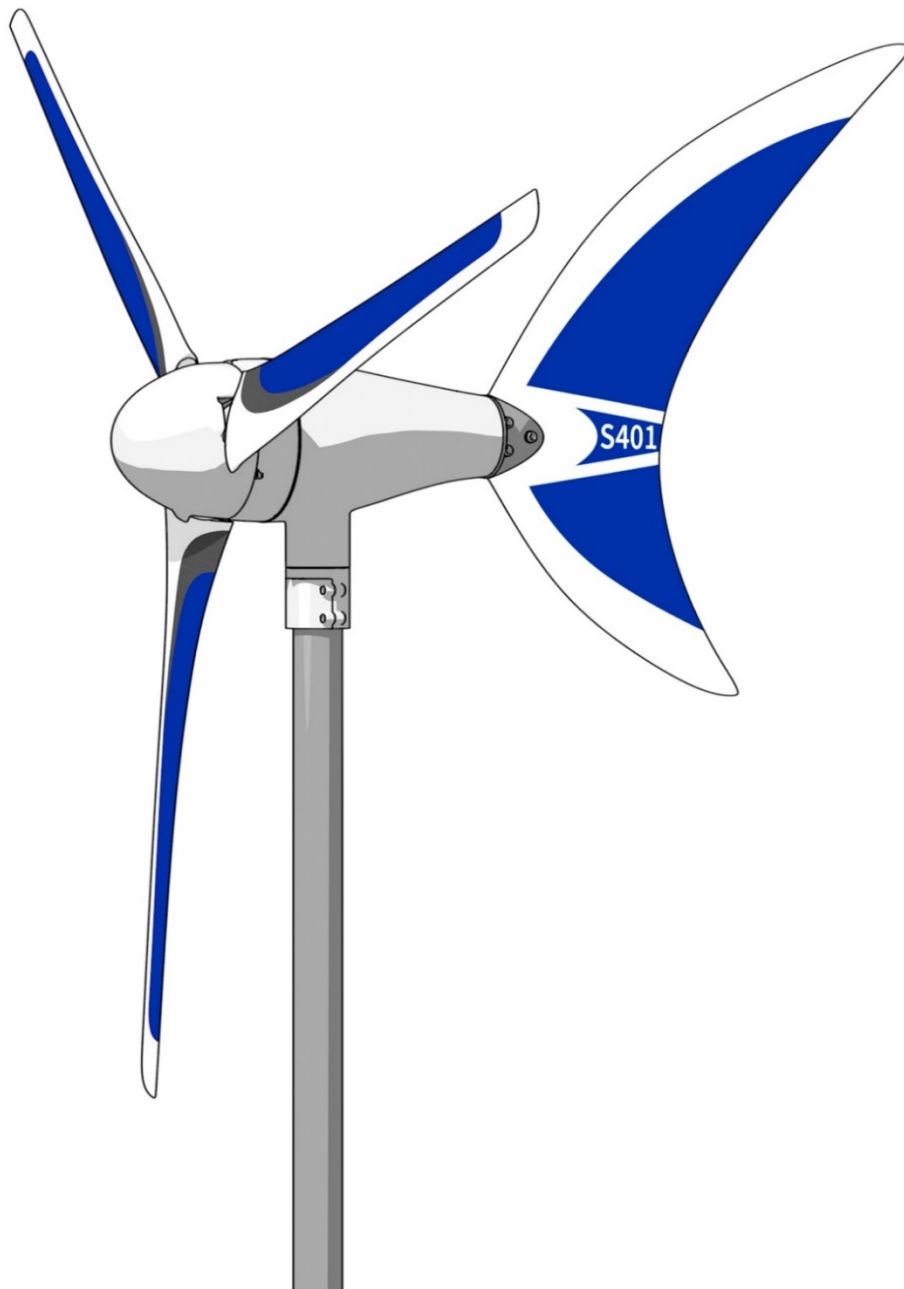


User manual and installation instructions

SilentShark S 401 12V / 24V / 48V



Dear customer!

Congratulations on your decision to purchase the **SilentShark S401**. Compared to conventional wind generators, it is characterized by high safety, enormous efficiency and very low noise levels over the entire range.

You will also benefit from our more than 30 years of experience with various wind generators in use on the high seas (Silent Wind from Spreco on sailing boats).

