

ENNOS SUNLIGHT SOLAR PUMP

Operation Manual



*Solar-Powered water pump
designed in Switzerland*



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Disclaimer:

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1. Introduction

Congratulations for purchasing a **'ENNOS SUNLIGHT SOLAR PUMP'**!

This state-of-art Solar pump is now yours to give you trouble free service for years! We set a new standard for quality and economy in solar pumping. It incorporates the best solar pump technologies that were very expensive until its introduction by ennos.

1.1 Use of this Operation Manual

This document is intended to help you install and maintain the ennos Sunlight Solar pumping system.

Please read this instruction manual carefully before beginning with the installation.

1.2 Technical Support

In case of technical problems or questions, please contact your dealer. Please provide a detailed description of your problem with photographs.

2. Technical information



General Information

- 0.5HP (375W) solar powered pump – suitable for multiple panel configurations of solar photovoltaic module of capacity ranging from 100 to 500W_p
- Progressive cavity displacement pump – for constant flow regardless of pressure
- High Efficiency Brushless DC Motor – for maintenance free operation over wide flow and pressure range
- Integrated Maximum Power Point Tracking and variable speed operation
- Battery Mode Controller – for operation with multiple battery voltage levels and integrated battery protection
- Simple LED Display – information about operation modes, actual power and flow rate
- Bluetooth Interface – Remote operation and data monitoring on Android smart phone
- Water flow sensor – to avoid dry running of the pump when water source is empty
- Tank overflow sensing and control – to avoid wasting of water.
- PAY-AS-YOU-GO facility – coming soon

Model		JSPBL0.3/HF2.4-5
Pump		
Maximum Total Dynamic Head (TDH)	m	40
Suction capacity at sea level (vertical meters) ¹	m	7
Maximum Flow rate	l/min	45
Pump type		Positive displacement
Solar Mode		
Range of maximum power point voltage (V_{MPP}) ^{2,3}	VDC	15-52
Range of open circuit voltage (V_{OC}) ⁴	VDC	17-65
Maximum Input current @25°C	A	9.5
Maximum Input power	W	500
Battery Mode (with external Charge controller)		
Battery type		Lead acid
Nominal voltage	VDC	12/24/36/48
Storage temperature	°C	-30 to +55
Operating temperature	°C	0 to +50
Type of enclosure		IP65
Measures	mm	L 595mm x H 290mm x W 240mm
Weight	kg	14
Filtration		Strainer

¹ Suction capacity at sea level. Subtract 1m for every 1,000m altitude.

² PV modules at standard test conditions: AM= 1.5, E = 1,000W/m², cell temperature: 25°C

³ CAUTION: If the connected solar module supplies an open circuit voltage of more than 65V, the controller will be damaged. While selecting the solar PV module, it is important to keep in mind that the open circuit voltage should never exceed 65V over the entire working temperature range. When using solar modules with a maximum open circuit

voltage of between 60 and 65V (over the entire temperature range), all Installation steps must be carried in accordance with protection Class II.

⁴ PV modules at standard test condition: AM = 1.5, E = 1,000W/m², cell temperature: 0°C

Simple and comprehensive Human Interface



Certifications

- CE
- MNRE (Ministry of New and Renewable Energy, India)

Awards

- Finalist in Global LEAP awards Solar water pump competition, 2019.

3. Safety Instruction

3.1 Actions that will damage the Solar pump and void the Warranty

If you do not follow these instructions, the system will be damaged and the warranty will void:

	Never run the Solar pump dry for longer than 30 seconds without the flow sensor active (default factory setting). Always fill the Solar pump with water by pouring water in the open hose connections before connecting the water hoses and before running the Solar pump. This is also called priming.
	Open circuit (no-load) voltage above 65V will damage the controller. This may occur if the wrong capacity PV modules (solar panels) are used, or if the solar array is incorrectly wired. Measure the array voltage before connecting to the controller. Please carefully read the instructions about the sizing and orientation of PV arrays and wiring.
	Never open the electronics or/and motor.
	Do not attempt to run the ennos Sunlight solar pump motor without the ennos Sunlight solar pump electronics. Do not attempt to use the electronics for any pumps other than the ennos Sunlight solar pump.
	The ennos Sunlight solar pump is to be installed, connected and serviced by qualified personnel only. Ensure all power sources are disconnected when making connections to this unit. Follow all appropriate electrical codes. There are no user serviceable parts inside the motor or the electronics.
	Keep away from the fire.

	Although this pump is IP65, always install and keep it somewhere where it is protected from dirt, water and direct sunlight. Keep pump under the shade.
	All installations have to be made in accordance with local laws and regulations and accepted codes of good practice.
	Check and clean the water Strainer periodically. Dirty and clogged Strainer leads to cavitation and damage of the Solar pump.
	Install proper grounding for safety and lightning protection.
	Do not touch the controller input or Solar pump wires together to test for a spark.

3.2 Actions that will negatively impact the performance of the Solar pump

If you do not follow these instructions, the system will not operate at its maximum possible performance:

	Shadow on even a small portion of the PV array will cause the Solar pump to slow down or stop completely and has huge impact on the water delivery. Make sure there is no shadow falling on the PV panels by trees or buildings or people walking beside the PV panel.
	The solar panel is breakable - never drop it or hit it with sharp and heavy objects (e.g. stones, tools etc.).

