Solar Pumps & Monitor
Instruction Manual

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CONTENTS

Introduction

The solar pump 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 4”& 5”& 6” centrifugal submersible pump or helical pump with a built-in inverter type controller, 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.

For centrifugal pump, With its own unique dry rotation protection function, no additional dry protection float is needed. When the pump runs under water shortage for 10s, it will stop and running again after 1min. If it is still short of water, it will stop and start running again after 30min. This cycle.

For Helical pump, A dry protection float ball has been integrated on the cable line. During installation, the water surface must submerge the floating ball. When the water surface drops below the floating ball position, the pump stops immediately. When the water surface overflows the floating ball position again, 10 minutes later, the pump starts to run.

To extend the flexibility of the system, each package is supplied with:

- Pump End suit to Head and Flow requirements;
- 4” Hybrid AC/DC Solar Motor 2.2kW(3HP);
- Solar Pumps & Monitor Instruction Manual;

Common installation accessories can be provided by the factory (Optional):

- Monitor (Refer to page 7 for detailed functions);
- GPRS/RMS(Must be used with monitor, Refer to page 11);
- Float Switch For Tank;
- Epoxy Resin Wiring Package or Heat Shrinkable Tube Wiring Packages;
- Sacrificial Anode;
- Surge Protection Device(SPD-DC-600RM);
- Surge Protection Device(SPD-AC-275RM);
- DC Circuit Breaker (500V,32A);
- AC Circuit Breaker (400V,32A);
- AC/DC Manual Switch;
- Flow Meter(DN32/DN40/DN50/DN80, Must be used with monitor);
- Mechanical Switch & Pressure Switch (optional).

Note: For details and usage of all accessories please consult factory.

Construction Features Of The Centrifugal Pump

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

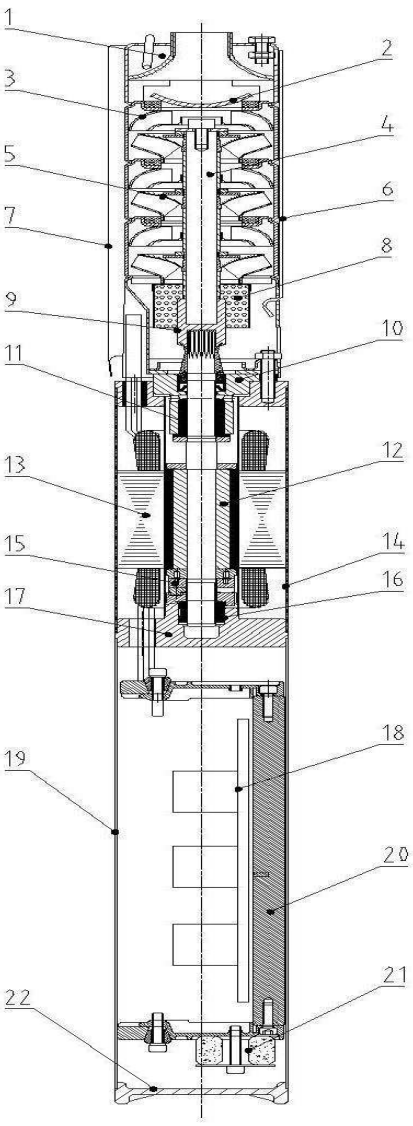
Stainless steel impellers fitted on floating clearance rings made of synthetic low abrasion material, and techno polymer diffusers that impart significant wear resistance to the pump.

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. Maximum permitted amount of sand: 120 g/m3.

Materials

NO	PART*	MATERIALS
1	Discharge chamber	Stainless steel
2	Non-return valve	Stainless steel
3	Guide vanes	PC/Stainless steel
4	Pump Shaft	Stainless steel
5	Impeller	POM/Stainless steel
6	Impeller fastener	Stainless steel
7	cable cover	Stainless steel
8	Inlet part	Stainless steel
9	Shaft coupling	Stainless steel
10	Upper Bearing Housing	Stainless steel
11	Upper Bearing	Silicon Carbide
12	PM Rotor	- -
13	Stator	- -
14	Pump Housing	Stainless steel
15	Thrust bearing	Graphite
16	Lower Bearing	Silicon Carbide
17	Lower Bearing Housing	Stainless steel
18	PCBA	- -
19	Controller Housing	Stainless steel
20	Radiator	Aluminum
21	Inductor	- -
22	Base	Stainless steel



Construction Features of The Helical Pump

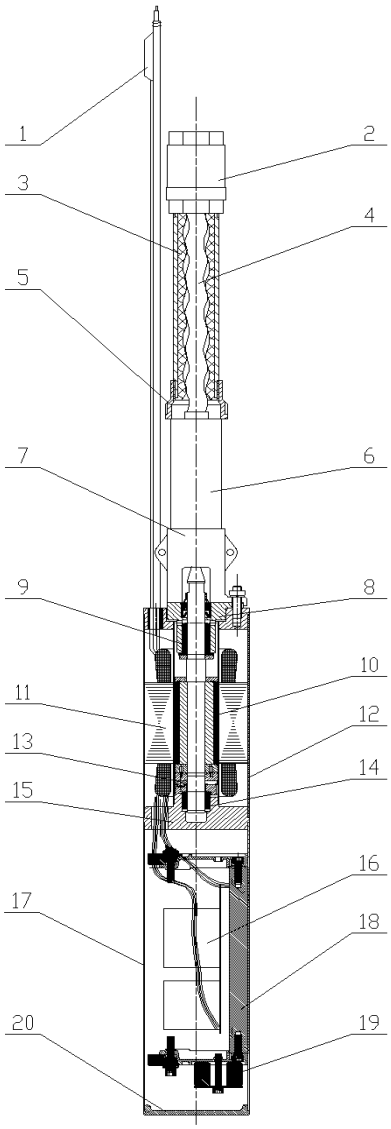
Helical pump provides more efficient system efficiency, more suitable for small flow and high head occasions.

Special wear-resistant screw and rubber stator, longer service life. However, The Helical pump is extruded by screw and rubber stator, the performance and service life of the system will be seriously reduced in the water containing sand. Therefore, it is strictly prohibited to use it in water containing sand, and the factory will not provide warranty.

The water temperature will also change the pump performance. It is recommended to use the water temperature of 20-30 ℃

Materials

NO	PART*	MATERIALS
1	Floating ball	Stainless steel/PC
2	Non-return valve	Stainless steel
3	Rubber stator	Rubber /Stainless steel
4	Screw shaft	Stainless steel
5	Transition Festival	Stainless steel
6	Supporting tube	Stainless steel
7	Intake section	Stainless steel
8	Upper Bearing Housing	Stainless steel
9	Upper Bearing	Silicon Carbide
10	PM Rotor	- -
11	Stator	- -
12	Pump Housing	Stainless steel
13	Thrust bearing	Graphite
14	Lower Bearing	Silicon Carbide
15	Lower Bearing Housing	Stainless steel
16	PCBA	- -
17	Controller Housing	Stainless steel
18	Radiator	Aluminium
19	Inductor	- -
20	Base	Stainless steel



Construction Features Of The Solar Motor

Innovative design allows the motor to be powered by both AC and DC power sources.

The motor is one size for all models with a maximum Input power (P1) of 2800 W and is suitable for selected pumps only. The speed range of the motor is 0 rpm to 3600 rpm depending on the power input and load.

Note: Use the pump body not provided by the factory, please consult factory.

The motor uses rare earth permanent magnets, and has a built-in electronic unit comprising a frequency converter and motor controller. Vector control and MPPT are used to select the best operating point for the pump, based on the energy available from the input source.

The motor can be supplied with either AC or DC power.

Note: Maximum axial thrust 3000N. Maximum Input power (P1) 2.8 kW.

The motor is sealed by welding, Encapsulated water filling structure ensures high efficiency, clean and pollution-free .The maximum diving depth 150m.

The Solar Motor is capable of the following functions:

1. Powered by AC/DC
2. MPPT Efficiency high
3. Dry protection
4. Reverse protection
5. Over-head protection
6. Over-load protection
7. Over-current protection
8. Losting-Phase protection
9. Missing-voltage protection
10. Over power protection

Motor Energy Input Capabilities

Voltage	Current	Energy
60 – 380Vmp/440VOC	12A DC (ISC)	Direct Current eg. Solar
1x 90 – 240V AC	10A AC	Alternating Current eg Generator or Mains Supply

Monitor

Monitor is not a necessary part of pump system, but it provides more functions and protections for pump system. Making the system more convenient and intelligent. For example: intelligent switching of AC/DC power supply; Float terminal; Power display; GPRS remote monitoring and control etc.

