MPPT – Windpower charge controller windMax1500

Description:

This windpower charger in processor technique, contains all functions for smooth charging of lead batteries by windpower generators of 1850W at 24V- and 960W at 12V-battery-systems.

Through power tracking 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 3phase input. The voltage in the Maximum powerpoint of the windgenerator is transformed to the level of the battery system. (12V/24V/48V).

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 (14.1V/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 power curve can be programmed ex works. The Voltage steps are 1V, between 0V and 192V.

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 Rs232 can be added.

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 (kilowatt hour meter)

Technical data:

<table>
<thead>
<tr>
<th>12V-Battery</th>
<th>24V-Battery</th>
<th>48V-Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Generator voltage, Ugendc</td>
<td>200Vdc</td>
<td>200Vdc</td>
</tr>
<tr>
<td>Max. Generator current</td>
<td>16A</td>
<td>16A</td>
</tr>
<tr>
<td>Max. Battery current</td>
<td>60A</td>
<td>60A</td>
</tr>
<tr>
<td>Max. Generator power, Peaks:EFF.:=90%</td>
<td>967W</td>
<td>1851W</td>
</tr>
<tr>
<td>Efficiency</td>
<td>90% @ 0.5Pgen</td>
<td>94% @ 0.5Pgen</td>
</tr>
<tr>
<td>End of charge voltage</td>
<td>14.5V</td>
<td>29.0V</td>
</tr>
<tr>
<td>Deep discharge protection</td>
<td>10.8V Battery voltage with 60 Sec. Delay</td>
<td>21.6V Battery voltage with 60 Sec. delay</td>
</tr>
<tr>
<td>Load reconnect</td>
<td>12.5V</td>
<td>25.0V</td>
</tr>
<tr>
<td>Max. consumer current</td>
<td>37.5A</td>
<td>37.5A</td>
</tr>
<tr>
<td>Break resistor dis-/reconnect</td>
<td>160Vdc/150Vdc</td>
<td>160Vdc/150Vdc</td>
</tr>
<tr>
<td>Current consumption</td>
<td>13mA</td>
<td>13mA</td>
</tr>
</tbody>
</table>

Terminals:

3x wind generator
2x battery output
2x consumer out.
2x temp. sensor
2x pot.free contacts
2x DUMPLOAD
1x Earth

Temperature sensor

RTTY10-5 or 1.91kOhm

LEDs

right: yellow (max. battery voltage)
left: green (battery current 1.5A)
middle: red (load disconnected)

Housing

Steel wall mounted wxhxd 300x400x150mm

Protection

IP55 with ventilation

Weight

1.5kg

Moisture

90% 

Operating temperature

-20°C to +50°C

Principal circuit

Fuse

20A FKS

PWM, Load disconnect

MPP-control, battery management

Master

Slave 1

Slave 2

3 phase rectifier

Break resistor

Power via generator voltage

Efficiency via power

Technical Data are subject to change.
Housing dimensions (mm):

- Height = 150 mm
- Mounting holes in bottom of housing
  - D = 10 mm

**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:

\[ U_{\text{gent}} = 1.35 \times U_{\text{rs}} \text{ or } 1.35 \times U_{\text{st}} \text{ or } 1.35 \times U_{\text{rt}} \]

\[ U_{\text{rs}} = 1.73 \times U_{\text{string}} \]

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

\[ U_{\text{gent}} = 1.35 \times U_{\text{rs}} \]

**Connection of break resistor**
The break resistor must be connected to the terminal DUMPLOAD.

It’s purpose is to remove electrical energy from the windgenerator when the battery is full and if the windpower is too large. As soon as a generator dc-voltage \((U_{\text{gent}})\) more than 150Vdc is at the charge controller, the break resistor is switched on.

Recommended dimensioning:

- Resistor value: \( R = \frac{150 \times V_{\text{gent}}}{P_{\text{gen}}} \)
- Resistor power: \( P = \frac{150 \times V_{\text{gent}}}{R} \)

Example: \( P_{\text{gen}} = 1870 \text{W} \)

\[ R = \frac{150 \times 150}{1870} = 12.03 \text{Ohm} \Rightarrow 12 \text{Ohm} \]

\[ P = \frac{150 \times 150}{12} = 1875 \text{W} \]