	In case of undersized wire the Solar pump will fail to start. Also if you choose to use smaller wire sizes than recommended, the energy from the PV array will be wasted in the PV power cable and the water output will be reduced.
	All parts of your mounting structure must be engineered for wind resistance, ease of adjustment and safety.
	In equatorial regions, never set the array horizontal (0°) as this will allow the accumulation of dust and debris. Even a small angle will help rainwater and dirt to clear from the array.
	Regular cleaning of the PV array is necessary to stabilize the performance of the system. Also check the mounting regularly to ensure the safe installation of the PV array.
	Do not connect any other electrical device to the same PV array simultaneously with the Ennos Sunlight Solar pump because the electronics will inhibit proper operation of the Solar pump system.
	When Solar pump is stopped by a shadow or by action of the float switch, it will restart after a delay as long as 90 seconds. This is normal operation.

4. Design the solar pump system

4.1 Application types

There are 4 main application types: standard application, water from lake, deep set floating and high-rise building application. Special applications are not covered in this manual.

Legend for the pictures:

A = Suction depth in meters

B = Vertical lift from the pump to the highest point

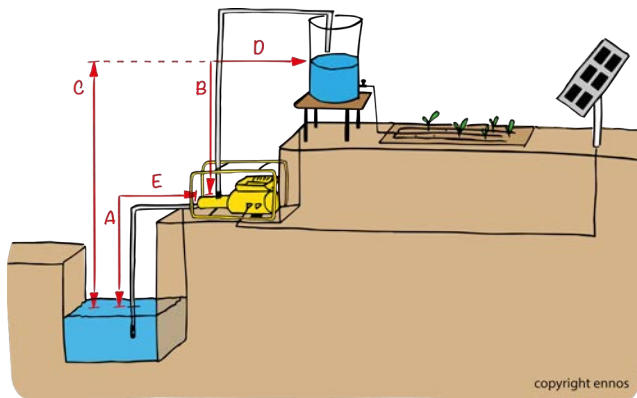
C = Total lift (geodetic or static lift, $A+B$)

D = Horizontal distance between pump and tank

E = Horizontal length suction line

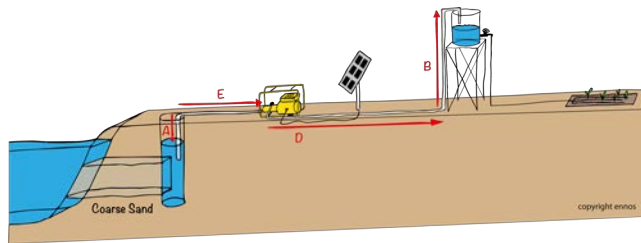
4.1.1 Standard application

This application is mostly used for crop irrigation. Ground water is pumped and fed to irrigation system or drinking water system. The overhead tank is optional.



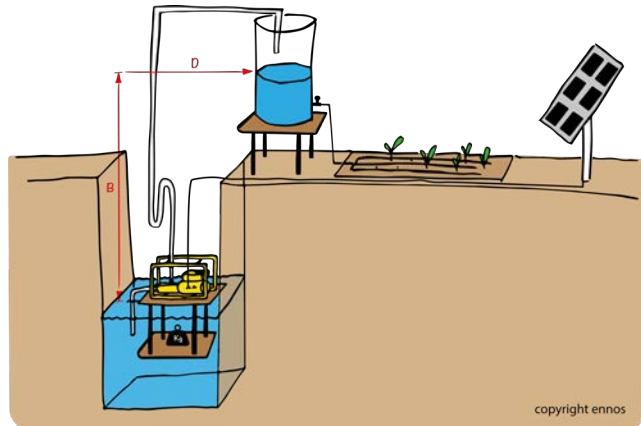
4.1.2 Water from lake application

This application requires a well or so-called "suction well" next to the open water source- see chapter 5.1 for details.



4.1.3 Deepset floating application

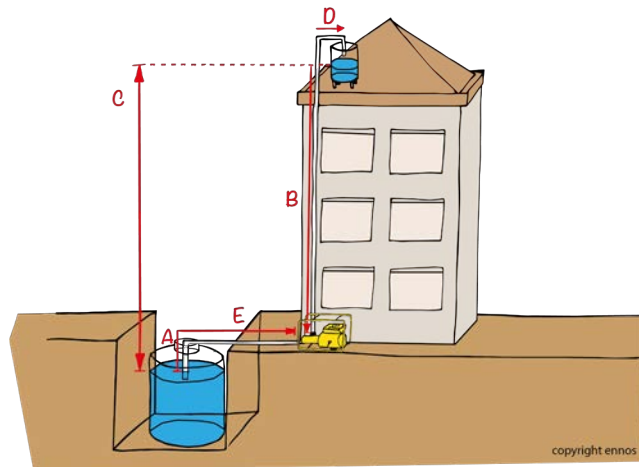
If the suction depth is bigger than the maximum 7 meters at sea level, the pump is lowered down into the well to get it closer to the water source. The pump can be put on a floating platform which goes up and down with the water table. Always make sure that the pump is not immersed into the water.



