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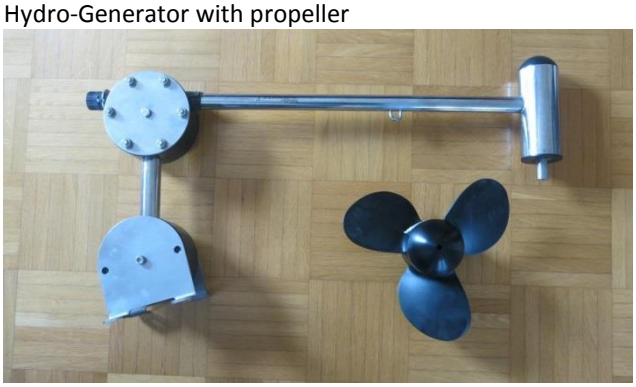
General Information

The SailingGen is a Hydro-Generator for sailing boats which is installed on the stern of the boat. The system is optimized for a sailing speed between 3 and 8 knots and can deliver up to 15 amps of charge current for 12 V battery systems.

The SailingGen Controller is a charge controller, monitoring the charging process of the SailingGen. The Hydro-Generator is automatically separated from the battery by the Controller when the charging process ends. The Controller gives acoustic signals if the Hydro-Generator should be lifted out of the water. It limits the charging current to a maximum of 15 amps or a lower value that can be regulated in the setup. Having reached a full battery status, the Controller throttles the charging power to the current demand for electricity of the sailing boat instruments. The output of the Controller can be directly connected to a 12V-system.

Accessories of Delivery

Hydro-Generator with propeller



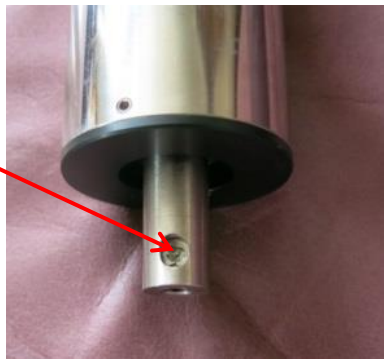
SailingGen-Controller, consisting of the Controller-Box and the LCD-Display

MECHANICAL INSTALLATION

Assembling propeller on generator axis:

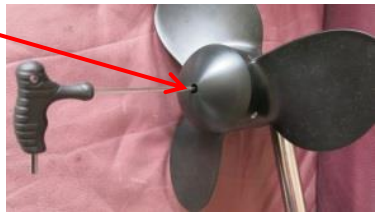
1. Use seawater proof grease to lubricate shaft seal of generator axis and the propeller axis itself.

2. Orientate propeller axis, so that the blind hole in the axis is visible.

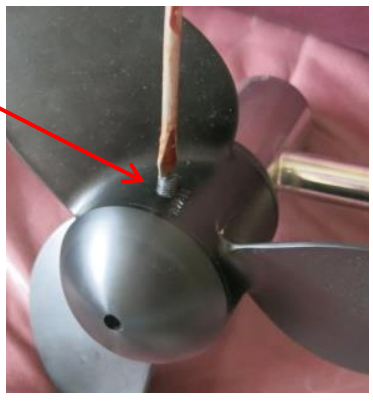


3. Remove the covering screw on the side of the propeller. The propeller must be positioned on the axis correctly! That means the lower socket screw must catch the blind hole in the propeller axis. Make small movements of the propeller to find the blind hole position when closing the hexagon socket screw.

4. Seize the axial M8-socket screw on propeller axis.



5. Close the hole with the covering screw. This also blocks the socket srew below!



Dismounting of propeller in reverse order!

MOUNTING OF THE HYDRO-GENERATOR HOLDER

Suggestion for a good mounting position:
The best place for the generator holder is in the boat's center or slightly off to portside with the direction of the slack rope to starboard because at a speed over 5 knots the Hydro-Generator wants to lift up to the port side due to the screw effect of the propeller. With the slack rope to starboard it can be avoided that the Hydro-Generator will lift up to the port side at a higher sailing speed.
When positioning the generator holder further to starboard, the angle of the slack rope to lift the generator may become worse and it will become harder to swing the generator up with increasing sailing speed.

