MPPT- Solar-Wind-Hybrid-Charge-Controller SWMR05K-1k

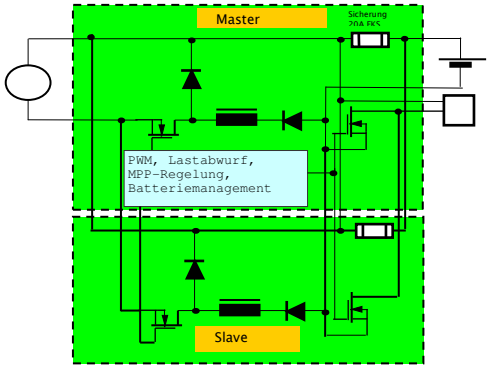
Description:

The SWMR05K-1K is Solar-Wind Hybrid charge control system and consists of a SMR500 and a windMax1000 unit. Both, wind- and solar generator currents are fed into the battery terminals.
This charger, in micro processor technique, contains all functions for smooth charging of lead Battery by solar modules of 604Wp at 24V- and 312Wp at 12V-Systems. As well as by a windgenerator of 1234W at 24V- and 644W at 12V battery systems.
Because of the powertracking it is possible to increase the electrical power of a solar system up to 40%, compared to standard pwm or shunt chargers.
The maximum solar voltage is 200Vdc for a 24V and 48V-battery system (Open circuit voltage).

Windpower is increased as well, depending on the the generator voltage with relation to the battery voltage. The maximum wind generator voltage can be 200Vdc (Open circuit voltage).

The buck converter topology feeds the maximum possible current from the power maximum, into the battery. As soon as the battery is full and reaches its end of charge voltage (14.5V/29.0V/58.0V) the device drives the solar voltage towards open circuit voltage, preventing overcharging of the battery. The windgenerator will be breaked by an external dumpload resistor in case of full battery and also at a maximum generator voltage level, which is 160Vdc.
Adjustment to other individual levels is possible.
A yellow LED indicates the state of full battery.
Deep discharge protection is activated with 60 seconds delay. Switching is done by a Power Mosfet on the ground level. Indication of consumer switch off, is by a red LED.
The green LED indicates solar- or wind generator current.
An optional temperature sensor tracks the maximum Battery voltage at -4mV/°C/Battery cell.
Solar power tracking is utilized every 8 seconds to optimize the solar power point. Wind powertracking is utilized every 1s, to follow the dynamic characteristics of windpower.
A battery management system allows adaptation to different battery types and optimal use of the battery capacity, including an automatic and manual equalization control.

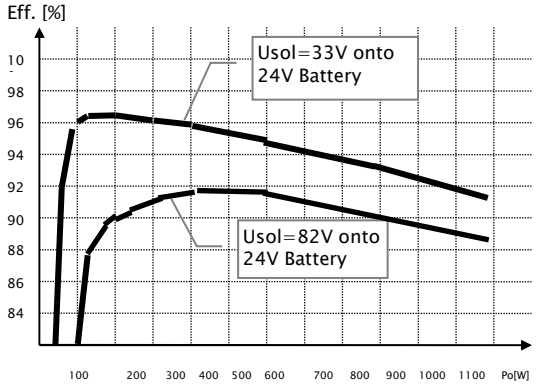
Principal circuit diagram



Highlights:

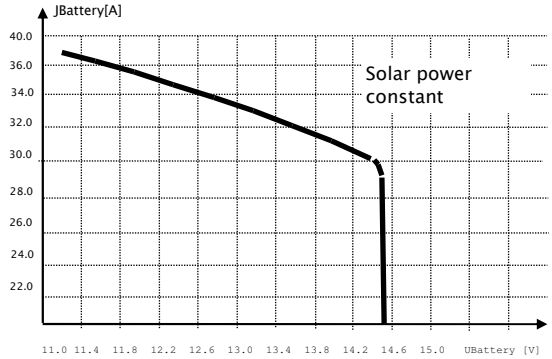
***DC buck-converter to optimize solar- & wind power income.**
***MPP-Tracking of solar- and windgenerator voltage**
***Selection of 3 Battery voltages 12V/24V/48V**
***Indication of state of charge per LED**
***Deep discharge protection**
***Temperature tracking of Battery voltage**
***Battery management system**
***temperature protection of power electronics**
***reverse polarity protection, over current protection, surge protection**
***Option: LCD for Battery voltage, -current, Power, Energy**
***Option: power curve programming in 1V steps by factory, enhances dynamics of regulation in windMax.**
***Option: boost converter for generator voltages above 6Vac.**