The monitor is suitable for outdoor installation and is weather-proof, however, its location/positioning against direct sunlight should be avoided.

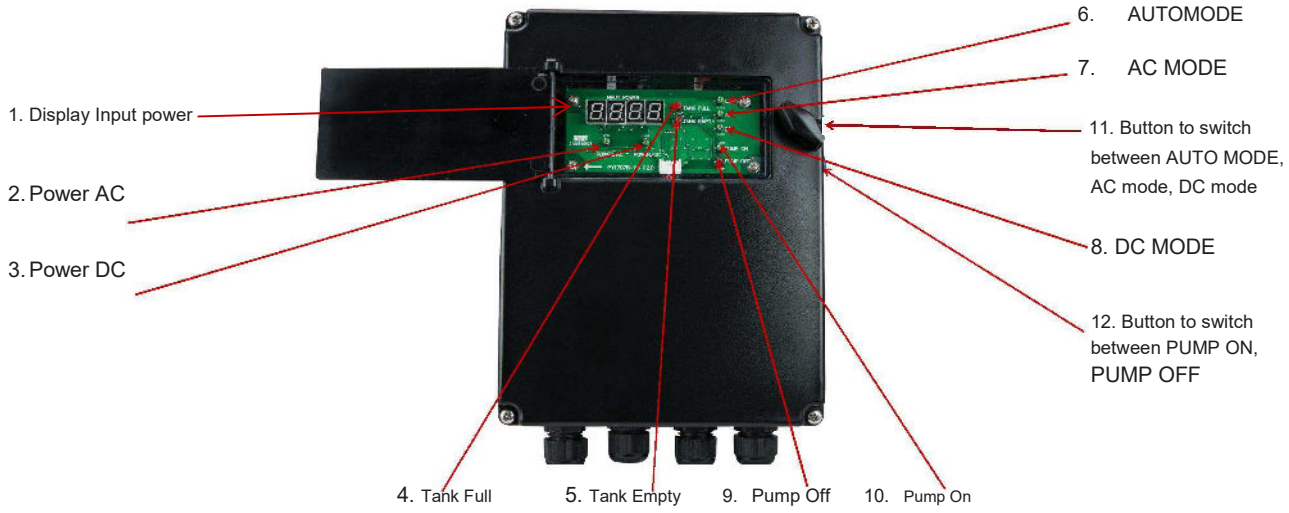
Functions and Features

The Monitor is capable of the following functions:

1. Display input power AC / DC;
2. Display of tank full / tank empty;
3. Intelligent mode(Three modes can be choosed);
   AC MODE, the incoming power source can be from Mains power supply or a generator;
   DC MODE, the power supply can be from either Solar Panels or Battery;
   AUTOMODE, Intelligent switching between AC and DC power supply, DC first;
4. Manual Control Pump ON / OFF;
5. Deadhead/no Flow conditions protection（with Flow Switch）;
6. Lightning and surge protection;
7. Over-voltage protection;
8. Automatic start and stop of generator;
9. GPRS/RMS (App and wed end monitoring data and control start or stop).

The Monitor is capable of the following features:

- The SP monitor can take signals from two float switches placed in a tank or similar.
- The “TWL” signal indicates on the Monitor that the reservoir/tank is full and at this point the controller stops the pump. When the water level of the storage tank drops, the float drops closed and the pump returns to operation after 10 minutes. Within 10min, the “TANK FULL”signal light remains on and the display starts counting down from “600” to “0.”The countdown ends and the “TANK FULL” indicator goes off and the pump system restarts.
- The “WWL” signal indicates on the Monitor that the reservoir/tank is empty and at this point the controller starts the pump. When the water wells or pools without water, the water under the float drop and closed, PV monitor “TANK EMPTY”signal indicator light, direct the pump system immediately shut down. When the water level rises, the float rises and falls, and the pump returns to operation after 10 minutes. Within 10 minutes, the “TANK EMPTY” signal light remains on and the display starts counting down from“600”to“0.”The countdown is over and the “tank full”indicator goes off and the pump system restarts.On power up,if tank is not full,then the SP monitor powers the pump to fill the tank.



Monitor Installation

WARNING

- The power supply from any DC or AC supply can cause serious harm or death from electrocution.
- Apply appropriate safety procedures when working on or with any system component.
- Only suitably qualified personal should be involved in the electrical connection / disconnection and handling of the equipment. Off-grid electrical equipment is subject to applicable state, national and country electrical standards.
- The Solar Motor contains capacitors that must be allowed to discharge before handling
- Allow a minimum of 1 MINUTE for stored energy to dissipate before handling the motor.
- The Solar panels will create electrical energy when exposed to light. Assume all panel cables are "live" at all times and handle with appropriate safety equipment and procedures.

Caution

Isolate all electrical sources before commencing any installation, servicing or repair on any component in the installation.
The SP monitor is used to switch AC and DC power supplies and can automatically start a connected generator or switch between DC (Solar) or AC (Generator / Mains) power sources at ANY time.
Ensure all energy sources and generator starting circuit is properly locked-out before working on the system.

Electrical Component Selection

When using DC power such as supply from Solar Panels, any switches, contactors, sensors, meters, recorders used in the electrical connection and monitoring of the installation MUST BE selected according to the Input power available and rated for DC POWER supply.

Monitor Mounting

The monitor is IP65 Rated however it is recommended that the panel is not mounted in direct sunlight.
Mounting the controller behind the Solar Panel array is often a good way to protect the panel.
Consideration should be given to mounting the control panel inside a steel cabinet (not included) to allow for easy access to isolation switches and termination of supply feeds and input control feeds.

Earthing

As most Solar installations are –off-grid, particular attention must be paid to earthing of the controller and pump motor. Follow the instructions in the controller manual and legislated electrical requirements for your area.

Switching between DC and AC supplies

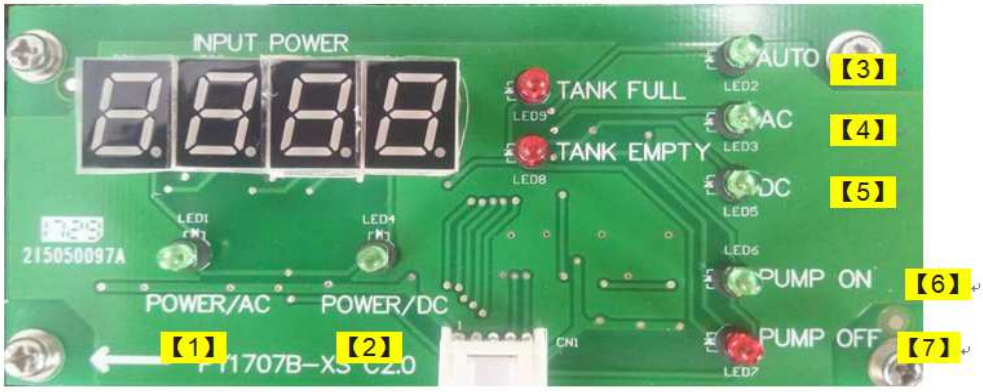
The SP monitor can be manually switched between a DC power supply and AC supply or the controller will perform the change when in AUTO mode.
During the switch over the controller in the Solar motor runs through an automatic discharge process to dissipate the electrical charge contained in the capacitors fitted to the electrical motor. This process cannot be sped up.

If the pump is not running when there is a suitable input power supply, firstly check the display panel to see if the changeover is taking place before further investigation.

The controller is biased to DC supply when in Automatic mode.