Electricity is particularly important there and ensures safety and comfort on board.

Please note that this user manual is part of the product. We recommend that you read this manual carefully before installing the **SilentShark S401** and follow the instructions. Please keep this user manual in a safe place.

Good luck and always enough wind

wishes you your

Spreco Team

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1. Use and area of application

New battery technologies allow and require powerful charging technology. With a **SilentShark S401** wind generator, you have the best technology in use!

You can achieve the greatest regenerative energy yield by combining a wind generator and solar module(s), storing the energy generated in a battery system and thus utilizing the available wind energy and daylight. Our charge controller is designed to connect a maximum of 300 Wp of solar power (hybrid charge controller). The possible applications are diverse and suitable for stationary and mobile stand-alone systems via the battery voltage with a connected 230 V inverter.

Our wind generator is aerodynamically optimized and very efficient. If the energy requirement is higher, several **SilentShark S401** wind generators can be used in parallel. Additional charge controllers are then required. Due to the low noise level, the **SilentShark S401** wind generator can be installed in residential areas and on sailing yachts without disturbing the neighbors.

The hybrid charge controller supplied is designed for the **SilentShark S401** and has inputs for solar modules and the wind generator.

Another advantage of the **SilentShark S401** is that virtually no electronics are installed in the housing. This drastically reduces maintenance work.

The electrical energy is fed down from the generator to the charge controller via three AC (alternating current) cables. This minimizes line losses. In the charge controller, the alternating current is converted into DC direct current to charge the battery.

The hand-laminated carbon fiber blades of the new generation have been successfully tested in the wind tunnel in accordance with the DIN EN-61400-2 standard. You don't need to worry about the **SilentShark S401** in storms as it has a specially developed patented storm brake. The brakes are applied at 130 degrees C° at the stator and are re-applied after cooling down.

Examples of applications:

E - car charging station in conjunction with photovoltaics

Stationary stand-alone systems / mobile stand-alone systems on boats e.g.

On grid / off grid measuring stations, emergency call systems, street lighting, development aid projects, wireless LAN access points, vacation homes with 230V (110V) inverters or anywhere where there is no power connection.

2. Safety instructions

Wind generators are not without danger due to the high speed and the voltage generated. Therefore, please read the following safety instructions carefully:

2. Mechanical hazards

The spinning rotor is a major hazard. Above a certain wind speed, it even appears transparent, so that the danger cannot be recognized visually. Our blades are coated with two colors (dark blue/white) so that they are easier for people and animals to see thanks to the light-colored rotor circle at the tips of the blades. Never touch the spinning rotor! Never try to stop the spinning rotor with your hand or an object!

Attention



Please keep your distance!

Only install the generator in places where it is impossible for anyone to touch the wind generator! This is particularly important on sailing yachts. Install the wind generator at a sufficient distance from the deck.

The rotor blades are made of hand-laminated carbon fiber material, which can withstand even hurricane-force wind speeds. Always keep away from the rotating rotor blades to avoid injury.



Flying parts or lines can still cause the rotor blades to break. If a rotor blade is damaged, the system must be taken out of operation immediately by manually actuating the stop switch. Damage to a rotor blade can result in considerable imbalances, which can endanger the entire mast on which the wind generator is mounted. Please also bear this in mind when selecting your installation site to ensure that it is really safe. During installation, the three AC connection cables to the generator must be disconnected from the charge controller and short-circuited or one blade must be tied down.

For safety reasons, we recommend switching off the wind generator using the stop switch before entering the port and starting mooring maneuvers.

The mast and the attachment of the mast must be designed so that it can withstand the resulting wind forces and fluctuating loads. Furthermore, the mast fastening and bracing should be installed in such a way that any vibrations that occur are not amplified. The involvement of a specialist is recommended.

2.2 Electrical hazards

Only connect all components if you have the relevant knowledge.

Otherwise, installation is reserved for specialist personnel! Make all electrical connections in accordance with the regulations before the wind generator turns for the first time. The resulting voltages/currents can cause burns, fire or serious injury if safety is not observed.



Take care with pacemakers, etc.! Never touch stripped cable ends. The current when charging batteries can reach more than 50 A direct current (DC). All cables, electrical components and connection points must be able to withstand at least 60 A at 12 V. A 60 A fuse at 12 V (30 A at 24 V, 15 A at 48 V) must be installed in the supply line (+) to the battery as close to the battery as possible.



