MPPT- Solar-Wind-Hybrid-Charge-Controller SWMR1K-05k

Description:

The SWMR1K-05K is 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 1208Wp at 24V- and 604Wp at 12V-Systems. As well as by a windgenerator of 617W at 24V- and 322W 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 200V 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 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
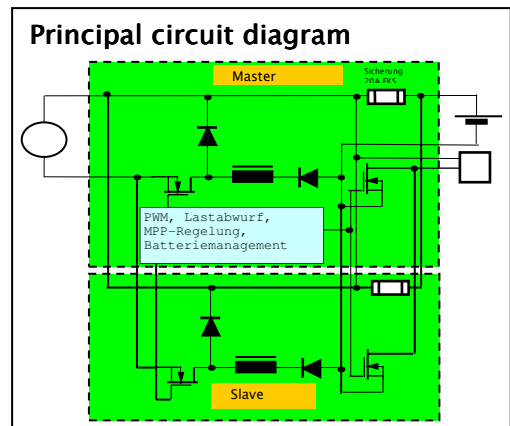
Highlights:

* 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

Efficiency vs solar- wind power(1)
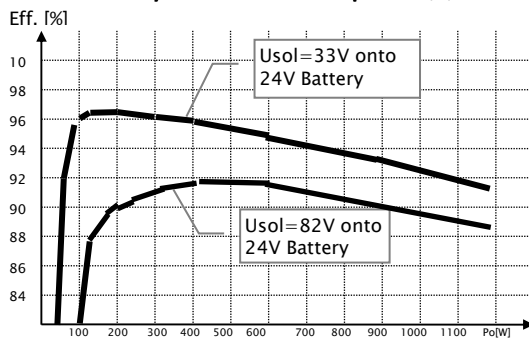
(1)   Subtract 2% effectivity for wind power and divide by 2 Po-values of X-Axis.

Charge current vs Battery voltage
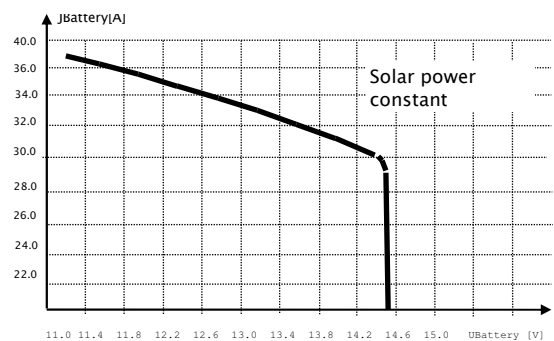
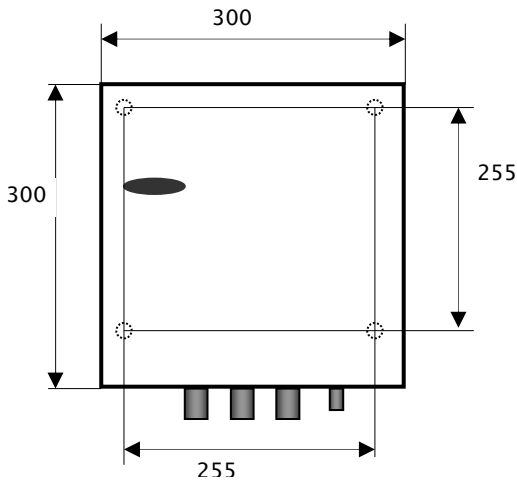
Technical data are subject to change

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	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	624Wp	1208Wp	1510Wp	**Max. wind power, Pnom**	322W	617W	771W
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 **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**	7mA	7mA	7mA

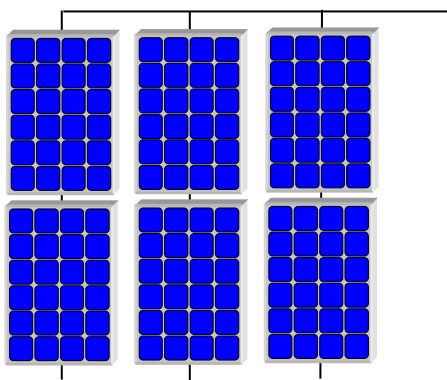| <u>Terminals:</u>	
2x Solar generator input	16sqmm/10sqmm
3x Wind generator input	16sqmm/10sqmm
2x dumpload	6sqmm/4sqmm
2x Battery output	16sqmm/10sqmm
2x consumer output	16sqmm/10sqmm
2x temperture sensor	1.5sqmm
Temperatur sensor	KTY10–5 or 1.91kOhm
Cable glands	3xPG16, 1x PG11, 2xPG7
LED's	right: 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℃ to +50℃