Monitor Operating Instruction

1. Before operating any components in the system preform a visual inspection of the installation for damage cause by weather events, stock, pests or human interference. Solar panels should be clean and not in shade. All wiring terminated, no bare wires exposed.
2. Check pump is completely immersed when in a surface water source.
3. Turn any isolator switches to ON position. Open any valves.
4. Mains AC Supply present (if connected) – Indicated by LED light on controller【1】
5. DC Supply present (Solar / Battery) - Indicated by LED light on controller【2】
6. Generator (if connected) is topped up with fuel, generator starts and runs on demand and is connected to
   SP monitor via “GEN Signal” wire.
7. Select MODE the Controller is required to operate in using the **TOP BUTTON** on the right hand side of the controller. Each time the button is pushed, the controller cycles through one of the operating modes indicated by the LED light on the display panel.
   i. **AUTO MODE**【3】 – Controller selects the power source and uses this to run the pump depending on input signals. Bias is always DC power source. When the system is using AC power, the AC led light pulses in 30 sec intervals ,the system is using DC power, the DC led light pulses in 30 sec intervals.
   ii. **AC MODE** 【4】- Controller only uses AC power source and uses this to run the pump depending on input signals and available power from grid supply or generator.
   Note, only one AC power supply can be used, either Grid Supplied AC 240V power or Generator supplied AC 240V power.
   iii. **DC MODE**【5】 - Controller only uses DC power source and uses this to run the pump depending on
   input signals and available power from Solar Panels or Batteries.
   CAUTION – When switching between modes, the motor needs to dissipate the energy stored within the internal capacitors. This process takes 1 minute. Repeated switching between modes will restart the dissipation cycle, causing extended delays before the pump will run.
8. Push PUMP ON button on the left hand side of the controller which is the BOTTOM BUTTON. LED【6】 light indicates pump on. Monitor starts counting down, after 120s start pump using selected power supply provided,
   i. The input energy is sufficient to run the motor
   ii. Motor has finished power dissipation cycle if required
   iii. The input signal devises indicate the unit should run. This would include,
      a. WWL – Well water level is “open” indicating sufficient water around pump(when fitted)
      b. TWL – Tank water level indicates tank requires filling (when fitted)
      c. TWL – Pressure switch indicates system pressure is low (when fitted)
      d. TWL is bridged meaning pump runs when input energy sufficient.
9. To stop pump, push PUMP OFF button on the right hand side of the controller which is the **BOTTOM BUTTON**. LED【7】 light indicates pump off.
10. When finished with the system, turn any electrical isolating switches and valves to the off position. Lock Out equipment from use as per your site specific procedures.



Technical Specification

- The SP Monitor is a micro controller, designed, developed and manufactured for the SOLAR pump.
- It is suitable for simultaneous AC and DC incoming power supplies.
- Manually or automatically switchable between two power supplies depending on solar irradiation.
- IP65 weatherproof enclosure.
- Suitable for up to 2.2 kW (3 HP) pumps.
- AC voltage input range 1X90 – 240 VAC. **Terminals L N & GND**
- DC voltage input range 60 – 380 Vmp/440VOC. **Terminals + - & GND**
- Input connections for 1 or 2 float switches. **TWL & WWL**
- Input connection for pressure switch. **TWL**
- Input connection for matching flow meter. **FLOW SIGNAL -> REF. Setting flow meter function (on this page)**
- Indication for power on, input power, pump on, pump off, water tank full or tank empty.
- Auto operation via 1 or 2 float switches.
- Auto operation via pressure switch.
- Auto off via flow meter.
- Auto starting of generator via volt free contacts. **GEN SIGNAL**
- Manual operation.
- Auto switching from AC to DC supply with DC bias. DC switching point is 40V.
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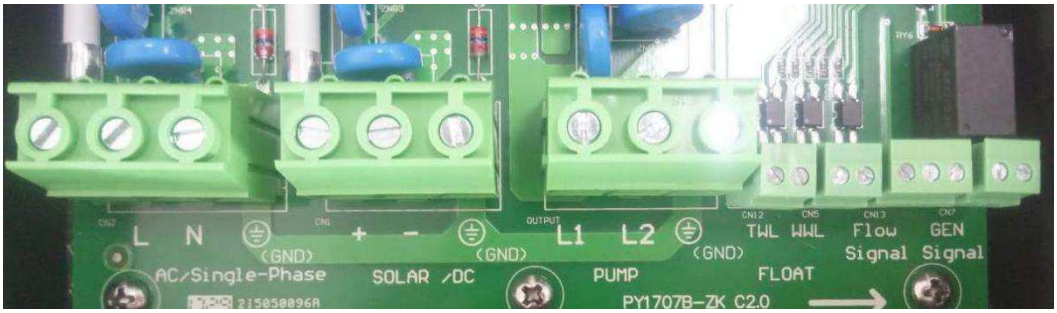


Note: Faulty wiring can cause serious damage or death. Please refer to page 10 for wiring.

Flow Meter And Generator Dry Contact (We offer dial or Knob optional way)

Flow Meter

The head and flow of solar pump will change with the change of sunlight. When the sunlight is weak and the power is insufficient, it may appear that the pump is in continuous operation.But the water can't be sent to the pipe outlet. At this time, the water temperature in the pump and pipeline will rise, and it will reducing the service life of the system. We call him “dead head”. The installation of flow meters provides a protection method . When there is no water flow in the flow meter, monitor will stop for protection. Resume automatic operation after Specified time.
The time can be set by the knob.
When the dial switch is turned on correctly and the flow meter is installed can the function work.

Dial

Flow Meter

Generator Dry

In the solar pump system, we may use the generator. Monitor provides a method to automatically start and stop the generator according to the change of sunlight. The minimum operation time of the generator can be set through the knob.

Dial:

Without flow meter connected set switch 1 “OFF ” condition;
With flow meter connected set switch 1 “ON” condition;
Set switch 2 “ON ” condition, Turn on the automatic start stop function of the generator;
Set switch 2 “OFF ” condition ,Turn off the automatic start stop function of the generator.

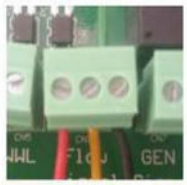
Flow Meter Terminal

The wiring sequence of the flow meter is red \yellow\black. Incorrect wiring may cause system abnormal work.

Knob

The upper knob adjusts the recovery time of the flow meter after protection, 10min for each cell, and 0 represents shutdown.
The lower knob is the minimum running time of the generator, 10min for each grid, 0 for 3min

Knob



Flow Meter Terminal

GPRS/RMS

The GPRS/RMS integrated module is a micro monitoring and remote operation system specially designed for solar pump system. The GPRS/RMS 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.

Function:

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

2, abnormal indication, when the equipment running voltage, current and so on abnormal. 3, web and APP end start and stop equipment

4. Historical data view and download

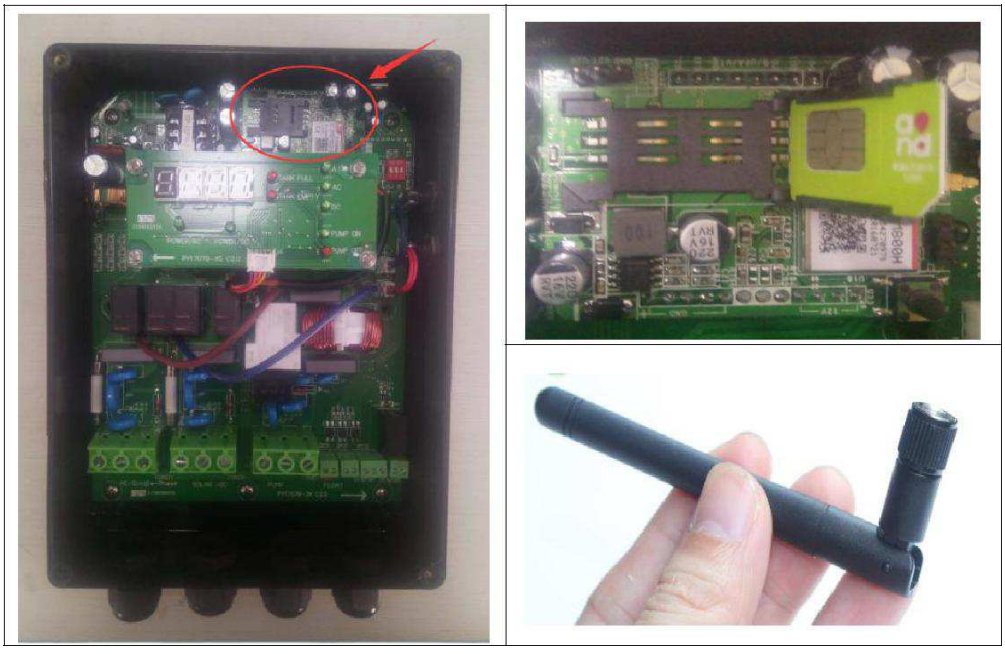
Operation

1、Open up Monitor install SIM card and antenna

2、Enter the ID and password on the logon site(http://118.190.33.7:8083/)

