Schams Electronic · Keltenring 12 · D-92361 Berngau
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MPPT-Solar-Wind-Hybrid-Charge-Controller SWMR1k-05k

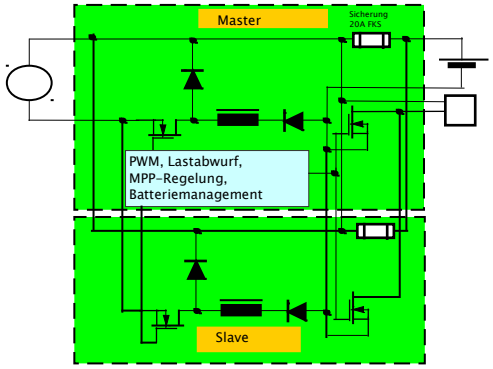
Product Description:

The SWMR1K-05K is a Solar-Wind Hybrid charge control system and consists of a SMR1000 and a windMax500 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 1120Wp at 24V- and 560Wp at 12V-Systems. As well as by a windgenerator of 560W at 24V- and 280W 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 250V for a 12V- battery system as well as 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 250V (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 powertracking 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.

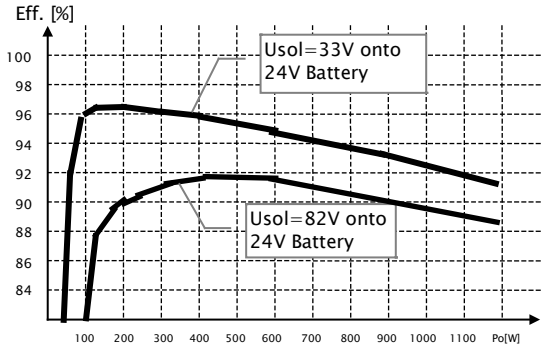
Principal circuit diagram



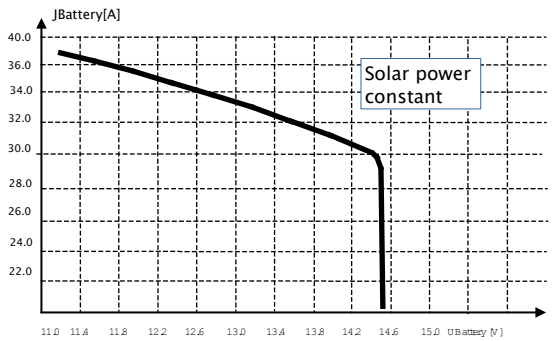
Highlights:

- 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

Effectivity vs solar- wind power



Charge current vs Battery voltage



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Technical data

Solar charge controller:				Wind charge controller:			
Battery	**12V**	**24V**	**48V**	**Battery**	**12V**	**24V**	**48V**
Max. solar open circuit voltage, Usoc	200V	250V	250V	**Max. wind generator voltage, Uwdc**	200V	250V	250V
Max. solar current	40A	40A	25A	**Max. wind generator current**	8A	8A	8A
Max. charge current	40A	40A	25A	**Max. charge current**	20A	20A	12.5A
Max. solar power, Pnom	560Wp	1120Wp	1410Wp	**Max. wind power, Pnom**	280Wp	560Wp	755Wp
Efficiency	Ca. 93% @ 0.5Pnom	Ca. 96%@ 0.5Pnom	Ca. 96% @ 0.5Pnom	**Efficiency**	Ca. 93% @ 0.5Pnom	Ca. 96%@ 0.5Pnom	Ca. 96% @ 0.5Pnom
End of charge voltage	14.5V	29.0V	58V	**End of charge voltage**	14.5V	29.0V	58V
Deep discharge protection				**Deep discharge protection**			
Load disconnect	10.8V	21.6V	43.2V	**Load disconnect**	10.8V	21.6V	43.2V
Load reconnect	12.5V with 60 sec. delay	25.0V with 60 sec. delay	50.0V with 60 sec. delay	**Load reconnect**	12.5V with 60 sec. delay	25.0V with 60 sec. delay	50.0V with 60 sec. delay
Current consumption	7mA	7mA	7mA	**Current consumption**	3.5mA	3.5mA	3.5mA

Terminals:	
2x solar generator input	16sqmm/10sqmm
3x wind generator input	16sqmm/10sqmm
2x dumpload	6sqmm/4sqmm
2x battery output	16sqmm/10sqmm
2x consumer output	16sqmm/10sqmm
2x temperature sensor	1.5sqmm
Temperature 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

