REEFE
PUMPS AUSTRALIA BETTER | FASTER | EASIER

SOLAR BORE PUMPS

RSB SERIES

INSTRUCTION MANUAL

MODEL: RSB | RSB.SP SERIES
CODE: 35009 | 35016 | 35023 | 35030 | 35047 | 35054
35061 | 35078 | 35511 | 35528 | 35535 | 35542 | 35542
35559 | 35566 | 35573 | 35580

CONTENTS

For Solar Panel Installation Information & Videos please scan QR Code.
https://www.clenergy.com/product/adjustable-tilt/postmount-a/

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Screw

SS Oil Cylinder

NSK Bearing

SCREW

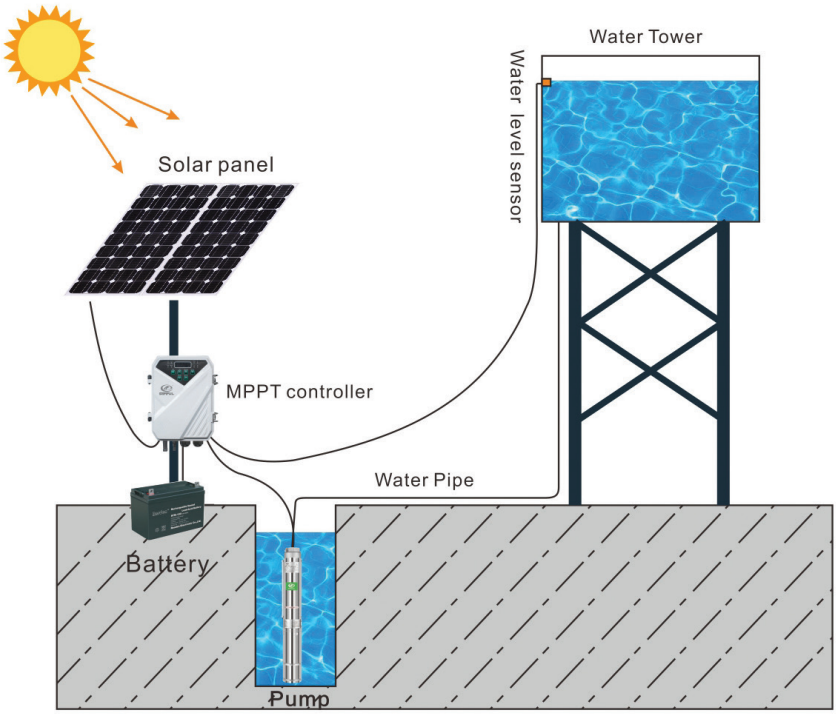
SS Impeller

SS Oil Cylinder

NSK Bearing

CENTRIFUGAL

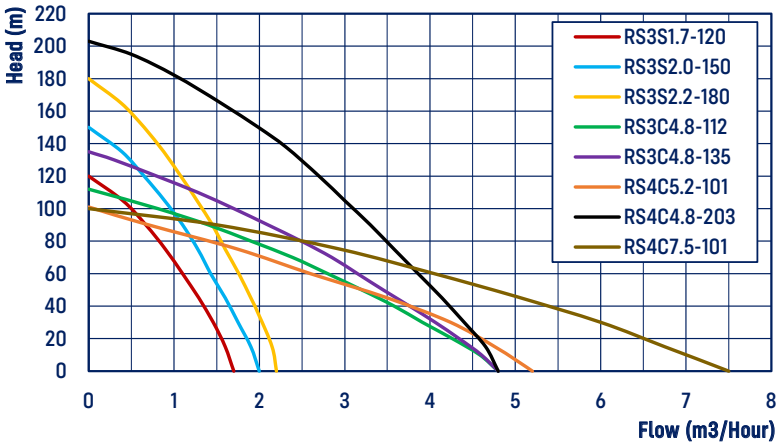
DC Controller



DC EXTERNAL CONTROLLER TYPE

CODE	MODEL	PUMP DIA	IMPELLER TYPE	POWER				MAXIMUM		SOLAR PANELS REQUIRED	OUTLET		WEIGHT (KG)	SIZE DØ X H (MM)
				VOLTS	BEST INPUT DC VOLTAGE	WATTS	OPEN CIRCUIT VOLTAGE	FLOW (M^3/HR)	HEAD (M)		MM	IN		
35009	RS3S1.7-120	3"	Screw	48V	60V-90V	500	<100V	1.7	120	2x330w	25	1"	9	76x418
35016	RS3S2.0-150	3"	Screw	72V	90V-120V	750	<150V	2.0	150	3x330w	25	1"	9	76x418
35023	RS3S2.2-180	3"	Screw	72V	90V-120V	1100	<150V	2.2	180	6x330w	25	1"	9	76x418
35030	RS3C4.8-112	3"	Centrifugal	110V	110V-150V	1100	<200V	4.8	112	6x330w	32	1 ¼"	14.5	76x702
35047	RS3C4.8-135	3"	Centrifugal	110V	110V-150V	1500	<200V	4.8	135	8x330w	32	1 ¼"	15	76x762
35054	RS4C5.2-101	4"	Centrifugal	110V	110V-150V	1100	<200V	5.2	101	6x330w	32	1 ¼"	14.6	98x605
35061	RS4C4.8-203	4"	Centrifugal	110V	110V-150V	1500	<200V	4.8	203	8x330w	32	1 ¼"	17.1	98x788
35078	RS4C7.5-101	4"	Centrifugal	110V	110V-150V	1500	<200V	7.5	100	8x330w	32	1 ¼"	14.5	98x605

CODE	MODEL	PUMP DIA	IMPELLER TYPE	POWER				MAXIMUM		SOLAR PANELS INCLUDED	OUTLET		WEIGHT (KG)	SIZE DØ X H (MM)
				VOLTS	BEST INPUT DC VOLTAGE	WATTS	OPEN CIRCUIT VOLTAGE	FLOW (M^3/HR)	HEAD (M)		MM	IN		
35511	RS3S1.7-120.SP	3"	Screw	48V	60V-90V	500	<100V	1.7	120	2x440w	25	1"	9	76x418
35528	RS3S2.0-150.SP	3"	Screw	72V	90V-120V	750	<150V	2.0	150	3x440w	25	1"	9	76x418
35535	RS3S2.2-180.SP	3"	Screw	72V	90V-120V	1100	<150V	2.2	180	3x440w	25	1"	9	76x418
35542	RS3C4.8-112.SP	3"	Centrifugal	110V	110V-150V	1100	<200V	4.8	112	3x440w	32	1 ¼"	14.5	76x702
35559	RS3C4.8-135.SP	3"	Centrifugal	110V	110V-150V	1500	<200V	4.8	135	3x440w	32	1 ¼"	15	76x762
35566	RS4C5.2-101.SP	4"	Centrifugal	110V	110V-150V	1100	<200V	5.2	101	3x440w	32	1 ¼"	14.6	98x605
35573	RS4C4.8-203.SP	4"	Centrifugal	110V	110V-150V	1500	<200V	4.8	203	3x440w	32	1 ¼"	17.1	98x788
35580	RS4C7.5-101.SP	4"	Centrifugal	110V	110V-150V	1500	<200V	7.5	100	3x440w	32	1 ¼"	14.5	98x605