Efficiency vs solar- & wind power(1)



(1) Subtract 2% efficiency for wind power curve. For solar power divide Po by 2 (X-Axis)

Charge current vs Battery voltage



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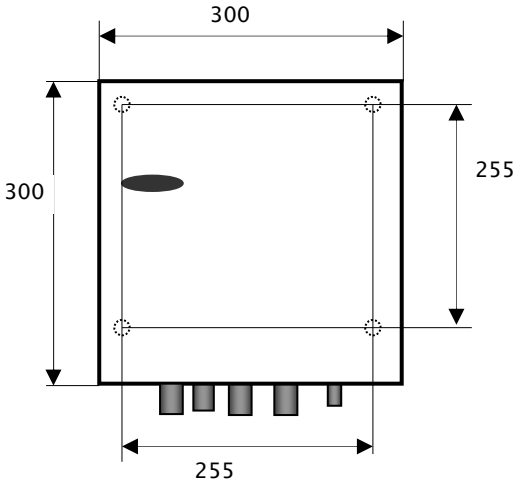
Technical data Solar charge controller: ***wind charge controller:***

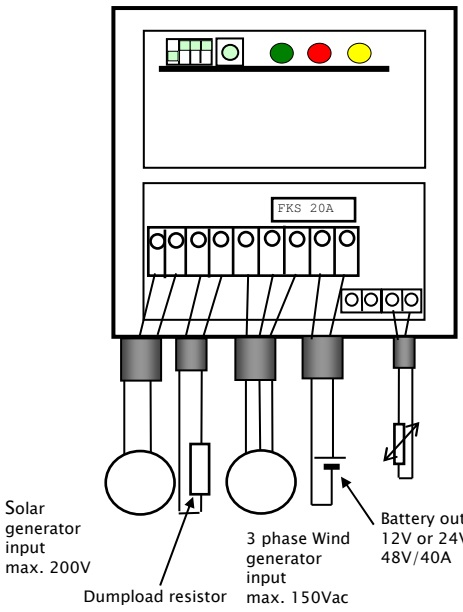
	12V-Battery	**24V-Battery**	**48V-Battery**		**12V-Battery**	**24V-Battery**	**48V-Battery**
Max. solar open circuit voltage, Usoc	200V	200V	200V	**Max. wind generator voltage, Uwdc**	200V	200V	200V
Max. solar current	20A	20A	12.5A	**Max. wind generator current**	16A	16A	16A
Max. charge current	20A	20A	12.5A	**Max. charge current**	40A	40A	25A
Max. solar power, Pnom	312Wp	604Wp	755Wp	**Max. wind power, Pnom**	644W	1234W	1543W
Efficiency	Ca. 93% @ 0.5Pnom	Ca. 96%@ 0.5Pnom	Ca. 96% @ 0.5Pnom	**Efficiency**	Ca. 92% @ 0.5Pnom	Ca. 94%@ 0.5Pnom	Ca. 94% @ 0.5Pnom
End of charge voltage	14.5V	29.0V	58V	**End of charge voltage**	14.5V	29.0V	58V
Deep discharge protection **Load disconnect** **Load reconnect**	10.8V 12.5V with 60 seconds delay	21.6V 25.0V with 60 seconds delay	43.2V 50.0V with 60 seconds delay	**Deep discharge protection** **Load disconnect** **Load reconnect**	10.8V 12.5V with 60 seconds delay	21.6V 25.0V with 60 seconds delay	43.2V 50.0V with 60 seconds delay
Current consumption	7mA	7mA	7mA	**Current consumption**	10mA	10mA	10mA
Terminals: **2x Solar generator input** **3x Wind generator input** **2x dumpload** **2x Battery output** **2x consumer output** **2x temperture sensor**	16sqmm/10sqmm 16sqmm/10sqmm 6sqmm/4sqmm 16sqmm/10sqmm 16sqmm/10sqmm 1.5sqmm						
Temperatur sensor	KTY10-5 or 1.91kOhm						
Cable glands	3xPG16, 1x PG11, 2xPG7						
LED's	right: yellow (Indication of max Battery voltage) left: green (Battery current>0.5A) middle: red (consumer off)						
housing	Steel wall mounted wxhxd 300x300x150mm						
protection	IP65						
weight	12kg						
Moisture	90%						
Operating Temperature	-20°C to +50°C						

