Local Service Center

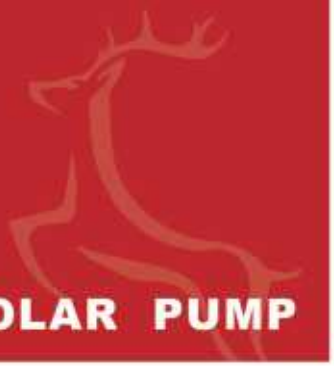
SOLAR PUMP

PUMP

USER MANUAL

for Solar Pump
Professional
Instruction Manual

Solar Water Pumping Systems
Leading Inovotation



SOLAR PUMP

Solar Water Pumping Systems

▶ Customer record card

Name _____

Address _____

Tel _____ Email _____

Model number _____

Date of purchase _____

Warranty Date	Maintenance Record	Maintenance Date	Repairman

Warranty Notice

- This product is guaranteed for 1 years.
- The quality problems caused by improper use are not covered by the warranty.
- Please contact the company for the quality problem of the product.
- Please don't repair it by yourself, otherwise the quality can't be guaranteed.
- Please bring this card and purchase certificate with you during warranty and contact the buyer.
- Please contact the merchant for other questions.

11. Trouble Shooting

Problem	Possible solution
Pump runs, but no water output	*1. Fauty solar panel connection, which cannot reach the motor required power or voltage; 2. Sunshine is too week, which cannot produce enough power to drive pump; 3. Reversed Connection for Pump Positive & negative terminal, which leads to the motor rotates reversely. 4. Water lift height exceeds the pump max lift ability (exceeded pump max head). 5. Motor runs dry, when the water level goes down and leaves the partial or total pump outside of water level.*
Motor don't run	*1. Disconnections wires / Wiring fall off. 2. Impellers are stucked pump or pump overload with too much current; 3. Too higher or too lower input voltage from solar panels. (not in the correct input voltage range). and the pump has been automatically protected by controller.*
Working voice unusual	*1. Bearings broken, Need to be replaced with new one. 2. Impellers are stucked, Just clean the pump and impeller.*

CONTENTS

DC SOLAR PUMP CONTROLLER

AC/DC HYBRID SOLAR PUMP CONTROLLER

1.Introduction

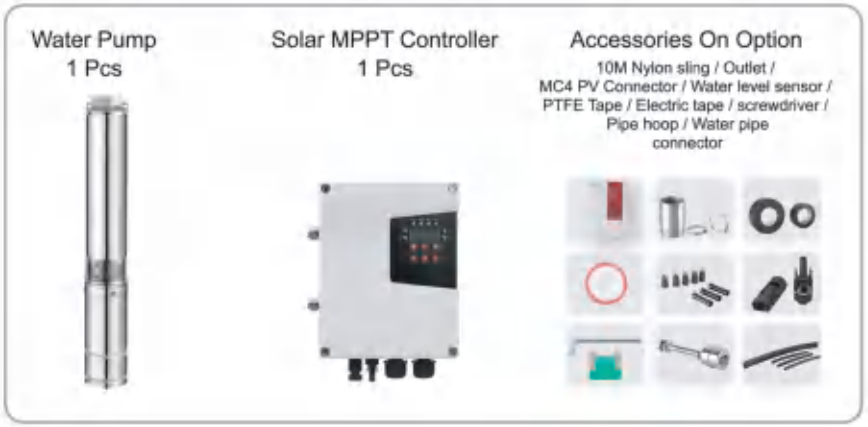
Z3DS,Z3DC,Z4DS,Z4DC Z4IDS,Z4IDC series solar pump is designed as DC brushless motor. The mppt controller can be external controller or built-in-motor controller. The pump body structure can be available for helical rotor or centrifugal impeller type.

External-Controller type solar pump: The pump is controlled by water level sensors from water level detector. Built-in-Controller type solar pump : The pump stops / starts running automatically with water level changes.The types solar pump is suitable in the areas, where lack of electricity or electricity charges is too high.

▶ FEATURES

- DC Brushless Motor, MPPT Controller
- MPPT Function (Maximum Power Point Tracking)
- Soft Starting Protection
- Low-Voltage / Over-Voltage Protection
- Over Current (Motor Seized-Pp) Protection
- Lack of Water Protection
- Restart Automatically upon the Sun and Water Level
- Controlling Running Speed Of Motor (External Controller Model Only)
- Efficiency improved up to 25% higher than the average solar pumps in the global market.

Packing List



Fault Code	Fault Description	Causes and Solutions of Fault	Recovery Procedure
P53	Current sampling fault	Internal current sampling reference voltage failure	Restart the power
P73	AC current protection	AC voltage fluctuation	Restart the power
E8	Current Sampling Failure	Cut off the power and restart after 30 seconds	Restart the power
PL	Power Shortage	No sunlight, waiting for the sunlight to restart Solar panel matching error, refer to the recommendation to match correctly	At the first 5 times, it will removal after 30 seconds, and then 30 minutes to removal
ALARM	Reverse connection protect	Exchange the positive and negative wire	Restart the power

