

Delta Solar Pump Controller

Solar-powered pump

A solar-powered pump is a pump running on electricity generated by photovoltaic panels or the thermal energy available from collected sunlight as opposed to grid electricity or diesel run water pumps. The operation of solar powered pumps is more economical mainly due to the almost zero operation and maintenance costs and has less environmental impact than pumps powered by an diesel engine. Solar pumps are useful where grid electricity is unavailable.

Components

A photovoltaic solar powered pump system has three parts:

▶ Pump ▶ Controller ▶ Solar Panels

The size of the PV-system is directly dependent on the size of the pump, the amount of water that is required (m^3/d) and the solar irradiance available.

The purpose of the controller is twofold. Firstly, it matches the output power that the pump receives with the input power available from the solar panels. Secondly, a controller usually provides a low voltage protection, whereby the system is switched off, if the voltage is too low or too high for the operating voltage range of the pump. This increases the lifetime of the pump thus reducing the need for maintenance.

Traditional DC motors not being suitable for submersible pumps because of maintenance implications. Hence a converter which converts DC generated by PV cells into variable frequency AC is more suitable for AC motors, which are more reliable.

Applications

Solar powered water pumps

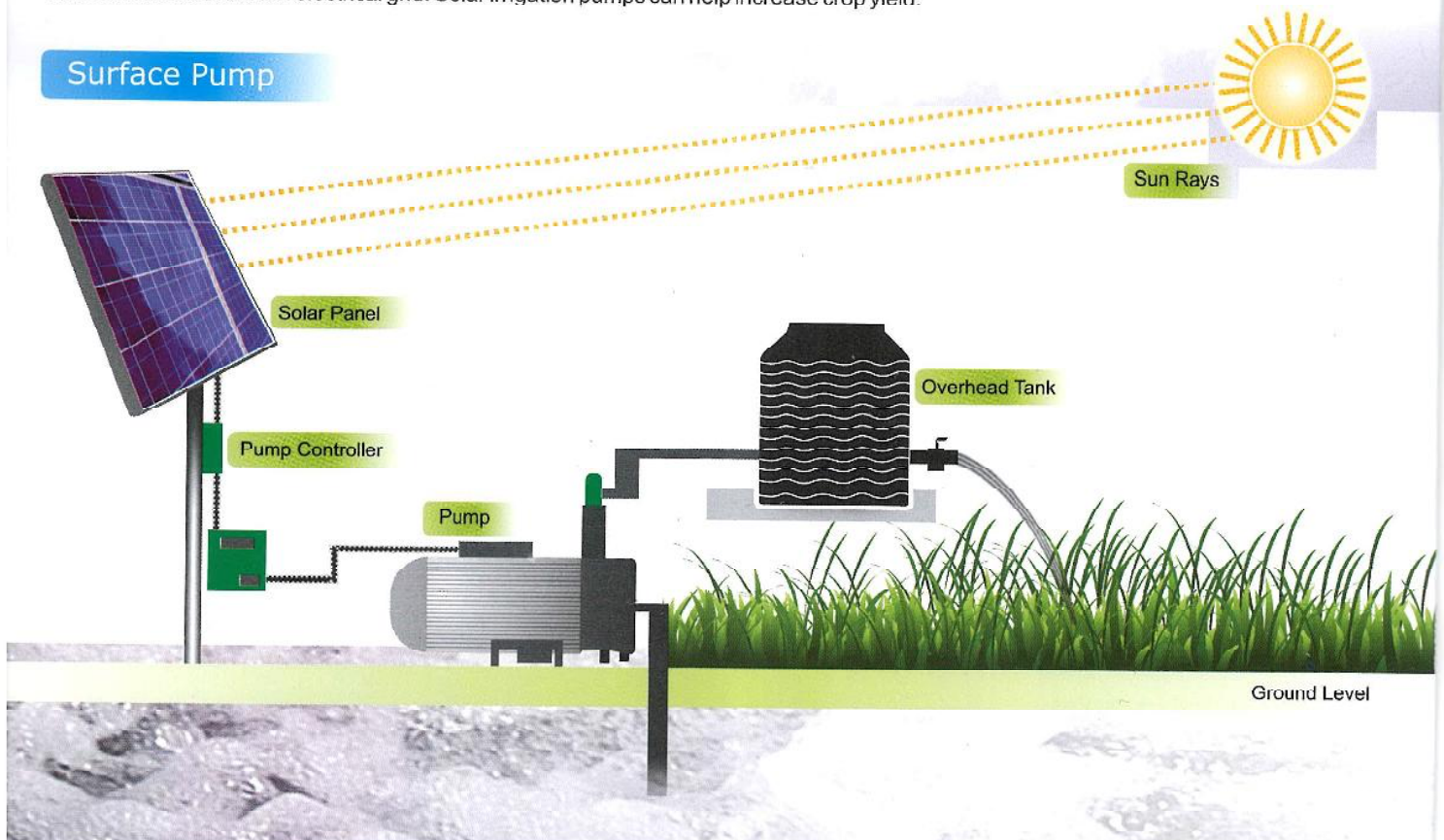
Can deliver drinking water as well as water for livestock or irrigation purposes. Solar water pumps may be especially useful in small scale or community based irrigation, as large scale irrigation requires large volumes of water that in turn require a large solar PV array. As the water may only be required during some parts of the year, a large PV array would provide excess energy that is not necessarily required, thus making the system inefficient.