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REEFE Solar Powered Submersible Bore Hole Pumps offer the ultimate in energy efficiency using 100% renewable energy directly from the sun. Includes easy to use MPPT maximum efficiency start controller. The pre-coupled quality and reliable 100% tested motor / pump assembly, means you can be up and running quickly. This specific range offers models with either helical rotor or centrifugal impellers.
Before installation and use, read the following instructions carefully. The manufacturer declines all responsibility in the event of accident or damage due to negligence or failure to observe the instructions described in this booklet or in conditions that differ from those indicated on the rating plate. It also declines all responsibility for damage caused by improper use of the water pump. When storing, do not pile weights or other boxes on top.

SAFETY
Before carrying out checks or doing any maintenance, disconnect the PV supply and motor lead from the control box. Before installing the water pump, ensure that the power supply is connected as per the wiring diagram and compliant with local solar electrical regulations. They are not suitable for pumping inflammable liquids or for operating in places where there is danger of explosion. Avoid contact between the power supply and the liquid to be pumped. Do not modify the components of the water pump. The water pump must never be lifted or transported by its electrical supply cable, lift via safety rope or safety cable only!
Do not use the pump in swimming pools, garden ponds or similar places when people are in the water.

APPLICATIONS
- Submersible bore hole installations – ensure that the pump is suspended in the clean water column free from debris, and below the water level once draw-down is considered.
- Stock watering
- Tank filling
- Water supply
- Water transfer

FEATURES & BENEFITS
- Automatic restarting for minimal user intervention. Starts and stops each morning and evening
- Loss of prime function for pump protection
- Under and over voltage protection to prevent damage to motor
- MPPT tracking for efficient low light operation
- Soft start functions to remove hammer on hydraulic system

CONSTRUCTION
- Stainless Steel construction of motor casing, pump casing, impellers, oil cylinder, coupling and fixings
- Quality NSK bearings
- Stainless steel helical shaft with rubber displacement body
- Permanent magnet DC brushless synchronous motor
- IP65 controller
- 2m Cable Length

PRELIMINARY INSPECTION
Unpack and check that it is in perfect condition. Also check that the data on the rating plate correspond to the required data. If there is any problem contact the supplier immediately, specifying the type of fault.
CAUTION: if there is any doubt about the safety of the machine, do not use it.

