



Instructions for use / installation manual

SILENTWIND
12V / 24V / 48V



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Dear customer

Thank you for buying our product. You have selected a new generation of windgenerators.

Compared to traditional windgenerators, the essential advantages of our product are:

- safety,
- efficiency
- very low noise emission.

You will also profit from our experience of more than 30 years with various windgenerators used in offshore sailing. For long distance cruising the availability of electric energy without the possibility of grid connection is essential.

Fair winds at any time

The Silentwind Team

Please note that this manual is part of the product and must be read carefully. Please study the information thoroughly before installing the SILENTWIND. This manual should always be kept near the product and passed on to future owners.

This manual is addressed to the person installing the SILENTWIND. This person should be familiar with electric wiring and the use of appropriate tools. Otherwise the SILENTWIND should be installed by a specialist.

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1. Operation and use

It's certainly an advantage being able to use the renewable energy of both wind and sun combined. One can charge his batteries making use of daylight and wind for 24 hours. Our hybrid charge controller is suitable for both sources, windpower and max. 550Wp (40A) solarpower → Hybrid-charge controller.

You can also charge the batteries of an electric vehicle with this unit.

Further applications are:

Any application without grid connection, research units, traffic management systems, emergency systems, street lamps, billboard illumination, projects in developing countries, wireless LAN access points, holiday homes with inverters for independent provision of electricity, wherever there is no grid connection available or too complicated to install.

The SILENTWIND is ultralight and aerodynamic, so that it is possible to connect several windgenerators if your energy demand is high. As noise emission is very low you can operate the SILENTWIND in neighbourhoods and on sailing yachts without annoying your neighbours.

Our charge controller HYBRID 1000 is suitable for 12 and 24 volt usage and can be connected to the SILENTWIND and solar panel.

Another advantage of the SILENTWIND is that it does not have any inbuilt electronics which means that there is hardly any maintenance work on the mounted windgenerator. The electric power is led down to the charge controller by 3 cables.

The hand laminated carbon fiber blades were successfully tested in a wind tunnel up to wind speeds of 35m/s (63 knots) according to DIN EN 61400-2. Therefore you need not worry about the SILENTWIND in any storm conditions. For maintenance work there is an additional manual stop switch.

2. Safety instructions

Due to the high RPM and electric energy that windgenerators generate, use should be made with caution. Therefore carefully read the following safety instructions.

2.1. Mechanical risks

For various reasons the turning rotor system must be handled with caution. You cannot see the end of the blades in high wind speeds so you do not recognise the inherent danger. Due to their aerodynamic shape the blades have very sharp edges that may hurt you in high wind conditions.

Never ever try to touch the turning rotor system!

Never ever try to stop the turning rotor system manually!

Make sure that you install the windgenerator in a position where nobody can touch the blades. Especially on boats ensure a sufficient height above deck.

The blades are produced from carbon fibre, which is extremely solid even in high wind speeds. Therefore keep away from the turning blades in any case. However,

they can break due to ropes or other objects touching the blades in very strong winds.

If one of the blades is damaged, activate the brake function manually with the stop switch of the charge controller. If one of the blades is damaged, the rotor system will be out of balance which may be a risk for the whole mounting construction. This has to be considered before mounting the windgenerator in a safe position.

Before you install the windgenerator on a mast construction make sure that the 3-phase wiring is disconnected from the charge controller or secure one blade so that the system cannot turn. You can also connect the 3 AC wires to block the system during mounting. Another possibility to install the system is to attach the hub with the blades to the shaft at the very end of the mounting procedure. The mast must be well fixed so that it is safe in strong wind and adverse sea conditions. Furthermore the mast-fixation and the mast-stays should be assembled in a way that applied vibrations will be not enhanced. Please ask a professional who is able to assess the load that the mounting system can handle in strong wind conditions.

2.2. Electrical risks

An idle running windgenerator can generate a considerable AC voltage per phase. Only connect all components if you are familiar with electric wiring. The high voltage can cause serious injuries and fire if you do not pay attention to safety. **Caution** recommended for cardiac pacemakers users, etc. Never touch the open end of the wires. The current when charging the batteries can reach more than 30A DC. The whole wiring electric components and connection points must be able to carry a current of 40 A. Find information about suitable cable dimensions on page 9.

Warning: Wires with insufficient diameters can cause fire.

Make sure the wires are placed so that mechanical damages cannot occur. A damaged cable is a severe safety risk. Install a fuse to the batteries positive pole as close as possible to the battery. The required value of the fuse depends on the rated current of the devices connected to the charge controller. Please contact a professional for this purpose. We recommend a fuse with the double nominal current of the connected devices.

Warning: When connecting the batteries, sparks can arise.
A short circuit is to be avoided.
Always ensure sufficient ventilation!

The electrical installation should be carried out by persons with appropriate technical skills and knowledge. Before a storm the SILENTWIND should be manually stopped with the stop switch on the charge controller. In case of storms we recommend fixing one rotorblade to the mast due to the risk of damage by flying objects.

2.3. Installation risks

Only use or build mounting/support systems that can handle the load of the generator and the blast pressure of the wind in any condition.

Working on the mounting system should only be carried out on a calm day. Make sure that nobody is close to the mast.

