Solar Pumps
Instruction Manual

Contents

Introduction

     MAXIMA solar motor powers the new system for the supply of clean water based on the most widely available renewable energy, the sun.

    By means of the electric power supplied by a series of photovoltaic panels and taking advantage of the combination of a series submersible pump Or helical pump, the system is able to ensure a continuous drawing of water from a suitable source while the solar irradiation conditions may vary.

    The permanent-magnet motor technology assures high efficiency of the system that, consequently, can require a smaller number of photovoltaic panels in order to work.

    It is designed for easy use and requires no maintenance. It is the ideal solution for supplying water in remote areas, where the normal power supply of electricity from the power grid is inconsistent or completely unavailable.

Features and Protections:

- High efficiency BLDC motor;
- High efficiency MPPT and Vector control;
- Built in controller;
- Water filled motor(No leakage pollution);
- Thrust Bearing system;
- Dry protection(No additional float sensor required);
- Over-load protection;
- Over-voltage protection;
- Low-voltage protection;
- Lost Phase protection;
- Stall protection;

Monitor Expand function:
- Display of voltage, current, power, etc;
- GPRS (Remote monitoring，SK5000,optional);
- Floating ball terminal
- ON/OFF

stainless steel   Plastic

Monitor

Pump End

Multistage centrifugal type with radial or semi-axial impellers. Pump and motor directly coupled with rigid coupling.

Impellers fitted on floating clearance rings made of synthetic low abrasion material, and techno polymer diffusers that impart significant wear resistance to the pump.Stainless steel and plastic impellers or SUS304 or SUS316 available.

Pump liner, shaft and coupling, strainer and cable sheath in stainless steel. Base support and upper head in microcast AISI 304 stainless steel; check valve incorporated in the head.

The innovative wet end design gives the pump superior sand handling capabilities and provides maintenance free operation.

Stainless steel pump end or plastic impeller pump end is available.

Motor

This series of motors are high efficiency BLDC motors specially designed for solar pump system.Adopt shielding structure, all stainless steel material, welding process, ensure long-term high reliability of the motor, free from maintenance.Thrust bearing system、water filled structure, ensuring more stable operation and longer service life。No oil, cleaner and on pollution。

All different types of motors are different. When using, pay attention to the matching of Voltage and power requirements. The centrifugal pump motor is 1000 rpm to 4000 rpm depending on the power input and load.

Here are some of the installation parameters used:

◆ The maximum submergence depth is 150m;

◆The sediment content of water source shall not exceed 120g/m³；

◆ Recommended water temperature of 0 to 40℃；

◆4" Maximum axial thrust 3000N, 3" Maximum axial thrust 1500N.

Monitor

Monitor is not a necessary part of pump system .However, it provides more functions and protections for pump system. Making the system more convenient and intelligent. For example :Water level control floating ball terminal;GPRS remote monitoring and control etc.

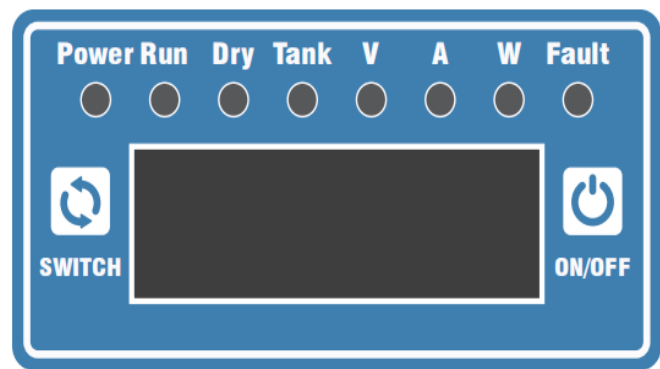Two specifications are available:**SK4000** and **SK5000**