INSTALLATION
Installation can be a complex operation. It must, therefore, be carried out by competent and authorized installers.

CAUTION: During installation apply all safety regulations issued by the applicable authorities and always use common sense.
Do not underestimate the risk of drowning if the installation must be performed in a well at a certain depth. Make sure there are no toxic discharges or harmful gases present in the atmosphere.
In applications of a bore / well / dam, ensure that the pump is suspended in the clean water column free from debris, and below the water level once draw-down is considered.
If the installation involves welding, take all necessary precautions to avoid explosions. Always remember the danger of infection and take all hygiene-health precautions. If at the bottom of the well there is the possibility of stones, debris, mud etc., lay a level raised supporting base. The delivery piping may be either rigid or flexible if the cross-section for passage of the fluid is no smaller than that of the pump delivery outlet. To avoid the backflow of liquid from the discharge manifold, install a check valve after the pump delivery outlet.
They are delivered ready to be connected.

CAUTION: It is the installer's responsibility to perform the connections accordance with applicable regulations. Make sure that there is no voltage at the line wire terminals before connecting. Check that the data on the name plate matches what you have purchased, and performance data meets your application requirements. When carrying out connections make sure that there is an efficient earth circuit. The earth wire must be longer than the five wires, and must be the first wire to be connected when the pump is being set up and the last to be disconnected during disassembly. A thermal overload cutout in the winding protects against voltage overload in the pump motor.
It is important to avoid air lock cavity causing a dry run scenario despite the pump being submerged. This is particularly important when using a shroud – if using duct tape to secure the shroud this MUST have vent holes in it to allow the shroud pipe to vent the air on installation. Failure to observe this could result in a burnt out motor and potential damage to the pump – which will not be covered by warranty.
Repair of the pump by personnel not authorized by Ascento will render the guarantee null and void and will entail operating with potentially dangerous equipment.

CAUTION: Any tampering may lead to performance being reduced and injury to persons and/or things.
Where there is the risk of freezing, empty the well or remove the pump and store it in a suitable place. Before doing anything, make sure that the pump is disconnected from the power source and that there is no possibility of accidental connections.
You are advised to check the following periodically:

- The condition of the cables and grommets, especially at their attachment points.
- The impeller must not be excessively worn, otherwise performance will be reduced; consult a dealer for replacement.
- Check that the suction area is clean.

ATTENTION: Food grade oil lubricant is used inside motor, the loss of any lubricant is not harmful but the pump needs to be immediately replaced

ATTENTION: The apparatus is not intended for use by people (children included) with reduced physical, sensorial or mental capabilities, or by those lacking the required experience or knowledge unless supervised or instructed in the use of the apparatus by a person responsible for their safety. Children should be supervised to ensure that they do not play with the apparatus.

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OPERATING INSTRUCTIONS

1: SAFETY

The submersible motor must only be operated in observance of the following safety regulations.

- Operate the motor only under water
- Ensure the implementation is within the limits of the motor and units
- Check the electrical connections and wiring is safe before switching on
- Protect electrical components against accidental access and damage by weather or animals, etc.
- Vent rising pipe before commissioning to avoid air lock when starting up
- Provide a check valve in the sump or rising pipe (Max 7m away from the pump)
- Maximum water temperature +35°C (Higher temperatures only with derated motors)
- With Generator operation, always unload the generator first, i.e.
  - Start: First the generator, then the motor
  - Switch off: First the motor, then generator
- After powering the system, check:
  - Operating current of the motor at each phase
  - Level of the medium to be pumped
- Switch off the motor immediately if:
  - Nameplate current is exceeded
  - Voltage tolerances of more than +6% /-10% compared to the rated voltage on the motor are measured.
  - Dry run is imminent
- Children should be supervised to ensure that they do not play with the equipment / appliance.

2: INTENDED USE

Submersible Motors are specifically designed for submerged operation as drivers of variable torque loads such as pumps for:

- General water supply
- Wells in domestic houses, waterworks and agriculture
- Dewatering, pressure boosting, irrigation systems
- Maximum 20 starts per hour, allowing 60 seconds between successive starts
- The maximum submergence depth is 200m

Improper use of electric submersible motor, like pumping of air or explosive media is strictly prohibited.
ATTENTION: For required motor cooling, please consult motor nameplate etch. If cooling flow is not sufficient, fit inducer sleeve.

