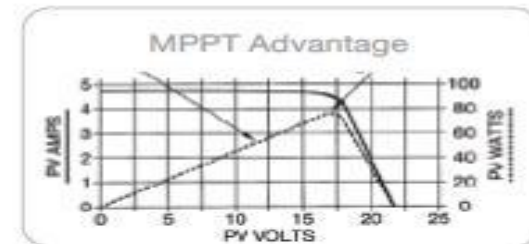


## Maximum Power Point Tracking (MPPT)

- Uses MPPT technology to maximise water delivery at various solar energy levels
- Water pumped even in morning, evening and in cloudy weather at low speed / flow
- Can be used for both Monoblock or Submersible pumps
- You can use existing pump setup so no need to buy new pump



## Options

- Solar or grid power selection
- Dual Input (Solar + Grid) Preferential Logic

## SOLAR PUMP CONTROLLER

MODEL	1 HP	2 HP	3HP	5 HP	7.5 HP	10 HP	15 HP	20 HP
INPUT-ARRAY OF PV PANEL	Number of PV panels in series of suitable wattages such that Vmp should be within range of 510-580V and Voc does not exceed 750V							
Total Panel Wattage Wp (approx) (HP X 750 X 1.6)	1200W	2400W	3600	6000	9000	12000	18000	24000
Max PV Volt (Voc)	750V	750V	750V	750V	750V	750V	750V	750V
MPPT Range (Vmp)	510-580V	510-580V	510-580V	510-580V	510-580V	510-580V	510-580V	510-580V
OUTPUT	suitable to 3 Phase 415V motor							
PROTECTIONS								
Lightning(MOV)	YES	YES	YES	YES	YES	YES	YES	YES
Panel Reverse Polarity	YES	YES	YES	YES	YES	YES	YES	YES
Short Circuit	YES	YES	YES	YES	YES	YES	YES	YES
Over Load	YES	YES	YES	YES	YES	YES	YES	YES
Over Voltage	YES	YES	YES	YES	YES	YES	YES	YES
DIMENSION								
ENCLOSURE	MS Powder Coated box							
WEIGHT								
OPERATING TEMP	0-50 DEG C							

\* PV Panels, Pump -- not in our scope of work, we will supply only pump controller

\* PV panels erection and wiring not in our scope of work.

# SMART SOLAR PUMP CONTROLLER MPPT FOR AC PUMPS

## Installation and Troubleshooting Manual

### PRINCIPLE OF OPERATION:-

This Solar Pump controller can be used on any AC 3 phase pump, whether Monoblock or Submersible Pump of given HP as per rating.

The solar pump controller is housed in powder coated, rugged MS enclosure of 1.6mm sheet. It is designed with MPPT technology to maximize water delivery at various solar energy levels. The pump controller can take solar power input and give three phase ac output to the ac pump such that when full solar power is available the motor will run at full rated speed and when it is cloudy or in the morning/evening

(i.e when solar power is limited) it will run at lower speed proportional to the availability of solar energy. It has arrangement to also accept three phase ac input from grid so that you can run the pump at full speed with solar preference mode whenever solar energy is not available sufficiently.

### SPECIFICATION:-

**Input :** ARRAY OF PV PANEL

V<sub>mp</sub> : MPPT point of PV Panels

V<sub>oc</sub> : Maximum open circuit voltage of PV Panels

Number of PV Panels in series of suitable wattage such that

V<sub>mp</sub> should be within range of 510-600V DC and V<sub>oc</sub>

Does not exceed 750V.

Pin (power from PV Panel) = HP X 0.75 X 1.35 in KW

Number of PV panels per string (N)= 750/Voc (nearest lower integer)

Wattage of each PV panel = Pin /N or higher

**Output:** three phase output to pump

**Protections:** Input surge, panel reverse polarity, short circuit, over load, over voltage , facility for dry run protection.