Disconnect the battery from the charge controller when working in the system. The turning of the blades must be avoided by fixing one blade to the mast. If not the charge controller will be destroyed.

3. Technical data

3.1. Windgenerator

3.1.1. Electrical data

Type of generator	Permanent magnet generator, 3 phases, AC
Rated voltage	12 VDC / 24VDC
Rated power	420 Watt / 450 Watt
Rated peak power at	14,5 m/s
Start up speed	2,2 m/s
Start of charging	2,5 m/s
Charge indicator	Blue LED on the bottom of housing

3.1.2. Mechanical data

Safety test in wind tunnel	122 km/h without failure
Rotordiameter	1,15m
Number of blades	3
Weight of blades	150g/blade
Material of blades	Carbon fibre, hand laminated
RPM range	550 - 1700 Upm
weight	6,8kg (Generator)
Package dimensions	780x400x210mm weight: 10 kg
Colour	white RAL 9010, powder coated
Warranty	36 months

3.2. Charge controller

- Charge and power management in the provided external hybrid-charge controller Hybrid 1000
- Maximum voltage adjustable for acid-, gel- and AGM-batteries.
- Brake mode: electronically or manually with integrated Stop-switch (see enclosed manual)

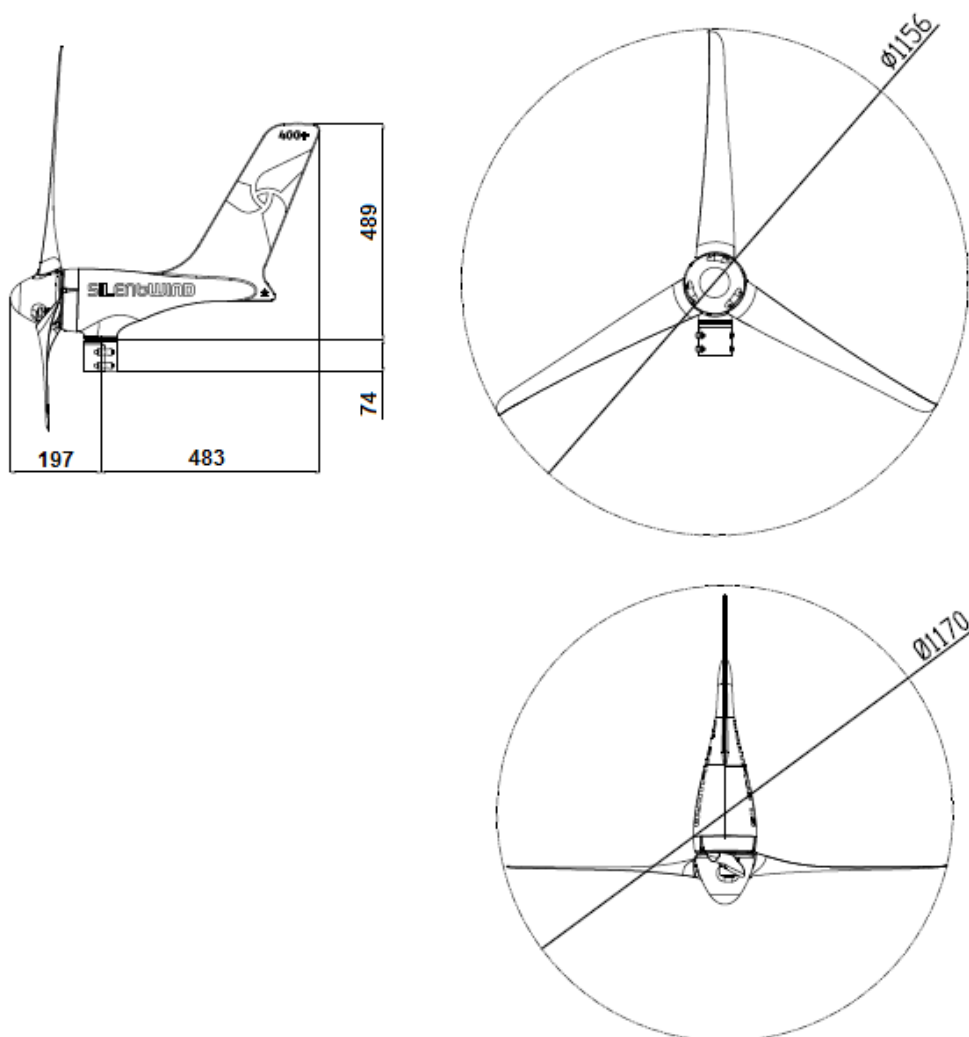
3.2.1. Electrical data

System voltage	12/24 VDC
Max. power input windgenerator	600 W
Max. current input windgenerator	40 A
Max. power input solar	550Wp
Max. current input solar	40A
Max. open circuit voltage input solar	50VDC
LCD + LED displays	W, V, A, kWh, Ah, load data