Housing dimensions:

300

300

255

255

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

Connection diagram

FKS 20A

Akkutemp. Sensor
KTY10-5
or Resistor
1.91kOhm for
20°C

Solar
generator
input
max. 250V

Dumpload resistor

3 phase Wind
generator
input
max. 150Vac

Battery output
12V or 24V/60A
48V/40A
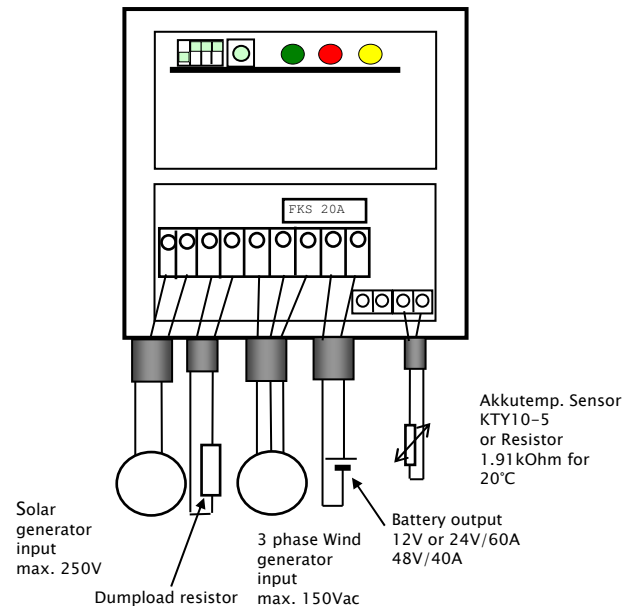
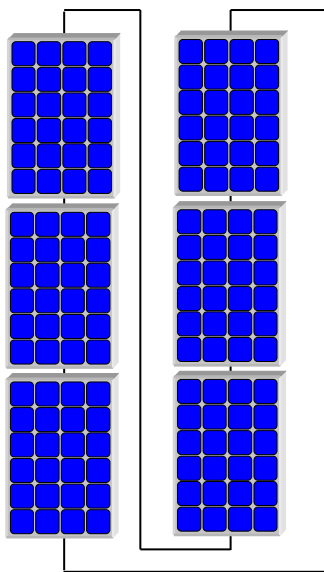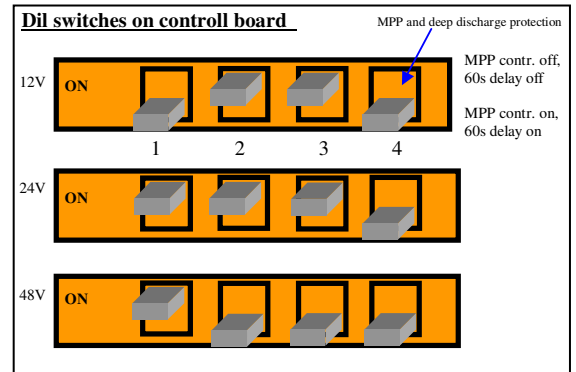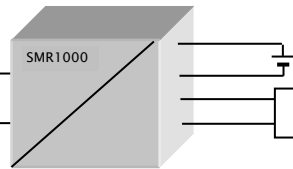## Applications:

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

SMR1000

Dil switches on controll board				MPP and deep discharge protection

MPP contr. off,
60s delay off

MPP contr. on,
60s delay on

12V ON

1   2   3   4

24V ON

48V ON

SMR1000
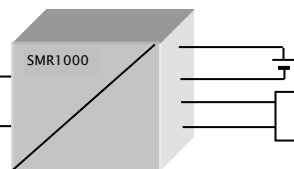
Configuration with
maximum Solar voltage
6 modules – string, 216
cells.
Umpp=102V, Usoc=124V
Pnom=1200Wp,
Effectivity=81%@ 0.1Pnom
91% @ 0.5Pnom, 89% @1Pnom
24V–Batterysystem,
I_Battery=40A

Technical data are subject to change

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**

Wind-   3phase   MPP-tracking   Battery
generator   rectifier   buck regulator   consumer

Fuse
10A FKS

Rdumpload

Technical data are subject to change

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