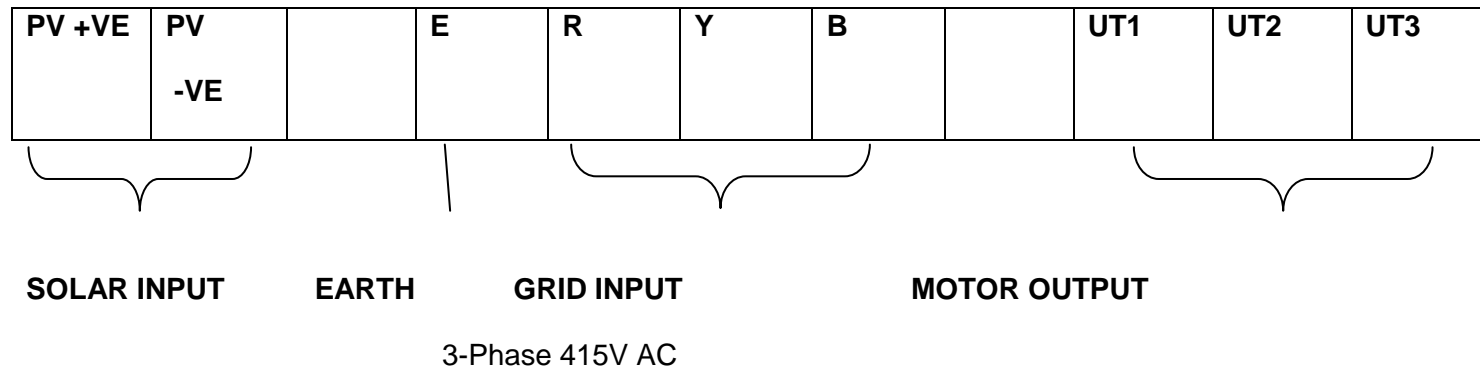
**Operating temperature:** 0-50 deg C

**Soft Start:** Power given to the pump is slowly increased to control the inrush current of the motor.

**Automatic start & stop:** It starts automatically when sufficient solar power is available to pump the water and stops automatically when solar power is not sufficient to pump the water. There is a built-in 20-30 minutes timer.

**Solar Energy Meter:** Provided to read PV (INPUT) voltage, current, instantaneous power and generated power in units.

### CONNECTIONS:-



PV +VE : Connect positive wire from PV array as input to panel

PV -VE : Connect negative wire from PV array as input to panel

E: EARTH (please ensure the proper earthing connection- it is must)

UT1, UT2, and UT3: MOTOR wires to be connected here

R, Y, B: 415V AC three phase ac input coming from grid (ac line)

#### **INDICATIONS ON PANEL DOOR:**

- 4) VFD ON – Green LED
- 5) CONTROLLER ON – Green LED
- 6) AC ON – Red LED
- 7) Dry Run - Red LED

#### **INSTALLATION:**

- 1) Ensure PV array combination is as per requirement i.e. Voc should not exceed 750V DC & MPPT point should be within range of 510-600V DC
- 2) Ensure the correctness of motor ratings & Panel ratings.
- 3) Make input connection from PV to control panel through solar fuse & EARTH connection.
- 4) If there is a DOL starter, please remove. Please note that Solar System will not operate when starter is present.
- 5) If AC mains supply is present, check current drawn by pump directly without using controller. This should match with the current on nameplate of pump. Please email this data to us
- 6) Before connecting motor, check the MPPT voltage of existing PV panel configuration.

Procedure as follows:-

- a) Back side of energy meter, 3 burrs pin (SW5) provided, remove jumper from left side and put it to right side then switch on the control panel switch. You can see MPPT voltage on energy meter (560V -default set ).
  
- b) To change the MPPT set voltage varies the potentiometer which is provided on MPPT controller and set the desired value.

Example: suppose if your PV panel rating -  $P=250W$ ;  $V_{oc}=36V$ ;  $V_{mp}=29V$

And if you have connected 20nos. of PV panels in series then total  $V_{mp} = 29V \times 20nos = 580V$  ; so you need to set  $V_{mp}$  point from default value to 580V by above steps.

- c) After  $V_{mp}$  setting donot forget to put jumper on original position i.e. left side (SW5) and switch off the control panel switch.
- 
- 7) Connect output to motor
  
  - 8) Toggle switch(Controller bypass switch) provided inside the panel should be on " NORMAL" position
  
  - 9) Check the input connection is made as per polarity i.e. +ve & -ve coming from PV array & output connection given to motor.
  
  - 10) Now switch ON the unit from front of panel door on position of VFD ON. Motor will start if sufficient power is available. In case, motor starts but water does not flow, then interchange one wire of motor output (UT2/UT3) to change direction of Motor.
  
  - 11) For Grid input { AC supply - if you wish to run motor without solar power OR with solar power & grid power( Preferential Mode) }  
Switch OFF the VFD by switch from panel door and connect 3 phase 415v ac grid supply R,Y, B wires through MCB provided inside the panel.
    - A) PV Solar Mode: If you want to run motor on solar only then keep AC MCB in OFF position.
  
    - B) PV Solar + AC mode –preferential logic: If you want to run motor at full speed at any time (morning/evening/night).

In this mode keep AC MCB always ON – Because of sharing of solar & grid power, motor will always run at full speed. Preference always goes to solar power and balance required power will be taken from grid.

Example: suppose if motor power is 3hp – 2250W & Solar available power is 1000W then balance 1250W will automatically be taken from grid source(ac line).

Load power = solar power + grid power (ac line)

Switch ON input MCB for 3 phase grid supply, Switch ON the switch from panel door. The motor will start at full speed. LED 4, 5 and 9 will glow will glow on outer panel.