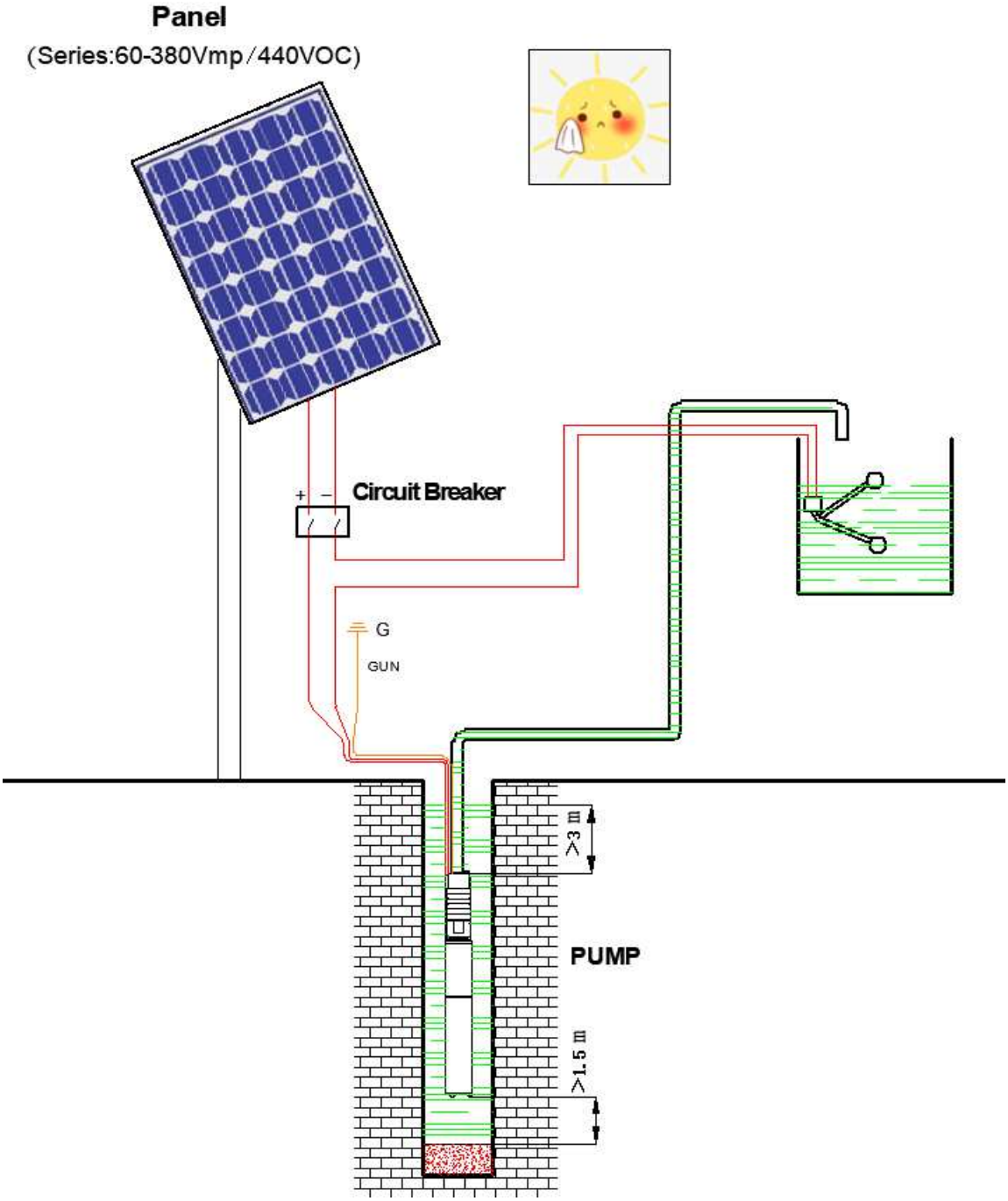
3、Set the pump model and head correctly

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



System Installation Options

1. Without Monitor



Note:

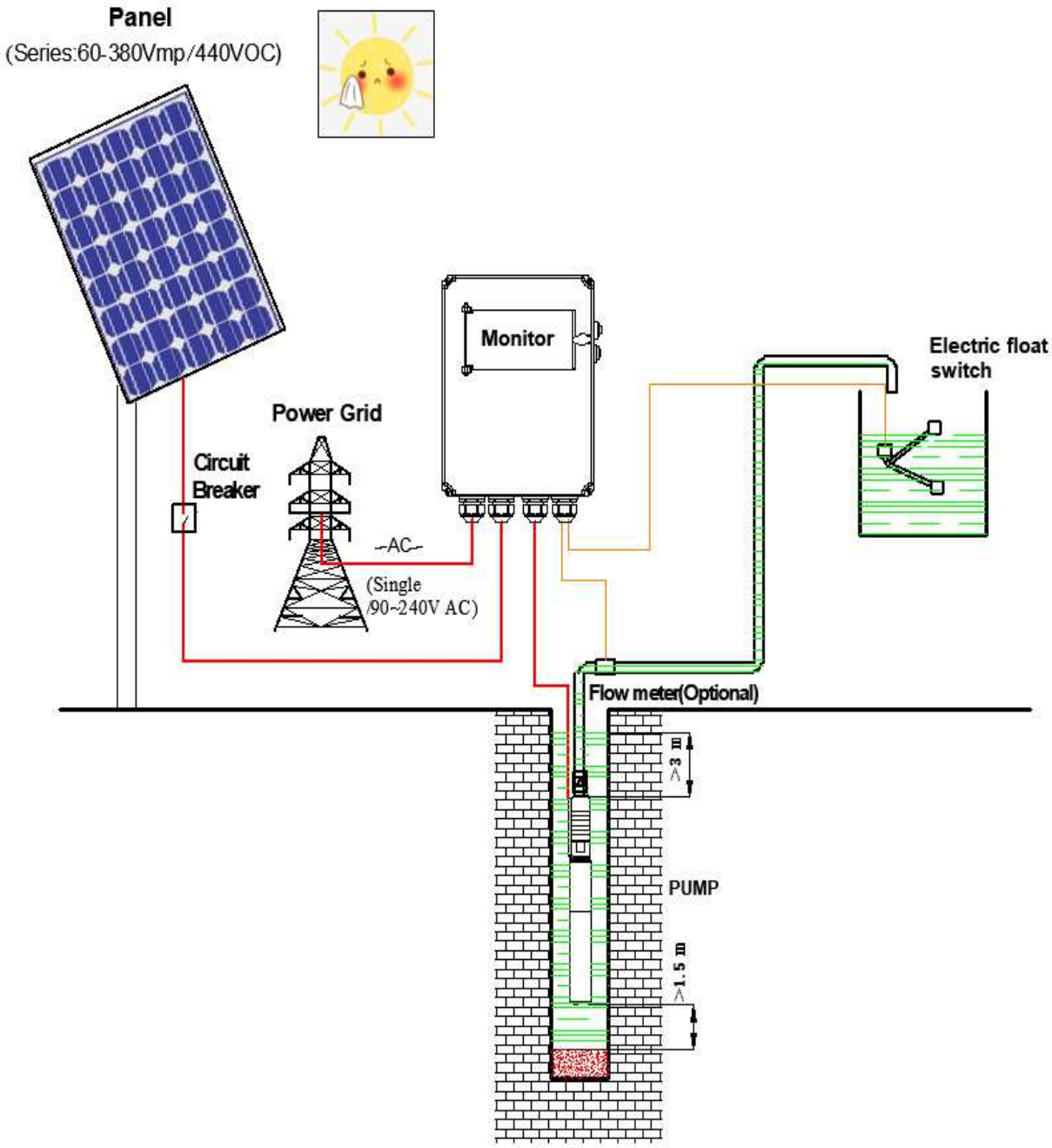
1、The above Solar panel power supply can be directly replaced by battery or AC power. When AC power is selected, the input power can be a utility power grid or a generator.

2、Green and blue cable for ground, other two cables connect anyway for pumps.

