# Using Manual of DC Solar Submersible Pump

Before using the pump, please read the following introduction carefully.

## 1. Features of Synchronous Motor Pump

We have got invention patent for our Permanent magnet synchronous motor high speed and efficiency deep well pump not only in China but also internationally; we've got Rignier Technology Innovation Awards 2014(pumps & Valves Industry). Compared with other common solar pumps, we have following advantages:

1) Adopt DC Brushless Permanent magnet Synchronous motor, our pump can work in variable frequency, speed of pump is from 0~6000rpm. That technology is the most advanced Technology of DC-INVERTER, small size, high efficiency, the weight and volume of our pumps are only 1/3 or 1/5 of same type pumps.

2) **Automatically working function**, have MPPT function, according to strength of sunlight, pump will change frequency and speed automatically; when there are sun energy, pump start working automatically, no sun energy will stop working.

**3)** D**o not need float switch, if there is no water in well for 1 minute, solar pump will stop working automatically. After 30 minutes, pump will start automatically power on to test whether there is water or not. Have Multifunctions and Auto-protecting, will protect motor.**

## 2. Range of Application

Solar Pump is using the electricity from solar panels to keep working. It is widely used in prairie, pasture and rural areas for water supply, farm irrigation, plant's watering, Lawn greening and water and soil conservation, etc.

## 3. Notes

1) This product consists of solar pump and controller, controller is synchronous motor drive which is especially designed according to our solar pump, cannot connect with other pump or change to other controller. The cable wire of pump(also marked in U,V,W) must be connected with the terminals of controller: U,V,W, CANNOT connect with other terminals.

2) Power supply voltage of controller need correspond to the solar panels' VOC/Vmp, same as the following chart(the VOC of solar panels will have slightly difference ±1~2V as different temperature); otherwise, pump cannot work, if total voltage of panels are too high will destroy the controller, if voltage is too low, pump cannot work.

| Controller Rate Voltage(V) | 12V | 24V | 36V | 48V | 72V | 96V |
|---|---|---|---|---|---|---|
| Panels　Vmp | 10-16V | 20-30V | 30-36V | 40-55V | 60-72V | 80-110V |
| Panels　Voc | 22V | 36V | 44V | 72V | 88V | 144V |
| Battery Voltage V | 10V | 20V | | 40V | | 80V |

3) When voltage is more than 48V,　need be more careful to protect from　electric shock.

## Connection Way of Controller and Pump, Solar Panels.



DC Solar Pump Controller Connection Way
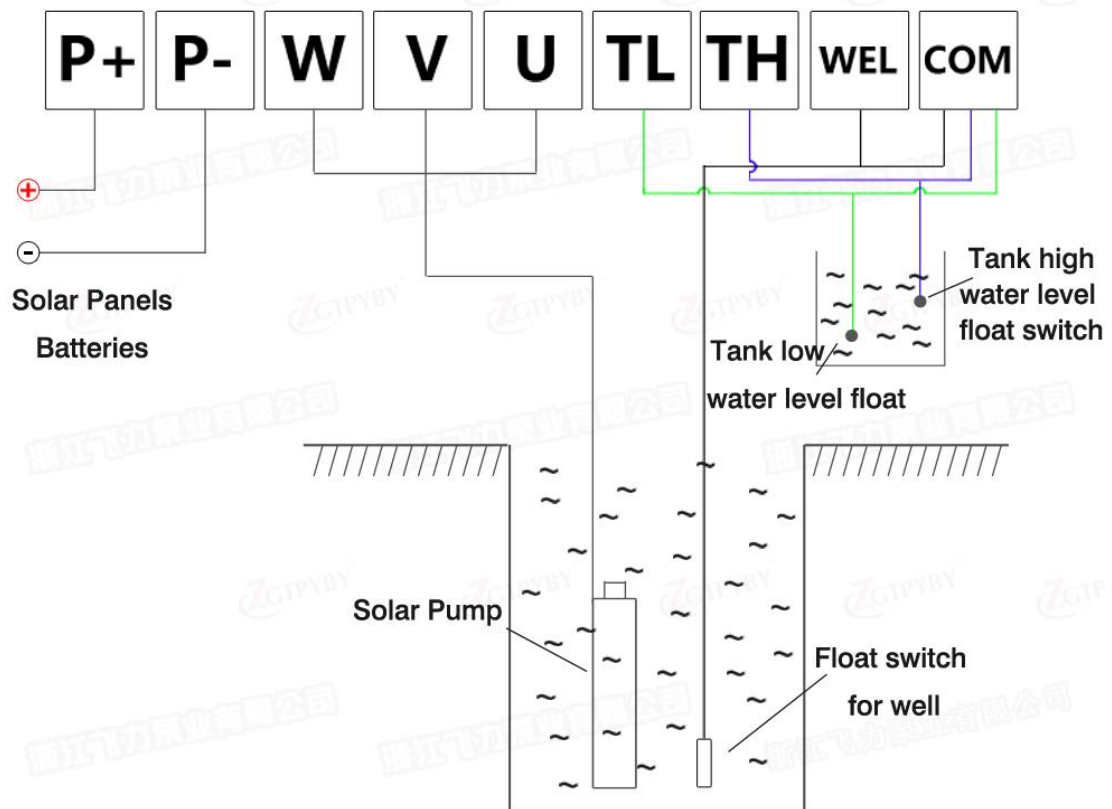
# 4. Operation and application