3.2.2 Mechanical data

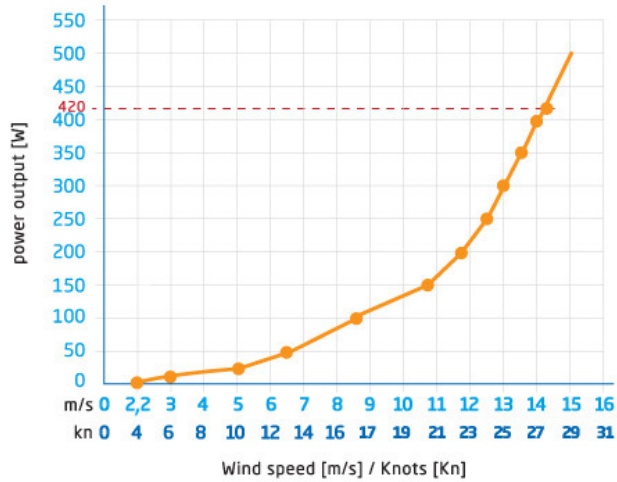
Weight	1,50kg (controller)
Package dimensions	270x130x80mm
Warranty	24 months

3.3 Dimensions



3.4. Power diagram

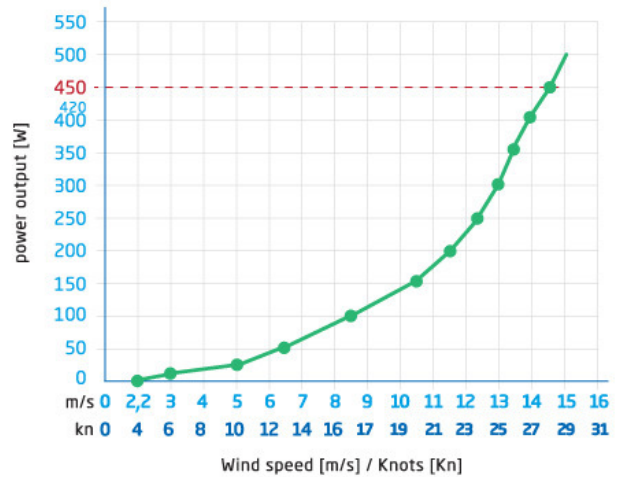
power curve
silentwind 12V



● 12V

* measured in the wind tunnel with laminar wind.

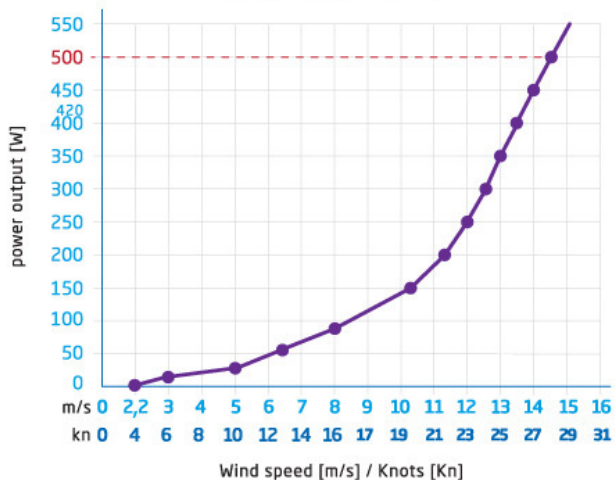
power curve
silentwind 24V



● 24V

* measured in the wind tunnel with laminar wind.

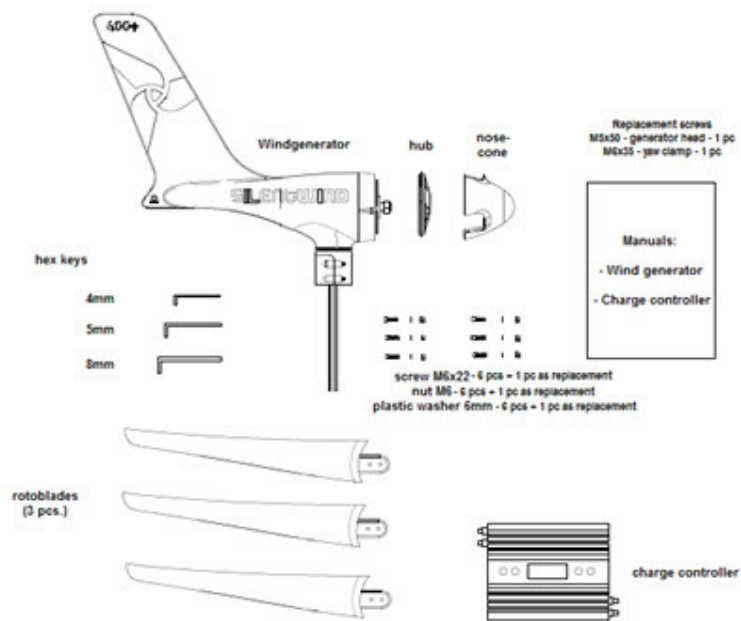
power curve
silentwind 48V



● 48V

* measured in the wind tunnel with laminar wind.

4. List of enclosed parts



48V version – Delivery without Charge Controller

All provided information is reliable. RULIS Electrica, Lda. will not be liable for damages resulting from a wrong installation and/or operation of the wind generator. All specifications are subject to change without notice.

5. Operation description

All windgenerators use the kinetic energy of the wind. This energy is captured by the turning motion of the blades and consequently transformed into 3-phase AC power. The energy output increases in line with the wind speed, exponentially. This means that doubling the wind speed generates octuple power. This must be especially considered in storm conditions.