3、Volts: Panel Max :380Vmp/440VOC
DC:60-380VDC
AC:1x90-240VAC

System Installation Options

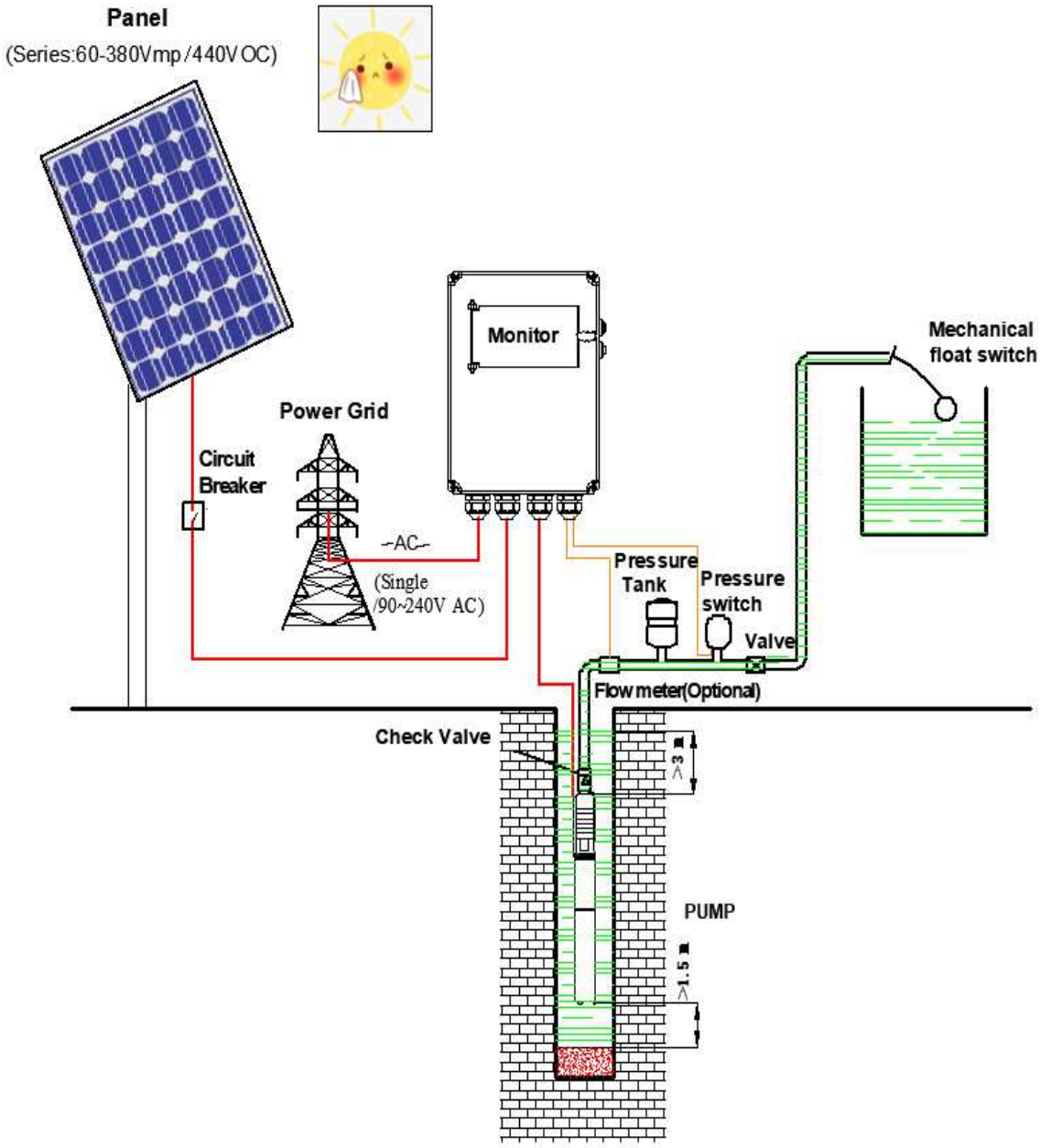
2 Monitor with Float Switch (For Tank or In Well)



Note:
The pump usually requires only one float for the tank. The float ball in well does not need to be installed, because the pump has dry running protection function.

System Installation Options

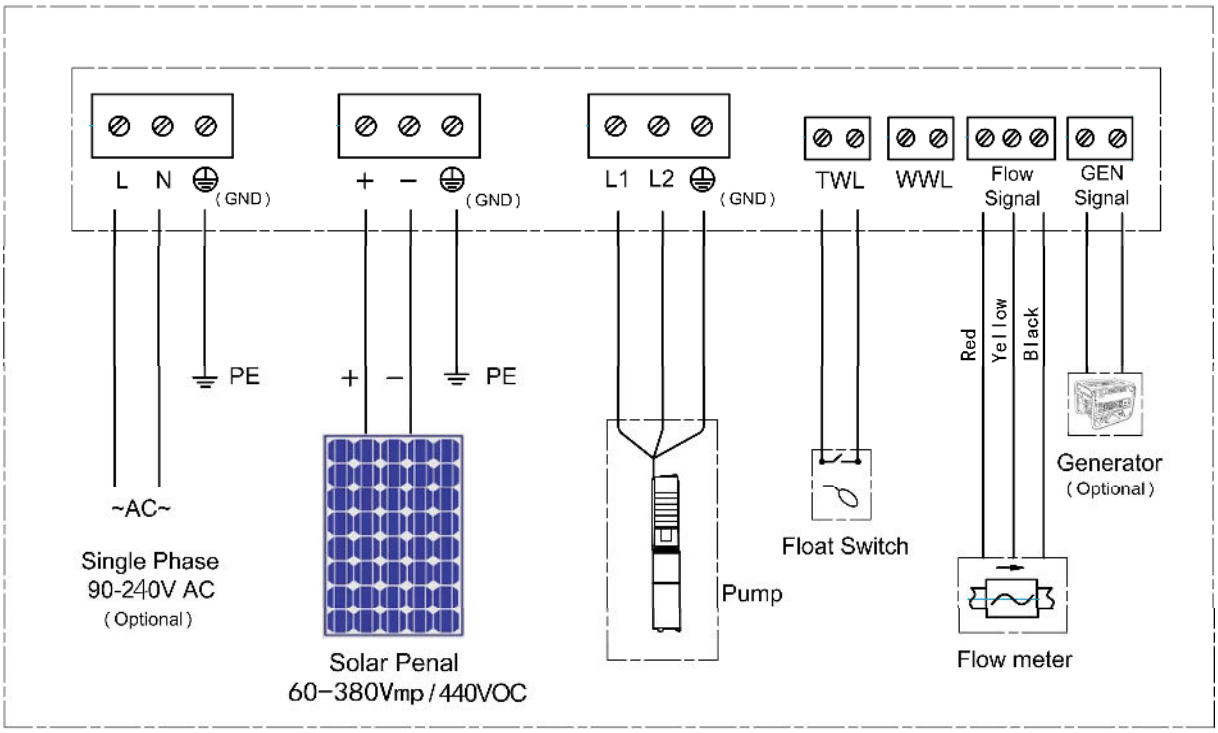
3 Monitor With Mechanical Float Switch



Note:
The mechanical float must be used in the system with the pressure switch, and the pressure switch needs to be adjusted to the appropriate pressure range. Otherwise, it may cause the pump to stop abnormal and even cause the pipeline to burst.