The float should be equipped with legs and some ballast below the water surface to avoid tipping over of the platform (centre of gravity below the water level will prevent tipping over). The suction hose should be over the leg ends to avoid sucking up mud from empty well.

4.1.4 High-rise building application

This is an application where water is pumped into a tank on the roof of a multi-storey building to supply household water to several families.



4.2 Configurator tool

For the design of your solar pump system, use the configurator tool which you can access on website: www.ennos.ch/configurator/
The configurator tool calculates all the relevant parameters for your application.

5. Installation Guidelines

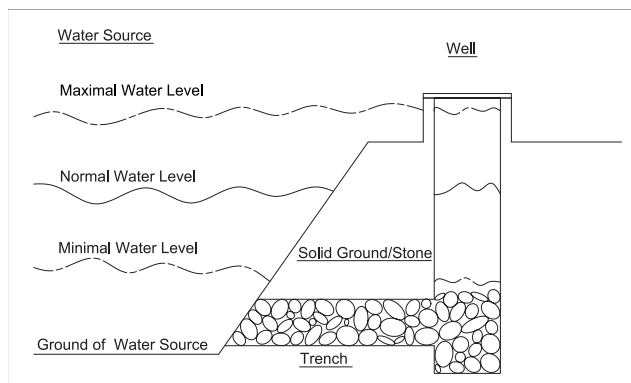
5.1 Water source

To ensure that the pump is running for a long time without any trouble, a well prepared and high quality water source is necessary. A suction well is always recommended because it has several important advantages:

1. The water is filtered so that no dirt could enter in the pump
2. No damage of the suction hose by animals, boats or other things
3. No blockage of the suction hose

Building a suction well

A schematic drawing of an optimal suction well is below



Water source

For an open water source, like a river or a lake, this kind of suction well needs to be build – it is NOT recommended to pump directly from this source. If you want to access groundwater, a well needs to be built anyway. When the water level is not constant, find out what the maximum and minimum water levels are during each season.

Well

- Make sure that the well is 1 meter deeper than the minimum water level.
- When the water reaches its maximum level, the well should not be flooded. Therefore, the wall of the well is to build 0.5 meter higher than the maximum water level.
- The horizontal distance between the well and the water source is recommended to be between 5-10 meters.
- The well needs to be built according to highest standards using good quality materials.
- Also, the well needs to be covered to prevent dirt, animals or people falling in.
- If the pump needs to be lowered down into the well, make sure that the pump:
 - a) will not be flooded when the water level rises and
 - b) will not get wet from rain.
- When the pump is installed outside the well, place it always 1 meter above the maximum water level and under a roof.
- Make sure that the inlet end of suction hose does not touch the bottom of the well because mud will be sucked which will cause damage to the pump.

Trench

The trench connects the water source to the well. The trench should be below the minimum water level. This prevents the well from running dry. The trench needs to be filled up with small

stones like granules. These small stones will filter the water, so that there is no sand in the water. The size of the trench should be approximately 0.5 meter wide and 0.5 meter high.

Solid ground / Stone

If the ground is solid or stone, a trench is necessary. If the ground is sandy, the water will automatically flow into the well and is filtered in the process.

5.2 Pump

Keeping the pump safe and at the right location will prevent it from damage and increase its lifetime.

Make sure that the pump is:

- Protected against flooding
- Not exposed to direct sunlight
- Not sucking water from deeper than the allowed 7 meters at sea level (with every 1,000 meters higher in altitude, the suction capacity decreases by 1 meter)

The performance of the pump is important. To have the desired output make sure that:

- Clean, sand-free and particle-free water is used
- Water is not pumped directly from an open water source but from a maintained suction well
- No shadow falls on the PV array
- All the wiring is correct
- All the hose connections are correct and tight

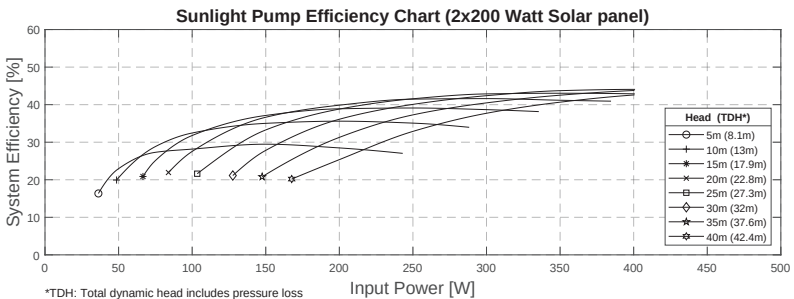
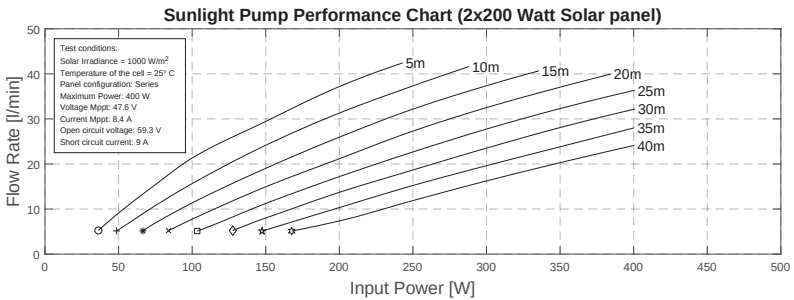
5.3 Water tank

Choose the right size and location of the water tank. Do not put the tank higher up than necessary because this means an additional lift for the pump and power is needed. Keep in mind that for every 10 meters of lift, a pressure of 1 bar is required.