LED Lamp Instructions In Panel

SK4000

◆ LED【Power】：Input power supply, the indicator is on;
◆ LED【Run】: Monitor is turned on, the indicator lights up,Associated with 【ON/OFF】
◆ LED【Dry】: Alarm for pump dry protection, Associated with **WWL** terminals Or **low power** ;
◆ LED【Tank】: Alarm for Water tank full protection , Associated with **TWL** terminals；
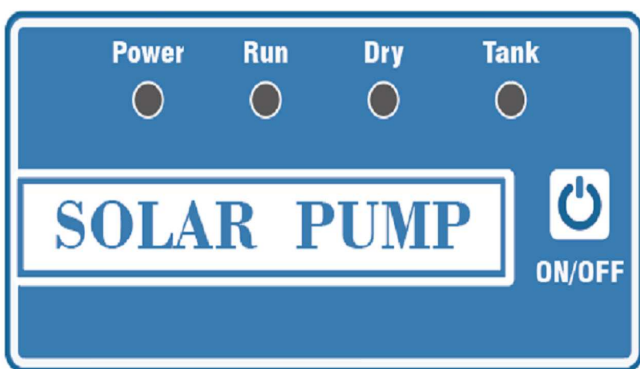
SK4000

SK5000

SK5000

◆ LED【Power】：Input power supply, the indicator is on;
◆ LED【Run】: Monitor is turned on, the indicator lights up,Associated with 【ON/OFF】
◆ LED【Dry】   : Alarm for pump dry protection, Associated with **WWL** terminals ;