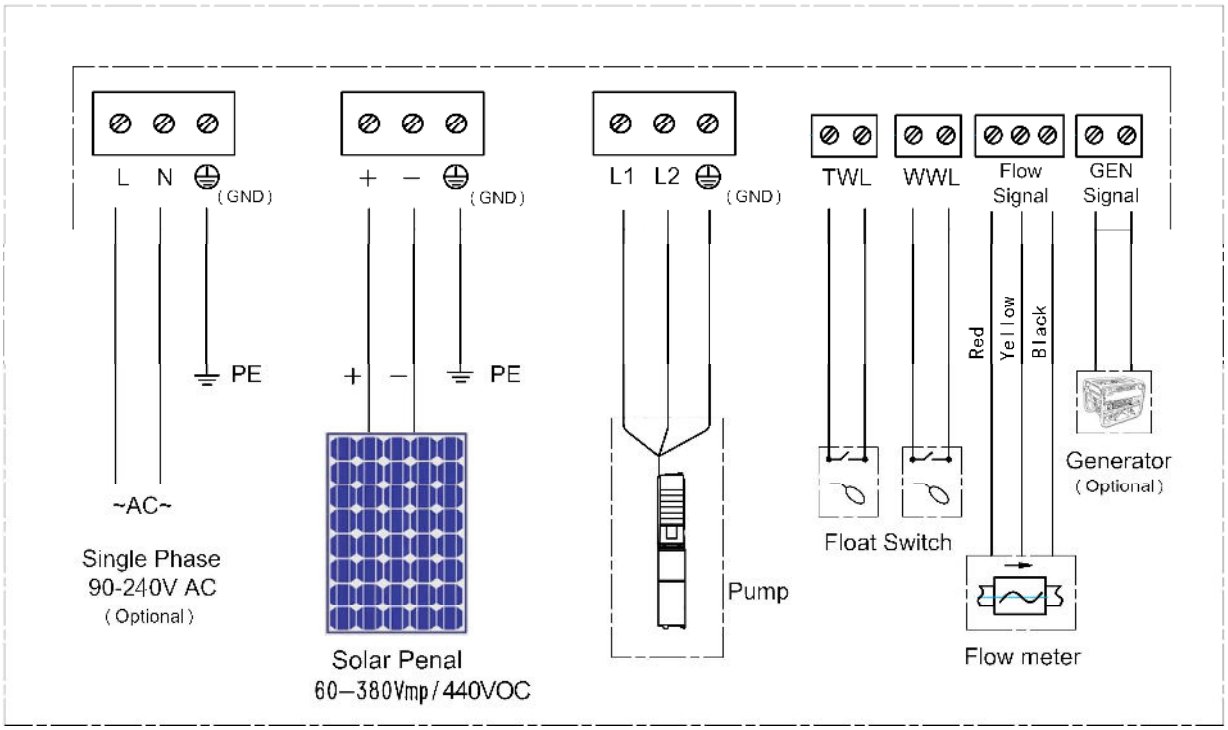
Electrical Connections

1. With One Float Switch.



TWL = TARGET TANK WATER LEVEL WWL = WELL WATER LEVEL
USE 3 WIRE FLOAT SWITCHES WIRED FOR TANK FILL (OPEN ON RISE - BLACK AND BLUE WIRES)
Kelly cable for ground, other two cable connect anyway for pumps

2. With Two Float Switches

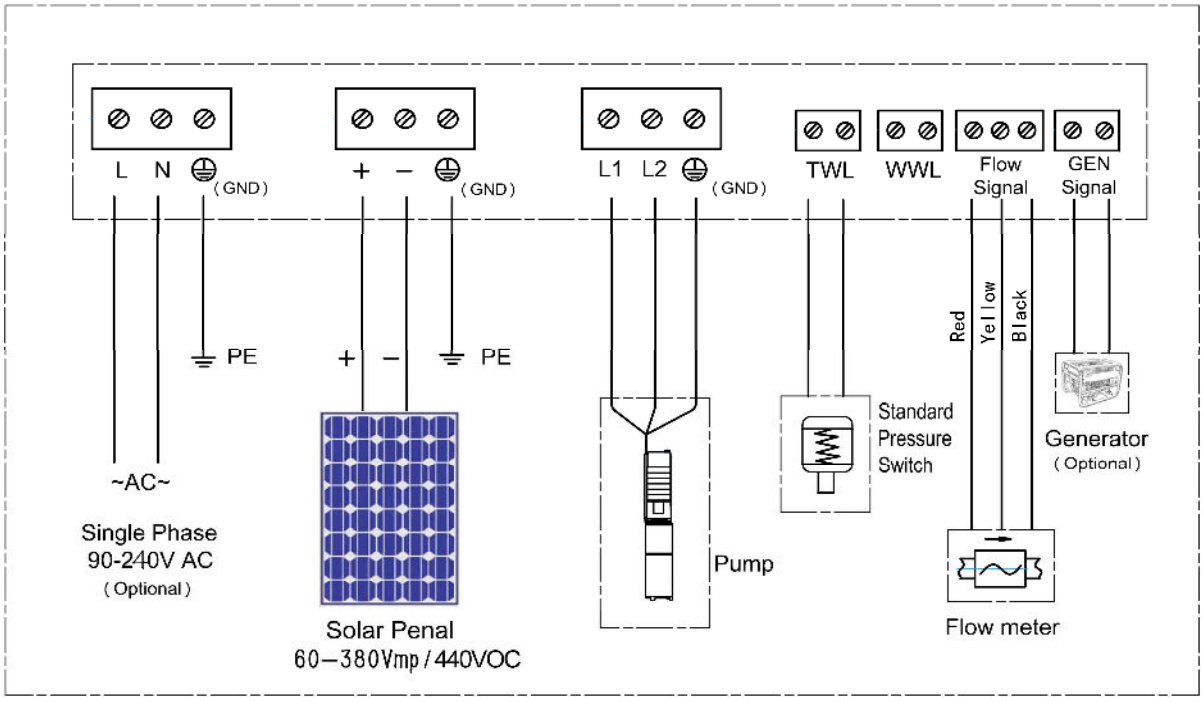


TWL = TARGET TANK WATER LEVEL WWL = WELL WATER LEVEL
BOTH FLOAT SWITCHES NEED TO BE 3 WIRE TANK FILL (OPEN ON RISE, BLACK AND BLUE WIRES)
GENERATOR CONTACT WILL CLOSE IF NO AC AND DC DROPS BELOW 90V.

FOR ALL WIRING OPTIONS ONLY ONE AC INPUT SOURCE CAN BE USED BY THE CONTROLLER – USE 240V AC MAINS SUPPLY or GENERATOR unless the Generator has an Auto Transfer System (ATS) to manage the switch over. Consult your Generator manual.