3: TRANSPORT AND STORAGE

ATTENTION: The motor may be commissioned by trained and instructed personnel only. Electrical connections only to be carried out by suitably qualified personnel.

- Store motor in original packaging until assembly
- Under no circumstances may the motor be stored at temperatures above 50°C since this can lead to filling liquid leakage and premature motor failure.

4: EXTENDING THE MOTOR CABLE

The cable provided can be extended by the customer, by one of the following means:

- Use joints with shrink hose sealing compound or finished cable fittings. Protect joints against penetrating moisture (strictly following manufacturer's instructions).

NOTE: The installers themselves are responsible for the correct selection and dimensioning of the drop cable! Extension cable must be approved for its use in the medium and the prevailing temperatures.

5: ASSEMBLY OF MOTOR AND UNIT

These instructions refer to the motor only. Please strictly observe the assembly instructions of the pump manufacturer.

- Take the motor out of the packaging and check for any bruising or evidence of liquid leakage.
- Place the motor and the pump horizontally.
- Turn motor shaft by hand before assembly. It must turn freely after overcoming the adhesive friction.
- Apply acid-free and waterproof food grade oil to the coupling internal teeth.
- Remove hexagon nuts from the studs on the motor.
- Align the pump so that its guard is in line with the lead exit of the motor, and guide pump and motor together.
- Place spring rings on the studs and tighten the nuts crosswise.
- Protect coupling spot against contact.

Strictly observe the tightening torques on the unit manufacturer.

ATTENTION: Check radial and axial clearance of the motor shaft. There must be no rigid connection otherwise the motor and pump may be damaged during commissioning.

6: ELECTRICAL CONNECTION

Please observe the specifications on both the nameplate and the enclosed data sheet. The flowing connection examples refer only to the motor itself. They are not intended to be a recommendation for controlling elements connected upstream.

6.1 Lightning Protection

Over-voltage protection (lightning surge protection) should be installed on the control box in all incoming phases.

6.2 Single Phase Connections

On single phase motors, both PSC and PSC+ST connections should be done strictly in accordance with the wiring diagram detailed on the motor itself.

PSC: Permanent Split Capacitor

PSC+ST: Permanent Split Capacitor plus Staring Capacitor.

Important Note: An incorrect capacitor value (higher or lower than the rated one) could affect the Start and Running parameters of the motor thereby compromising its life. Warranty is voided if a different capacitor value, from the rated one, is used.

6.3 Connection Examples

3 Phase Connection – Connect the motor so that its direction of rotation corresponds to that indicated on the unit. The connection features the usual circuit with a clockwise rotating field and a counterclockwise rotation of the motor shaft.

6.4 Operation with a soft starting device

- Adjust soft starter to 55% of the rated voltage
- Adjust acceleration and deceleration time to maximum 3 seconds
- Soft Starting device must be bridged after acceleration with a contactor.
- Please strictly observe the manufacturers operating instructions.

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7. WORK ON THE MOTOR

Attention: De-energise the system prior to starting work and protect it against re-energising!

With reference to troubleshooting and rectification of the entire system, please strictly observe the appropriate instructions of the motor and unit manufacturer.

Never open the motor since it can only be shut and adjusted with special tools. Do not carry out any modifications or conversions to the motor or its electrical connections.

After completion of the work, apply all safety and protective devices completely, and check for correct functioning thereof.

7.1 Measuring the insulation resistance

Perform this measurement before and while the unit is being lowered to the place of application.

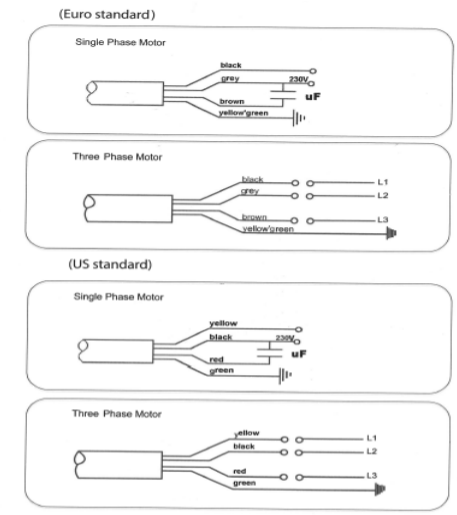
The motor is OK if the insulation resistance at 20°C is at least

- >4MΩ for a new motor
- >1MΩ for a used motor

Minimum insulation resistance without extension cable:

- >200MΩ for a new motor
- >20MΩ for a used motor

WIRING DIAGRAM



SELECTION GUIDE FOR SOLAR PANELS

1. SOLAR PANEL CONNECTION INSTRUCTIONS AND RECOMMENDATIONS

Solar Panel Selection

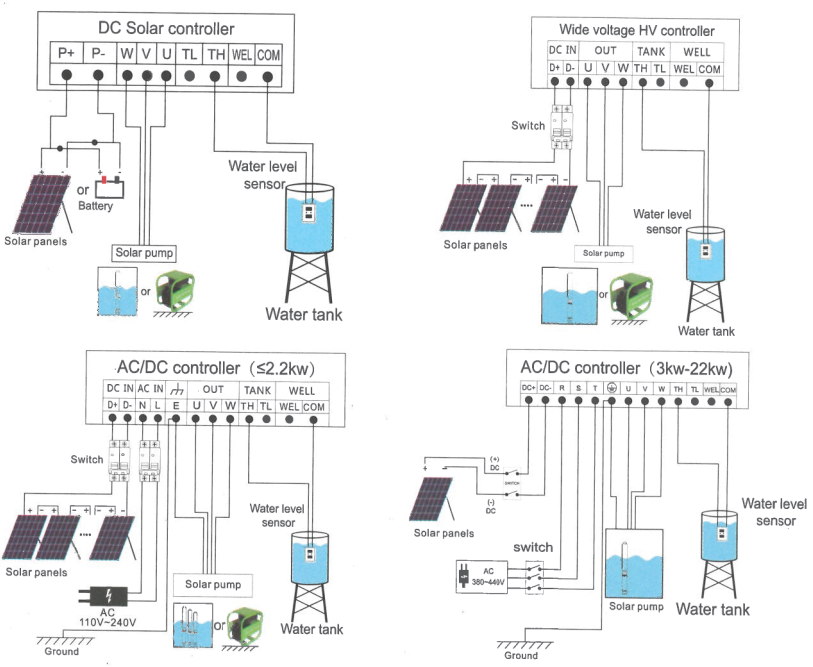
- Total solar panel power recommendation is 1.2-1.3 times the rated power of the pump.
- Recommended optimal operating voltage for solar panels is 1.0-1.4 times the rated voltage of the pump.

For the AC3380 Controller, when selecting and installing solar panels, the solar panels need to be connected in series and ensure that the open circuit voltage (Voc) after the solar panels, are connected, is less than the maximum limit working voltage of the controller.

2. THREE-PHASE AC POWER INSTRUCTIONS AND NOTES

For the AC380 Controller, the RST interface of the AC side needs to connect to the RST phase line of three-phase four-wire three-phase power and the Earth wire E.

If the RST interface of the AC side is not correctly connected to the three-phase AC power supply, such as access to two of the three input lines, or access to the neutral wire and live wire of the AC220V/ AC110V, the controller can also be turned on at this time. In this case the controller will not run the pump and will report an input phase loss error. If you need to use the AC power supply, the AC port needs to be connected to all the phase lines of the three-phase power supply. Other input methods cannot make the device drive the motor normally.



Wiring diagram of water pump system

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Electrical and Pump Specifications

Electric Control Module	Applicable Pump Specifications	Max Input Current (A)	Max Input Voltage	Min Input Voltage	Optimal MPPT Voltage	Working Environment
DF12	Rated 12V	17	55VDC	20VDC	30-48V	-15°C - 60°C
DF24	Rated 24V	17	55VDC	20VDC	30-48V	-15°C- 60°C
DF36	Rated 36V	17	55VDC	20VDC	30-48V	-15°C- 60°C
DF48	Rated 48V	17	105VDC	40VDC	60-90V	-15°C- 60°C
DF72	Rated 72V	17	160VDC	60VDC	90-120V	-15°C- 60°C
DF110	Rated 110V	17	210VDC	80VDC	110-150V	-15°C- 60°C
DF110-750W	Rated 110V	17	430VDC	80VDC	110-190V	-15°C- 60°C
DF150-11kW/1.3kW	Rated 150V	17	430VDC	80VDC	150-220V	-15°C- 60°C
D200-1.5kW	Rated 200V	17	430VDC	80VDC	200-290V	-15°C- 60°C
D300-1.5kW	Rated 300V	17	430VDC	80VDC	300-390V	-15°C- 60°C
A110-750kW	Rated 110V	10.0	430VDC/280VAC	80VDC / 85VAC	110-190V	-15°C- 60°C
A150-1.1kW/1.3kW	Rated 150V	10.0	430VDC/280VAC	80VDC / 85VAC	150-220V	-15°C- 60°C
A200-1.5kW	Rated 200V	10.0	430VDC/280VAC	80VDC / 85VAC	200-290V	-15°C- 60°C
A300-2.2kW	Rated 300V	10.0	430VDC/280VAC	80VDC / 85VAC	300-390V	-15°C- 60°C
A380-3kW	Rated 500V	17.0	780VDC/ 528VAC	200VDC/ 323VAC	520-750V	-15°C- 60°C
A380-4kW	Rated 500V	25.5	780VDC/ 528VAC	300VDC / 323VAC	520-750V	-15°C- 60°C
A380-5.5kW	Rated 500V	32.0	780VDC/ 528VAC	300VDC / 323VAC	520-750V	-15°C- 60°C
A380-7.5kW	Rated 500V	32.0	780VDC/ 528VAC	300VDC / 323VAC	520-750V	-15°C- 60°C
A380-9.2kW	Rated 500V	32.0	780VDC/ 528VAC	300VDC / 323VAC	520-750V	-15°C- 60°C
A380-11kW	Rated 500V	32.0	780VDC/ 528VAC	300VDC / 323VAC	520-750V	-15°C- 60°C
A380-15kW	Rated 500V	32.0	780VDC/ 528VAC	300VDC / 323VAC	520-750V	-15°C- 60°C
A380-18.5kW	Rated 500V	32.0	780VDC/ 528VAC		520-750V	-15°C- 60°C