5.4 Power Source

5.4.1 Sizing of the PV array

Ennos Sunlight solar pump comes with the best pumping performance.



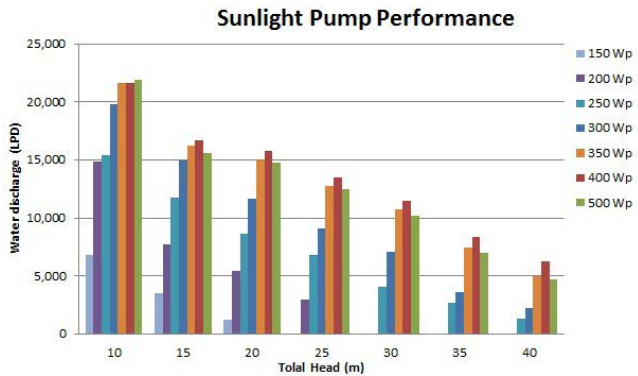
The curves in this graphics are mean values. Input Power is measured on the pump not on the solar panel output.

In order to achieve maximum performance of the Ennos Sunlight Solar pump, the following PV arrays are recommended:

Sr. No.	PV array capacity	Ennos PV Panel requested
1	150W _p	JJ-M636, 150W _p x 1 No.
2	200W _p	JJ-M648, 200W _p x 1 No.
3	250W _p	JJ-M660, 250W _p x 1 No.
4	300W _p	JJ-M672, 300W _p x 1 No.
5	400W _p	JJ-M648, 200W _p x 2 Nos. in series connection
6	500W _p	JJ-M660, 250W _p x 2 Nos. in parallel connection

Important note: For any of the Solar PV arrays, output voltage should be maximum 52 VDC and short circuit current maximum 9.5A.

The following recorded performance will give idea of daily solar pump discharge in liters at different heads, assuming a typical maximum suction depth of 6m and solar radiation 7.15kWh/m² per day.



- The discharge values in the graph are indicative. Actual discharge depends on the location specific conditions like weather, temperature, geographical conditions, solar radiation level, etc.
- You can visit at <http://solarelectricityhandbook.com/solar-irradiance.aspx> to find out the solar radiation level at your location throughout the year.

5.4.2 Solar photovoltaic array

5.4.2.1 Location

Sunlight is the "fuel" that drives a Solar pump. Full solar exposure of the solar array is critical for full performance of the system. Choose a location for the solar array that has unrestricted sun exposure throughout the day and throughout the year.



Shadow on a small portion of a PV array may cause the Solar pump to stop completely. Each PV module (panel) in the array contains a series of solar cells (typically 36 or 72 cells). Every cell that is shadowed acts like a resistor, reducing the output of the entire array. Shading just a few cells will reduce the power disproportionately, and may even stop the pump completely.

Place the bottom edge of the solar array at least 1 foot above ground to clear rain water, growing vegetation, etc. Keep in mind that trees and perennial plants will grow taller in the coming years.



Recommended maximum distance between PV array and pump is 7m in case of 4mm² wire or 15m in case of 6mm² wire.

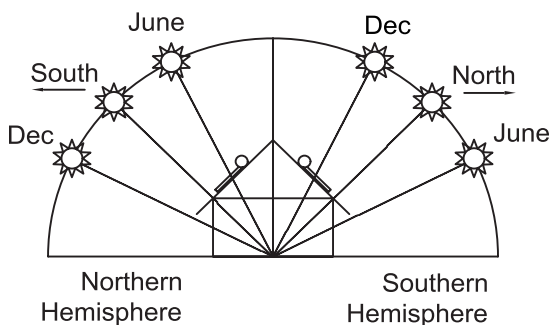
5.4.2.2 Orientation

For full performance, solar array must be oriented properly. We can find North-South direction using a Compass. You may use a magnetic Compass or an appropriate app in your smart phone.

1. Hold the Compass horizontal to the ground and observe the NORTH direction shown by Compass niddle tip. 180° opposite is the SOUTH direction. Please see photo below.



2. If your location is in the Northern hemisphere then face the PV array towards the South, and vice versa.



5.4.2.3 Setting the Tilt Angle

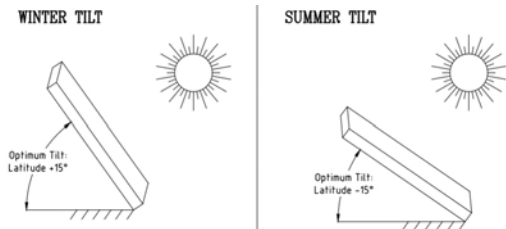
Maximum performance is obtained from a Solar Pump when its photovoltaic array is tilted (elevated) to face the Sun.

The optimum tilt angle is determined by the latitude of the location. It also varies with the time of the year.

Should the tilt angle be adjusted periodically through the year? This depends on the seasonal water-use pattern.