10. Fault Information and Troubleshooting Method

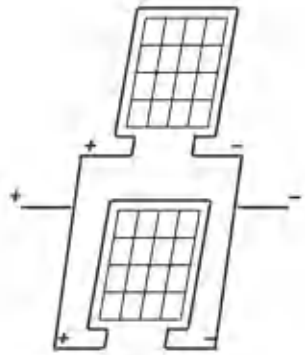
AC/DC Hybrid Controller Fault Type			
Fault Code	Fault Description	Causes and Solutions of Fault	Recovery Procedure
P0	Hardware Overcurrent	Motor model is mismatch,please choose matching pumps UVW three-phase short-circuit connection,please rewiring to ensure the normal installation of UVW	Automatically remove after 30s
P43	Phase Protection	UVW three-phase open circuit, please rewiring to ensure it reliable contact.	Automatically remove after 30s
P46	Stall 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	Automatically remove after 30s
P48	Dry-run Protection	Not all of air in the pump is exhausted, cut off the power, re-power and start the pump drainage after 30 seconds There is no water in the water tank waiting for water, it will restart	Automatically clear after 30 minutes or re-power to clear
P49	Software Overcurrent	Water pump bearing stuck,clean pump bearings UVW three-phase short-circuit connection, please rewiring to ensure the normal installation of UVW	Automatically remove after 30s
P50	Low Voltage Protection	The input voltage is too low, please distribute power refer to the electrical characteristics.	Voltage return to normal, remove the fault immediately
P51	High Voltage Protection	The input voltage is too high, please distribute power refer to the electrical characteristics.	Voltage return to normal, remove the fault immediately
P60	High Temperature Protection	The temperature of controller MCU is more than 90° C	Automatically clear after the temperature is normal

2.Solar Panel selection

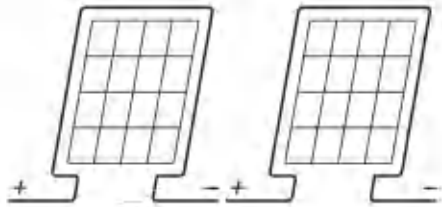
2.1. Solar Panel Connection Knowledge

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.

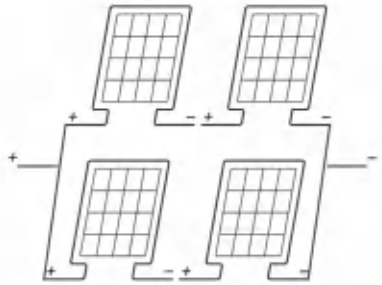


Series



Parallel

Series and Parallel



Tips：When it's series connection, the voltage is added, but the current is not changed; When it's parallel connection, the voltage is unchanged, but the current is added.

2.2 Recommend Selection of solar panel

Model	Demonstration	Matching principle
ZSCO24-FR36	*2 pieces of 100W solar panels in series. (Voc≈45V,Vmp≈36V)*	1.The open circuit voltage of the solar power supply system shall not exceed the maximum input voltage of the PCB. 2.The MPPT voltage of the solar power system shall be higher than the rated voltage of the pump.
	4 pieces of 100W solar panels, the first two in parallel, and then the two groups in series. (Voc≈45V,Vmp≈36V)	
	Only one 300W solar panel. (Voc≈45V,Vmp≈36)	
	2 pieces of 250W solar panels in parallel. (Voc≈36V,Vmp≈28V)	
ZSCO48-FR75	*3 pieces of 100W solar panels in series (Voc≈67.5V,Vmp≈56V)*	
	4 piece of 300W solar panels, each 2 pieces first in parallel, then the series. (Voc≈90V,Vmp≈72V)	
	4 pieces of 100W solar panels in series. (Voc≈90V,Vmp≈72V)	
ZSCO96-F1R3	*6 pieces of 100W solar panels, every 3 block series, and then in parallel. (Voc≈86V,Vmp≈68V)*	
	3 pieces of 300W solar panels in series. (Voc≈135V,Vmp≈108V)	
	4 pieces of 200W solar panels in series. (Voc≈148V,Vmp≈123V)	
	4 piece of 300W solar panel in series. (Voc≈180V,Vmp≈140V)	

Tips：when solar panels is in the sunlight and the absence of any load, the voltage is called Voc; the voltage is called the Vmp in the normal status after load.

9. Servicing and Maintenance

1.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.

8. Operation Mode

8.1 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).

2)Button to start
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).