Our **spb^Ω** blades are made of high-tensil carbon fibre and are hand laminated with epoxy resin. This material provides the maximum consistency with the lowest weight. This material is also used in Formula 1 and airspace industry. Therefore these CF-blades are extremely light, but can resist even the strongest wind conditions. They have been successfully tested at German WindGuard – according to DIN EN61400-2 (VDE 0 127-2) at windspeed of 122 km/h at 5480 RPM. This is an equivalent of sonic velocity at the tips of the blades. For every-day use and safety reasons we have equipped the charge controller with an electronical and manual stop switch.

6. Diameters of cables

System voltage 12 Volt

Distance from wind generator to the charge controller in m	0 - 9	10 – 19	20 – 29	30 – 44	45 – 69	70 – 110
Cable cross section mm ²	6	10	16	25	35	50
AWG	10	8	6	4	2	1
Distance from the charge contr. to the battery in m	0 - 9	10 – 19	20 – 29	30 – 44	45 – 69	70 – 110
Cable cross section mm ²	16	25	35	--	---	---
AWG	6	4	2	--	---	---

System voltage 24 Volt

Distance from wind generator to the charge controller in m	0 - 9	10 – 19	20 – 29	30 – 44	45 – 69	70 – 110
Cable cross section mm ²	2.5	4	6	10	16	25
AWG	14	12	10	8	6	4
Distance from the charge contr. to the battery in m	0 - 9	10 – 19	20 – 29	30 – 44	45 – 69	70 – 110
Cable cross section mm ²	16	25	35	--	---	---
AWG	6	4	2	--	---	---

System voltage 48 Volt

Distance from wind generator to the charge controller / inverter in m	0 - 29	30 – 79	80 – 99	100 – 150
Cable cross section mm ²	2.5	4	6	10
AWG	14	12	10	8
Distance from the charge contr. to the battery in m	0 - 29	30 – 69	70 – 99	100 – 150
Cable cross section mm ²	4	6	10	16
AWG	12	10	8	6

7. Installation

Before mounting the SILENTWIND onshore find a suitable position for the windgenerator. It is an ideal position if the wind flows against the blades without any obstructions. The generator should be mounted as high as possible.

Fixed/land installation:

The height depends on the distraction of the wind by surrounding objects. You can simply test this by fixing a 3 m long – 4cm wide plastic band at the top of a min. 4 meter pole. You can use a 2nd band at 2 meter height. This does not apply when mounting the generator on boats.

If the upper band flows horizontally straight or up to 30 degrees only you have found the suitable position. In case the band shows more than 30 degrees or turns round the mast, the position is unsuitable. This test should be carried out at moderate wind conditions and only gives an orientation.

We recommend doing various tests for a correct site assessment. You do not need to do this test if the windgenerator is mounted far away from obstructions. You can also get help from a specialist on small wind turbines.

Installation on a sailing boat:

The assembly height must be chosen in a way that no member of the crew is endangered by the rotor. The mechanical fixation of the mast foot has to withstand the mechanical loads occurring specially in rough sea conditions. We recommend additional rigging to the sea rail or the deck of the ship.

Note: Please note that the SILENTWIND can never be fully efficient if it is not mounted in the prevailing wind direction or distracted by obstructions. Therefore it is important to find a position without obstructions!

Having found the suitable position, an appropriate mast with suitable hardware must be chosen. **The outer mast diameter must be 48mm** and it should be made of stainless steel or aluminum. Please also consider possible maintenance work. The mast with mounted windgenerator should be able to take a wind blast pressure of 250Nm. Grounding of the mast is highly recommendable. On boats you can use the central ground for mast and engine. Ask a specialist for advice.

Once the mast is mounted you can start the relatively simple installation of the SILENTWIND. First connect the 3 CF blades to the assembly hub (see page 15, sketch 4) with the enclosed screws (page 16, sketch 9, assembly- and safety instructions inside the rotor-blade box). The enclosed nylon discs protect against electrolytic corrosion. The fastening torque is 7-8Nm equivalent to a weight of 7-8 kg on a 10cm long lever arm, upright to the lever arm.

If the fastening torque is too high, this will destroy or damage the blades. If the fastening torque is not high enough, the blades can get lose. A wrong fastening torque is a considerable safety risk.

Before the final tightening of the blade screws, make sure that the distance between the blade tips is exactly the same, in order to avoid vibrations. **Move each rotorblade in running direction towards the edge of the blade guide of the hub. The running direction is clockwise looking from the front.** Then fix the blades as described above.

The blades should not be out of balance then. The blades have been balanced statically and dynamically. In case of damage of only one blade you can buy a single one. When ordering one blade, be sure to inform RULIS Electrica, Lda. on the exact weight of the undamaged blades.

**An incorrect tightening torque represents a significant security risk.
Regularly control the fixation of the blades!**

After attaching the blades to the hub, the set is fixed to the generator shaft with the enclosed screw nut (use the enclosed hexagon socket screw key). After that, snap the nose cone into place on the assembly hub. (see page 17, sketch 5,6 and 7)

Then you must connect the three AC outlet cables which have to be led from the SILENTWIND to the charge controller.