Warning: Cables with an insufficiently dimensioned cross-section can heat up to such an extent that a fire can occur.

Cables must be laid protected so that mechanical damage to the cables is ruled out. A chafed cable poses a safety hazard.



Warning: Connecting the batteries can cause sparks.

Avoid short-circuiting the batteries at all costs.

Batteries can gas during charging and the resulting gases can form an explosive mixture with oxygen. Always ensure adequate ventilation!

It must be ensured that the electrical installation is only carried out by persons with specialist knowledge.

Before a storm, the **SilentShark S401** should be braked using the stop switch built into the charge controller or the optional external stop switch. In the event of an impending hurricane, it is advisable to tie a rotor blade to the mast. This is particularly recommended when operating the **SilentShark S401** on a sailing yacht.

2.3 Dangers during installation

Only use mast constructions that can withstand the loads caused by the wind generator and its wind pressure as well as movements of the vessel (forces can add up) at any wind speed.

If possible, work on the mast should be carried out on a windless day. No persons should be in the danger zone of the generator mast.

The system must be electrically disconnected from the battery during all work on the system. The rotor must be prevented from running loose during work by tying down a rotor blade or by short-circuiting the three AC cables, otherwise the charge controller may be destroyed. The electrical installation must be fully completed before connecting the battery.

3. Technical data

3.1 Windgenerator SilentShark S401

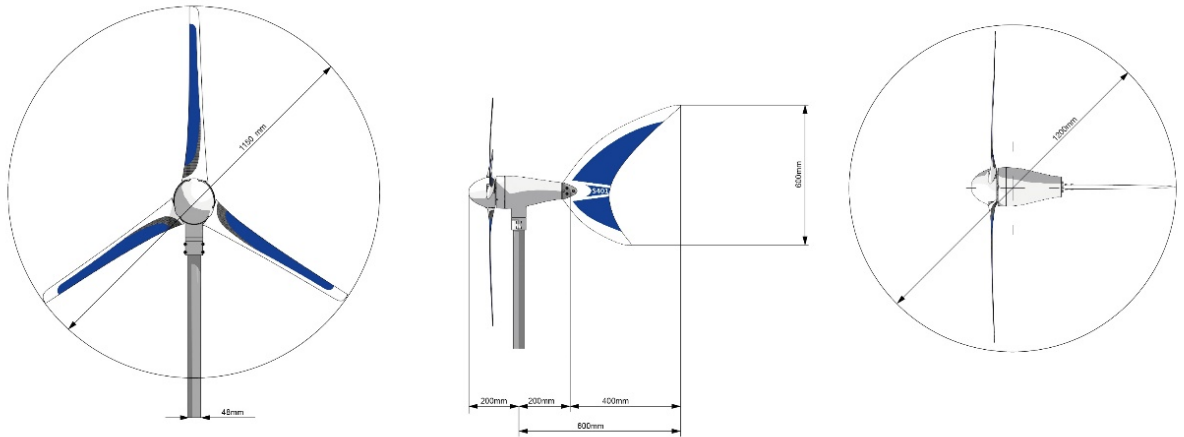
3.1.1 Electrical data

Generator type	Permanent magnet generator, 3-phase, AC
Rated voltage	12 V DC / 24 V DC / 48V DC with boost charge controller
Rated power	450 Watt 500 Watt 550 Watt
Nominal wind speed	Approx. 13.5 m/s
Start-up wind speed	Approx.. 2,2 m/s
Start charging*	Ca. 300 Upm

* The start of charging also depends on the charge status of the battery!