The positive pole of the solar panel connect SOLAR+, negative pole connect SOLAR-, rechargeable battery connect BATTERY, U, V, W connect the corresponding three wire, H, L, COM (or S1, S2, COM) connect tank level's high level, low level and middle, the two water tower float connect the high water level and low water level separately, both float switches are are normally open type, one wire of every float switch connect to the COM of the controller.



Picture 1. Display Panel
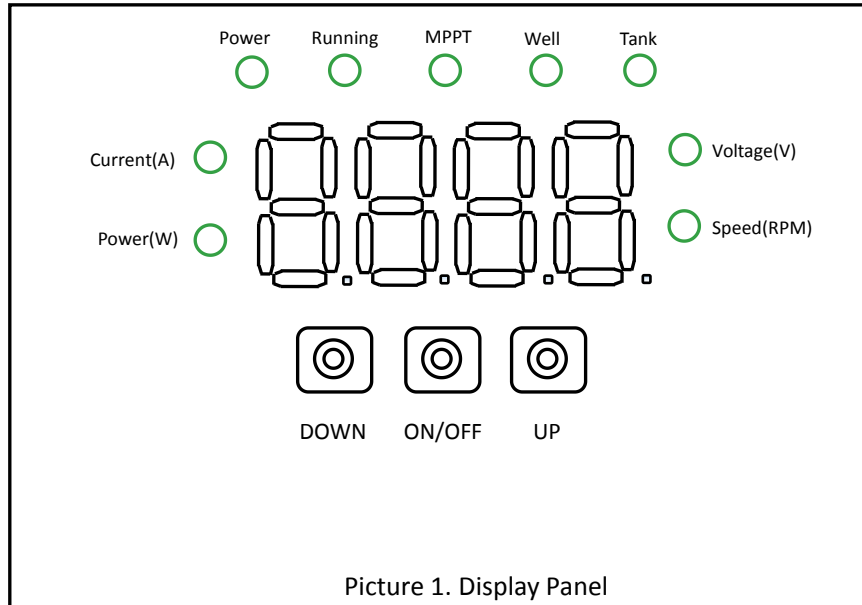
**Explanation of the panel light:**

Power: Standby indicator lights

Running: Running lights

MPPT: Solar energy running lights (twinkling)

Well: Light indicates no water in well

Tank: Light when tank is filled with water

Current(A): Current indicator light

Power(W): Power indicator light

Voltage(V): Voltage indicator light

Speed(RPM): Speed indicator light

**Panel keypad instructions:**

On/Off: On/Off key      Down: Speed slow down key

Down: Query Key      Up: Speed up key

The solar panel would work when connect with electricity, press the "On/Off key" to power off, press again, then power on. Short press the "slow down key" will show the current setted speed of pump, display screen twinkle at 1HZ frequency, every time press the slow down key or speed up key, the speed increase or decrease at 1000RPM interval, the speed interval is 1000RPM-6000RPM. The speed set interface would automaattinen siirtyminen after 10s.

Instructions of "slow down key": press the slow down key about 1.5S into the query and pivot interface. Long-click the slow down key will show the input voltage, currant, input power of the solar panel and speed. The unit of the voltage, currant, and power is A, V and W. When power on the whole system, default display the input voltage of solar energy.

# 5. Operation Mode

This controller have three operation modes: solar mode, manual mode, Float Switch model. When the solar panels are connected to the controller's corresponding negative and positive part, all system starts working, the default is solar mode, then directly into the solar automatic working mode, short press the ON/OFF button to open or close the whole system. When System is open, water pumps start working with maximum speed immediately (without any fault); when the system is turned off, the pump stop running immediately.

## 1) Solar Mode

When plugged into a power supply, the system will automatically identify the supplied power: solar power or battery, will transferred to the corresponding program and start working. Controller is compatible with separate dc battery, solar energy which are two kinds of different ways of power supply. During solar operation mode, the water tank as well as other outage protection are effective. When solar energy separate power supply, the operation of the pump frequency will be affected by the strength of sunlight. When the solar energy is insufficient, the controller will automatically reduce frequency to ensure the pump working speed needed to adapt to the maximum output power of solar panels, to realize the automatic tracking the maximum power point of solar energy, the MPPT light will flashing at the same time until the solar power is not enough will stop working automatically. In the second day, solar panels get solar energy from sunshine, pump will start working automatically.

When controller detect the power is from the batteries, the system will be adjusted by the working voltage of battery frequency make full power operation, will stop working when the battery voltage discharge to protection voltage, in order to protect the batteries.

