MPPT – Windpower charge controller windMax500

Description:

This windpower charger in processor technique, contains all functions for smooth charging of lead batteries by windpower generators of 600W at 24V- and 300W at 12V-battery-systems. Through powertracking more electrical energy is charged from the wind generator into the battery compared with standard charging systems, depending on the nominal voltage of the wind turbine. The higher the turbine voltage against the battery voltage, the higher the gain.

The maximum generator voltage can be 150Vac (Open circuit voltage). It is a 3 phase input. The voltage in the Maximum powerpoint of the windgenerator is transformed to the level of the battery system.

The topology of the buck converter feeds the maximum possible current from the power maximum into the battery. As soon as the battery is full and reaches its maximum voltage (14V/28.2V/56.4V) the charger drives the generator voltage towards open circuit voltage, preventing overcharging of the battery.

For protection of the windgenerator and charge controller it is possible to connect a break resistor to the terminal DUMPLOAD. The break resistor is switched on the gnd level via a mosfet at the output of the 3 phase rectifier. MPPT is activated about every second.

Optional a temperature sensor placed near the battery system effects the maximum battery voltage at a rate of –4mV/°C/battery cell.

Optional the device can be equipped with a LCD Display for battery current, battery voltage, power and energy (kilowatt hour meter).

Optional a boost converter can be equipped, which feeds energy into the battery from minimum 7Vdc generator voltage. The battery system voltage may be 12V, 24V or 48V.

Optional a RS232 can be added.

Technical data

<table>
<thead>
<tr>
<th></th>
<th>12V-Battery</th>
<th>24V-Battery</th>
<th>48V-Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Generator voltage, Ungen</td>
<td>200Vdc</td>
<td>200Vdc</td>
<td>200Vdc</td>
</tr>
<tr>
<td>Max. Generator current</td>
<td>8A</td>
<td>8A</td>
<td>8A</td>
</tr>
<tr>
<td>Max. Battery current</td>
<td>20A</td>
<td>20A</td>
<td>12.5A</td>
</tr>
<tr>
<td>Max. Generator power, Pgen/Eff. =90%</td>
<td>322W</td>
<td>617W</td>
<td>771W</td>
</tr>
<tr>
<td>Efficiency</td>
<td>92% @ 0.5Pgen</td>
<td>94% @ 0.5Pgen</td>
<td>94% @ 0.5Pgen</td>
</tr>
<tr>
<td>End of charge voltage</td>
<td>14.5V</td>
<td>29.0V</td>
<td>58.0V</td>
</tr>
<tr>
<td>Deep discharge protection</td>
<td>10.6V Battery voltage with 60 Sec. Delay</td>
<td>21.6V Battery voltage with 60 Sec. delay</td>
<td>43.2V Battery voltage with 60 Sec. delay</td>
</tr>
<tr>
<td>Load reconnect</td>
<td>12.5A</td>
<td>25.0V</td>
<td>50.0V</td>
</tr>
<tr>
<td>Max. consumer current</td>
<td>160Vdc/150Vdc</td>
<td>180Vdc/150Vdc</td>
<td>180Vdc/150Vdc</td>
</tr>
<tr>
<td>Break resistor dis-/reconnect</td>
<td>7mA</td>
<td>7mA</td>
<td>7mA</td>
</tr>
<tr>
<td>Current consumption</td>
<td>16qmm/10qmm</td>
<td>16qmm/10qmm</td>
<td>16qmm/10qmm</td>
</tr>
<tr>
<td>2x temp. sensor</td>
<td>1qmm</td>
<td>1qmm</td>
<td>1qmm</td>
</tr>
<tr>
<td>2x pot.free contacts</td>
<td>4qmm/2.5qmm</td>
<td>4qmm/2.5qmm</td>
<td>4qmm/2.5qmm</td>
</tr>
<tr>
<td>2x DUMPLOAD</td>
<td>1x Earth</td>
<td>M6</td>
<td></td>
</tr>
</tbody>
</table>

Temperature sensor: KTY10-5 or 1.91kOhm

LEDs

right: yellow (max. battery voltage)
left: green (battery current>0.5A)
middle: red (load disconnected)

Housing: Diecast aluminium 8xHxT 220x80x120mm

Protection: IP65

Weight: 2200g

Moisture: 90%

Operating temperature: -20°C to +50°C

Option boost converter: 14.5W, 29W, 58W

Max. charging current: 1A, 1A, 1A

Min. input voltage: 7Vdc

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Highlights:

* DC-Converter to optimize wind power income
* MPP-Tracking of wind generator voltage
* Selection of 3 battery voltages 12V/24V/48V
* Break resistor switching output
* Deep discharge protection with shortcut protection
* Optional power curve programming, instead of mpp
* Optional dc boost converter for generator voltage.
* Optional LCD for current, voltage, power, energy

Principal circuit

![Principal circuit diagram](image)

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Housing dimensions (mm):

Height 80mm
- Mounting hole in cover, M6
- Mounting hole in bottom of housing
  D=7mm

**Basic calculations:**
The maximum admissible input voltage of the charge controller is determined by the rectified AC-voltage of the three-phase generator. Depending on star or delta connection, the dc-voltage is different.

At a star connection the maximum generator dc-voltage is:

$$U_{\text{gendc}} = 1.35 \times U_{\text{string}}$$

At a delta connection the maximum generator dc-voltage is:

$$U_{\text{gendc}} = 1.35 \times U_r$$

**Connection of break resistor**
The break resistor must be connected to the terminal DUMPLOAD.
It's purpose is to remove electrical energy from the wind generator when the battery is full and if the windpower is too large. As soon as a generator dc-voltage ($U_{\text{gendc}}$) more than 160Vdc is at the charge controller, the break resistor is switched on.

Recommended dimensioning:

- **Resistor value:** $R = 150V \times 150V / P_{\text{gen}}$
- **Resistor power:** $P = 150V \times 150V / R$

Example: $P_{\text{gen}} = 620W$

$$R = 150 \times 150 / 620 = 36.3 \Omega \Rightarrow 330 \Omega$$

$$P = 150 \times 150 / 33 = 682W$$