Depending on the boats hull thickness a stiffening of the stern with a stiffening plate or disk at the holders mounting position is emphasized.
It can be glued at the inner aft peak, e.g. from a 15 mm boat plywood.

You need 4 M8-Screws to fix the holder on the stern. They are not in the delivery set, because it's length depend on the boat type!

Example for a stiffening disk

Tip for the holder mounting procedure:

1. Drill holes with diameter 7mm from the outside while using the holder as a drilling template. Suggestion: Pre-drill the holes with a smaller drill after marking the hole positions. To prevent the gelcoat not to burst use a counter sunk drill to counter bore the pilot hole to the final diameter, then drill to final diameter 7 mm.

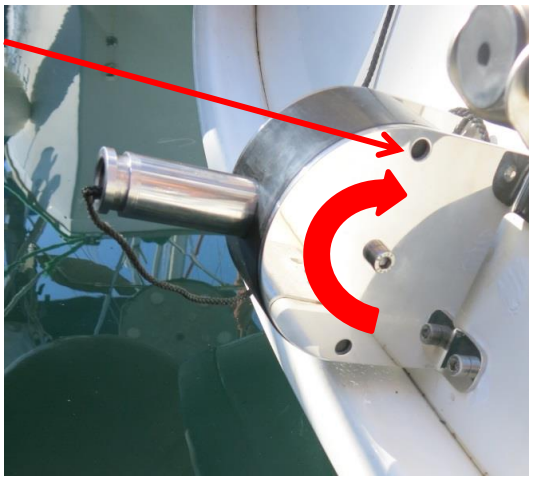
2. The GFK-holes should be drilled first, so it becomes visible from the inside at which place the intern stiffening has to be placed.

3. Thread M8 in the drilled holes and the internal wood-stiffening.

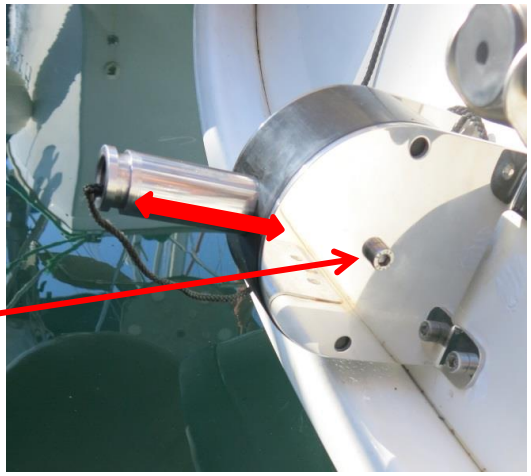
4. Now fix the holder with M8-screws form outside (not included in the delivery) and seal with Sika (or the like) before tightening them.

5. The screws have to be long enough in order to be countered from the inside with M8-screw nuts and washers.

Adjusting the holder orientation:
The sheet metal parts of the holder have 2 holes. One of them shall be used to fix the breaker bold. Drill a hole with 10 mm diameter through the black holder block after the swival axis is orientated horizontally.
The 10 mm hole should be drilled after demounting the holder from the hull. Be careful with the holes perpendicular orientation to hit the opposite hole of the sheet metal part of the backside!



Adapt the length of the swivel axis pipe.
It must be as short as possible to lift the SailingGen shaft up and down as close as possible to the stern.
Shorten the pipe, if it is too long.



The M8-screw must go through the swivel axis pipe! Drill a hole into the pipe in the appropriate position.

During the mounting process with the boat already beeing in the water, secure all parts with a rope not too loose them in the water!
Fixing the SailingGen at the swivel axis:
Use the M8-Screw in the center of the block.
Open the screw only a few turns.