Select one of these options for seasonal management:

1. **Year-round compromise (no seasonal adjustment):** If you use the Solar pump all year but do not want seasonal adjustment to be required then set the angle equal to the latitude of the location and "forget it". This is practical because people often forget to adjust the array.
2. **Seasonally adjusted:** It is sufficient to perform the adjustment only twice per year, in the summer and the winter angles.
3. **Seasonal use only:** If the Solar pump is to be used no more than half of the year, set the array



to the appropriate seasonal angle and "forget it".

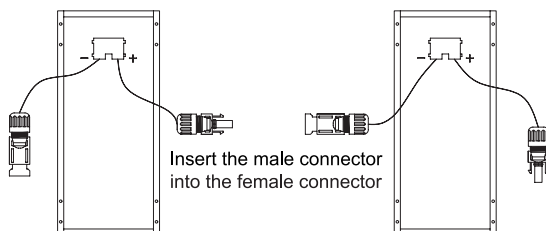
Note: Ideal angles (from horizontal):

Winter optimum = Latitude + 15°

Summer optimum = Latitude - 15°

5.4.2.4 Serial connection of modules in PV array

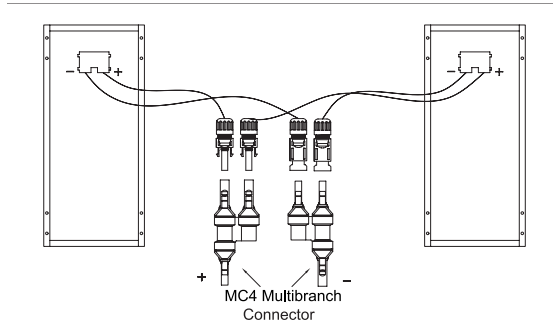
A series connection is when you wire the modules together by connecting the positive lead of one module to the negative lead of another module. The male connector will snap directly into the female connector. Please refer following diagram.



Series connection of the PV modules is done for increasing array voltage. For example, if your modules are rated for 18 volts at maximum power (V_{mp}), then two of them connected in series will produce 36 V_{mp} . The current at maximum power (I_{mp}) will be constant in this circuit.

5.4.2.5 Parallel connection of modules in PV array

Parallel wiring is when the positive leads of all panels are connected together to form a common positive lead. Also, all negative leads of the same panels are connected together to form common negative lead. Please refer the following diagram.



Parallel connection of the PV panels is done for increasing array current. For example, if modules are rated for 8A at maximum power, then two of them connected in parallel will supply 16A at maximum power. The voltage at maximum power (V_{mp}) will be constant in this circuit.

When wiring two or more modules in parallel, you will need some additional components. If you are using two modules only, the easiest method is to use MC4 multi-branch connectors. There are two different multi-branch connectors. One type accepts two male MC4 connectors on the input side and has a male MC4 connector for output. The other type accepts two female MC4 connectors on the input side and has a female MC4 connector for its output.



Animals and rodents tend to chew on the cables. If they are present in the area of installation, protect the wiring by electrical conduits.

5.5 Connection

5.5.1 Electrical Connections

5.5.1.1 Wire Size

It is recommended to use at least 4mm² copper wire. Undersizing the wires from the PV array to the electronics is one major reason for low performance.

Keep the cable from Solar pump to the PV array as short as possible.



If you choose to use smaller wire sizes than recommended, the energy from the PV array will be wasted in the PV power cable and the water output will be reduced.

Always use UV-proof solar cable. The PV array is built to last for 20 years. Don't diminish the lifetime of your system by using cheap cables.

5.5.1.2 Wiring Float Switch (water level sensor)

Ideally, the Ennos Sunlight Solar pump is used in combination with some sort of water storage technology (e.g. water tank, water bag, etc.).

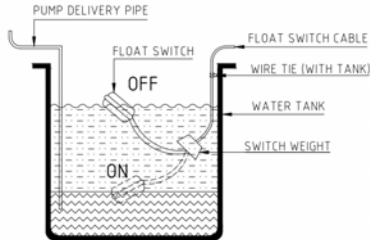
If you do so, the Solar pump Electronic Control Unit (ECU) offers you the possibility to connect a float switch (not included in standard kit).



The float switch is necessary to prevent overflow and water wastage.

Instruction for the installation:

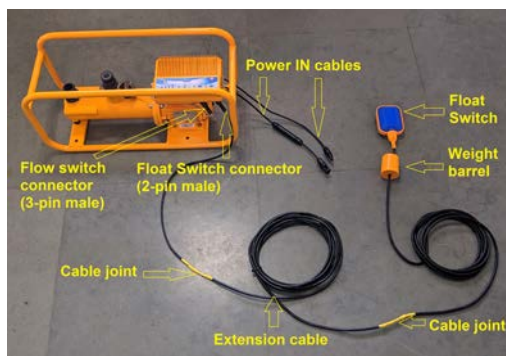
1. Put the cable through the round weight barrel.
2. Attach the round weight barrel to the tank wall.
 - Make sure that the cable has the correct length in a way that the sensor is up when the tank is full.
 - The distance between switch and weight barrel should be as short as possible.
 - Make sure that the distance between the switch and the maximum water level is as short as possible. If the distance is too long, the full capacity of the tank is not used.