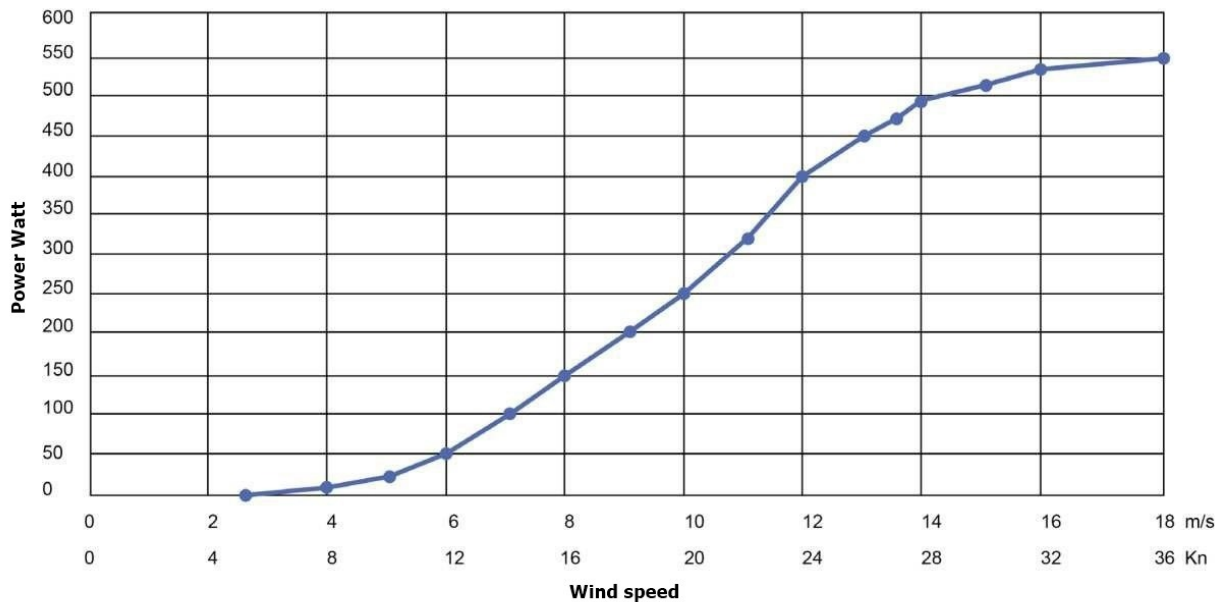
3.1.2 Properties, dimensions, space requirements

Wind tunnel safety test	122 km/h (passed)
Rotor diameter	1,15 m
Number of blades	3
Rotor blade weight	150g each
Rotor blade material	Hand-laminated carbon fiber Cfk
Rotational speed range	300 - 1450 rpm
Weight	Approx. 7 kg (generator)
Color	white, powder-coated - two-layer painting
Warranty	24 months



3.1.3 Performance curve

SilentShark S401 Performance Curve



3.2 Hybrid charge controller

The hybrid charge controller should be mounted vertically in as cool a location as possible near the batteries. Caution: Outgassing is possible with lead-acid batteries in particular, with the risk of **explosion!** Ensure adequate ventilation!
 The end-of-charge voltage is adjustable for lead-acid, gel, AGM and lithium batteries. Please follow the battery manufacturer's instructions!

Braking process: electronic depending on the individual parameter setting, manual with the built-in stop switch or with the extended external switch (additional part).
 The braking time can be set from 10 - 60 minutes.

For details, please refer to the user manual of the hybrid charge controller!

Never apply voltage to the external stop switch. This will destroy the charge controller (loss of warranty).