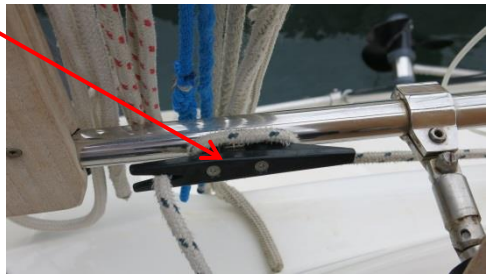
Then position the shaft block of the hydrogenerator and fit the M8-screw into the notch of the swivel axis pipe.

Check if the shaft can be turned up and down, than tighten the M8-Screw in order not to lose the hydrogenerator in operation.

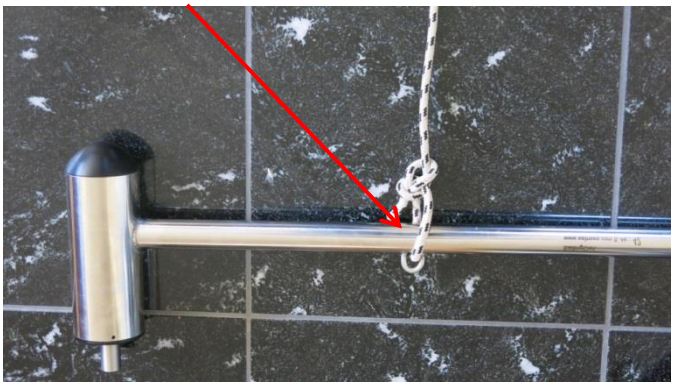
The hydrogenerator can be lifted upwards completely.
Find a solution to fix it in its parking position.

When using a bathing ladder, you can turn the Hydro-Generator up and fix it somewhere to port with a rope.

To fit the slack rope:
Install a curry clamp or other device (pulley) at an appropriate position



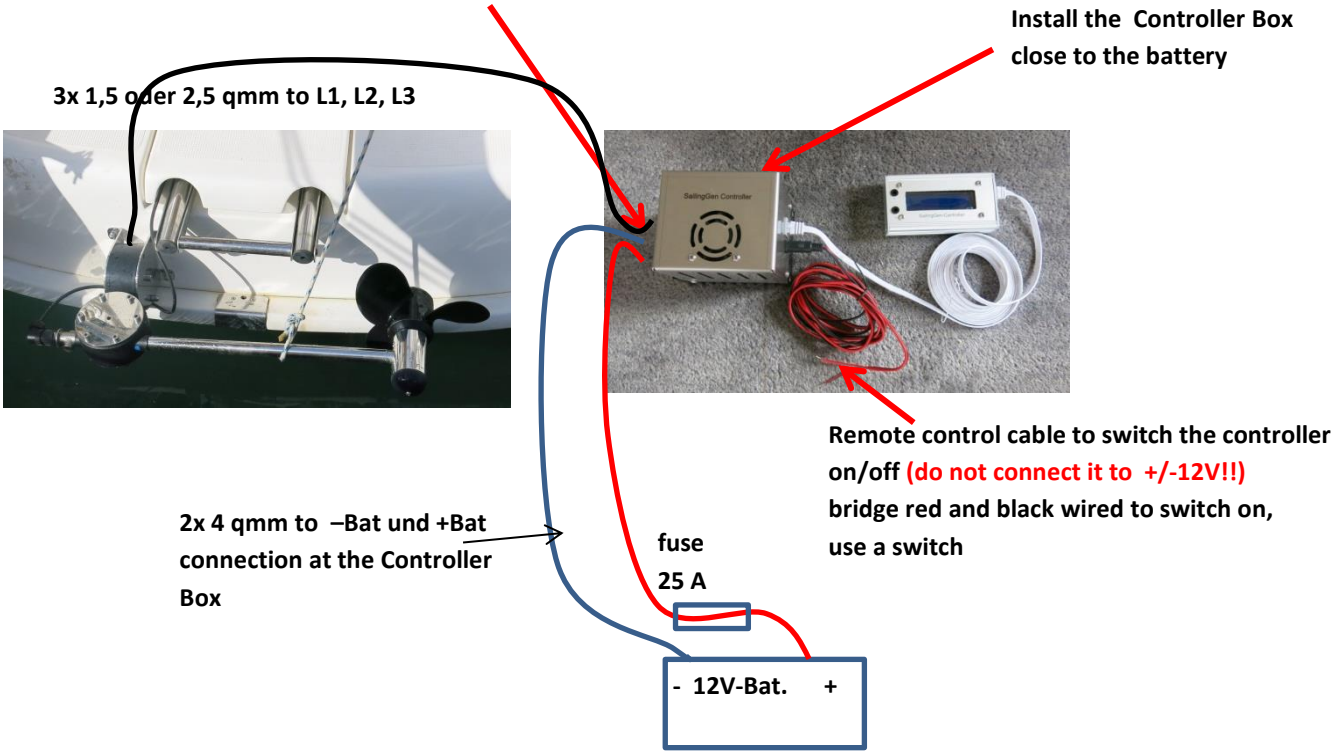
To fit the slack rope at the pole:
Put the rope with a palstek through the provided eye.