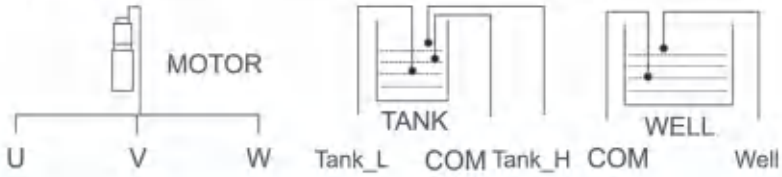
8.2 Pump Stop

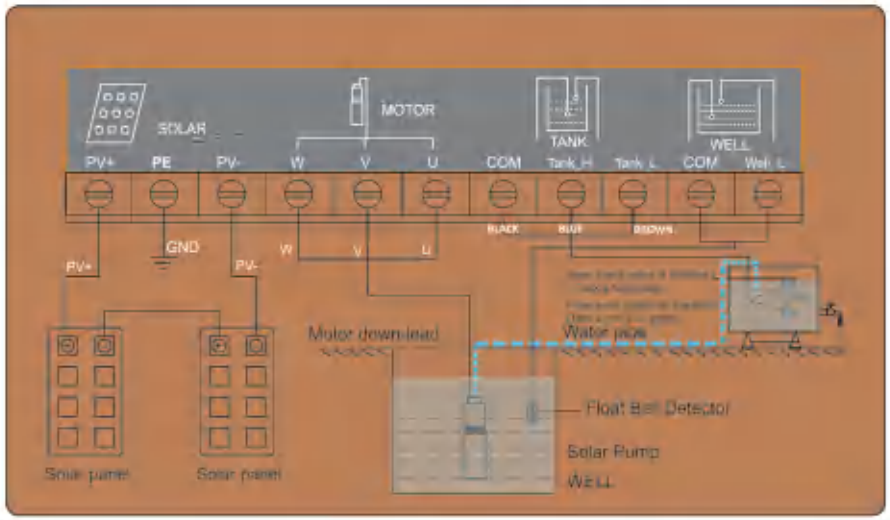
1)Float Switch Mode
In running state, when the water full switch is closed, the pump immediately stops. (TH signal terminal of the main control board is shorted to the COM terminal, and the Tank light is on)
In running state, when the water shortage switch is closed, the pump immediately stops. (WEL signal terminal of the main control board is shorted to the COM terminal, and the Tank light is on)

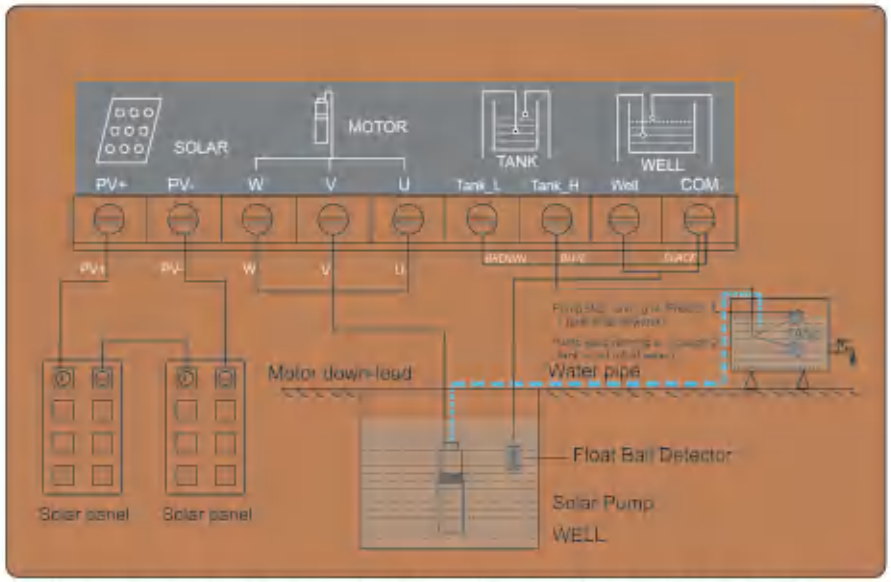
2)Dry Pumping Shut Down
If the water pump continuous work for a period of time, and the power is less than the set power at the current speed and continues for 20s, the pump will stop immediately and report P48 fault. After 30 minutes, the fault is cleared.

3)Button to Stop,
In running state, press the button to turn off the pump.

3. Wiring Diagram







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

4. Working Environment and Electrical Property

PCB and Pump Matching Method						
PCB Model	Adaptable Pump	Rate Input Power (KW)	Maximum Input Current (A)	Maximum Input Voltage (V)	MPPT Voltage Range (V)	Working Temperature (℃)
ZSCO-24V	Rated 24V Pump	0.36	15	48	18-36	-15-60
ZSCO-36V	Rated 36V Pump	0.50	15	96	24-58	-15-60
ZSCO-48V	Rated 48V Pump	0.75	15	96	30-80	-15-60
ZSCO-72V	Rated 72V Pump	1.1	15	135	50-112	-15-60
ZSCO-96V	Rated 96V Pump	1.3	15	180	60-135	-15-60
ZSCO-110V	Rated 110V Pump	1.6	15	230	60-160	-15-60

⚠Caution:

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 it will cause irreversible damage.

Technical parameters

ZSCO_A/DSW Switching Controller

Model	Electrical specifications and parameters									
	DC parameters			AC parameters			parameters			
	DC input Voltage (V)	Max. DC Input Current(A)	Max. Power Input (W)	AC input Voltage (V)	Max. AC Input Current (A)	Max. Power Input (W)	Max. Power Input (W)	Hybrid Type	Waterproof Grade	Ambient temperature (℃)
F2R2-ACDC-SW1	108-410	12	2500	100-264	20	2500	2500	Switching	IP67	-15-60
F1R5-ACDC-SW1	108-410	12	2500	100-264	20	1800	1800	Switching	IP67	-15-60
F1R1-ACDC-SW1	108-410	12	2500	100-264	20	1500	1500	Switching	IP67	-15-60

ZSCO_A/DCP Complementary Controller

Model	Electrical specifications and parameters									
	DC parameters			AC parameters			parameters			
	DC input Voltage (V)	Max. DC Input Current(A)	Max. Power Input (W)	AC input Voltage (V)	Max. AC Input Current (A)	Max. Power Input (W)	Max. Power Input (W)	Hybrid Type	Waterproof Grade	Ambient temperature (℃)
F2R2-ACDC-CP1	108-410	12	2500	100-264	20	2500	2500	Complementary	IP67	-15-60
F1R5-ACDC-CP1	108-410	12	2500	100-264	20	1800	1800	Complementary	IP67	-15-60
F1R1-ACDC-CP1	108-410	12	2500	100-264	20	1500	1500	Switching	IP67	-15-60