Attention During this procedure the 3 AC wires of the extension cable at the end must be connected together. Otherwise the rotor system may start running and you can get injured.

Finally you mount the SILENTWIND on the mast. Fix the 4 hexagon screws to the yaw clamp after inserting the rubber pad (see page 18, sketch 8)

When tightening the screws take care for a uniform, circumferential tightening of the 4 screws. The tightening should be made with small increments in order to avoid damaging the marine grade painting.

8. Getting started

Before getting your SILENTWIND started check the correct mounting and installation according to the following check list:

OK	Test
	<u>Mast construction:</u> Optional; check according to instruction, especially all screw connections, bracing, vertical position. Grounding and lightning protection according to local regulations?
	<u>Electric installation:</u> Check battery status and correct polarity
	<u>Charge controller:</u> Charge controller securely fastened to the mounting location? battery connected with correct polarity, otherwise controller will be destroyed Caution: Connect always first the battery to the charge controller. Are all screw terminals firmly tightened? Is stop switch in position "O"?
	<u>Fuse:</u> Fuse connected as close as possible to the battery?

OK	Test
	<u>STOP switch:</u> If a stop switch from a previous installation is installed in the connection cable at the AC- or DC-side of the charge controller, it must always be removed or secured against switching off. The activation of the stop switch while the windgenerator is running will immediately destroy the windgenerator or the charge controller.
	<u>Wiring:</u> All cables connected in line with plan? Check the polarity of all wires in the screw connection poles. Is the 3-phase cable of the SILENTWIND connected to the charge controller? Are the cables correctly crimped and is the strain relief inserted?
	<u>Yaw shaft:</u> Is the rubber pad well placed?
	<u>Rotor blades:</u> Mounted in line with instructions?
	<u>Assembly hub:</u> Is the assembly hub fixed to the generator shaft? Is the central screw nut fastened with 30 Nm?

Connect to a 3-phase rectifier (optional) or the included charge controller. Please read the charge controller manual for details on its installation.

Now you can go ahead!

9. Run and Stop

Switch the enclosed stop-switch or the stop-switch of the charge controller to position "RUN". If the wires are correctly connected to the battery (without having mixed up the polarity) the SILENTWIND should start charging if windspeed is sufficient. You can control this on the LCD-display of the charge controller.

10. Charging indicator

A blue LED at the bottom of the windgenerator-body shows you if the generator is producing electrical energy. The charging-amount is shown on the display of the charge controller.

11. Check ups

Your SILENTWIND was constructed for long term use without any maintenance. However, simple and regular check ups ensure the necessary security.

Safety first!

Before you start the check up, make sure the blades are stopped and the battery is not connected to the charge controller.

The following check ups should be carried out at regular 12 months intervals:

11.1 Rotor blades

Check if the blades show damages like broken edges, damaged surface or cracks. If you notice any damage, the generator must not be used any longer. Check the screwing one day after mounting and after that every 3 months. Eventually then you can turn to a longer interval.

11.2 Screws

Check that all accessible screws are correctly fixed. Especially the hexagon screws from the hub, the central shaft nut and the fixing of the mast must be checked (see page 17, sketch 4, 5, 6, 7 and page 18, sketch 8, 9).

11.3 Bearings and gaskets

The bearing of the generator shaft and the bearing of the yaw shaft are permanently lubricated. Please check these bearings for free movement, bearing play and watertightness. Deficient bearings must be replaced.

11.4 Corrosion protection

The complete housing is made of seaworthy aluminum and additionally powder coated. If the outer layer is damaged, there is a risk of corrosion. Please paint these spots with suitable varnish (RAL9010)

11.5 Mounting system

Check the mounting system for stability and absence of loose screws (if applicable).

11.6 Electrical system

Please first stop the SILENTWIND generator so that all wires carry no voltage. Check if all connections are properly fixed and not corroded. If corroded they must be removed and treated with contact spray. Give special attention to the battery connections: they must be clean and greased with vaseline. Check the battery in line with the instructions of the producer and (if necessary) refill with distilled water. In the case that more than one battery is used check if all batteries have the same capacity and state of charge.

12. Maintenance

Maintenance of the SILENTWIND is not necessary.
The SILENTWIND is produced for troublefree long-term use.

13. Trouble shooting

In case of problems, however, these can be easily solved by using the following check list:

Windgenerator doesn't start to run:

<u>Possible Cause</u>	<u>Test</u>	<u>Solution</u>
Not enough wind	Measure the wind speed (Anemometer)	Wait for more wind, start up speed from 2,2m/s
Stop switch activated		Switch to „RUN“
Generator shaft sluggish	Turn manually	Connection windgenerator-charge controller damaged, short circuit of AC cables, short circuit of generator, customer service