## 2) Manual mode

Manual mode is independent fixed frequency operation mode, the pump's operating frequency can be set by the user.

Manual mode frequency Settings, if it is manual mode, short press "DOWN" to reduce speed, the screen will show code is "XXXX", such as "5000", it means the pump current setting speed to 5000rpm. Through the UP/DOWN buttons to adjust the required running speed, speed setting effective immediately, after 10S automatic exit setup interface, according to the parameters set during the digital screen twinkle frequency of 1 Hz.

During Manual mode, the start and stop of water pump can be done by short press the ON/OFF key, at the same time, the water tank filled with water, well no water, and other general protect downtime are still valid.

## 3) Float Switch Mode

Float ball model is used to water supply for the pump to the water tank, install float switches to the water tank to control the water level. Operation mode for floating switch is as following: when the tank water to the water line on full (that is, the water Tank water level switch is closed), "Tank" light on screen will on. When the water level reached the waterline, light is extinguished, pump start to work.

When the well is no water (i.e., borehole water level switch is closed), "Well" light on screen will on, or go out.

# 6. General Protection

**1. 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 to restart 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.

**2. Low or high input voltage protection**
If the input of solar DC voltage matched monomer battery 10V dc voltage is less than the minimum limit and continuous after 2 seconds, will display low voltage fault. If the input of solar maximum dc voltage is higher than that stipulated in the open circuit voltage controller, system will be displayed over-voltage alarm, prohibit to start pump. Alarm with red lights flashing, High open circuit voltage will cause damage to the controller.

**3. Current protection**
After pump start working, if the running current of motor is more than 20A , motor will limit frequency, when the current dropped to 16 A, return to normal operation.

**4. Temperature protection**
When the pump motor running current is higher and that situation lasts long time, the controller shell temperature will rise to guard point, controller will stop automatically; after the temperature is lower as normal, pump will be automatically switched on.

**5. Overload protection**
If start pump when all or some parts of the wire of motor is not connected with controller, it will report phase failure, motor will not start anymore unless the fault is solved.

**6. Start protection**
When all wires of motor connected to the controller and start up, we have tried start motor try 10 times in a row, the speed is still zero, controller will report the start-up failure.

The fault code table

| | | | |
|---|---|---|---|
| P42 | Start protection | P50 | DC low voltage protection |
| P43 | Open-phase | P51 | DC high voltage protection |
| P48 | Dry-run protection | PL | Solar low power protection |
| P49 | Current protection | | |

## 7. Battery Matching

This controller can work together with battery, matching the capacity of the
battery is according to solar panels power/voltage the day after the current value
of A same value (or smaller) to take the battery AH. Battery and solar panels of
the anode and the anode in the controller, battery and solar panels of the cathode
and anode in the controller, for battery charging directly by solar panels. When
single-stage battery discharge to 10 v, the system will shut down in order to protect
the battery from discharge have been damaged.
Note: If only use solar panels, haven't connect batteries to controller, pump will start or stop
working automatically; once connecting with batteries, need manual operation to turn it on or
off.

## 8. Solar Panel selection

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.

## 9. Examing before use:

1) Before using, the solar water pump need to check if it is in good condition, if there exist the
phenomenon of joint loose, oil impregnate or oil leak. And need to check if the cable
damaged and application megohm table to check the electrical insulation resistance, it should
be lager than 2M when the engine in cold state.
2) If the pump cable need to lengthen, the diameter of extension cable should be larger than
the original cable. And the joint need to seal with mackintosh.
3) The pump need to check if it can start or operate normally before using. Check whether the
rotation direction of pump is anticlockwise or not. If the rotation direction of three phase
pump is wrong, exchange any two wires of power supply input wire on the controller.
4)When installation, the pump should hang on the rope and it is strictly prohibited to lift the

pump through its cable. The submerged depth should one meter more than bottom in case of the sediment suction. Or the spare parts like mechanical seal and impeller are easy broken.

## 10. 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. If the pump didn't use for long time, please scrub it, place at dry and ventilated place and keeping properly.

**For Solar Pump 3SSW2.7-52-48-550    , need 4PCS 250W solar panels connection way as below:**
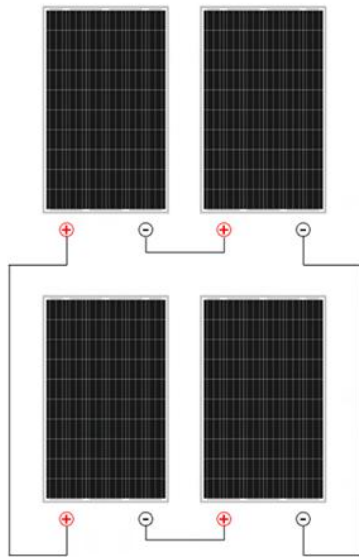




2pcs 250W solar panels connected in series, another 2PCS 250W panels connected in parallel.



**Contact Person:** ˚            " ˚ V‑                    **Email:nrjsolaire1@gmail.com**