Electrical Connections

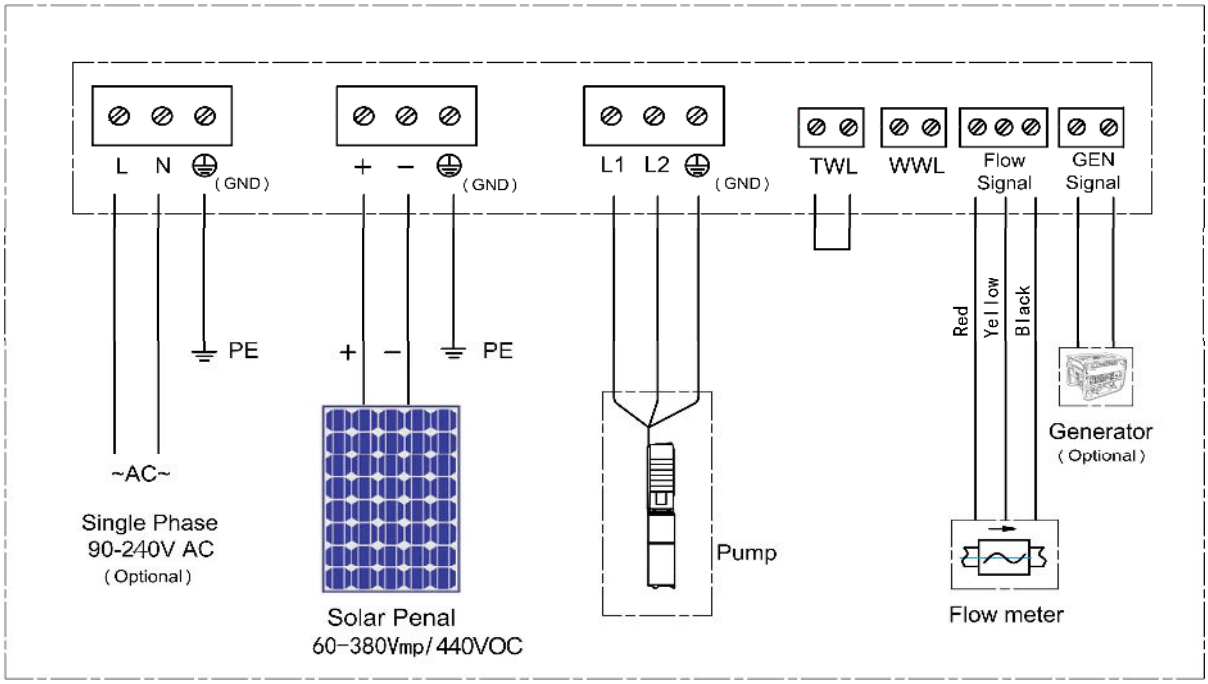
3. Pressure Switch



FORPRESSURESWITCHCONTROL,USEANORMALPRESSURESWITCHOFSUITABLERANGE–SWITCHOPENSONPRESSURERISE

Kelly cable for ground, other two cable connect anyway for pumps

4. No Switches



GENERAL NOTES FOR ALL SET UP CONFIGURTIONS

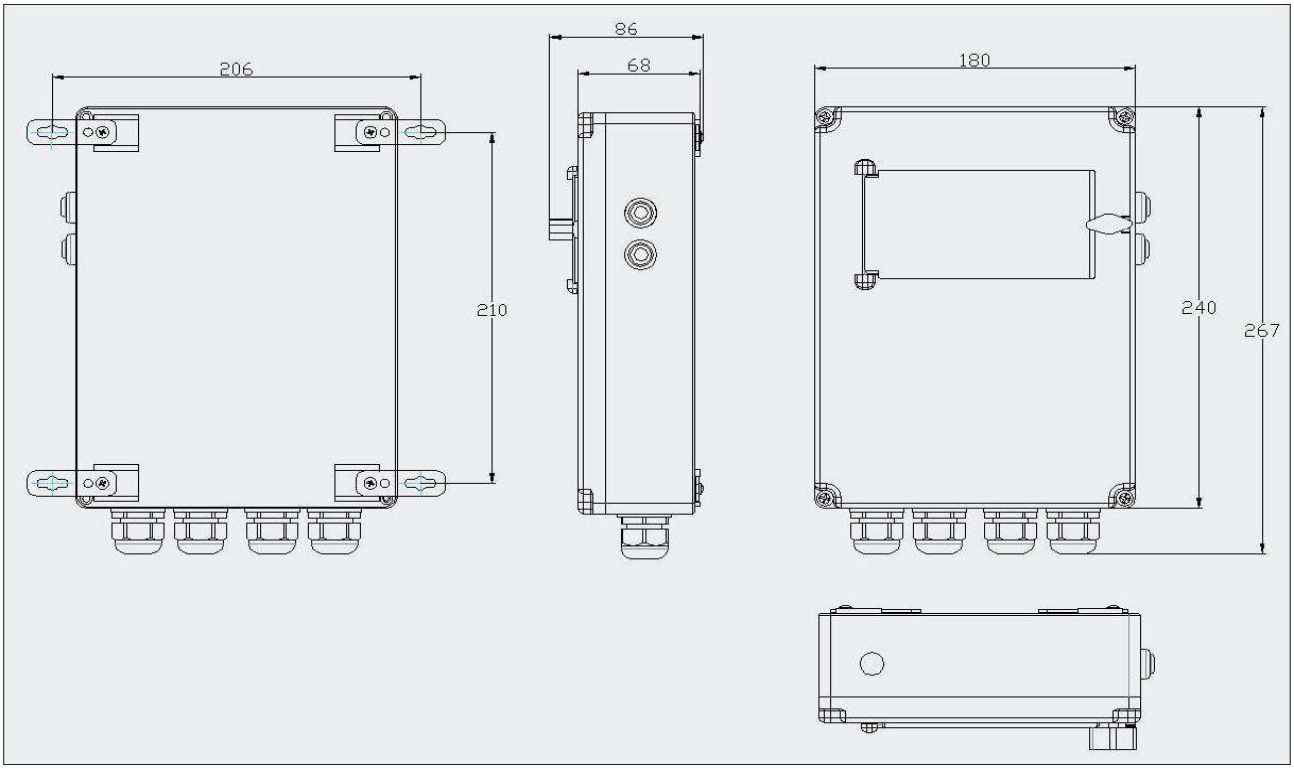
NORMAL PRESSURESWITCH ONTWL
REVERSE ACTING PRESSURE SWITCH ON WWL WITH JUMPER ON TWL
GENERATOR CONTACT WILL CLOSE IF NO AC AND DC DROPS BELOW 90V.

Kelly cable for ground, other two cable connect anyway for pumps

FOR ALL WIRING OPTIONS ONLY ONE AC INPUT SOURCE CAN BE USED BY THE CONTROLLER – USE 240V AC MAINS SUPPLY or GENERATOR unless the Generator has an Auto Transfer System (ATS) to manage the switch over. Consult your Generator manual.

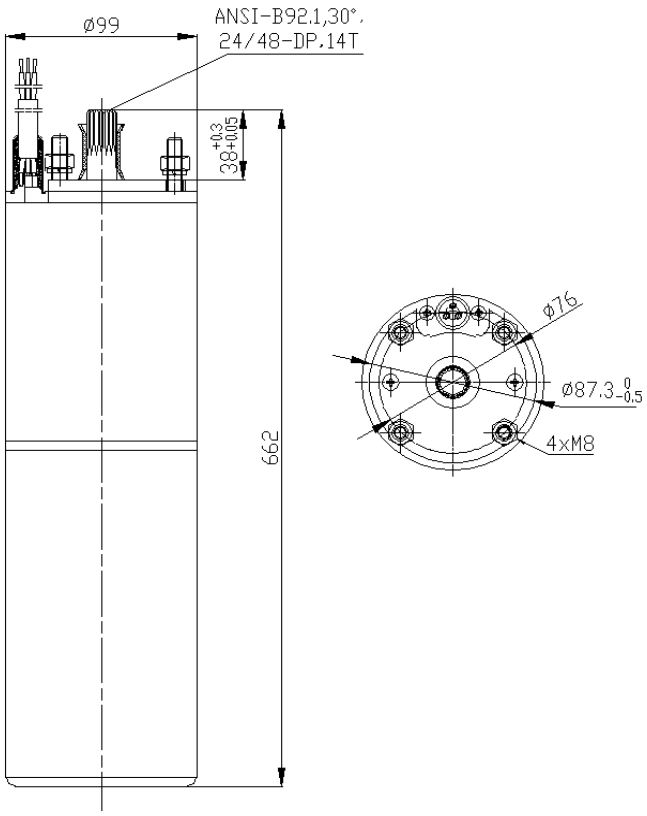
Dimensions

Monitor



Dimensions: 267mm (H) x 180mm (W) x 86mm (D); Weight 1.4 kg

Motor



Dimensions: 662mm (H) x 99mm (Dia); Weight 12 kg

Solar Panels

For DC operation, power supplied by solar panels is required:

Motor is rated：60 – 380Vmp / 440VOC, 12A.

WARNING:

Panel combinations must NOT exceed the Solar Motor input limits

DC Volts Max: 380Vmp/ 440VOC DC Amps Max:12AISC

AC Volts Max: 240V AC Amps Max:10A

Exceeding limits may cause serious harm or irreparable damage to the motor and VFD as well voiding the motor warranty.

Recommended solar panel power for the Solar Pump:

Motor Power(kW)	Motor Power(kW)	Recommend Photovoltaic. Power(kW)	Connection
0.37	0.5	0.6	In Series
0.55	0.75	0.75	In Series
0.75	1	1	In Series
1.1	1.5	1.5	In Series
1.5	2	2	In Series
1.8	2.5	2.5	In Series
2.2	3	3	In Series

For example:

Below is a selection table based on 300W solar panels.
The panels would be wired in series connected in parallel.

ALL Electrical Data@STC				
Pmax(W)	VOC(V)	Vmp(V)	ISC(A)	Impp(A)
300	44	37.6	8.64	8.11

VOLTS, AMPS and WATTS

- VOC (V) Volts open circuit, nothing connected
- Vmp (V) Volts maximum power point, under load
- ISC (A) Amps short circuit
- IMPP (A) Amps maximum power point
- DC Power in W=Vmp*IMPP

SOLAR PUMP model: 4SP8-8 3HP In this case:

Recommended: 10 solar panels in series.

Output voltage multiplies by the number of panels. *eg： 10 x 44 VOC = 440 VOC*
Output voltage multiplies by the number of panels. *eg： 10 x 37.6 Vmp = 376 Vmp*
Output watts multiplies by the number of panels. *eg： 10 x 300 W = 3000W*
Output amps remains the same as a single panel. *eg： 8.64 ISC (A)*

All equipment mentioned in this manual must be installed by skilled and qualified people. A licensed electrician must make all electrical connections.

Solar Panel Installation

WARNING

–The power supply from a DC supply such as Solar Panels can cause SERIOU SHARM or DEA TH from electrocution.

- Apply appropriate safety procedures when working on or with any system component.

-Only suitably qualified personal should be involved in the electrical connection / disconnection and handling of the equipment.

- Off-grid electrical equipment is subject to applicable state, national and country electrical standards.

-The Solar panels will create electrical energy when exposed to light. Assume all panel cables are “live” at all times and handle with appropriate safety equipment and procedures.

-Use only electrical cable and connectors supplied with the Solar Panels. Avoid cutting or joining cables by ordering correct lengths of cable and connectors at time of purchase.

Follow the instructions provided with the Solar Panels and mounting system to complete the framing support for the panels.

General Notes:

Mounting Frame must always face NORTH for panels fitted in the Southern Hemisphere. The orientation of the PANEL to the SUN is determined by the LATITUDE co-ordinate for the site location.

Use a GPS or other mapping app such as “Google Maps” to determine the latitude co-ordinate of the panel installation site. This becomes the angle the panels are orientated from the horizontal to face the sun directly.

Solar availability

As a general rule-of-thumb panels will receive 3.5hr or more of solar irradiation during winter months. Actual average sun hours for each geographic region are available from NASA or your countries weather statistics recorder

Possible pump flow capabilities should be based on minimum WINTER energy availability.