7.4 Customize AC power operation mode

User defined AC power operation mode is a programmable hybrid compensation mode. Users can enter the setting mode to set the maximum input of AC power to achieve the purpose of saving AC power. The user can turn on this mode by pressing and holding the switch key, and the indicator light (AC_ LIM) on

B) ZSCO_A/DSW Switching Controller

7.5 Single solar mode

The controller can be used in single solar mode, the maximum current is limited to 12Amp, and the maximum power is tracked by MPPT algorithm.
The running speed of the water pump is determined by the solar panel power input, the maximum speed of the water pump, the maximum power of the controller and the temperature of the controller. When any condition is satisfied, the speed of the water pump will maintain the current speed,otherwise run at a reduced speed.

7.6 Single AC mode

The controller can be used in single AC mode, and the maximum AC current input is limited to 13Amp (different models will vary).
The running speed of the pump is determined by the AC input current, the maximum speed of the pump, the maximum power of the controller and the temperature of the controller. When any condition is satisfied, the speed of the pump will maintain the current speed or run at a reduced speed.

7.7 AC / DC switching mode(DC Power firstly)

a) Power on process

① AC before DC: after AC, the controller operates with AC; When DC is energized again, the controller will switch to DC operation immediately after detecting DC.

② Direct current before alternating current: after direct current, the controller operates with direct current; When AC power is applied again, the controller continues to operate on DC power.

b) Operation process

The controller works under the DC power supply state. If the current DC power is lower than the minimum DC power value allowed to work (500W by default) and lasts for 3 minutes, the controller switches to AC operation. When AC is used for a period of time (the default factory is 10 minutes), it will be switched to DC again and the process will be repeated.

5. Operation Panel

LED LIGHT FOR ESCO CONTROLLER

DISPLAY FOR ZSCO CONTROLLER

5.1 LED Indicator Light

Voltage(V): Voltage indicator lights.
Speed(RPM): Speed indicator light.
Current(A):Current indicator light.
Power(W): Power indicatorlight.
Tank: Light when tank is filled with water.
Well: Light indicates no water in well.
MPPT: Solar energy running lights (twinkling).
Power: light twinkles at downtime, light is constent in running.

5.2 Key Operation

Key Type	Function
 Set Key	Manufacturer parameter setting, not opened. Operation Panel A: Short press work same as Swith Key
 Enter	Manufacturer parameter setting, not opened.
 Up	RPM setting key, Each time you press, the RPM will increase for one grade. In fault state, turn off / on the fault display.
 Down	RPM setting key, Each time you press, the RPM will decrease for one grade.
 Switch	In the operation status, you can circularly switch the display mode in voltage (V) - > speed (RPM) - > current (A) - > power (W).
 On/Off	In the running state, you can turn it off. In the stop state, you can turn it on.

6. Test Running

1.Before using, you should check whether the solar water pump is in good condition, such as joint loose, oil impregnate or oil leak and cable damaged, and you should apply megger to check the insulation resistance, which should be larger than 2M when the engine in cold state.

2.If the cable length needs to be lengthened, the diameter of extension cable should be larger than the original cable. And the joint need to seal with mackintosh.

3.You should check whether the pump can start or operate normally before using. Check whether the rotation direction of pump is anticlockwise or not. In the absence of water, operating is strictly prohibited. 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 be hung 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 of sand damage the mechanical seal and impeller.

7. Power Supply Mode

A) ZSCO_A/DCP Complementary Controller

7.1 Single solar mode

The controller can be used in single solar mode, the maximum current is limited to 12Amp, and the maximum power is tracked by MPPT algorithm.
The running speed of the water pump is determined by the solar panel power input, the maximum speed of the water pump, the maximum power of the controller and the temperature of the controller. When any condition is satisfied, the speed of the water pump will maintain the current speed,otherwise run at a reduced speed.

7.2 Single AC mode

The controller can be used in single AC mode, and the maximum AC current input is limited to 13Amp (different models will vary).
The running speed of the pump is determined by the AC input current, the maximum speed of the pump, the maximum power of the controller and the temperature of the controller. When any condition is satisfied, the speed of the pump will maintain the current speed or run at a reduced speed.

7.3 Full power AC / DC automatic hybrid mode

Under the full power AC / DC automatic hybrid compensation mode, the maximum current of DC side is limited to 12Amp, DC priority, which can be put into use all day, and the minimum power of solar panel can be used to 1W. In order to meet the full power operation of the pump, when the solar power is not enough, the AC side will automatically supplement the power to ensure the normal operation of the pump power. In this mode, the operation speed of the pump is still determined by the AC input current, the maximum speed of the pump, the maximum power of the controller and the temperature of the controller. After any condition is met, the speed of the pump will maintain the current speed or run at a reduced speed.

5. Key Operation

Key Type	Function
 Set Key	Manufacturer parameter setting, not opened. Operation Panel A: Short press work same as Swith Key
 Enter	Manufacturer parameter setting, not opened.
 Up	RPM setting key, Each time you press, the RPM will increase for one grade. In fault state, turn off / on the fault display.
 Down	RPM setting key, Each time you press, the RPM will decrease for one grade.
 Switch	In the operation status, you can circularly switch the display mode in voltage (V) - > speed (RPM) - > current (A) - > power (W).
 On/Off	In the running state, you can turn it off. In the stop state, you can turn it on.