◆ LED【Tank】   : Alarm for Water tank full protection , Associated with **TWL** terminals；
◆ LED【V】   : When this indicator light is on, Voltage is displayed；
◆ LED【A】   : When this indicator light is on, Current is displayed；
◆ LED【W】   : When this indicator light is on, Power value is displayed；
◆ LED【Fault】   : Alarm for Various fault；
◆Press 【switch】, check the 【V】,【A】,【W】, cycle.

Monitor Electrical Connections
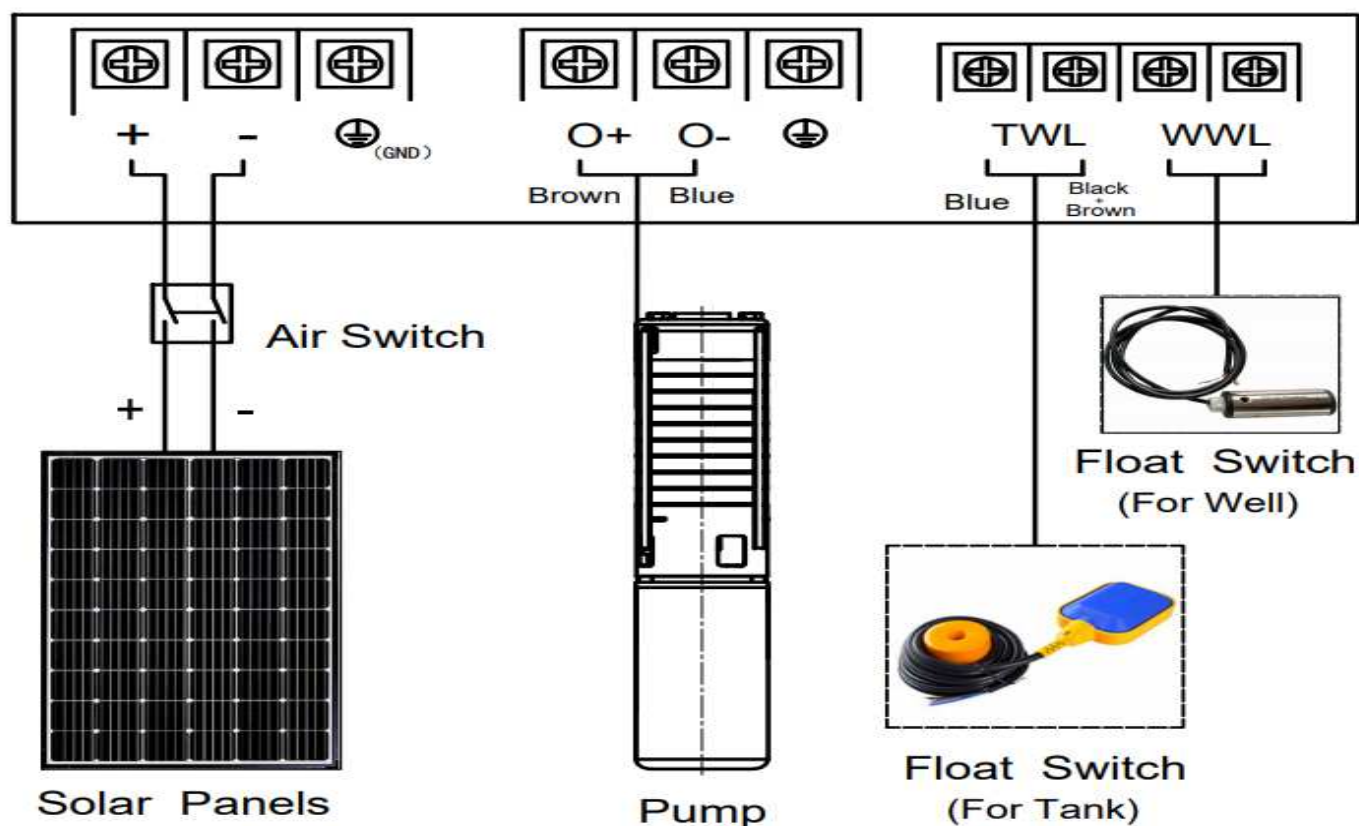
⚠️ *If the maximum VOC voltage is exceeded, the pump will be damaged irreparably.Maximum VOC see page 14（table5）.*

