 10-minute delay clears the fault code and restores startup.