6. Running Test

1.Before using, you should check whether the solar water pump is in good condition, such as joint loose, oil impregnate or oil leak and cable damaged, and you should apply megger to check the insulation resistance, which should be larger than 2M when the engine in cold state.

2.If the cable length needs to be lengthened, the diameter of extension cable should be larger than the original cable. And the joint need to seal with mackintosh.

3.You should check whether the pump can start or operate normally before using. Check whether the rotation direction of pump is anticlockwise or not. In the absence of water, operating is strictly prohibited. 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 be hung 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 of sand damage the mechanical seal and impeller.

7. Operation Mode

7.1 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).

2)Button to start
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).

7.2 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 Tank light 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 Tank light 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 30 minutes, the fault is cleared.

3)Button to Stop,
In running state, press the button  to turn off the pump.

7.3 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 1000-6000RPM. The default setting speed is 6000RPM. The speed can be set by the  or  keys, and the speed can be increased (or decreased) by pressing the increment (or decrement) button.
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.

Model	Protection Voltage(V)
ZSCO24-FR48	20
ZSCO48-FR75	40
ZSCO72-F1R1	60
ZSCO96-F1R3	80

2) PV Mode

In PV mode, the pump setting speed is similar to DC mode, and the maximum speed (6000 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.
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.

7.4 Reverse connection protect

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

ZSCO_A/DSW Switching Controller

Digital display(PDC/VDC/IDC):
DC Power,DC Voltage,DC Current.
AC Power,AC Voltage,AC Current.
the current running speed or set speed.

Tank:
Light when tank is filled with water.

Well:
Light when no water in well.

MPPT:
Solar energy running lights (twinkling).

Power(Run/Err):
When the water pump stops, the green light flashes slowly, and Green light on when it is running; the red light flashes rapidly when it fails.

4.Display introduction

ZSCO_A/DCP Complementary Controller

Digital display(PDC/VDC/IDC):
DC Power,DC Voltage,DC Current.

Digital display(PAC/VAC/IAC):
AC Power,AC Voltage,AC Current.

Digital display Speed(RPM):
the current running speed or set speed.

Tank:
Light when tank is filled with water.

Well:
Light when no water in well.

MPPT:
Solar energy running lights (twinkling).

Power(Run/Err):
When the water pump stops, the green light flashes slowly, and Green light on when it is running; the red light flashes rapidly when it fails.

AC_Lim :
light on when the AC limit function open, otherwise it will be off.

7.5 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.

8. Servicing and Maintenance

1.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.

ESCO_MPPT CONTROLLER

ERROR CODE: Analysis System Failure by Led frequency

1.Hardware over current	*2.Software over current*	*3.Low voltage*
4.Over voltage	*5.Lack of Motor Phase*	*6.Over Loading*
7.Start protection	*8.Hardware failure*	

ZSCO_MPPT CONTROLLER

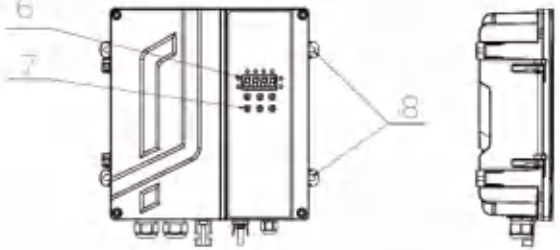
ERROR CODE

P0: Hardware over current	*P43: Phase Protection*	*P46: Stall Protection*
P48: Dry-run Protection	*P49: Software Overcurrent*	*P50: Low Voltage Protection*
P51: High Voltage Protection	*P60: High Temperature Protection*	*E8: Current Sampling Failure*
PL: Power Shortage	*ALARM: Reverse connection protect*	

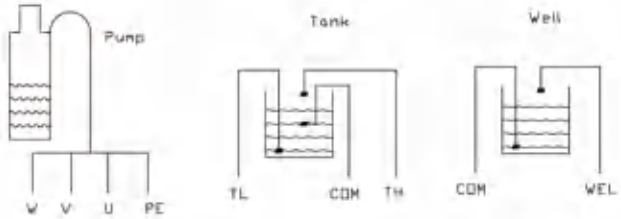
9. Fault Information and Troubleshooting Method