3. Float switch comes with three wires - Red, Black and Blue. Red wire is connected to Black wire when the float switch is DOWN, and disconnected with the float switch is UP.

Cut Blue wire and use only Red and Black wires to join to extension cable. Use extension cable size 1.0 mm² x 2core.

4. Find a 2-pin male connector in the accessory kit provided along with the pump. Join the lead cable of this connector to the extension cable from the Float switch. See photo below.



5. Connect the 2-pin male connector to the 2-pin female connector (already on the pump controller). Refer photo below.



5.5.2 Hydraulic connections

Use 1¼" HDPE or flexible hose pipe. Use suction and delivery pipe length as per site specific requirement.

5.5.2.1 Suction pipe preparation



Maximum allowed suction height is 7 meters at sea level. Every 1,000 meters increase in the altitude decreases the suction height by 1 meter.

Components required for Suction pipe are:

1. Spiral reinforced/HDPE pipe, 1 1/4"
2. Foot valve, 1 1/4" (with Strainer)
3. Hose connector, 1 1/4"
4. Hose Clamps, 1 1/4"
5. Camlock coupler hose tail, 1 x 1 1/4"



Fix Hose connector to the foot valve. You can use Teflon tape for thread sealing.



Fix one end of the suction hose on the hose connector nipple and tighten with hose clamp. Use Silicone sealant on hose

connector threads to have better protection against air leaks.



Fix the other end of the suction hose on the Camlock coupler tail and tighten with 2 hose clamps in 180° offset.



Suction pipe is ready for use!



Make sure there is no leakage in the piping (especially on the suction side) to avoid air in the circuit. This could lead to cavitations and damage the Solar pump.

Make sure to use high quality suction hose with spiral reinforcements.

5.5.2.2 Pressure pipe preparation

Components required for Pressure pipe are:

1. Hose/HOPE pipe, 1 ¼"
2. Hose Clamp, 1 ¼"
3. Camlock coupler hose tail, 1 x 1 ¼"



Fix the Camlock female coupling on the pressure pipe in the same way as described in 5.5.2.1 above. Here one hose clamp is sufficient.



If it is difficult to slip on the suction or pressure hose onto the Camlock coupling then the hose end should be softened in hot oil. Do not use open flame or fire for heating. This can not only destroy the pipe but also can be dangerous.

6. Commissioning and Operation

6.1 Commissioning



It is preferable to build a concrete base foundation for Solar pump installation. This will ensure leveled base for Solar pump and facilitate use of anchoring bolts.



Pour water into the pressure and suction side to avoid running dry of the Solar pump. This is called as priming.



Connect suction and delivery pipe to the pump. The suction port is marked as "IN" and discharge port is marked as "OUT" on pump body.



Connect to power supply with MC4 connectors. The extension wires with MC4 connectors are in Accessory box.

Starting of the pump: If the installation is finished then the pump can be commissioned.



As soon as the PV array power cable is connected, the Green LED light between START and STOP will glow. Solar pump will turn ON automatically after delay of about 15 seconds.

If not, please refer to explanation of Operating and display elements (chapter 7) and Troubleshooting (chapter 8) hereafter.

It can take a few minutes for the air in the system to flush out. After that, the pump delivers water in the desired amount.

If bubbles continue for long time then check for possible air leak and recondition it if required.



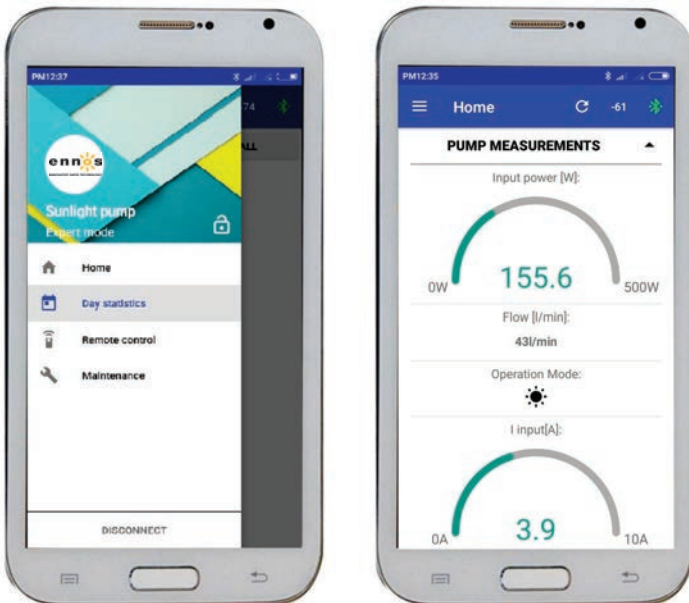
Couple Solar pump with Suction and Delivery pipes at correct location as marked on pump body.



Detect air leakage in the systems by putting delivery hose in a water bucket and check the bubbles.

6.2 Operation and Sunlight pump App

You need to have a mobile phone with Android 5.0 OS or higher. To monitor the performance of pump, start the sunlight pump application on your device and turn on the Bluetooth of the pump. Then connect your phone with the pump.