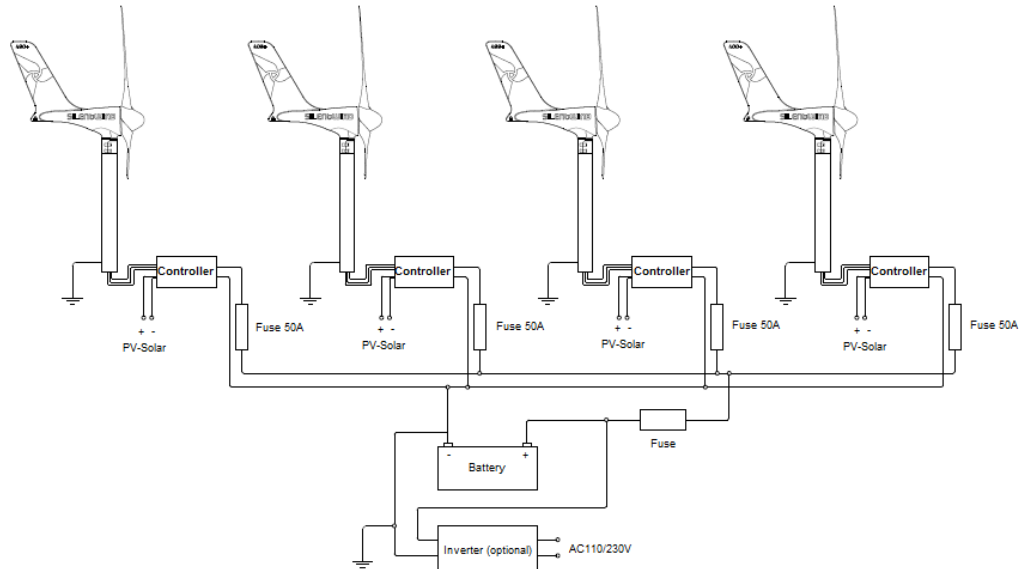
Windgenerator doesn't charge:

<u>Possible cause</u>	<u>Test</u>	<u>Solution</u>
Not enough wind	Measure the wind speed at the rotor. (Wind speed on the main mast-top may be higher)	Start up of charging depends on the battery status, check the adjustment of the charge controller
Electric wiring interrupted	Check wires, connections and gadgets	Replace damaged wires or gadgets
Fuse is gone	Check fuse	Replace fuse or cool down the automatic circuit breaker
Carbon brushes in the yaw shaft have no contact	Check carbon brushes and springs	Replace carbon brushes and reactivate springs

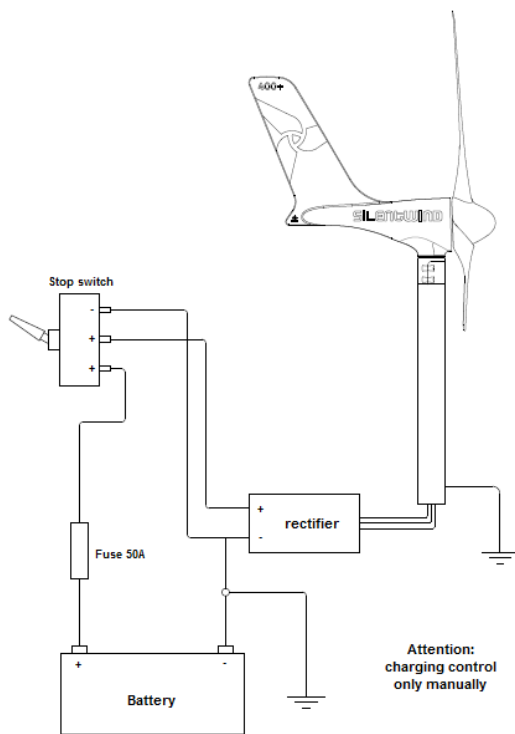
Battery is not fully charged:

<u>Possible cause</u>	<u>Test</u>	<u>Solution</u>
Old, damaged battery deficient	Test battery status and liquid of every battery	Replace battery, refill distilled water (not necessary for gel- or AGM-battery)
Fuse gone	Check fuse	Replace fuse, find cause of deficiencies
Charge controller wrongly installed	Check in line with manual	Correct installation
Charge controller stop-switch is in position "STOP"	Switch stop switch in position "RUN"	Observe manual instructions
Deficient generator	Check AC voltage, AC screw terminals	Check all 3 AC cables after disconnecting from charge controller as to short circuit
Deficient charge controller, mix up of polarity	Check adjustments according to instructions	Repair customer service / replacement