Alarm and Fault code

Table 2

Code	Interpretation	Causes and Solutions
P51	High voltage protection	◆The voltage exceeds the requirement
E10	PCB component failure	◆PCB damaged, need to return to factory for inspection
E11	PCB component failure	◆PCB damaged, need to return to factory for inspection

System Installation Diagram

With monitor system
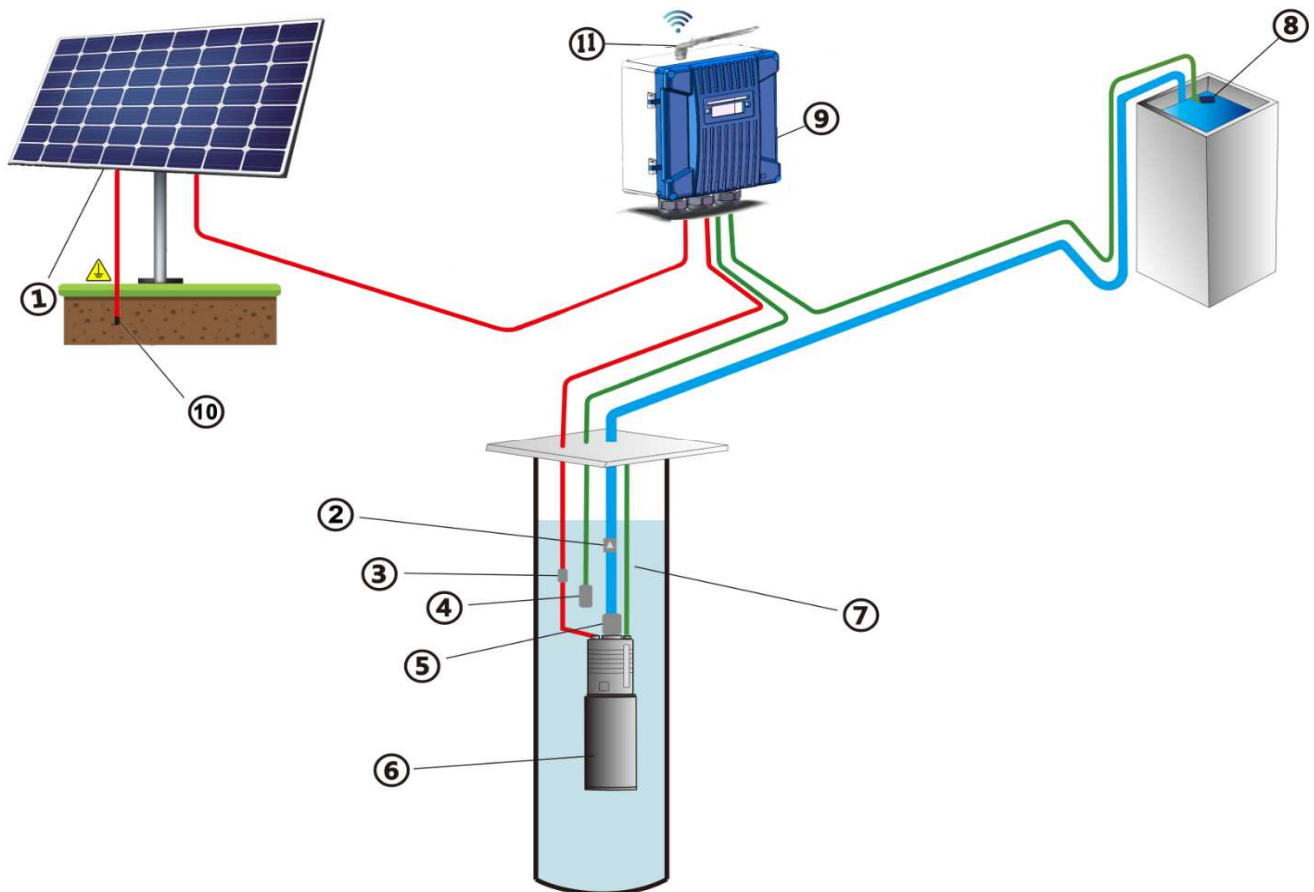
- 1、Solar Panel Array
- 2、Check valve (Optional)
- 3、Wiring waterproof assembly
- 4、The Low-Level Float （For Well ,Optional)
- 5、Sacrificial Anode （Optional）
- 6、Water Pump End and BLDC Motor
- 7、Safety rope
- 8、The High-Level Float （For Tank ,Optional)
- 9、Monitor
- 10、Grounding pile（Optional）
- 11、GPRS (Optional)

⚠️ *SAMKING solar pump operation is very easy, please read the manual carefully before use.*

