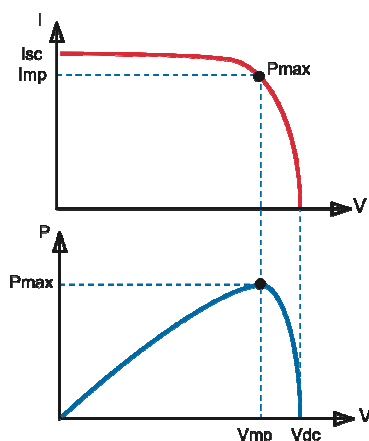# BlueSolar charge controller MPPT 75/15 & MPPT 100/15

www.victronenergy.com

**Solar charge controller
MPPT 75/15**

Ultra fast Maximum Power Point Tracking (MPPT)
Especially in case of a clouded sky, when light intensity is changing continuously, an ultra fast MPPT controller will improve energy harvest by up to 30% compared to PWM charge controllers and by up to 10% compared to slower MPPT controllers.

Load output
Over-discharge of the battery can be prevented by connecting all loads to the load output. The load output will disconnect the load when the battery has been discharged to a preset voltage.
Alternatively, an intelligent battery management algorithm can be chosen: see BatteryLife.
The load output is short circuit proof.
Some loads (especially inverters) can best be connected directly to the battery, and the inverter remote control connected to the load output. A special interface cable may be needed, please see the manual.

BatteryLife: intelligent battery management
When a solar charge controller is not able to recharge the battery to its full capacity within one day, the result is often that the battery will be continually be cycled between a "partially charged" state and the "end of discharge" state. This mode of operation (no regular full recharge) will destroy a lead-acid battery within weeks or months.
The BatteryLife algorithm will monitor the state of charge of the battery and, if needed, day by day slightly increase the load disconnect level (i. e. disconnect the load earlier) until the harvested solar energy is sufficient to recharge the battery to nearly the full 100%. From that point onwards the load disconnect level will be modulated so that a nearly 100% recharge is achieved about once every week.

Resin encapsulated electronics
Protects the electronic components against the environment.

Programmable battery charge algorithm
See the software section on our website for details

Day/night timing and light dimming option
See the software section on our website for details

Maximum Power Point Tracking

Upper curve:
Output current (I) of a solar panel as function of output voltage (V).
The maximum power point (MPP) is the point Pmax along the curve where the product I x V reaches its peak.

Lower curve:
Output power P = I x V as function of output voltage.
When using a PWM (not MPPT) controller the output voltage of the solar panel will be nearly equal to the voltage of the battery, and will be lower than Vmp.

BlueSolar charge controller	MPPT 75/15	MPPT 100/15
Battery voltage	12/24 V Auto Select	
Rated charge current	15 A	
Maximum PV power, 12V 1a,b)	200 W (MPPT range 15 V to 70 V resp. 95 V)	
Maximum PV power, 24V 1a,b)	400 W (MPPT range 30 V to 70 V resp. 95 V)	
Automatic load disconnect	Yes, maximum load 15 A	
Maximum PV open circuit voltage	75 V	100 V
Peak efficiency	98 %	
Self consumption	10 mA	
Charge voltage 'absorption'	14,4 V / 28,8 V	
Charge voltage 'float'	13,8 V / 27,6 V	
Charge algorithm	multi-stage adaptive	
Temperature compensation	-16 mV / °C resp. -32 mV / °C	
Continuous/peak load current	15A / 50A	
Low voltage load disconnect	11,1 V / 22,2 V or 11,8 V / 23,6 V or BatteryLife algorithm	
Low voltage load reconnect	13,1 V / 26,2 V or 14 V / 28 V or BatteryLife algorithm	
Protection	Battery reverse polarity (fuse) Output short circuit Over temperature	
Operating temperature	-30 to +60°C (full rated output up to 40°C)	
Humidity	100 %, non-condensing	
Data communication port	VE.Direct See the data communication white paper on our website	
ENCLOSURE		
Colour	Blue (RAL 5012)	
Power terminals	6 mm² / AWG10	
Protection category	IP43 (electronic components), IP22 (connection area)	
Weight	0,5 kg	
Dimensions (h x w x d)	100 x 113 x 40 mm	