For Control Panel Configuration procedures please refer to separate manual.

WARRANTY

2 Year Warranty applies **

**All warranties subject to the current version of the Ascento Standard Terms & Conditions of Warranty which can be found by navigating to www.reefe.au and searching “Warranty”

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PUMPS AUSTRALIA BETTER | FASTER | EASIER

SOLAR WATER PUMP

DC CONTROLLER

INSTRUCTION MANUAL

MODEL: RSB & RSB.SP SERIES DC CONTROLLER
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WARNING

1. The DC controller will burn out when the open-circuit voltage is higher than setting value.
2. The DC controller must be matched with the recommended solar pumps.
3. Do not use the DC controller for other pumps. It may cause problems, and we do accept any responsibility.
4. For perfect performance and long working-life, the DC controller should be kept away from lightning strikes, earthquakes, sunshine, salt mist, oil mist, etc.
5. Because of the power loss from the cable, try to use the shortest cable.
6. While using longer cables, the cable connecting DC controller and solar panels should be over 4mm2 (Do not use single wire type). While the cable between DC controller and pump within 30m, the cable should be at least 2mm2. While over 30m, the cable should be at least 4mm^2

1. Overview

1. Nameplate
2. Operation panel
3. DC electric cable entrance
4. Water level sensor cable entrance
5. Pump electric cable entrance

2. Specification

Working Environment and Electrical Property

Controller and Pump Matching Method					
Controller Model	**Adaptable Pump**	**Max Input Current (A)**	**Max Open Voltage (V)**	**MPPT Voltage Range (V)**	**Working Temperature (°C)**
DF-12	Rated 12V Pump	15	<48	30-48	-15~+60
DF-24	Rated 24V Pump	15	<48	30-48	-15~+60
DF-36	Rated 36V Pump	15	<48	30-48	-15~+60
DF-48	Rated 48V Pump	15	<100	60-90	-15~+60
DF-72	Rated 72V Pump	15	<150	90-120	-15~+60
DF-110	Rated 110V Pump	14	<200	110-150	-15~+60

3. INSTALLATION and WIRING

3.1 Solar Panel Selection

Before installing the solar water pump and DC controller, we should know how to select the solar panel for the solar water pumping system

3.1.1 Select the type

Solar panels can be divided into thin-film photocell, polycrystalline silicon solar cell and mono-crystalline silicon solar cell. The prices are different for the three kinds of solar panel. Mono-crystalline type has the highest price, but the efficiency is the best. The thin-film photocell is the cheapest one.

3.1.2 Select the rated power and Voc

- Rated power: The power is proportional to the panel area. Normally, the rated power of solar cell is 150W per square meter.
- Voc: The open-circuit voltage (Voc) means the maximum electromotive force before the solar panel works. The common open-circuit voltage (Voc) is DC 21V, 36V, 44V, etc. The lower the temperature, the higher the Voc. Because the open-circuit voltage changes along with the change of area and temperature. If the Voc is not high enough, connect more solar cells in series. The total voltage value equals the sum of each panel's Voc.
- How to select Voc and rated power?
  How to select Voc and rated power?
  When the solar panel is working, its voltage will decrease, this voltage is called working voltage (Vmp). The Vmp of solar cell needs to be selected according to the solar pump controller's working voltage, and then to confirm the open-circuit voltage (Voc) of solar panel.
  After that, according to the solar pump power to select the solar panel power. The generating efficiency of solar panel is usually under 70%. To ensure the rated working time (for example 4 hours a day), the solar panel power must equal 1.5 times of solar pump power. It is the minimum power to choose. That means, if the solar panel power is smaller than the minimum power, the solar pump can work normally but can't reach its rated flow and head. The best solution is to use more solar panels if condition permits and ensures more working time for the solar water pump.