Without monitor system
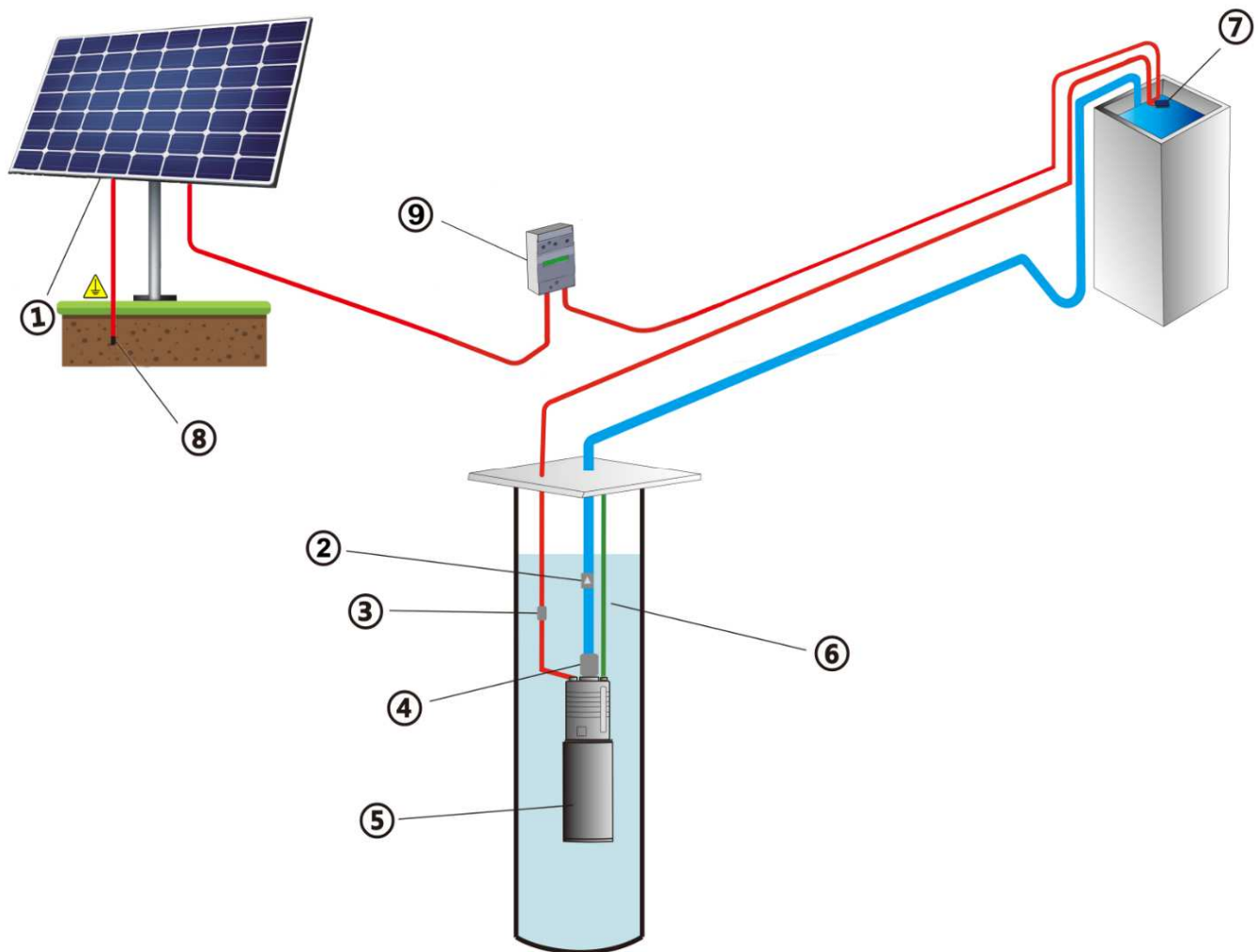
- 1、Solar Panel Array
- 2、Check valve (Optional)
- 3、Wiring waterproof assembly
- 4、Sacrificial Anode （Optional）
- 5、Water Pump End and BLDC Motor
- 6、Safety rope
- 7、The High-Level Float （For Tank ,Optional)
- 8、Grounding pile（Optional）
- 9、Air Switch

⚠️ *SAMKING solar pump operation is very easy, please read the manual carefully before use.*
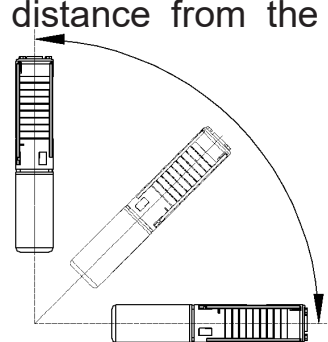
System Installation

Water Source

The water source must be "clean water", free from contaminates such as, dirt, dust, loose rocks, decaying organic matter and other foreign bodies that could block the intake screen or fowl the impeller stack. Sand content not to exceed 120g/m3 of water pumped.

⚠️ *The new bore must be clean before installation. A helical pump must **NEVER** be used to bail a new bore. Warranty does not cover failure or wear due to abrasives in the water.*

Pump Installed

◆ Before the pump is put into the well, test run in the tank to ensure that the pump works normally;

◆ Make sure the pump is completely submerged in water;

◆ When the pump is installed, it must keep a certain distance from the bottom. Prevent sand from burying and damaging the pump.

   → In well, the pump and the bottom keep 1.5m;

   → In open water, such as river, keep 0.3m.

◆ Allowable installation angle of pump 0-90°.

◆ Allowable operating temperature 0-40℃.

Heat Dissipation Requirements For Pump Installation

In all installation positions, the Solar motor must be fully submerged and a minimum water flow across the motor surface .0.5m/s for 3" motor and 0.8m/s for 4" motor.