ELECTRICAL INSTALLATION

GENERAL VIEW

Note: Connection „+BGL" is not used in normal mode of operation!



The Controller does not require energy if the wires of the remote control cable are open.

The –Bat and +Bat charging outputs can be directly connected to the battery. The Controller limits the charging current electronically to a maximum of 15 amps and it has 2 internal 20 amps fuses.
While the Hydro-Generator is working – the Controller may not be turned off ➔ take Hydro-Generator out of water before turning off.

The 25A fuse nearby the battery protects against short circuit and mistake in wiring between battery and Controller.

Important: Make sure that the connection between plus and minus output of the Controller with the battery terminals is secured, especially when the SailingGen is working (better: the whole time). Don't put a switch in the +battery charging wire and then forget to turn it on or rather don't turn it off when the generator is working. A turned on Controller would in this case not be able to deliver the generator's energy and during high speed frequency the Controller would be damaged.

MOUNTING OF THE CONTROLLER-BOX:

Install Controller-Box if possible nearby the battery.
It is fixed with the 4 delivered retaining feet. The housing should be well aerated. Mounting: The cooling fins should lie vertical, ensuring that the generated thermal produces air movement.
The box is not waterproof!! You should find a try place for mounting!

Place the LCD-Display somewhere it can be visible, if possible nearby the place the boat is navigated from. The back side the LCD-Display module is equipped with a double sided adhesive tape, providing an attachment without remaining damage. The length of cable between LCD-Display and Controller-Box is ca. 3m. It may not be lengthened! Use only the network cable of the delivery set!

CONNECTING CABLE HYDRO-GENERATOR TO CONTROLLER

The Hydro-Generator has a 4-terminal plug with the pin-assignment as it follows:

Plug at Hydro-Generator		**Flat plug at Controller-Box**
Pin 1	Phase L1	L1
Pin 2	Phase L2	L2
Pin 3	Phase L3	L3
Pin ⏚	open	

The delivery covers a suitable counterpart to the plug at the Hydro-Generator as well as a waterproof cover cap.

The wire to the Controller / to the battery is not included in the delivery because its length depends on the individual installation. Use a seawater proof and UV-proof 3-wire cable with a wire cross section of 1,5 $mm^{2,}$ better 2 mm^2 at a minimum.

Suggestion: Ölfex-cable of Fa. Lappkabel, Source: Fa. Conrad, e.g.:

http://www.conrad.de/ce/de/product/1038788/Steuerleitung-OeLFLEX-ROBUST-210-3-x-15-mm-Schwarz-LappKabel-0021930-100-m?ref=searchDetail

The 3 wires are connected to the Controller-Box according to the labelling on the casing: L1, L2, L3 (see grid above).

If a board implementation with a waterproof plug-solution is desired, the following plug is suggested (Fa. Reichelt):

http://www.reichelt.de/CA-Serie/CA-3-LS/3/index.html?&ACTION=3&LA=2&ARTICLE=52082&GROUPID=3264&artnr=CA+3+LS

http://www.reichelt.de/CA-Serie/CA-3-GD/3/index.html?&ACTION=3&LA=2&ARTICLE=52092&GROUPID=3264&artnr=CA+3+GD

Caution: The Hydro-Generator may produce dangerous voltages in operation. Wiring must be appropriate for voltages up to 100 V. Installation must ensure sufficient protection against human electrical contact to all connection points!