Solar PV water pumping systems are used for irrigation and drinking water in India. The majority of the pumps are fitted with a 1hp to 10hp motor that receives energy from a suitable PV array. The larger systems can go upto 30hp or so.

Solar powered irrigation pumps

Make agriculture possible in areas that previously could not be farmed. Innovations in solar pump design now make all kinds of irrigation possible. Drip irrigation, sprinklers, micro-emitters, flood irrigation, even center-pivot irrigation systems can be powered without fuel, and without a connection to an electrical grid. Solar irrigation pumps can help increase crop yield.

Surface Pump






Specifications

Voltage Class	115V		
Model Number VFD-___ E	002	004	007
Max. Applicable Motor Output (kW)	0.2	0.4	0.75
Max. Applicable Motor Output (hp)	0.25	0.5	1.0
Rated Output Capacity (kVA)	0.6	1.0	1.6
Rated Output Current (A)	1.6	2.5	4.2
Maximum Output Voltage (V)	3-phase proportional to twice the input voltage		
Output Frequency (Hz)	0.1-600Hz		
Carrier Frequency (kHz)	1-15		
Rated Input Current (A)	Single-phase		
	6	9	18
Rated Voltage/Frequency	Single phase 100-120V, 50/60Hz		
Voltage Tolerance	± 10% (90-132V)		
Frequency Tolerance	± 5% (47-63Hz)		
Cooling Method	Natural Cooling		Fan Cooling
Weight (kg)	1.2	1.2	1.2

Voltage Class	230V									
Model Number VFD-___ E	002	004	007	015	022	037	055	075	110	150
Max. Applicable Motor Output (kW)	0.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
Max. Applicable Motor Output (hp)	0.25	0.5	1.0	2.0	3.0	5.0	7.5	10.0	15	20
Rated Output Capacity (kVA)	0.6	1.0	1.6	2.9	4.2	6.5	9.5	12.5	17.1	25
Rated Output Current (A)	1.6	2.5	4.2	7.5	11.0	17	25	33	45	65
Maximum Output Voltage (V)	3-phase proportional to input voltage									
Output Frequency (Hz)	0.1-600Hz									
Carrier Frequency (kHz)	1-15									
Rated Input Current (A)	Single/3-phase					3-phase				
	4.9/1.9	6.5/2.7	9.7/5.1	15.7/9	24/15	20.6	26	34	48	70
Rated Voltage/Frequency	Single/3-phase, 200-240V, 50/60Hz					3-phase, 200-240V, 50/60Hz				
Voltage Tolerance	± 10% (180-264V)									
Frequency Tolerance	± 5% (47-63Hz)									
Cooling Method	Natural Cooling					Fan Cooling				
Weight (kg)	1.1	1.1	1.1	1.9	1.9	1.9	3.5	3.5	3.57	6.6

Voltage Class	460V											
Model Number VFD-___ E	004	007	015	022	037	055	075	110	150	185	220	
Max. Applicable Motor Output (kW)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0	15	18.5	22	
Max. Applicable Motor Output (hp)	0.5	1.0	2.0	3.0	5.0	7.5	10.0	15.0	20	25	30	
Rated Output Capacity (kVA)	1.2	2.0	3.3	4.4	6.8	9.9	13.7	18.3	24	29	34	
Rated Output Current (A)	1.5	2.5	4.2	5.5	8.5	13.0	18.0	24.0	32	38	45	
Maximum Output Voltage (V)	3-phase proportional to input voltage											
Output Frequency (Hz)	0.1-600Hz											
Carrier Frequency (kHz)	1-15											
Rated Input Current (A)	3-phase											
	1.9	3.2	4.3	7.1	11.2	14	19	26	35	41	49	
Rated Voltage/Frequency	3-phase, 380-480V, 50/60Hz											
Voltage Tolerance	± 10% (342-528V)											
Frequency Tolerance	± 5% (47-63Hz)											
Cooling Method	Natural Cooling						Fan Cooling					
Weight (kg)	1.2	1.2	1.2	1.9	1.9	4.2	4.2	4.2	7.47	7.47	7.47	