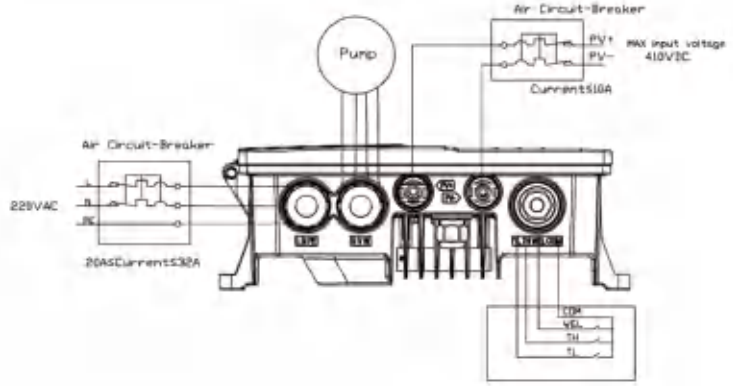
ESCO Fault Type			
Fault Code	Fault Description	Causes and Solutions of Fault	Recovery Procedure
Hz 1	Hardware Over current	Motor model is mismatch,please choose matching pumps UVW three-phase short-circuit connection,please rewiring to ensure the normal installation of UVW	Automatically remove after 30s
Hz 2	Software Over current	Water pump bearing stuck,clean pump bearings UVW three-phase short-circuit connection, please rewiring to ensure the normal installation of UVW	Automatically remove after 30s
Hz 3	Low Voltage Protection	The input voltage is too low, please distribute power refer to the electrical characteristics.	Voltage return to normal, remove the fault immediately
Hz 4	Over Voltage Protection	The input voltage is too high, please distribute power refer to the electrical characteristics.	Voltage return to normal, remove the fault immediately
Hz 5	Lack of Motor Phase	Motor wire connection error please recheck and install	Automatically remove after 30s
Hz 6	Over Loading	Motor overload, please take out the pump, check and clean to ensure that the failure disappeared, then put back to water	Automatically remove after 30s
Hz 7	Start 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	Automatically remove after 30s
Hz 8	Hardware failure	The hardware failure,please show the local Service man to check and repair	Automatically remove after 30s

ZSCO_A/DSW Switching Controller



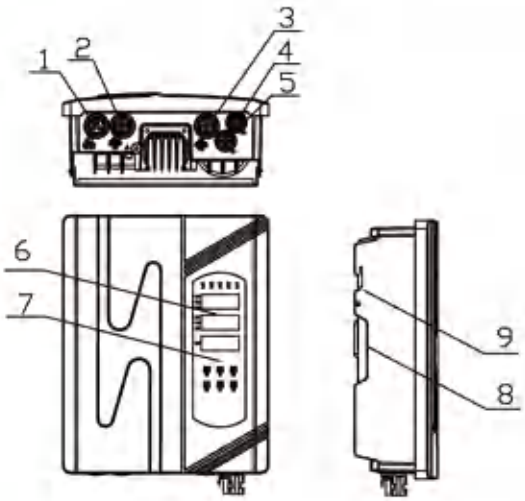
1. AC Input Terminal
2. Pump Outlet Terminal
3. PV Positive Input
4. PV Negative Input
5. Water level signal Terminal
6. display window
7. Key operation area
8. mounting bracket



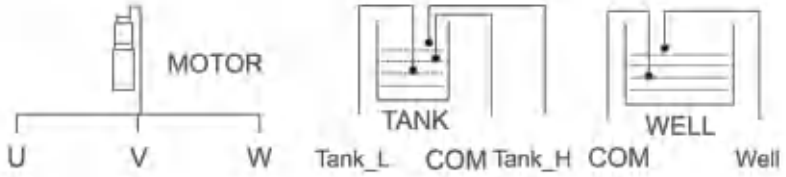


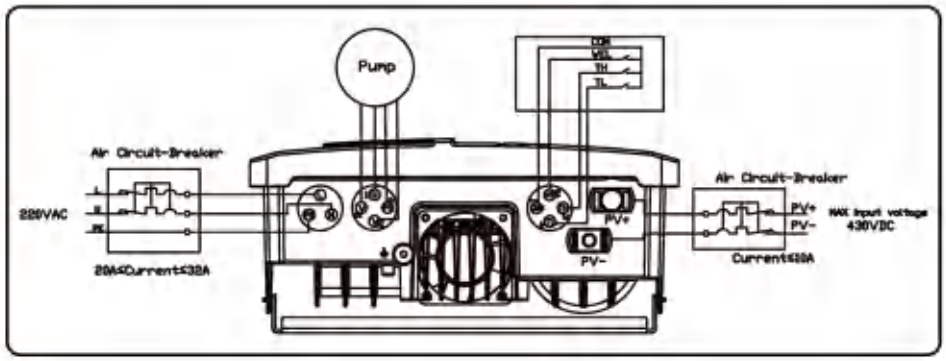
3. Wiring Diagram

ZSCO_A/DCP Complementary Controller



1. AC Input Terminal
2. Pump Outlet Terminal
3. Water level signal Terminal
4. PV Positive Input
5. PV Negative Input
6. display window
7. Key operation area
8. Handling handle
9. mounting bracket