Basic Operation of the Controller and description of the Display

Display values at start up

The following information appear on the Display when starting the Controller Software(in matters of control):

- the version of the Controller Software
- the programmed limit of charging voltage UBatMax,
- the adjusted type of regulator for the Hydro-Generator

In order to check its function the integrated aerator of the power unit shortly turns on when starting.

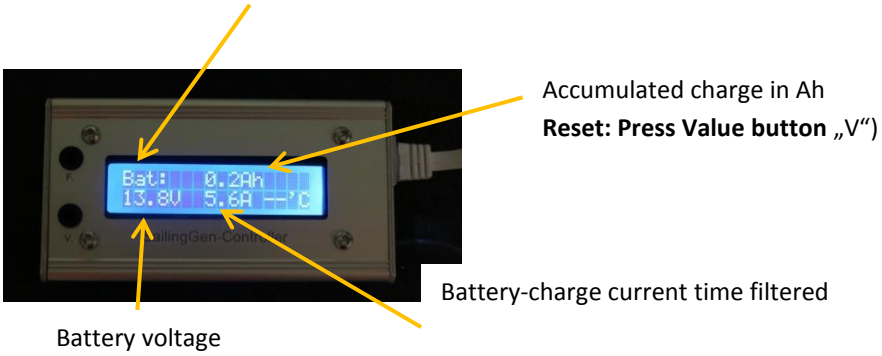
The Buzzer signals - using a continuous tone (ca. 1 sec.) - that the Hydro-Generator can be let into water, if not already happened. The display tells: *„Set Gen in water“*.

From now on the Online-Values of the system are shown. With the Functional-Key two different value groups can be chosen.

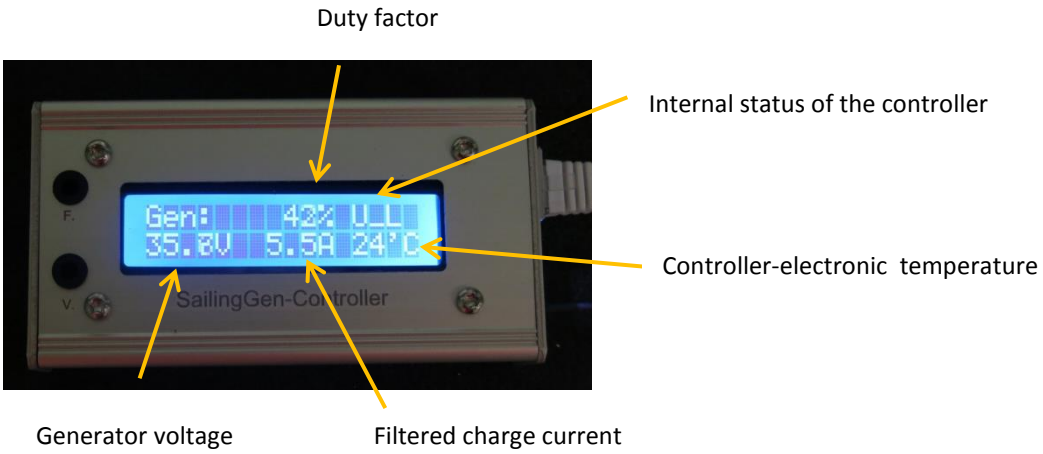
Select Value group

Change the value group by pressing the Functional-Key for about one second.

VALUE GROUP “Battery Values”:



VALUE GROUP „GENERATOR-VALUES“:



GENERATOR VOLTAGE:

Output Voltage of the bridge rectifier circuit at the input of the internal step-down converter.
Note: If the voltage is lower than the board battery voltage „----“ appears.

CHARGING CURRENT:

In operation of generator the charging current fluctuate continuously because of sea condition and sailing motions. That's why the charging current values are shown with a low-pass filter with a time constant of approx. 5 sec.