Control Characteristics	Control System	SPWM (Sinusoidal Pulse Width Modulation) Control (V/f for sensorless vector control)	
	Frequency Setting Resolution	0.01Hz	
	Output Frequency Resolution	0.01Hz	
	Torque Characteristics	Including the auto-torque/auto-slip compensation; starting torque can be 150% at 3.0Hz	
	Overload Endurance	150% of rated current for 1 minute	
	Skip Frequency	Three zones, setting range 0.1-600Hz	
	Accel/Decel Time	0.1 to 600 seconds (2 Independent setting of Accel/Decel time)	
	Stall Prevention Level	Setting 20 to 250% of rated current	
	DC Braking	Operation frequency 0.1-600.0Hz, output 0-100% rated current Start time 0-60 seconds, stop time 0-60 seconds	
	Regenerated Braking Torque	Approx. 20% (up to 125% possible with optional brake resistor or externally mounted brake unit, 1-15hp models (built-in brake chopper))	
V/f Pattern	Adjustable V/f pattern Setting by ▲▼		
Operating Characteristics	Frequency Setting	Keypad	Setting by ▲▼
		External Signal	Potentiometer-5kΩ/0.5W, 0 to +10VDC, 4 to 20mA, RS-485 interface; Multi-function Inputs 3 to 9 (15 steps, Jog, up/down)
	Operation Setting Signal	Keypad	Set by RUN and STOP
		External Signal	2 wires/3 wires (FWD, REV, EF), JOG operation, RS-485 serial interface (MODBUS), programmable logic controller
	Multi-function Input Signal	Multi-step selection 0 to 15, Jog, accel/decel inhibit, 2 accel/decel switches, counter, external Base Block (NC, NO), auxiliary motor control is invalid, ACI/AVI/AUI selections, driver reset, UP/DOWN key settings, sink/source (=NPN/PNP) selection	
Multi-function Output Indication	AC drive operating, frequency attained, non-zero frequency, Base Block, fault indication, local/remote indication, auxiliary motor output, drive is ready, overheat alarm, emergency stop and status selections of input terminals (NC/NO)		
Analog Output Signal	Output frequency/current		
Alarm Output Contact	Contact will be On when drive malfunctions (1 Form C/change-over contact or 1 open collector output)		
Operation Functions	Built-in PLC, AVR, accel/decel S-Curve, over-voltage/over-current stall prevention, 5 fault records, reverse inhibition, momentary power loss restart, DC braking, auto torque/slip compensation, auto tuning, adjustable carrier frequency, output frequency limits, parameter lock/reset, vector control, PID control, external counter, MODBUS communication, abnormal reset, abnormal re-start, power-saving, sleep/wake function, fan control, 1st/2nd frequency source selections, 1st/2nd frequency source combination, NPN/PNP selection		
Protection Functions	Over voltage, over current, under voltage, under current, external fault, overload, ground fault, overheating, electronic thermal, IGBT short circuit, PTC		
Display Keypad	6-key, 7-segment LED with 4-digit, 5 status LED, master frequency, output frequency, output current, custom units, parameter values for setup and lock, faults, RUN, STOP, RESET, FWD/REV		
Built-in EMI Filter	For 230V 1-phase and 460V 3-phase models		
Enclosure Rating	IP20		
Pollution Degree	2		
Installation Location	Altitude 1,000m or lower, keep from corrosive gasses, liquid and dust		
Ambient Temperature	-10°C to + 50°C (40°C for side-by-side mounting) Non-Condensing and not frozen		
Storage/Transportation Temperature	-20°C to 60°C		
Ambient Humidity	Below 90% RH (non-condensing)		
Vibration	9.80665m/s ² (1G) less than 20Hz, 5.88m/s ² (0.6G) at 20 to 50Hz		
Approvals	  		

Features



Model Explanation



Ordering Information

Part No.	Input DC Voltage Range	Output 3 Phase Voltage (Max)	Output 3 Phase Current (Max)	Suitable for Submersible Pump motor rating (HP)
VFD007X21A*	150 - 400V	230	4.2	1
VFD015X21A*	150 - 400V	230	7.5	2
VFD022X21A*	150 - 400V	230	11	3
VFD022X43A*	350 - 700V	415	5.5	2
VFD037X43A*	350 - 700V	415	8.5	3
VFD 040 CB43A	350 - 700V	415	10.5	4
VFD055X43A*	350 - 700V	415	13	5
VFD075X43A*	350 - 700V	415	18	7.5
VFD110E43A	350 - 700V	415	24	10
VFD150E43A	350 - 700V	415	32	15
VFD185E43A	350 - 700V	415	38	20
VFD220E43A	350 - 700V	415	45	25

*X is the name of the series (could be E or CB)

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