Housing dimensions:

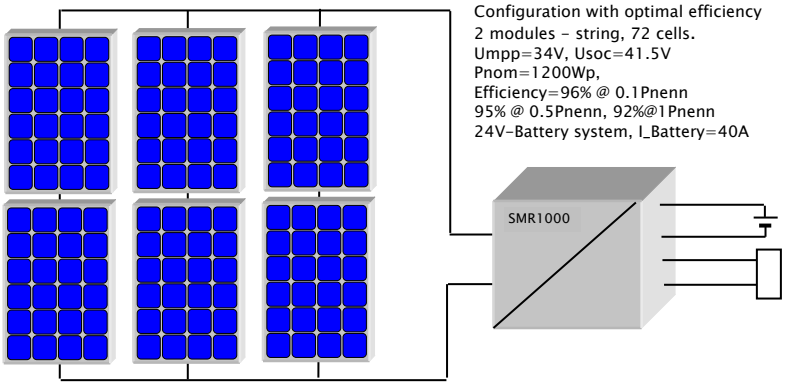


Height=150mm
Mounting holes in bottom of housing
D=10mm

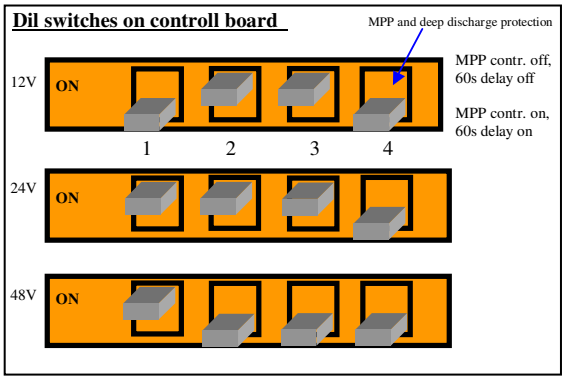
Connection diagram

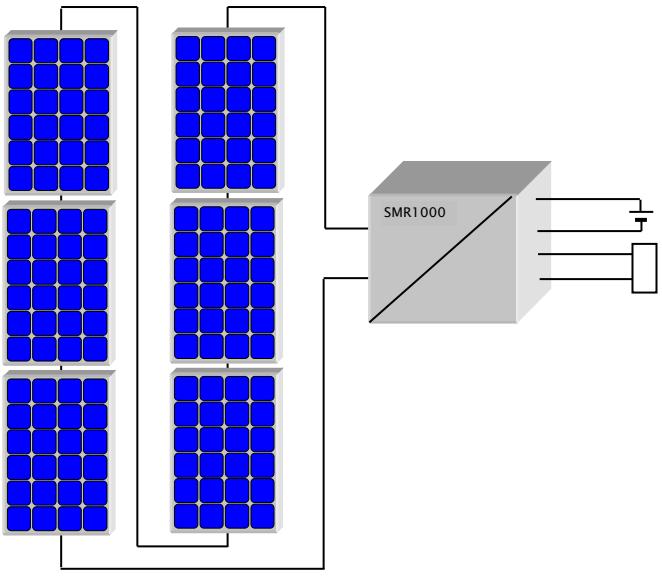


Applications:



Configuration with optimal efficiency
2 modules - string, 72 cells.
Umpp=34V, Usoc=41.5V
Pnom=1200Wp,
Efficiency=96% @ 0.1Pnenn
95% @ 0.5Pnenn, 92%@1Pnenn
24V-Battery system, I_Battery=40A





Configuration with
maximum Solar voltage
6 modules - string, 216
cells.
Umpp=102V, Usoc=124V
Pnom=1200Wp,
Effectivity=81%@ 0.1Pnom
91% @ 0.5Pnom, 89% @1Pnom
24V-Batterysystem,
I_Battery=40A

Windpower 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:
Ugendc=1.35*Urs or 1.35*Ust or 1.35*Urt
Urs=1.73*Ustring

At a delta connection the maximum generator dc-voltage is:
Ugendc=1.35*Urs

Connection of dump load resistor

The load resistor must be connected to the terminal Rload.
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 **(Ugendc**) more than 150Vdc is at the charge controller, the load resistor is switched on.

Recommended dimensioning:

Resistor value: Rload=150Vx150V/Pgen
Resistor power: Pload=150Vx150V/Rload

Example: Pgen=620W

Rload=150x150/620=36.3Ohm => **33Ohm**
Pload=150x150/33=**682W**