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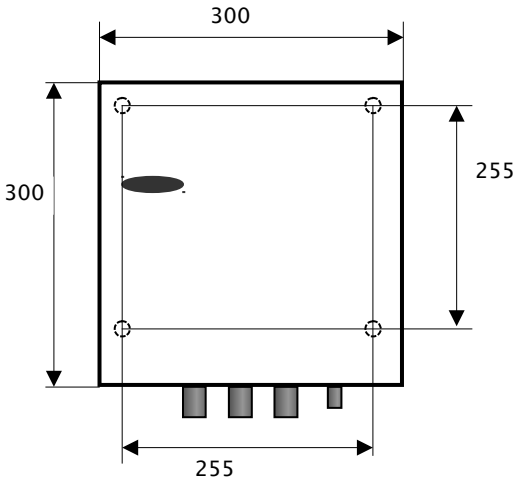
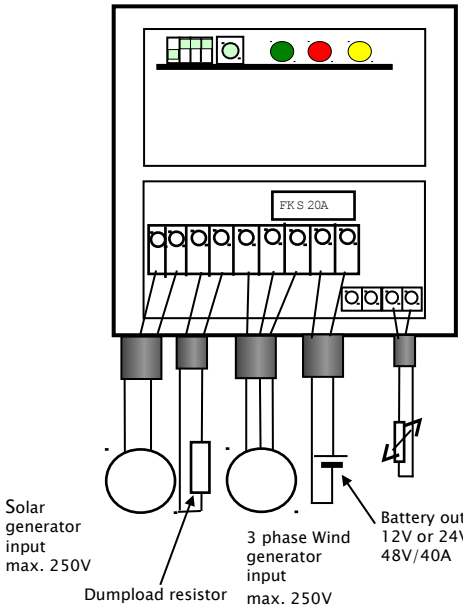
Housing dimensions:

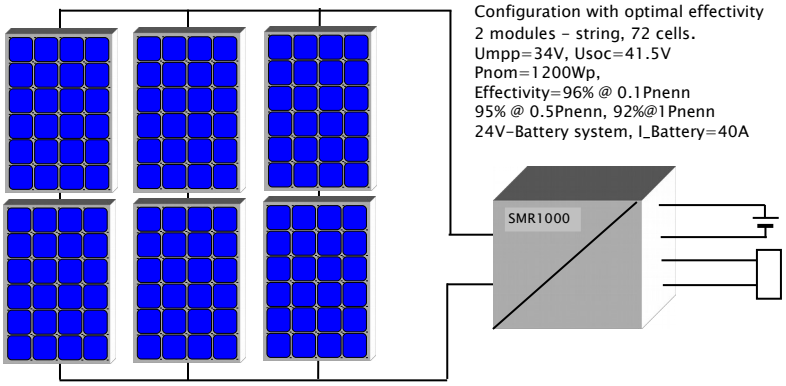


Height=150mm
Mounting holes in bottom of housing
D=10mm

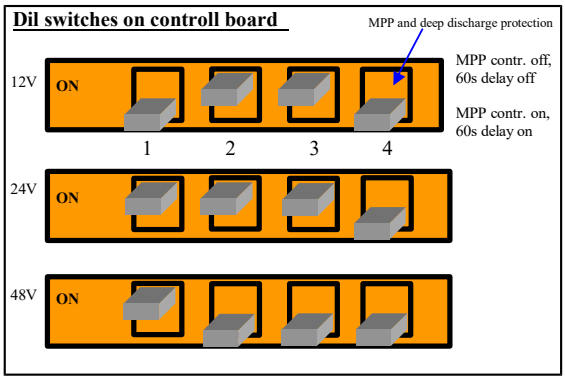
Connection diagram

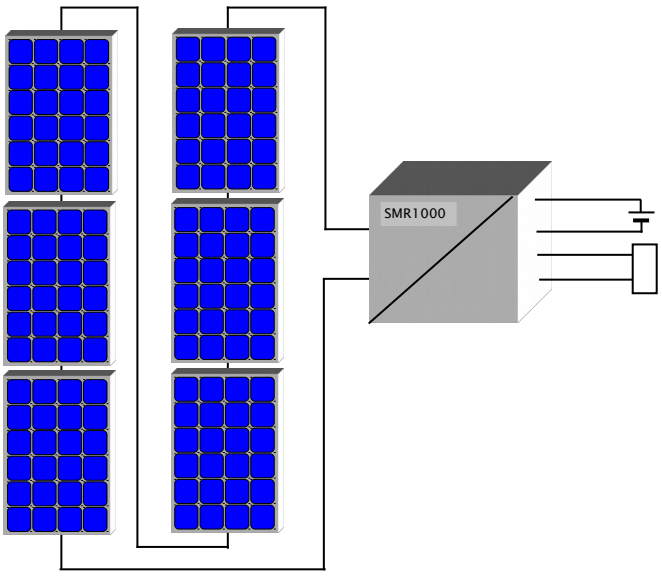


Applications:



Configuration with optimal effectivity
2 modules - string, 72 cells.
Umpp=34V, Usoc=41.5V
Pnom=1200Wp,
Effectivity=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

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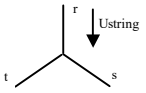
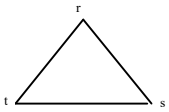
Windpower Basic calculations:

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**