3.1.3 Solar panel recommendation for 12V-110V DC solar water pump

When the solar panels are in series connection, the voltage is added, but the current isn't changed.

When the solar panels are in parallel connection, the voltage is unchanged, but the current is added.

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

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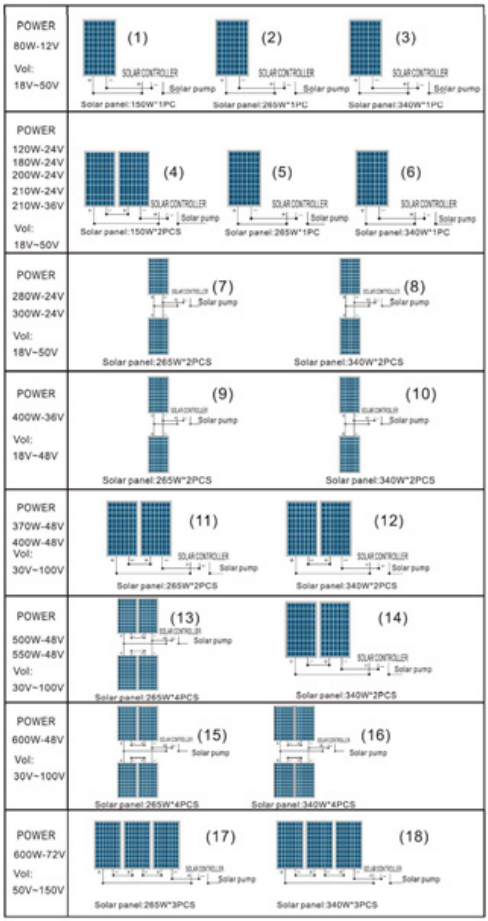
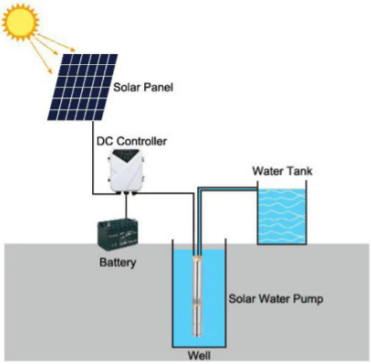


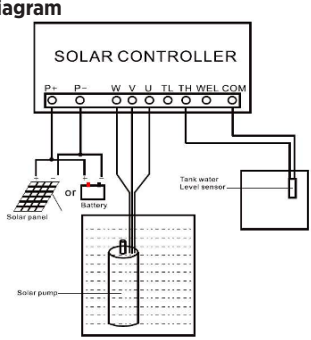
Solar Panel Specification:

	150W	265W	340W
Max power	150W	265W	340W
Short Circuit Current	9A	8.7A	9.5A
Open Circuit Voltage	22V	36.6V	46.2V
Max Power Current	8.4A	7.98A	8.9A
Max Power Voltage	18V	30.6V	38.2V

3.2 Solar Water Pumping System Installation Diagram



3.3 Solar DC Controller Wiring Diagram



3.4 Solar DC Controller Wiring Diagram for Pressure System Applications. Auto Stop and Start Functionality

Please note that an additional control switch is required, namely RMP12 Control Switch for Transfer pump applications, and RMP16 Control Switch for Bore pump applications.

The interconnecting wiring connections will be as follows,

- Com on Pressure Switch to Com on Controller
- NC on Pressure Switch to TL on Controller
- NO on Pressure Switch to TH on Controller

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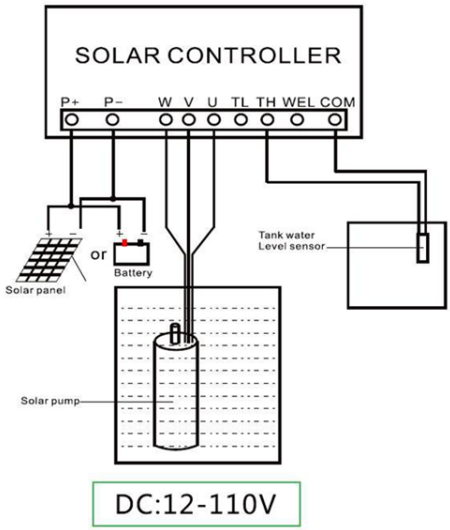

3.5 Wiring Instructions

Before you start wiring the controller box switch MUST be in the OFF position. Wire the solar pump and solar panels to the DC controller as per the wiring diagram. Make sure the pump and controller are not touching each other. If the wiring is incorrect, the pump will run backwards. Then exchange two wires of solar panel to the correct wiring. When connecting with the battery, make sure the polarity is correct, "+" to "+", "-" to "-".