14. Attachment / sketches

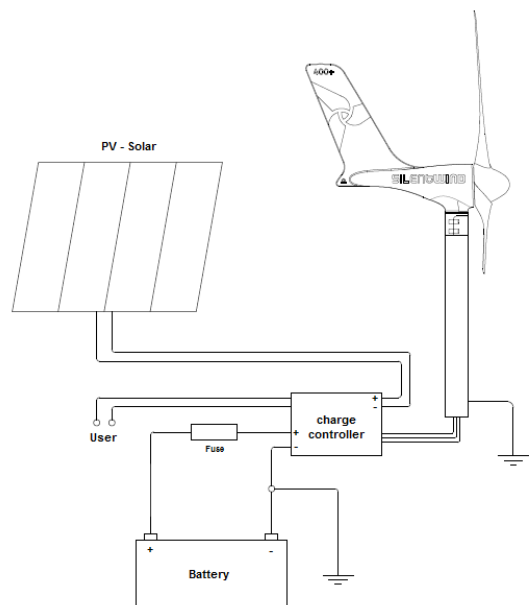


sketch 1



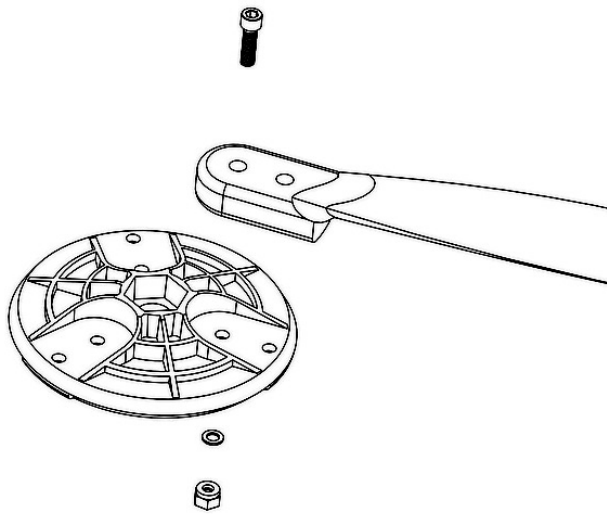
Sketch 2

sketch 2

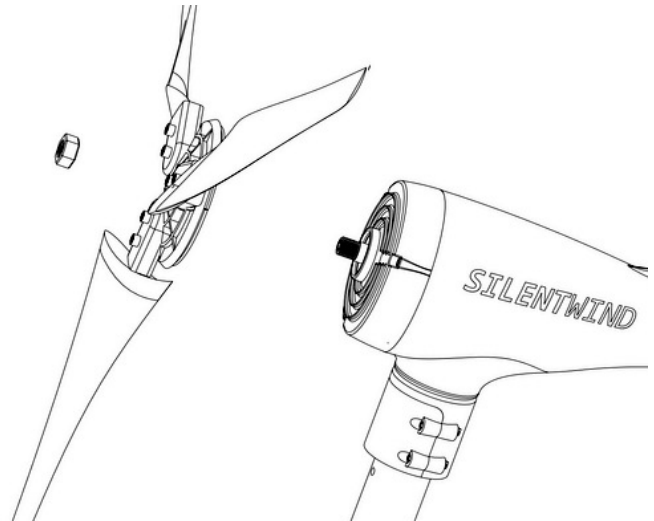


Sketch 3

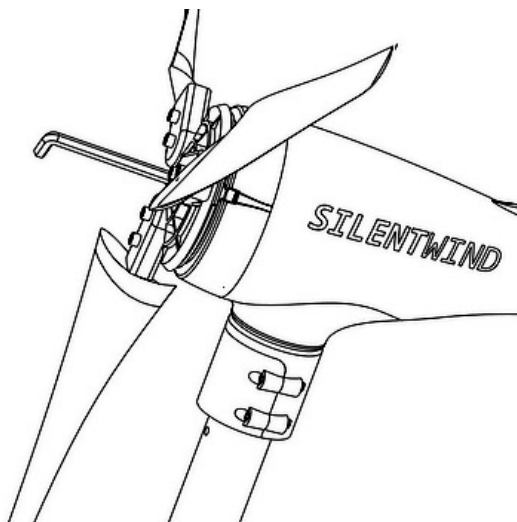
sketch 3



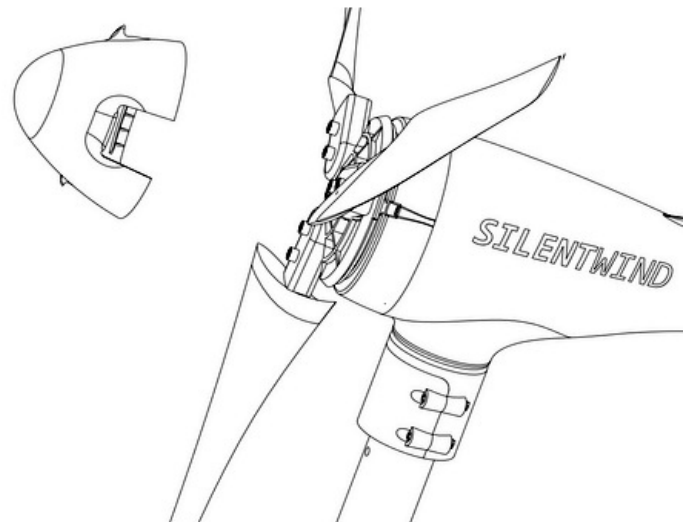
sketch 4



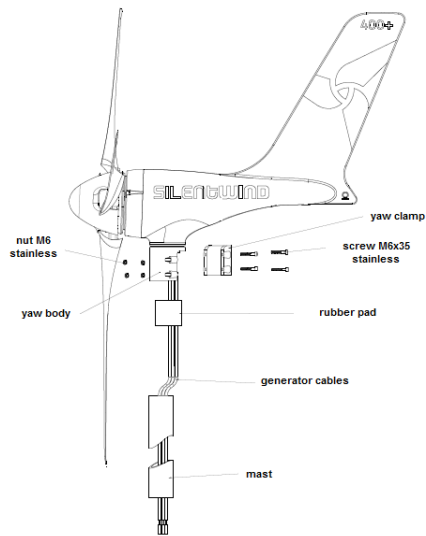
sketch 5



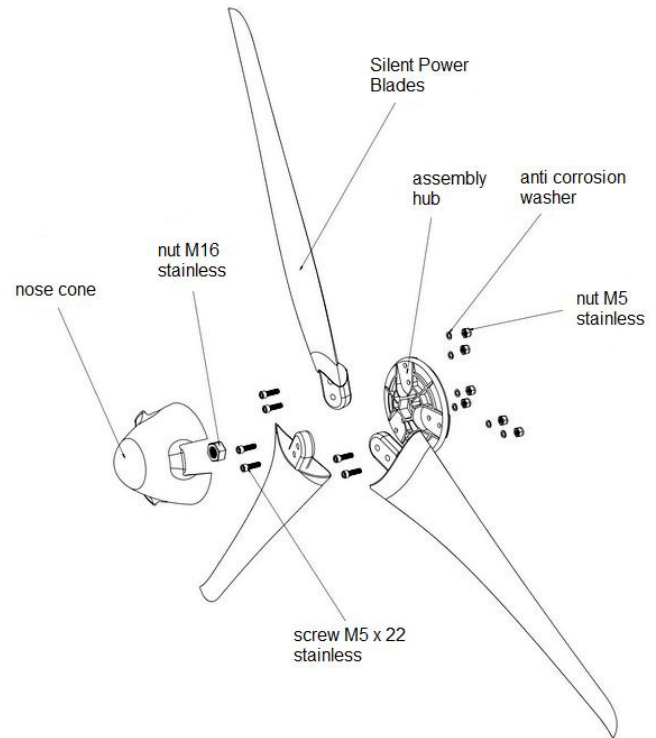
sketch 6



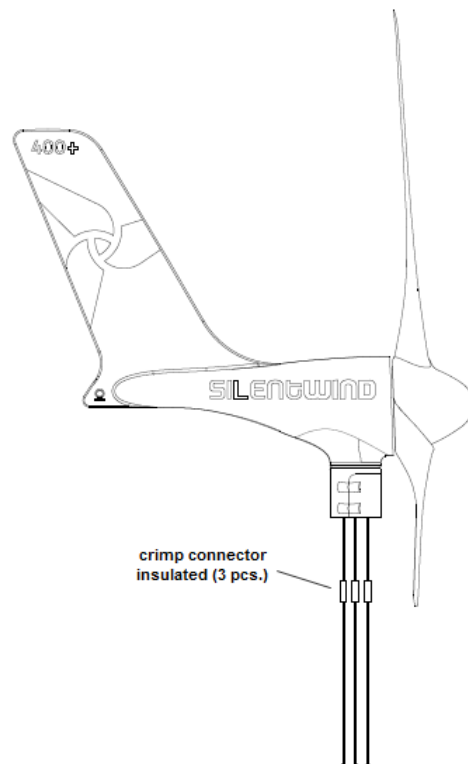
sketch 7



sketch 8



sketch 9



sketch 10

15. Warranty

RULIS Electrica Lda. guarantees that all the equipment sold by the company will not show any material or processing defects within the period of warranty.

Period of warranty for	Silentwind generator:	36 months
	Charge controller HYBRID 1000	24 months

If material or processing defects are detected in this period, RULIS Electrica Lda. will repair the equipment or replace broken parts of the unit at their expense.

Guaranty is only provided if the warranty note (page 21) is filled in properly and the original invoice can be presented.

Warranty does not cover:

- Regular checkups, maintenance, repair or replacement of consumable parts.
- Charges for transport, freight and the risk of transport which are directly related to the case of warranty.
- Any expenses incurred from travel to and from the repair location, troubleshooting, diagnostic and repair services.
- Damages that have been caused by wrong use or mistreatment of the equipment, especially if the damage is due to the mounting of the system to an inappropriate / unsuitable mast (construction). In case of damage the customer will have to prove that the windgenerator has been mounted to an appropriate mast (construction).