1a) If more PV power is connected, the controller will limit input power to 200W resp. 400W
1b) PV voltage must exceed Vbat + 5V for the controller to start.
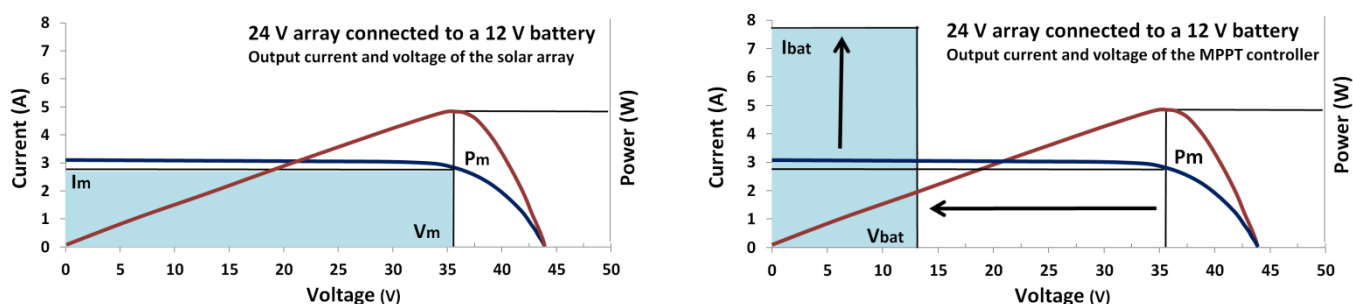   Thereafter minimum PV voltage is Vbat + 1V

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BLUE POWER

Which solar charge controller: PWM or MPPT?

What follows is a summary of our white paper with the same title.

1. What they do

The PWM controller is in essence a switch that connects a solar array to a battery. The result is that the voltage of the array will be pulled down to near that of the battery.

The MPPT controller is more sophisticated (and more expensive): it will adjust its input voltage to harvest the maximum power from the solar array and then transform this power to supply the varying voltage requirement, of the battery plus load. Thus, it essentially decouples the array and battery voltages so that there can be, for example, a 12 volt battery on one side of the MPPT charge controller and a large number of cells wired in series to produce 36 volts on the other.

Graphical representation of the DC to DC transformation as performed by an MPPT controller

2. The resultant twin strengths of an MPPT controller

    a)   Maximum Power Point Tracking

The MPPT controller will harvest more power from the solar array. The performance advantage is substantial (10% to 40%) when the solar cell temperature is low (below 45°C), or very high (above 75°C), <u>or</u> when irradiance is very low.

At high temperature or low irradiance the output voltage of the array will drop dramatically. More cells must then be connected in series to make sure that the output voltage of the array exceeds battery voltage by a comfortable margin.

    b)   Lower cabling cost and/or lower cabling losses

Ohm's law tells us that losses due to cable resistance are P_c (Watt) = $R_c \times I^2$, where R_c is the resistance of the cable. What this formula shows is that for a given cable loss, cable cross sectional area can be reduced by a factor of four when doubling the array voltage.

In the case of a given nominal power, more cells in series will increase the output voltage and reduce the output current of the array ($P = V \times I$, thus, if P doesn't change, then I must decrease when V increases).

As array size increases, cable length will increase. The option to wire more panels in series and thereby decrease the cable cross sectional area with a resultant drop in cost, is a compelling reason to install an MPPT controller as soon as the array power exceeds a few hundred Watts (12 V battery), or several 100 Watts (24 V or 48 V battery).

3. Conclusion

PWM

The PWM charge controller is a good low cost solution for small systems, when solar cell temperature is moderate to high (between 45°C and 75°C).

MPPT

To fully exploit the potential of the MPPT controller, the array voltage should be substantially higher than the battery voltage. The MPPT controller is the solution of choice for higher power systems because of the lowest overall system cost due to smaller cable cross sectional areas. The MPPT controller will also harvest substantially more power when the solar cell temperature is low (below 45°C), or very high (above 75°C), <u>or</u> when irradiance is very low.

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