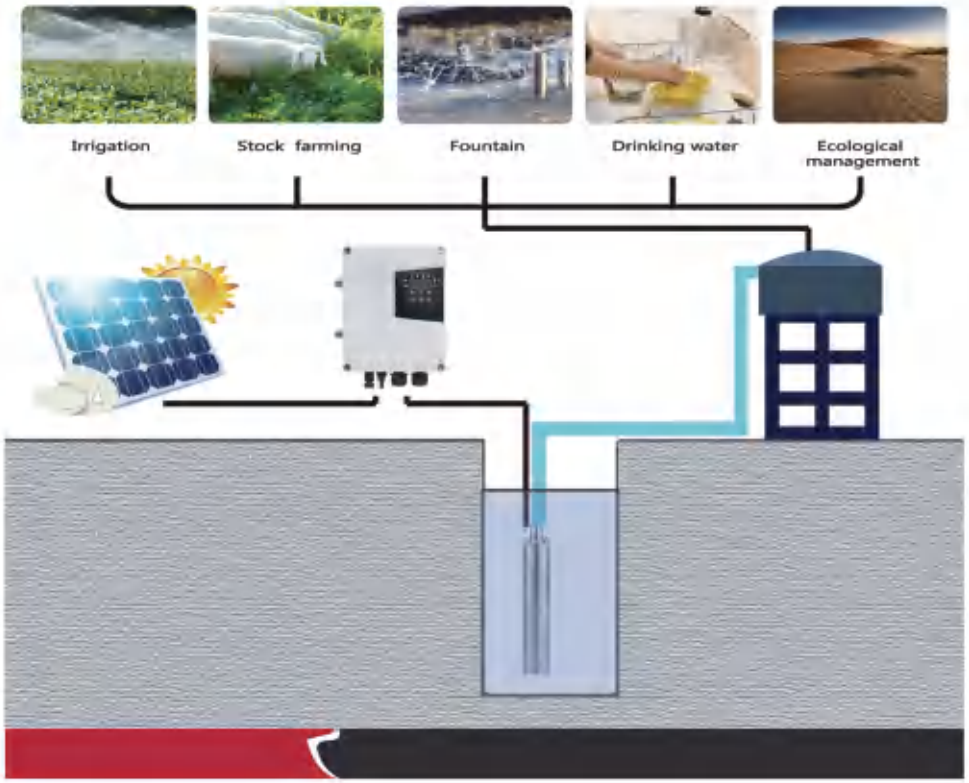




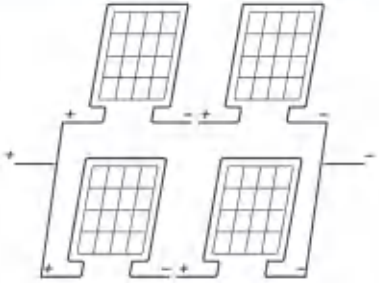
Fault Information and Troubleshooting Method

ZSCO / SSCO Fault Type			
Fault Code	Fault Description	Causes and Solutions of Fault	Recovery Procedure
P0	Hardware Overcurrent	Motor model is mismatch,please choose matching pumps UVW three-phase short-circuit connection,please rewiring to ensure the normal installation of UVW	Automatically remove after 30s
P43	Phase Protection	UVW three-phase open circuit, please rewiring to ensure it reliable contact.	Automatically remove after 30s
P46	Stall 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	Automatically remove after 30s
P48	Dry-run Protection	Not all of air in the pump is exhausted, cut off the power, re-power and start the pump drainage after 30 seconds There is no water in the water tank waiting for water, it will restart	Automatically clear after 30 minutes or re-power to clear
P49	Software Overcurrent	Water pump bearing stuck,clean pump bearings UVW three-phase short-circuit connection, please rewiring to ensure the normal installation of UVW	Automatically remove after 30s
P50	Low Voltage Protection	The input voltage is too low, please distribute power refer to the electrical characteristics.	Voltage return to normal, remove the fault immediately
P51	High Voltage Protection	The input voltage is too high, please distribute power refer to the electrical characteristics.	Voltage return to normal, remove the fault immediately
P60	High Temperature Protection	The temperature of controller MCU is more than 90° C	Automatically clear after the temperature is normal

Fault Code	Fault Description	Causes and Solutions of Fault	Recovery Procedure
E8	Current Sampling Failure	Cut off the power and restart after 30 seconds	Restart the power
PL	Power Shortage	No sunlight, waiting for the sunlight to restart Solar panel matching error, refer to the recommendation to match correctly	At the first 5 times, it will removal after 30 seconds, and then 30 minutes to removal
ALARM	Reverse connection protect	Exchange the positive and negative wire	Restart the power



Series and Parallel



Tips: When it's series connection, the voltage is added, but the current is not changed; When it's parallel connection, the voltage is unchanged, but the current is added.

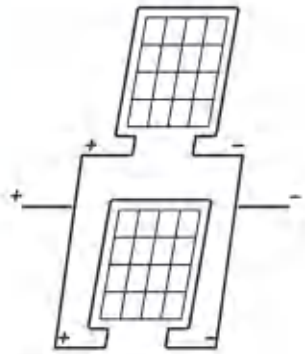
2. Electrical specification

Model	Demonstration	Controller parameters
F1R1-ZSCO_ADCP F1R1-ZSCO_ADSW	***DC Input:*** *Voltage Input: 80-380V DC* *Max. Current Input: 12A* *Max. Power Input: 2500W*	***1.AC/DC Hybrid Solar Pump Controller*** ***2.Waterproof grade: IP 67*** ***3.Working environment temperature: -15 - 60℃***
	AC Input: *Voltage Input: 150-264V AC* *Max. Current Input: 10A* *Max. Power Input: 1500W*	
F1R5-ZSCO_ADCP F1R5-ZSCO_ADSW	***DC Input:*** *Voltage Input: 80-380V DC* *Max. Current Input: 12A* *Max. Power Input: 2500W*	
	AC Input: *Voltage Input: 150-264V AC* *Max. Current Input: 10A* *Max. Power Input: 1800W*	
F2R2-ZSCO_ADCP F2R2-ZSCO_ADSW	***DC Input:*** *Voltage Input: 80-380V DC* *Max. Current Input: 12A* *Max. Power Input: 2500W*	
	AC Input: *Voltage Input: 150-264V AC* *Max. Current Input: 12A* *Max. Power Input: 2500W*	

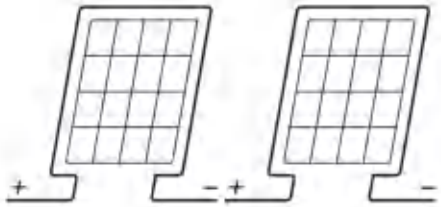
1.Solar Panel selection

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 6 hours at day, the solar panel power equals to input power multiply 1.2-1.5 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.