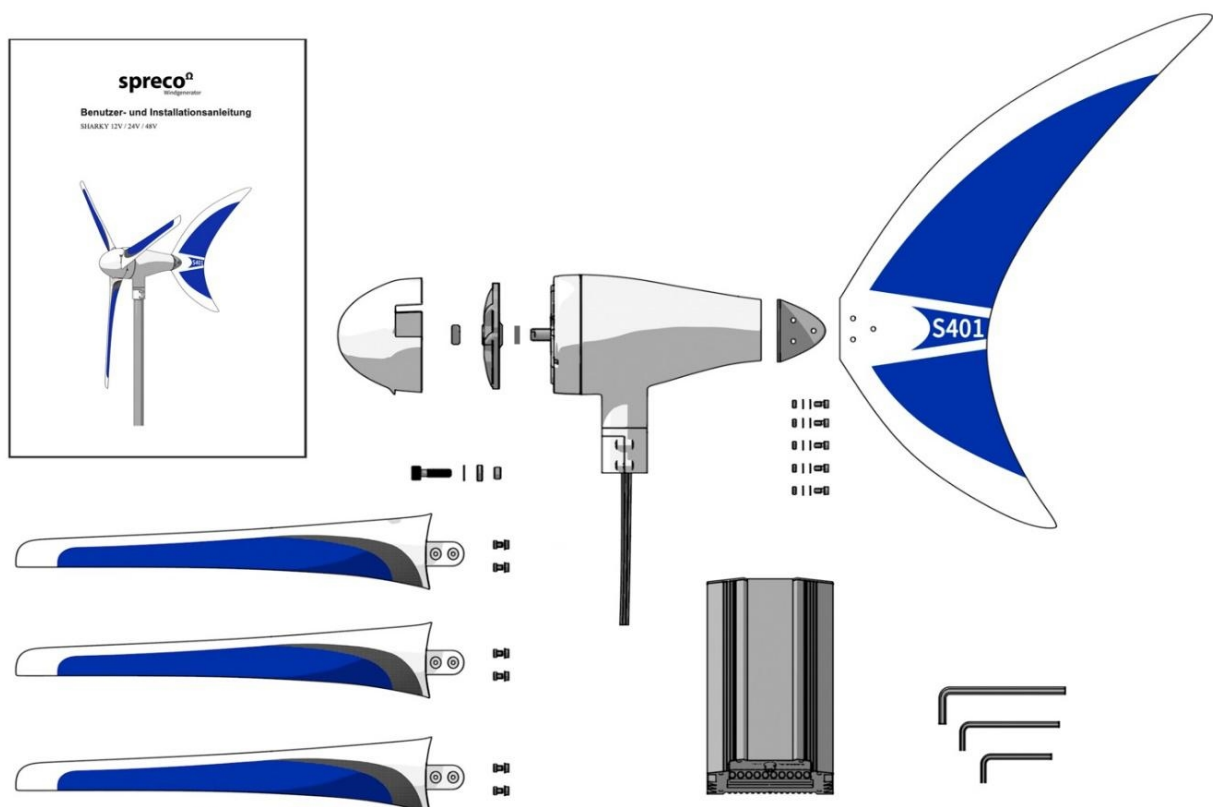
3.2.1 Electrical data

System voltage	12V	24V	48V
Max. Input power wind generator	450 W	500W	550W
Max. Input current wind generator	32 A	25A	12,5A
Max. Solar input power	300 Wp	300 Wp	300 Wp
Max. Solar input current	20 A	10 A	5 A
Max. Open-circuit voltage input solar	24 V/ DC	36 V/ DC	72 V/ DC
Multi-functional display + LED	W, V, A, kWh, Ah,		

3.2.2 Dimensions, weights

Weight	2.8 kg (controller)
Dimensions	220 x 150 x 82 mm
Warranty	24 months

4. Scope of delivery



Generator, powder-coated	1
Fin, CfK Carbon	1
Rotor blade mounting hub Aluminum	1
Nose, ABS	1
Rotor blade Carbon CfK	3
Boost hybrid charge controller	1

Quick Installation Guide	1
Screw set for rotor blades	1
Screw set for fin	1
Allen key 4mm	1
Allen key 5mm	1
Allen key 8mm	1
Spacer ring 3,5mm	1

5. Before installation

5.1 Functional description

All wind generators use the kinetic energy contained in the wind. The rotor blades convert part of this energy (theoretically 58%) into a rotary motion, which is then converted into a 3-phase alternating current in the generator. The power of the energy in the wind increases proportionally to the 3rd power with the wind speed. This means that a doubling of the wind speed leads to an eightfold increase in power. This is particularly important to bear in mind during storms.

Our rotor blades are manufactured from high-tensile carbon fiber mats using a hand-lamination process with epoxy resin. This material offers maximum strength with minimum weight. As a result, the newly developed blades are extremely light and cannot be destroyed by air forces during operation.

For normal operation, we have installed an additional safety feature in our controllers in the form of an electronic and manual brake.

There is also a patented high-wind brake in the generator housing. If a large amount of current is drawn, the stator can become very hot and there is a risk of fire. The brake is then activated via a bimetallic switch and released again once it has cooled down.

5.2 Cable dimensioning



Please note: Undersized cable cross-sections lead to poor performance and pose a considerable risk of overheating and fire! If in doubt, it is better to select a cable cross-section that is one size larger!