DUTY FACTOR:

The duty factor defines the operation point of the Hydro-Generator. The value in % is the duty factor of the intern pulse duration modulation of the step-down converter. It corresponds to the percentage Turn-On-Time of the Hydro-Generator. A small duty factor reduces the charging current.

STATUS OF CONTROLLER:

display	**meaning**
init	Initialization: If the generator is not yet in the water there is a buzzer sound, duration 1 sec., Display shows „Set Gen in water“.
ramp	The duty factor starts from lowest level up to the target value (depending from the type of controller, see above)
norm	Normal operation: the charging current is monitored on.
I_L	Current limitation : The duty factor is reduced for not passing over *IGen_Max*
U_L	Voltage limitation: The duty factor is reduced for not passing over *UbatMax*. The Hydro-Generator delivers only as much energy as the board systems are requiring.
Gout	The alarm buzzer rings and the message „take out Gen“ occur. Take the Hydro-Gen out of the water, the battery is now fully charged.

off1	The Hydro-Generator stays turned off for about 3 minutes after the battery was fully charged and the Generator was taken out of the water (minimum off period). If the Hydro-Generator gets into water during this time the controller sets back to the mode „U_L“.
off2	At the end of the minimum off period (Mode *off1*) the controller checks if the board voltage has fallen under the previously in the setup defined switch-on voltage. If so, the controller returns to the mode init and restarts the Gen.

SETUP-MENU

1. Press the function-key and the value-button simultaneously to enter the set up menu.
2. Select the displayed value type using the function-key.
3. Change a value using the value-key between the allowed limits.
4. Press the value-key while having chosen the option „Quit and Save“ to leave the setup-menu. All values will be stored in the electrically erasable ROM (EEPROM).

   The following values can be changed:

Value	**range**	**meaning**
“IGen_Max”	5 … 15 A (default 15 A)	Charging current limit in A
“UBatEnd”	13.8 – 15.0 V (default 13.8 V)	End of charge voltage in V
“PWM_Set_Val”	14 – 96 (default 95)	Only for Regtyp_Gen == 2: maximal duty factor in %
“Display”	10 - 100	Display-brightness in %
“UBatEin”	13,0 V … UBatEnd - 0,5V (default 13,1V)	Battery voltage, Controller switches on the SailingGen again if it was switched off before.
“Quit and save”	-	Quit the setup menu with the value-key

Note: After quitting the setup there will appear 6 numbers on the display. They count the frequency of errors since delivery. Those numbers cannot be deleted.

FACTORY-RESET

Press the function-key and the value-key simultaneously during the start up procedure of the controller to restore the default values (factory reset). “Set Default” will appear on display.

DISPLAY-/PIEZO-BUZZER-MESSAGES

Error messages are announced with 5 acoustical alarm sounds from the piezo buzzer. The corresponding information appears on the display. Those messages are appearing cyclical as long as the error occurs. Every error message is recorded and counted in the EEPROM. So it can be detected how often an error occurred.

Important: If the alarm buzzer sounds cyclically,, the Hydro-Generator must be taken out of the water because this sound schema implies a high danger of damage for the Generator, controller electronics and /or battery!

"Overtemp TPWM" "Take out Gen!!!"	The electronic of the controller has reached the upper limiting temperature.
"Overvoltage Gen" "Take out Gen!!!"	The voltage of the generator has reached the upper limit value (e.g. if the controller wants to switch off and the turbine idles.)
"Overvoltage UBat" "Take out Gen!!!"	The battery voltage is too high.
"Bad. Bat.-Connect " "Take out Gen!!!"	The charging connection to the battery is not in order and the charging power cannot be delivered.
"Bat nearly full" "Take out Gen!!!"	The controller has set to the lower PWM-limit. The Hydro-Generator hardly delivers charging power anymore and idles unnecessarily.
"Overload I_Gen"	The upper charging current limit 15 Amps has been clearly passed over, thus the Hydro-Generator has to be throttled or taken out of the water.