- Damages caused by acts of nature beyond control. RULIS Electrica Lda. cannot be held responsible for lightning, flooding, snow (ice) load, fire etc.

If the equipment must be demounted for a warranty case and mounted again after repair or replacement, the expenses for these procedures are not covered by RULIS Electrica Lda. Whether repair or replacement is appropriate or necessary, it's up to Rulis Electrica Lda. decision only. If neither repair nor replacement are possible, the customer is only entitled to withdraw the order.

Unless applicable law says otherwise, the rights of the buyer against the company Rulis Electrica Lda are restricted to this warranty terms, and neither Rulis Electrica Lda. nor the distributor of the products take over additional liability for direct or indirect damages.

Otherwise the general terms for products delivery and services from the Portuguese law are applicable.

Notes:

Certificate of warranty

✂-----



Garantieschein Warranty card

Name und Anschrift des Käufers / Name and address of the purchaser:	
Seriennummer Windgenerator / Serialnumber windgenerator:	
Seriennummer Laderegler Serialnumber charge controller:	
Verkäufer (Firmenstempel / Unterschrift) / Purchaser (company stamp / signature):	
Kaufdatum / date of purchase:	

Die genauen Garantie-Bedingungen finden Sie in der Gebrauchsanweisung auf Seite 19.
The exact warranty conditions you can find in the user manual on page 19.

✂-----



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