To induce the correct water flow across the motor use of a flow inducing sleeve should be used when:

◆ Well diameter too large relative to motor diameter to induce correct flow.

◆ Motor and Pump are in open water.

◆ Motor and Pump are in a rock well or below casing.

◆ The Bore is top feeding (water enters intake without passing over motor).

◆ Motor and Pump are set in screens.
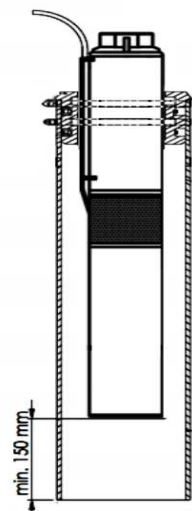
Installation Of The Float

The Low Level Float

◆ The low-level float fitted into the **WWL** terminal to prevent dry running.

⚠️ *It is an option for centrifugal pump, but it **must** be installed for Helical pump to prevent dry running.*

◆ The low-level float must be Vertical installed of 150mm above the pump outlet.

◆ When the water level rises the pump will restart after a 10-minute delay,The display shows the countdown of delay time.

◆ The **Low Level Float** can only be used in the system with monitor.

Voltage $\leqslant$ 100V；

Current $\leqslant$ 1A.

The High Level Float

◆ The High-Level float fitted into the **TWL** terminal to prevent the tank is full.

◆ To prevent the pump from starting and stopping frequently, adjust the float to a suitable swing range.

◆ When the float "closed", the pump will restart after a 10-minute delay.SK4000 The LED **RUN** indicator will flash;SK5000 The display shows the countdown of delay time.

◆ To prevent the pump from starting and stopping frequently, adjust the float to a suitable swing range.

◆In the system without monitor, floating balls can be connected in series in the circuit

Pressure Switch And Mechanical Float

When the pipeline is very long, it is not convenient to install the long-way floating ball cable. Pressure switch and mechanical floating ball is a kind of alternative to the High-Level float.

The mechanical float is installed at the outlet of the pipeline. When the water tank is full, the floating ball is closed and the pipeline pressure is increased. When the pressure switch changes state,and stop the pump by changing the **TWL** or **WWL** status. When the water level of the water tank drops, the pump returns to work.

◆ Normally closed pressure switch connected to **TWL** terminal

◆Normally Open pressure switch connected to **WWL** terminal

Installation Of Monitor

The SAMKING Monitor Panel is IP65 Rated however it is recommended that the panel is not mounted in direct sunlight. It is recommended to install on the back of solar panels or in a room or control cabinet with good heat dissipation.

Check Valves

Check valve can effectively prevent the impact damage caused by water hammer on the pump.It is recommended to install a check valve every 70m of the vertical height of the pipeline。

Areas where water freezes in winter,When installing check valve, it is necessary to consider pipeline drainage or pipeline protection.

GPRS/RMS

The GPRS/RMS integrated module is a micro monitoring and remote operation system specially designed for solar pump system. The GPRS module is integrated in the Monitor. Customers can check the pump's running state and control start and stop by web or mobile phone APP terminal.

GPRS is the optional item of Monitor, not every one has the function.

Function:

◆ check the device operation parameters, such as: voltage, current, instantaneous power, PV power and pump flow

◆abnormal indication, when the equipment running voltage, current and so on abnormal.

◆ Web and APP end start and stop equipment.

◆ Historical data view and download.

Operation:

◆ Open Monitor install SIM card and antenna;

◆ Enter the ID and password on the logon site;

◆ Set the pump model and head correctly.

Note: The specific operation can be referred to the GPRS instruction manual.

Extension Cable Specifications

Locate the solar array and the Monitor as close to your water source as possible. it is important that energy losses are minimised to ensure performance expectations are met.

The following parameters are calculated based on power loss not exceeding 8% and voltage drop not exceeding 5%.