7. Operating and Display Elements

7.1 Display elements

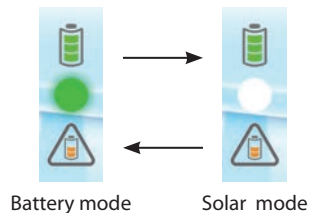
The Ennos Sunlight Solar pump has the following LED indications:

Error or warning		
		
Water flow - Continuous glow	Warning - LED Blinking	Error - LED Continuous glow
Water flow or Warning/Error type		
Water flow	Warning	Error
		
Each LED indicates 25% water flow. i.e. 4 LED glowing indicates 100% water flow.	Please see chapter 8.1 for details	Please see chapter 8.2 for details
Bluetooth connection status		
	OR	
Connected		Disconnected

Pump power status		
	OR	
ON		OFF
The Mode of Solar pump 1. Continuous glow: Battery mode. Battery fully charged. 2. Blinking LED: State of battery. The faster the blinking the less is the battery charge. 3. Off: Solar mode.		
		
Battery fully charged	Battery partly charged	Solar Mode

7.2 Mode Change

To change the operation mode, **keep both the START and STOP buttons pressed together** until you see a change in the mode indication.



The pump remembers the Mode setting and will continue with the last selected mode after power up.

7.3 Solar mode

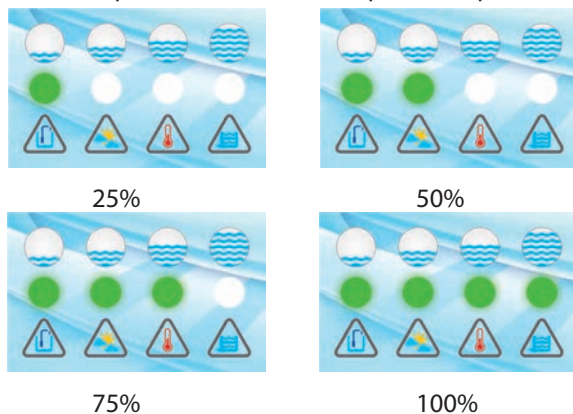
The pump starts automatically when there is enough power from the sun.

7.4 Battery mode

Caution: Battery mode is only recommended if a battery is connected. Always use short cables to connect a battery. Use external Charge controller for charging the battery bank.

Starting the pump and controlling pump power in battery mode

- To start the pump, press the Start button.
- To increase power, press Start button multiple times.
- Each press will increase one power step.



- To reduce power, press Stop button.
- Please note that the pump never Starts automatically in battery mode.
- If the pump stops due to a temporary error, you have to restart it manually by pressing Start button.

8. Trouble shooting

8.1 Warning Handling

8.1.1 Water source dry or empty



- If the water flow is lesser than the lower limit of the flow switch then this warning will occur.
- In Solar mode, the pump tries to start again after 15 minutes.
- Make sure pump is filled with water.
- Make sure the Strainer and nozzle are not blocked.

8.1.2 Not enough energy to run the motor



If the Motor does not turn and the ECU switches between "wait for energy" and "start-up" only. There are following two reasons:

1. **Insufficient power from the PV array.** The system can only start if there is sufficient solar radiation available to power the motor. During morning and evening time as well as cloudy situations, this is normal. Check with sun power meter or measure the short circuit current of the PV array.

2. **Solar pump blocked.** If there is sufficient sun power available to run the motor, probably the Solar pump is clogged or broken. The first action is to remove plug at the back end of the motor and turn the shaft with a screw driver.

Important: The client should NEVER disassemble the pump.

When the motor runs without load, it will stop after 2-5 seconds. This is a normal behaviour and not a problem.

- In Solar mode, the pump tries to run the motor again after a few seconds.
- Check wiring connections properly.
- Check orientation of PV array.

8.1.3 High temperature



The ECU automatically reduces power when a certain temperature limit is reached to protect itself.

Solutions:

- Move ECU in the shadow and assure air circulation for cooling the ECU.
- Make sure the pump is not exposed to direct sunlight.

8.1.4 Tank full



- This indicates that the delivery tank is full. The pump will restart after the water level in the tank is lowered. This is normal operation.

Solutions:

- If the delivery tank is not full and this warning occurs, check the overflow sensor and its cabling.

8.2 Error handling



8.2.1 Battery empty

- This error prevents the battery from deep discharge.
- The error resets after the battery voltage recovers.
- Use short battery cables to avoid malfunction of this protection.
- Charge the battery properly.

8.2.2 Overcurrent



- Green LED glows continuously for input overcurrent and blinks for motor overcurrent.

Solutions:

- The pump restarts automatically after 30 seconds.
- If Error persists, contact our technician.

8.2.3 Over temperature



- The ECU shuts down due to over temperature.

Solutions:

- Move ECU in the shadow and assure air circulation for cooling the ECU.
- The pump restarts when the pump has cooled down. Make sure the pump is not exposed to direct sunlight.

8.2.4 Over voltage



Solutions:

- Measure PV array Open Circuit voltage. This value must be in the specified range.
- If PV array voltage in specified range and error persists, then is contact our technician.

8.3 Water output lesser than expected

If the water output is lesser than expected then check if the installation is according to this manual. This includes especially PV array sizing, orientation, electrical installation and sizing of the wires, installation and maintenance of the piping and Strainer.