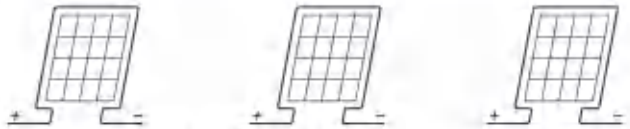
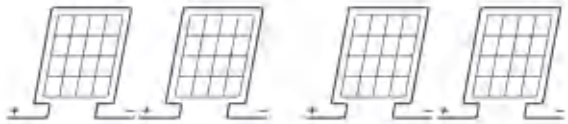
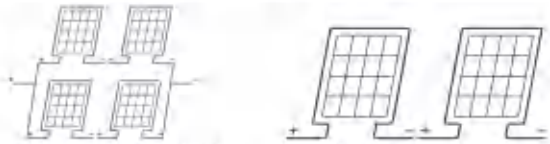


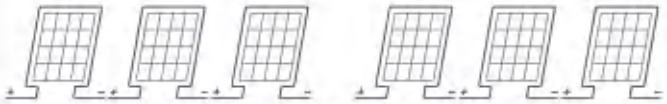
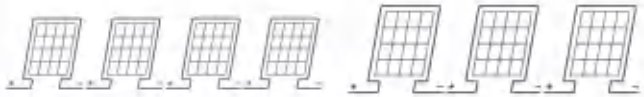
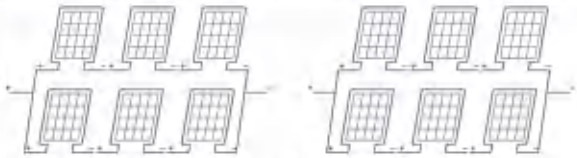
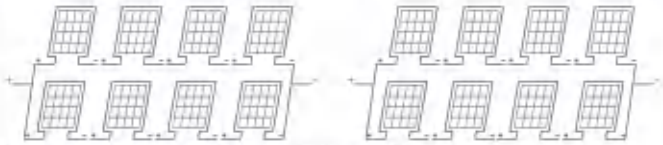
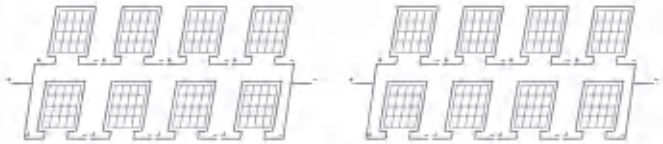
Series



Parallel

10. Solar Panel recommendation for 24-110V DC

Power 80W-12V Vol: 18-50V	 Solar Panel: 150w*1PCS / 265W*1PCS / 340W *1PCS
Power 120-210W-24V 210W -36V Vol: 18-50V	 Solar Panel: 150w*2PCS / 265W*1PCS / 340W *1PCS
Power 280W-24V 300W-24V Vol: 18-50V	 Solar Panel: 265w*2PCS / 340W*2PCS
Power 400W-36V Vol: 18-50V	 Solar Panel: 265w*2PCS / 340W*2PCS
Power 370W-48V 400W-48V Vol: 30-100V	 Solar Panel: 265w*2PCS / 340W*2PCS
Power 500W-48V 550W-48V Vol: 30-100V	 Solar Panel: 265w*4PCS / 340W*2PCS
Power 600W-48V Vol: 30-100V	 Solar Panel: 265w*4PCS / 340W*4PCS

Power 600W-72V Vol: 50-150V	 Solar Panel: 265w*3PCS / 340W*3PCS
Power 750W-48V Vol: 30-100V	 Solar Panel: 265w*4PCS / 340W*4PCS
Power 750W-72V Vol: 50-150V	 Solar Panel: 265w*4PCS / 340W*3PCS
Power 900W-72V Vol: 50-150V	 Solar Panel: 265w*4PCS / 340W*4PCS
Power 1000W-96V Vol: 60-200V	 Solar Panel: 265w*6PCS / 340W*6PCS
Power 1300W-96V Vol: 60-200V	 Solar Panel: 265w*8PCS / 340W*8PCS
Power 1600W-110V	 Solar Panel: 265w*4PCS / 340W*4PCS

▶ TROUBLE SHOOTING

Problem	Possible solution
Pump runs, but no water output	*1. Fauty solar panel connection, which cannot reach the motor required power or voltage;* *2. Sunshine is too week, which cannot produce enough power to drive pump;* *3. Reversed Connection for Pump Positive & negative terminal, which leads to the motor rotates reversely.* *4. Water lift height exceeds the pump max lift ability (exceeded pump max head).* *5. Motor runs dry, when the water level goes down and leaves the partial or total pump outside of water level.*
Motor don't run	*1. Disconnections wires / Wiring fall off.* *2. Impellers are stucked pump or pump overload with too much current;* *3. Too higher or too lower input voltage from solar panels. (not in the correct input voltage range).* *and the pump has been automatically protected by controller.*
Working voice unusual	*1. Bearings broken, Need to be replaced with new one.* *2. Impellers are stucked, Just clean the pump and impeller.*

▶ Customer record card

Name _____

Address _____

Tel _____ Email _____

Model number _____

Date of purchase _____