Table 3

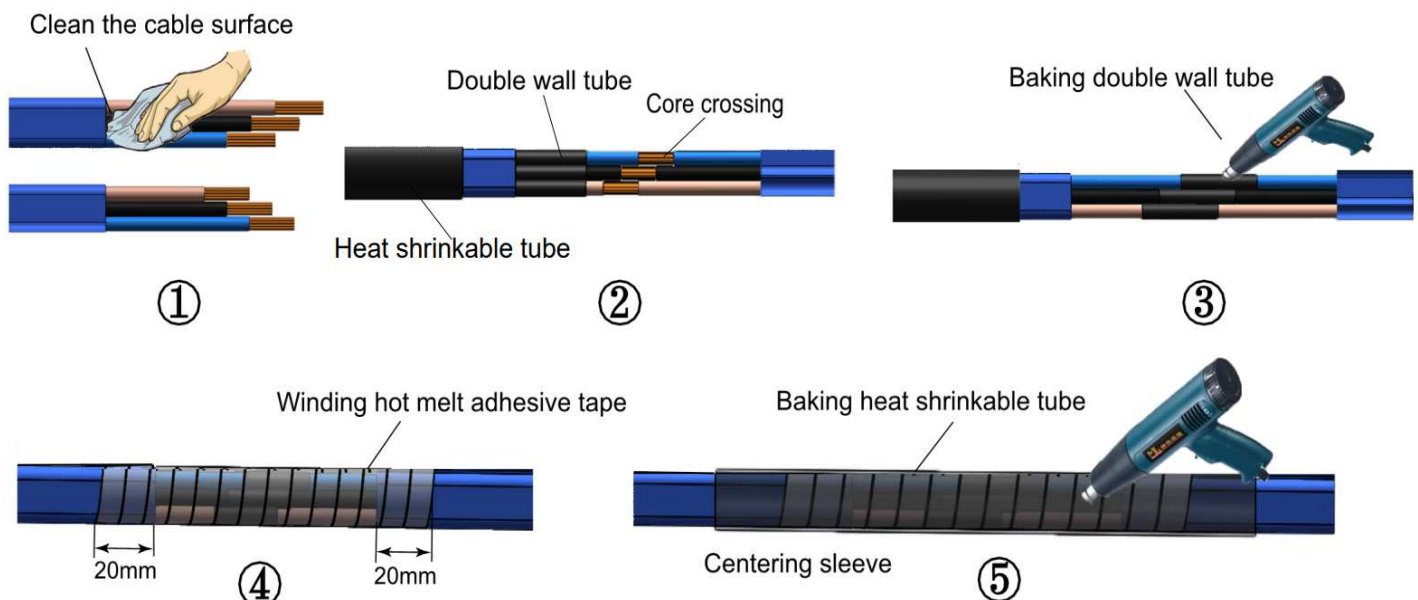| Input Power	Cable specification （mm² ）					
	2.5	4	6	10	16	25
	Maximum allowable length of cable (m）					
0.3HP	16	26	39	65	104	163
0.5HP	33	52	78	130	209	326
0.75HP	54	87	130	217	348	543
1HP	65	104	157	261	417	/
1.5HP	82	130	196	326	522	/
2HP	120	191	287	478	/	/
2.5HP	136	217	326	543	/	/
3HP	163	261	391	/	/	/

◆ *Total cable length measured from the solar array to the pump motor.*
◆ *Do not use the cable to carry the weight of the pump or make the cable bear any tension. The cable should be kept in a relaxed state.*
. ◆*Drop cable should be affixed at three metre intervals by a suitable underwater tape with the cable having some slackness between each interval .*

Extension cable Jointing

The effective contact and waterproof of the joint of the cable extension line are the necessary conditions for the pump system to work for a long time. The wrong method may lead to electric leakage, and cause the pump system can not work or corrosion, and even cause personal injury.

The factory provides an effective wiring method and material, please follow the steps in the picture.