Note: The message on the display always appears at the beginning of a new alarm buzzer period. It then disappears and the online-values are shown in order one can recognize the status of the values.

By pressing the „Value-Key" the last occurred error message can (uniquely) been brought back to the display.

TROUBLESHOOTING

A simple test procedure for the Hydro-Generator is:
Unplug the Hydro-Generator and bypass the connector pis 1,2,3 with some sort of metal.
Now turn the propeller by hand. If you feel a hard torque friction the Hydro-Generator is electrically o.k. Without bypassing, it should turn with low torque friction.

Of course it is possible to measure the three AC voltages of the Hydro-Generator at the connector pins when turning it manually.

Use a circuit indicator to check the pins 1, 2, 3 at the plug for bypass to the stainless steel housing of the hydrogenerator. The pins 1, 2, 3 may not have contact to it.

Between the pin 1 and pin 2, accordingly between pin 2 and pin 3 and between pin 3 and pin 1 you should measure an inductive resistance of 0.6 ohm, if the coil winding of the generator is okay.

Controller-message: „Bat.-Connection not ok": If the wires to the battery are checked and okay, there are 2 internal fuses (25A) in the controller-box which can be blown.

Emergency operation of the Hydro-Generator without Controller:

If the electronics of the controller fail during sailing, the Hydro-Generator can still be used without those as long as the integrated bridge rectifier is still working. Remove the cable form the connection „+Bat" and put it in „+BGL" (exit of the bridge rectifier, see photo on page 9). The Hydro-Generator

voltage is now rectified and directly connected to the battery. The LCD-Display can stay turned off. The surveillance of the battery voltage is now carried out in person.

MAINTENANCE AND HAZARD NOTE

Generally the Hydro-Generator is maintenance-free.

The Hydro-Generator should be checked against leakage regularly. In case of a leakage the internal oil will escape there. In this case the generator may not be used any more. The oil serves cooling purposes and it provides the lubrication of the bearing and planetary bearing as well as corrosion protection.

It is recommended to check the friction torque of the propeller by hand regularly (e.g. once or twice a sailing day). If the propeller turns with high friction or if it feels nearly blocked there may be something blocking at the propeller axis, for example a fishing line which was captured in operation. Do not use the generator before this problem is solved!

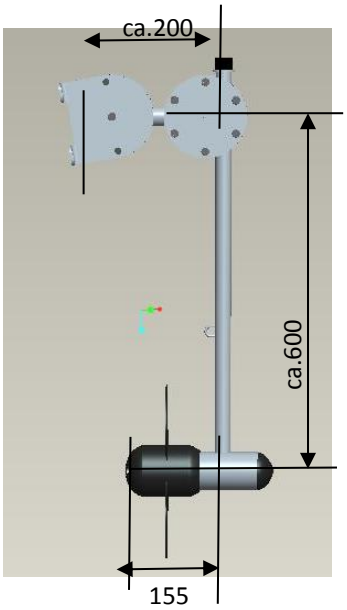
In operation the rotation of the Hydro-Generator can be observed by a humming sound. If this sounds dramatically changes, please look out for the reason. **In case of doubt, take FIRSTLY the Hydro-Generator out of the water and SECONDLY switch off the controller electronics, not in reverse order!**

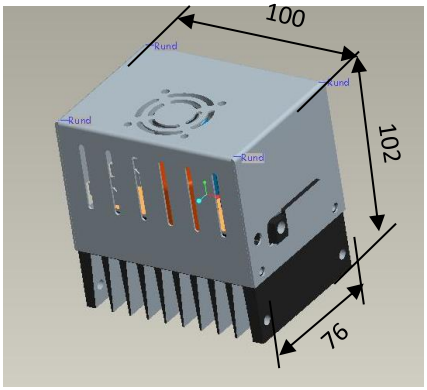
Check the locking screw of the Hydro-Generator holder regularly (which locks the Hydro-Generator) to prevent a loss of the Hydro-Generator during operation.

The cable and the plug connection must not be under tensile load. Do not overturn the Hydro-Generator's cable several times. This may lead to a broken cable.

