

WATER PUMPING

Solar Water Pumping

The sun is the natural source of energy for an independent water supply. Solar pumps operate anywhere that the sun shines, and the longer it shines, the more water they pump. When it's cloudy, they pump less water, but often you need less water when it is cloudy. Photovoltaic modules, the power source for solar pumping, have no moving parts, require no maintenance and last for decades. A properly designed solar pumping system will be efficient, simple and reliable. Solar water pumping systems operate on direct current. The output of the solar power system varies throughout the day and with changes in weather conditions. The nature of variable electricity in the form of direct current (DC) is quite different from conventional, steady alternating (AC) current from the utility grid or a generator. To use solar energy economically, the pumping system must utilize the long solar day, drawing a minimum of power. This means pumping more slowly than conventional pumps. Pumping at rates of less than 6 gpm requires different mechanisms from the conventional (centrifugal) pumps. Small solar pumps are unique, both electrically and mechanically. The most efficient pumps are "positive displacement" pumps. They pump a certain amount of water with each rotation. If it is cloudy or early morning, the pump will receive less energy and run more slowly. A positive displacement pump will pump approximately half as much water with half as much energy. Solar powered pumps can provide an equal volume of water per day without the high and inefficient energy demands of a large capacity AC pump. Instead of pumping a large volume of water in a short time and turning off, the solar pump works slowly and efficiently all day. Often a solar pump will work fine in a well with a recovery rate too slow for a conventional AC pump.

SHURflo 2088 Pressure Pumps

These positive displacement diaphragm pumps make excellent household pressure pumps if you need less flow than the booster pumps on the page 151 deliver. The SHURflo 2088 pumps up to 3.6 gallons per minute, is designed for continuous-duty operation with addition of optional heat sink, and can be run dry without harm. It has a built-in pressure switch and half-inch male pipe-thread ports for easy connection to common plumbing fittings. Home pressurization installation requires a precharged water tank. For general water pumping, this pump can self prime to 10 feet and lift water up 100 feet. The 120-volt AC version can run on a 200-watt inverter and can be 1000 feet from the inverter using 12 gauge wire. Dimensions: 4.45" x 12.4"



SHURflo part #	Description	Voltage	Max gpm	Pressure (psi)	Flow (gpm)	Current (amps)
2088-443-144	Standard pump - 3.5 gpm open flow, 45 psi demand switch, 1/2" MSPT ports	12VDC	3.5	10	2.83	5.80
2088-514-145	Premium pump with fan cooled motor 3.6 gpm open flow, 45 psi demand switch, 1/2" MSPT ports, splash-proof motor	12VDC	3.5	10	2.9	5.60
2088-514-144	High flow pump - 3.8 gpm open flow, 45 psi demand switch, 1/2" MSPT ports	12VDC	3.8	10	3.3	7.90

SHURflo 9300 Submersible Pump

Use this lightweight submersible pump for livestock, irrigation or remote home application with low water requirements. The 9300 is a positive displacement diaphragm type pump with very high efficiency, but a much shorter life than centrifugal or helical rotor pumps. Diaphragm should be replaced every two to four years, depending on pumping volume. The SHURflo 9300 can be operated on a 12- or 24-volt battery, or, with the use of one of the SHURflo Pump Controls, directly on a PV array. The pump can lift 1.3 gpm to 230 feet and can pump nearly 2 gpm from very shallow wells. It measures only 3.75" diameter x 12" long. The 902-200 controller comes in an outdoor enclosure with water level sensors and sensor wire. It can be operated from a 12V or 24V array. The 902-100 control must be mounted in a dry location and used with a 24V array. Performance on a 12-volt battery will be less than half the flow on the accompanying chart

Vertical lift	Minimum solar array size	Flow rate (gpm)	Amps @ 30V
20	2 x 32 watts	1.95	1.5
40	2 x 32 watts	1.90	1.7
60	2 x 50 watts	1.81	2.1
80	2 x 50 watts	1.76	2.4
100	2 x 50 watts	1.71	2.6
120	2 x 50 watts	1.68	2.8
140	2 x 80 watts	1.65	3.1
160	2 x 80 watts	1.63	3.3
180	2 x 80 watts	1.55	3.6
200	2 x 80 watts	1.52	3.8
230	2 x 80 watts	1.36	4.1

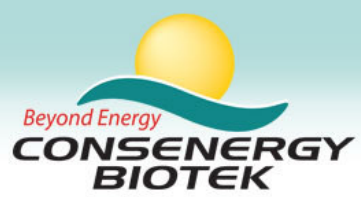


Grundfos – SQFlex Submersible Pumps

This is the ultimate submersible pump for water lifts of up to 525 feet. They can be directly powered by solar or wind power or can be run on an inverter, a generator, a battery or the utility grid, or any combination of these sources. Virtually any source of power, 30-300 VDC and 90-240 VAC, can be used to run the pump. And with Grundfos, you know it is built to last and is maintenance-free. Some SQFlex pumps will fit into a 3" well.

Seven pump models can deliver from 4 gpm at 525 feet to 50 gpm at 20 feet of head with a 1 kilowatt solar array or less. Helical rotor pumps (models 3, 6 and 11) for high head applications and centrifugal pumps for low head applications assure a pump that is efficient for any use. The SQFlex has built-in protection from dry-running, overload and overheating. The SQFlex pump can run on a solar arrays starting at 129 watts. The array must have an operating voltage over 30 volts. The array can be made of any combination of 3 or more 12-volt nominal modules in series or 2 or more 24-volt nominal module.





Grundfos SQ AC Submersible Pumps

The SQ series pump features a permanent magnet motor controlled by an electronic frequency converter developed by Grundfos. It starts slowly, without surge, so it can be run on a much smaller inverter or generator than any conventional AC submersible pump. It is a high-efficiency pump and motor with built-in dry-run protection. This is the ideal pump to use if you are pumping from a well and into a pressure tank, especially for solar-powered homes. They work on modified sine wave or sine wave inverters. Highest volume pumps run on 240VAC. They can be powered by inverter systems with 240VAC output, or by using an autotransformer to step 115VAC from an inverter to 240 to run the pump. Minimum well diameter of 3" is required. Use 2-conductor with ground pump cable.