Caution:

1. When wiring a battery. Be careful not to reverse or short circuit the terminals. We advise you remove all metal wrist bands or watches before you start.
2. Connecting Solar PV panels together can also produce a lot of energy, so operators are urged to be more careful about the wiring.
3. A dark cloth to shade the panels is good precaution to reduce the power output.

4. OPERATION

4.1 Operation Panel

- Voltage (V): Voltage indicator lights.
- Speed (RPM): Speed indicator light.
- Current (A): Current indicator light.
- Power (W): Power indicator light.
- 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 constant in running.

4.2 Key Instructions

Key Type	Function
 **Set Key**	Manufacturer parameter setting (not opened)
 **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.

4.3 Test Running

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

1. Attach a durable rope or stainless-steel cable to the top of the pump using the mounting hole. Make sure the rope or cable is longer than the depth at which you want to install the pump. This is used to raise and lower the pump. *Never use the power cable to do this.*
2. Attention:
    - Do always keep pump under water when operating
    - DO be careful with wiring.
    - DO remove the pump if not used for a long time and wipe the screw and body. Wipe with vegetable oil. Do make sure the pump has adequate water around it during pumping. Don't run without water.
    - Do put your solar PV panels in a sunny position facing true north (southern hemisphere) or true south (northern hemisphere). If the panel angle is fixed, then an angle equal to your latitude will be a good compromise.
    - Don't run the pump out of the water, even momentarily. It will void the warranty.
    - Don't use the pump in dirty water. Premature wear will not be covered by warranty.
    - Don't disassemble the pump and controller.

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4.4 Operation Mode

4.4.1 Pump Start

1. Power on to start
   Every time it connects with electricity, the system boots to default, and starts the pump immediately without testing for water (without any shutdown conditions).
2. Key to start
   In shutdown state, press the ON/OFF key to turn on the pump, without testing for water (without any shutdown conditions).
3. Water shortage to start
   If the system boots 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).

4.4.2 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 continuously works for a period 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 ON/OFF key to turn off the pump.

4.4.3 Pump Operation

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

1. DC mode (battery)
   In DC (battery) mode, the pump speed is adjustable, range of 1000-4000RPM. The default setting speed is 4000RPM. The speed can be set by the UP or DOWN 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)
DF-12	20
DF-24	20
DF-36	20
DF-48	40
DF-72	60
DF-110	80

2. PV Mode (solar panel)
   In PV mode, the pump setting speed is like the DC mode, and the maximum speed (4000RPM), limit is effective. Pump running speed is also determined by the current solar power. 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 600RPM, pump stops, and report P46 faults after 3 second.

When solar power is 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.

4.4.4 Reverse connection protection

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

4.4.5 Dry-run protection

This function refers to the pump pumping out water from the well, the system can automatically detect the anhydrous state. Pump will stop working automatically by set program. Dry-run protection is effective in 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. If there is water, it will keep on working, and that cycle repeats.

5. 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 hasn't been used for long time, please scrub it, place it in a dry and ventilated place thereby keeping it properly

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6. FAULT ANALYSIS AND CORRESPONDING SOLUTIONS

Fault Type			
Fault Code	**Fault Description**	**Causes and Solutions of Fault**	**Recovery Procedure**
P0	Hardware Overcurrent	1. Motor model is mismatch, please choose matching pumps. 2. 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	1. Motor model is mismatch, please choose matching pumps 2. Pump extension cord is too long, please reduce the extension cord 3. Power is too low, increase the power supply 4. Pump bearing is stuck, please clean pump bearings	Automatically remove after 30s
P49	Software Overcurrent	1. Water pump bearing stuck, clean pump bearings 2. 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 returns 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 returns to normal, remove the fault immediately
P48	Dry-run Protection	1. Not all of air in the pump is exhausted, cut off the power, re-power and start the pump drainage after 30 seconds 2. There is no water in the water tank waiting for water, it will restart	Automatically clear after 30 minutes or re-power to clear
P60	High Temperature Protection	The temperature of controller MCU is more than 90°C	Automatically clear after the temperature is normal
E8	Current Sampling Failure	Cut off the power and restart after 30 seconds	Restart the power
PL	Power Shortage	1. No sunlight waiting for the sunlight to restart 2. 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

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