TECHNICAL SPECIFICATIONS

Hydro-Generator and controller casing: all measures in mm



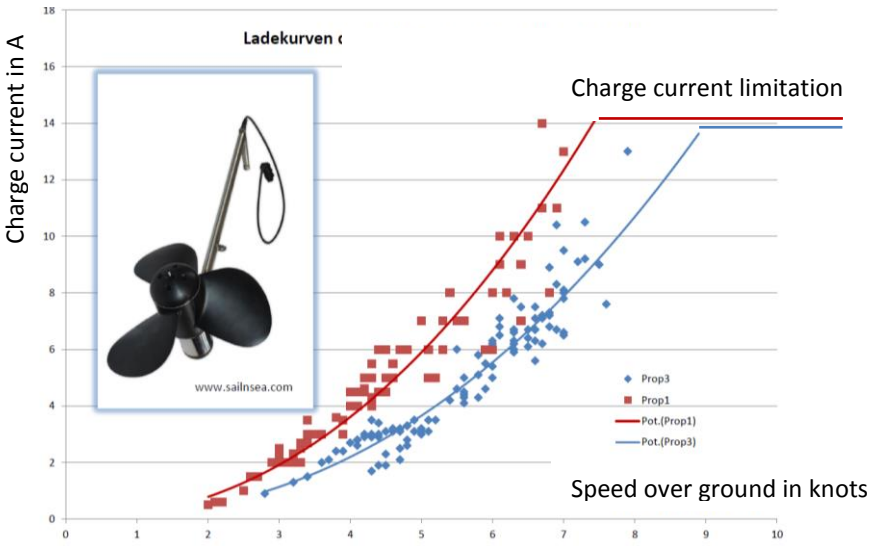


100 x 55 x 24
(LxBXT)

SailingGen Controller Electrical Specification:

Current consumption	40 mA in online mode 0 mA in offline mode
Maximum charge current	15 A
Battery voltage	12 V

SailingGen charge characteristics with the two available propeller sizes



SAILNSEA LIMITED WARRANTY

SailnSea warrants that in normal usage and with proper maintenance this product will confirm it's specification for a period of two years from the date of purchase by the end user. Any component, which proves to be defective in normal usage during this two-year period, will be repaired or at SailnSea's option, replaced by SailnSea.

CONDITIONS AND LIMITATIONS

1. SailnSea's liability shall be limited to the repair or replacement of any part of the product which are defective in material or workmanship.
2. SailnSea shall not be liable in any way for product failure or any resulting loss or damage which arises from
   a) Faulty or deficient installation of the product
   b) Any modification or alternation of the product
   c) Conditions that exceed the products performance specification or safe working loads.
3. Product subject to a warranty claim must be returned to SailnSea unless otherwise agreed by SailnSea in writing.
4. This warranty does not cover any incidental costs incurred for the investigation, removal, carriage, transport or installation of the product.
5. Service by anyone other than SailnSea shall void this warranty.

EXCEPTIONS

Cover under this warranty is limited to a period of one year from the date of purchase by the end user in the case of any of the following parts of the products: Electric parts, electronic controls, weather seals, products used in racing applications.

LIABILITY

SailnSea's liability under this warranty shall be to the exclusion of all other warranties or liabilities (to the extent permitted by law). In particular, but without limitation:
a) SailnSea shall not be liable for:

1. Any loss of anticipated turnover or profit or indirect, consequential or economic loss;
2. Damages, costs or expenses payable to any third party;
3. Any damage to yachts or equipment;
4. Death or personal injury (unless caused by SailnSea's negligence).

Some states and countries do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

b) SailnSea grants no other warranties regarding the fitness for purpose, use, nature or satisfactory quality of the product.

SEVERANCE CLAUSE

If any clause of this warranty is held by any court or other competent authority to be invalid or unenforceable in whole or in part the validity of the remaining clauses of this warranty and the remainder of the clause in question shall not be affected.

DISPUTES

Any dispute arising under this warranty shall be referred to the Court in Stuttgart/Germany.