Follow the following steps:

- Ensure that the installation is according to this manual.
- Check that enough Solar radiation is available.
- Ensure that the Strainer is clean.
- Ensure no blockage in the suction and delivery pipe.
- Switch to the Solar mode and check.
- If the water output is still lesser than expected, contact our technician.

8.4 No LED on

The ECU has no power supply. Most probably this is caused by wrong connection or failed connections.

Solutions:

- Check PV power and Irradiance.
- Check cabling.
- Measure input voltage directly on the ECU connecting cable. If ECU input voltage is greater than 15V and no LED glows, contact our technician.

8.5 Unknown problem

Solutions:

- Disconnect and reconnect PV array
- If error persists, contact our technician.

9. System Inspection and testing

9.1 System Inspection

To locate most of the problems, a simple inspection is sufficient.

9.1.1 PV array

Ensure that the array is oriented according to chapter 5.4.2.2 (sun facing, tilting angle, etc.)

Ensure that complete PV array is free of shadows. Even small leaves, dirt or a little shadow (less than 10%) from a tree can cause the system to stop!

9.1.2 Wiring

Ensure that connections are made correctly. Take care about polarity of signals.

Check all terminals and connections between cables because improper connection is a major reason for malfunction. Pull the wires by hand with light force to check if the connection is done properly.

Check if the insulation of the wire is not interfering with the connection.

Check the condition of all wiring. Animals often bite onto cables and destroy them.

9.1.3 Water level sensor (if present)

Regularly check the delivery and suction tank sensors. Failure of the sensor will be detected only after the delivery tank overflows which can lead to damage. If the suction sensor fails, this will damage the Solar pump. To check the sensor, operate them manually like water would do and check if the indicators on the ECU front panel indicate the correct state.

9.2 System testing

This chapter describes deeper testing of the system. This should only be done by skilled personnel with technical electrical training. You will need a multimeter capable of measuring 0-65VDC and 0-10 IDC for this tests

- **Measure the open-circuit voltage** - To measure the open circuit voltage, disconnect the system from the PV array. The measurement should give the same values as readable on the data sheet of PV array. Normally this data sheet value is on the back side of the PV array. The reading only varies slightly with changing irradiance.
- **Measure the Short-Circuit Current** - First, disconnect the pump from the PV array. Select multimeter to read 0-10ADC and connect the multimeter across the two output MC4 connectors of the PV array. This reading of the short circuit current gives you an indication of the possible power output from sun. This is helpful if the Solar pump does not run, but the sun is present.
- **Measure the Load Current** - Measure the current on the PV array while the Solar pump is running. For this you need either a DC clamp-on ampere meter or a conventional ampere meter which you can wire in series. The current depends on solar radiation conditions and the function of the pump. If the pump draws low power then the current will be lower.
- **Measure the Load Voltage** - Measure the voltage on the PV array while the Solar pump is running. Under load, the voltage is slightly lower than the open circuit voltage of PV array. If difference is more than 20%, there is something wrong with the electric wiring or connection.
- When the pump is in operation the input voltage and current can be seen on the App.

10. Maintenance

Ennos Sunlight Solar Pump requires little or no maintenance. Pump set does not have any filed serviceable parts. For efficient working of the pump following care has to be taken.

10.1 Pump maintenance

- Maintain suction head below 7m at sea level. Reduce 1m every 1,000 m altitude.
- Clean the Strainer.
- Install a shadow cover over the pump set to protect from sun heating, rain, dust, etc.
- For open water sources construct a suction pit.
- Wire from PV array to the pump set should be protected from animals. Wire through underground conduit is advisable.

10.2 PV array maintenance

- Regular cleaning of the PV array is necessary to improve the performance of the overall system. Frequency of cleaning depends on your local constraints such as climate, rain, dust, etc. Clean with potable drinking water. Do not use soap, shampoo, etc for cleaning.
- Check the mounting regularly to ensure the proper orientation of the PV array.

10.3 Serviceable Parts

- Pump stator and rotor
- Water hoses
- Foot valve and Strainer

11. Disposal

Disposal of the parts or product must be carried out according to the following guidelines:

1. Use the local public or private waste collection service.
2. Deliver parts / product to our company authorized service workshop.
3. Electronic / Electrical waste should be disposed off according to local rules and regulations.

NOTE

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12. Declaration

To be given after successful installation of Ennos Sunlight Solar Pump.

Dear Sir/Madam,

Your installation engineer Mr./Ms. _____ has
installed Ennos Sunlight Solar Pump Model No. _____
and the same has been successfully commissioned today.

Pump Set Serial No.: _____

A live demonstration was also given and the Ennos Sunlight Solar Pump in functioning satisfactorily. The engineer has also explained us about the system details and our responsibility about proper operation & maintenance.

I hereby confirm that there is no complaint from our side as the installation & commissioning is complete in all respects.

I am fully agree with the warranty terms for the systems.

Customer's Signature

Date

NOTE

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Vision

The vision of ennos is to make the sunlight pump physically and financially accessible to many people in developing countries and to contribute to an improvement of their income and living condition. Further more, ennos wants to support the establishment of a local renewable energy sector and to create jobs and value.



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