Clean the cable surface

①

Double wall tube
Core crossing
Heat shrinkable tube

②

Baking double wall tube

③

Winding hot melt adhesive tape
20mm
20mm
④

Baking heat shrinkable tube
Centering sleeve
⑤

Solar Array Installation

• The power supply from a DC power source such as solar panels can cause **SERIOUS HARM** or **DEATH** from electrocution

• Use appropriate safety procedures when working on any system component

• Only suitable qualified personnel should carry out electrical connection /disconnection

• Off-grid electrical equipment is subject to applicable regional and national electrical standards

• Always treat solar panels as **LIVE** and handle with care

• Use correctly rated electrical cable and connectors

Solar Panel Glossary of Electrical Terms

Table 4

Term	Definition
VOC(V)	Volts open circuit,nothing connected
Vmp(V)	Volts maximum power point,under load
Isc(A)	Amps short circuit
Imp or Impp(A)	Amps maximum power point

Solar Panel Connection(Recommended in series for the Pumps)

In order to make the system more safe and effective, the maximum input current of this series of pumps is limited to 10A. Therefore, Solar panel parallel system can not play the maximum efficiency. In General, solar panels in series are recommended.
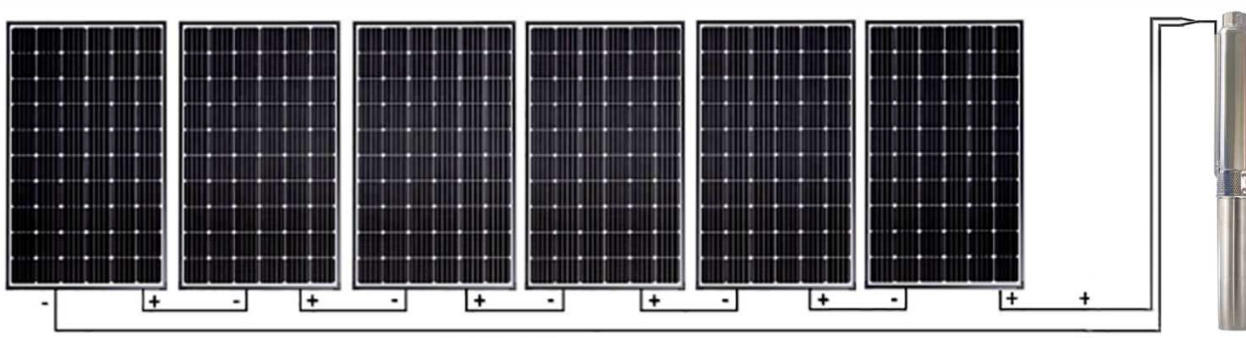
In series solar panel system, VOC,Vmp and Power are calculated as follows:

- VOC of System = VOC of each solar panel $\times$ Number of solar panels;

- Vmp of System = Vmp of each solar panel $\times$ Number of solar panel;

- Power of System = Power of each solar panel $\times$ Number of solar panels

- A of System = A of each solar panel

Table 5

Motor and Monitor Input Energy Limitations:

Motor	Vmp	Max. VOC	Max. Current	Recommended for solar panels
1/3HP	18-40	48	15A	300W*1
1/2HP	40-76	96	15A	300W*2
3/4HP	65-110	150	15A	300W*3
1HP	80-150	180	15A	300W*4
1.5HP	130-190	230	10A	300W*5
2HP	200-280	360	10A	300W*6 or 300W*7
2.5HP	280-380	450	10A	300W*8
3HP	280-380	450	10A	300W*9 or 300W*10

⚡ *The pump system must not exceed the allowable VOC voltage , otherwise, it will cause pump damage and even personal damage.Damage caused by incorrect voltage is not Warranty.*

Solar Array Installation Considerations:

- The installation direction of solar panels must be determined according to the installation position. Generally, in the southern hemisphere, the solar panels should face north. In the northern hemisphere, it should face south.

- The solar panel angle should correspond to the latitude of the site. Consult the instructions supplied with the solar array to assist your decision regarding the best angle for your situation.

- Any shading whatsoever will reduce the solar panel(s) performance so locate the

- panels with this in mind. Panel shadowing is like "open circuiting" a panel.

- Dust or bird droppings will impair the array energy output. Keep panels clean.

- Ensure the array is earthed to ground in the event of lightning strike.

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