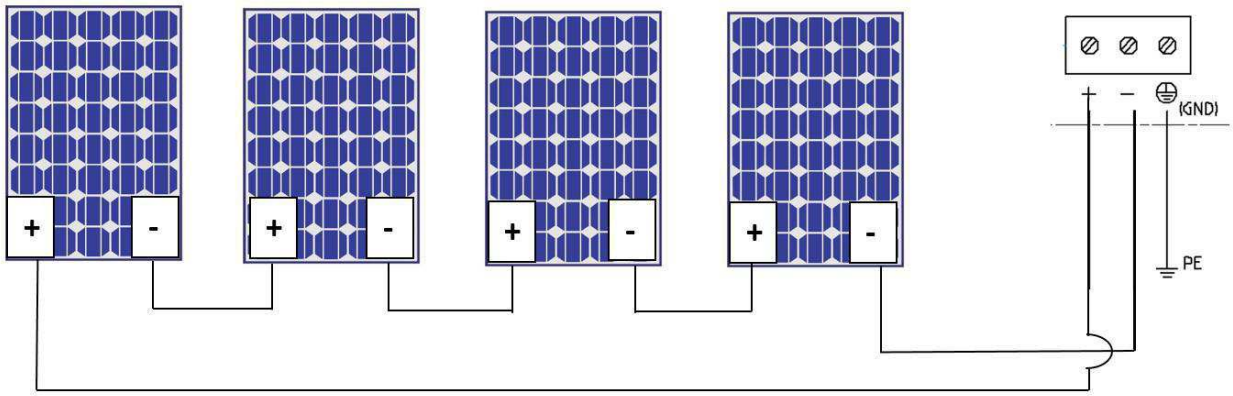
Solar Panel Wiring

Series (Recommended for 1-3HP series Solar Pump)

To wire solar panels in series, positive of one solar panel is wired to the negative of the next solar panel.

In this case:

- Output voltage multiplies by the number of panels. eg：4 x 44 VOC = 176 Voc
- Output voltage multiplies by the number of panel.eg：4 x 37.6Vmp = 150.4Vmp
- Output watts multiplies by the number of panels. eg：4 x 300W = 1200W
- Output amps remains the same as a single panel. eg：8.64 ISC (A)



A group of panels wired in series as above is called a string.

Note: in any combination, output Volts or Amps must not exceed stated limits.

Solar Pump Installation Notes

Water Source and Pump Installations Options

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. For centrifugal pump ,Sand content not to exceed 120g/m3 of water pumped. For Helical pump, no sand is allowed in the water.

The Solar Pump can be installed:

- Vertically in a bore or well

In all installation positions the Solar motor must be fully submerged and a minimum water flow across the motor during operation of 8cm / sec before entering the pump intake.

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

WARNING

- **The power supply from any DC or AC supply can cause serious harm or death from electrocution. Apply appropriate safety procedures when working on or with any system component.**
- **Only suitably qualified personal should be involved in the electrical connection disconnection and handling of the equipment. Off-grid electrical equipment is subject to applicable state, national and country electrical standards.**
- **The Solar Motor contains capacitors that must be allowed to discharge before handling. Allow a minimum of 1 MINUTE for stored energy to dissipate before handling the motor.**
- **The Solar panels will create electrical energy when exposed to light. Assume all panel cables are “live” at all times and handle with appropriate safety equipment and procedures.**

Caution

Isolate all electrical sources before commencing any installation, servicing or repair on any component in the installation.
The Monitor is used to switch AC and DC power supplies and can automatically start a connected generator or switch between DC (Solar) or AC (Generator / Mains) power sources at ANY time.
Ensure all energy sources and generator starting circuit is properly locked-out before working on the system.

Installation and operating instructions

These instructions supply the necessary information for the installation and operation of SP series submersible pumps, and should be thoroughly read and understood before installation is attempted.

WARRANTY

The following Warranty conditions shall apply to the solar pump installation. The factory shall not be held responsible for damage caused by improper installation, use of cable and SP Monitor or level controls which are not approved by factory, negligent or careless handling, lightning, improper voltage supply, corrosion due to impure water, wear caused by sand, gravel or other abrasives in the water being pumped.

Important precautions

1. Damage to pump or motor caused by abrasive or corrosive water is not covered by the Warranty; however, to guard against installing a pump in aggressive water, it is suggested that an analysis of the bore water be carried out prior to installation to ensure pump suitability.
2. The bore should be clean before installation. The submersible pump must not be used to bail a new bore. Guarantee does not cover failure or wear due to abrasives in the water.
3. Be sure voltage and frequency as shown on the nameplate of the Monitor and motor the same as the voltage and frequency on the line to which the motor is to be connected. Voltage at the motor must be 60 to 380Vmp/440VOC or 240V AC.
4. In addition to the check valve built into the pump, it may be necessary to install an additional check valve. This is mandatory for heads greater than 80 meters, or on pressure systems. This will reduce water hammer shocks to the pump.
5. Know the total depth of the bore and ensure that the pump does not rest on the bottom or in sand. Ensure 1.5 meters (5 feet) clear below the pump to the bottom of the bore.
6. Know the pumping level of the bore and ensure that the pump remains submerged at all times. Use of level controller is recommended. If probe type is used, the probe should be located to switch the pump off when the bore water level drops within 1 meter of the pump suction.
7. A Flow Inducer Sleeve or shroud which ensures that the water is drawn into the pump from below the motor is required when the pump is in open water (i.e. water tank, river or dam), is in a rock well, below casing or set in screens, or well diameter is too large. Do not install borehole submersibles in a crooked bore without gauging first. Lower a gauge which is the same diameter and length as the pump to be used into the bore. If the gauge does not bind, it is safe to install the pump.
8. Never support the weight of the pump by the drop (power) cable or by the safety rope

Wiring

Wiring should conform to the requirements of local and national electrical codes. If in any doubt, contact your Electricity Supply Authority.

Caution

The use of smaller cable than specified below may cause premature motor failure and will void the warranty. Larger sized cables may be used.

The table indicates the correct size electrical drop cable and maximum lengths to be used.

Earthing pumps

The Pump motor is equipped with an earth lead which must be connected to the earth of the control module. If testing or used outside a well, the motor must be connected to the power supply earth lead to prevent a lethal shock hazard.

Electrical Check List

It is recommended that where possible, all electrical connections be carried out before delivery to site.

Always check that the motor gland is tight.

Check Monitors, motors and pumps are as ordered and correctly matched. If possible, it is good to practice run the pump briefly in a container of water (water must be over the suction inlet) to check on operation before installation in the bore.

Drop cable should be affixed at three meter intervals by a suitable underwater tape with the cable having some slackness between each interval to compensate for the expansion of the polythene pipe when under load.

Trouble shooting

THE TROUBLE IS?	WHAT TO LOOK FOR
Pump doesn't start	Faulty pressure switch Control box in sun or near heat source Wrong control box being used Defective control box Hydraulic overload Water logged pressure tank Low voltage supply to motor (low solar irradiation) ISOLAR controller switching between energy sources
No water delivered	Low solar irradiation Broken pump shaft or coupling Check valve installed backwards Check valve stuck closed Inlet screen clogged Water level too low in well Hole in delivery pipe below top of bore
Low water delivery	Fittings stopping check valve opening fully Water level too low in well Discharge pipe clogged, corroded or ruptured Pump installed too low in well and covered with sand or other solids Inlet screen partial clogged Worn pump Leak in outlet pipe below top of bore Check valve stuck partially closed
Pump doesn't shut off	Pipe ruptured Defective or improperly adjusted pressure switch Water level too deep for pump. Check selection Pump is air or gas bound Worn pump Pipe obstruction Pump needs adjusting
Pump starts and stops too often (i.e. more than 5 per hour)	Incorrect pressure switch, see pressure system installation Defective air valve or tank diaphragm Pressure switch differential adjustment failure Pressure tank is too small
Electric shock from water pipe Note: A motor down to earth or defective cable will not cause a shock.	Defective (grounded) incoming power leads Defective control box Earth wire connected to wrong control box terminal
Pressure gauge oscillates, flow surges (snoring)	Water level too low in the well. (Flow through pump greater than flow into well)
Electrolysis on motor and pump	Insufficient earth / earth leakage Broken earth wire

NOTE: Always install borehole submersibles with ON/OFF switches and approved circuit breaker to protect against motor damage and electrocution

Notes

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