Whenever you do not want to use grid (AC) supply please switch OFF grid (AC) MCB

## **TROUBLE SHOOTING:**

Before starting trouble shooting please write down Pump Voltage and Current from pump label. Also note Pv Panel wattage, number of panels, Vmpp and Voc.

Also check if Bypass switch is in Normal mode.

### **A) Pump Controller starting but no water flow or less flow**

- 1) While commissioning if sufficient input power is given to panel but no water comes then switch OFF input and interchange one wire of motor output (UT2/UT3) at the output terminal and again switch ON.
- 2) Check if solar power is sufficient for given Pump rating.

- 3) If Power drawn by motor is more than specified ratings then VFD may trip. Ensure correct motor ratings for the application.
- 4) Check MPPT settings by following Installation Step 6.
- 5) In case of failure of controller (i.e. when 'controller ON' LED No. 5 is not ON) then change the position of controller bypass switch (toggle switch –inside panel) to 'BYPASS/AC ONLY' position which is provided inside the panel.
- 6) If still not giving required results, please email all data and call us

### **B) Controller/ VFD tripping**

- 1) Check the MPPT Voltage setting for the panels. If it does not match then please repeat Installation step 6

If VFD tripping after 1 minute, check the VFD display message. If OL or L is seen in display message, then in the VFD, press the 'down' key till you reach

- 2) IF VFD tripping and if Dry Run LED 8 comes on, check the dry run contact and if not used then it should be shorted.
- 3) If energymeter LCD display and LED display No. 5 (CNTRL ON) on external panel door are not glowing, then check inside panel for LED No. 10 (i/p OK) and No. 13 (o/p ok). If both are off then please call us. You can run the pump temporarily by switching Controller Bypass switch to Bypass mode located above Input/output connections.
- 4) To Check error in VFD display, remove jumper shown on diagram or orange wire No. 6 ( Older versions). Turn on switch S1 and then check the VFD display and call.  
Error example:

uV – PV Panel undervoltage

Sc – Short Circuit

OL/L – Overload

OV – Overvoltage



### **c) Controller not starting**

- 1) Check all input / output connectors.
- 2) If Voltage on Energymeter LCD is showing less than 400VDC in switched off position then add required number of PV panels as it is incorrect.
- 3) If LED 5 (CNTRL ON) is off, then do Troubleshooting Step B3.
- 4) If LED 5 (CNTRL ON) is on, then reset controller by On/Off switch S1. IF still doesn't start then goto Troubleshooting Step B4

### **d) Pump not working in Hybrid (Solar + Grid AC) mode or only AC Mode.**

- 1) First go through all steps shown in Troubleshooting 'B' to ensure pump operates on Solar.
- 2) Disconnect PV input by removing PV fuse. Switch AC MCB on and check if LED 9 (AC on) is glowing. If not glowing then connections are not correctly done. Redo and recheck all connections. If it is glowing, please call us.
- 3) If in only AC mode it is working but in Hybrid mode it is not working, then fix Vmpp to 540VDC following installation step 6. If still not working, then keep increasing Vmpp till it starts.

**DC SURFACE PUMPS WITH BLDC MOTORS SUITABLE FOR SOLAR APPLICATION**



<i>Sr. No.</i>	<i>Model No.</i>	<i>Pump (HP)</i>	<i>Speed (rpm)</i>	<i>Size (mm)</i>	<i>Head (Meters)</i>	<i>Discharge (LPH)</i>	<i>Supply (VDC)</i>	<i>Input (Watts)</i>	<i>Power</i>
1.	PGMM2-24	0.5 HP	3000	25X25	6/24M	2000/400	24	500 W	
2.	PGMM2-48	0.5 HP	3000	25X25	6/24M	2000/400	48	500 W	

PUMPTYPE : Centrifugal Self Priming DC Pump

APPLICATION : Suitable for Solar Application – 1. Household 2. Farm house 3. Resort  
4. Bungalows 5. Schools 6. Offices 7. Restaurants 8. Guest Houses.

MOTOR : Brushless DC Motor (With In Built Controller)

CONTROLLER :

1. Micro Controller based PWM MOSFET Drive
2. Preset Acceleration.
3. Fixed speed (standard).
4. Direction - Unidirectional.
5. Protections: - a) Preset Over & Under Voltage.  
b) Over current (Trip)  
c) Inbuilt thermal overload.
6. Voltage Range of Controller: a. For 24 V - 22 V to 28 V  
b. For 48 V - 42 V to 52 V
7. For best performance or good efficiency, we suggest MPPT CCU is required.  
Can be used with Charge Controller & Batteries.

Recommended for 5 to 6 hours of Solar Operation (Full Load)

MPPT CHARGE CONTROLLER: - Extra can be supplied.