System voltage 12 Volt:

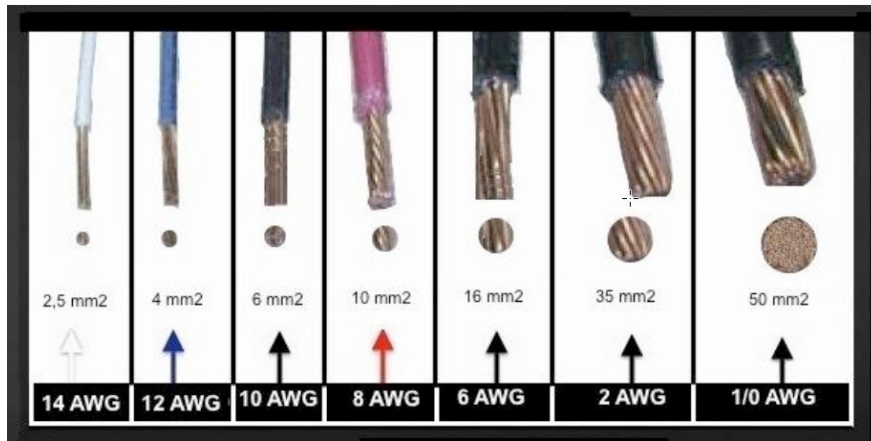
Distance from wind generator to charge controller in m	0 - 9	10 – 19	20 – 29	30 – 44	45 – 69	70 – 110
Cable cross-section in mm ²	6	10	16	25	35	50
AWG	10	8	6	4	2	1
Distance from charge controller to the battery in m	0 - 9	10 – 19	20 – 29	30 – 44	45 – 69	70 – 110
Cable cross-section in mm ²	10	16	25	35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

System voltage 24 Volt:

Distance from wind generator to charge controller in m	0 - 10	11 – 19	20 – 29	30 – 44	45 – 69	70 – 110
Cable cross-section in mm ²	2.5	4	6	10	16	25
AWG	14	12	10	8	6	4
Distance from charge controller to the battery in m	0 - 9	10 – 19	20 – 29	30 – 44	45 – 69	70 – 110
Cable cross-section in mm ²	10	16	25	35	---	---
AWG	8	6	4	2	---	---

System voltage 48 Volt:

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



5.3 Selecting a suitable installation location

Before you install the wind generator, you should find the optimum installation location. This is often the most difficult task. Ideally, the rotor blades should always receive an even flow. This assumes that the wind generator is mounted high enough and free of obstacles.

5.4.1 Stationary installation:

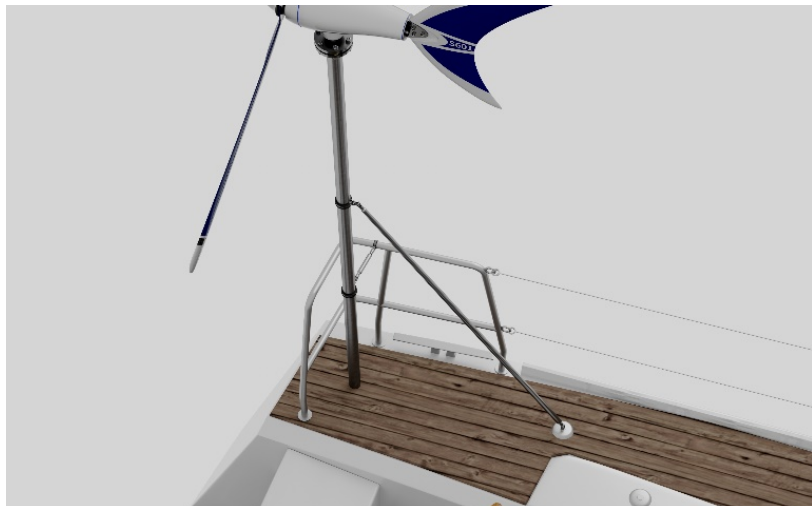
The required mounting height depends on how much the surrounding objects deflect the wind from the main direction. You can first carry out a simple test by attaching a plastic tape (available from DIY stores) approximately three meters long and four centimeters wide to the top end of a pole at least 4 m long and also attaching a second tape two meters lower down.

If the upper band blows out horizontally or moves back and forth up to 30 degrees, you have found a suitable location. If the band moves more or even wraps around the mast, the location is unsuitable. This test is only a rough indication and should only be carried out in medium winds. We recommend that you make several attempts to get a better feel for this. You do not need to carry out this test if the wind generator is completely free-standing.



5.4.2 Mobile installation on a sailing yacht:

The installation height must be selected so that no crew member can be endangered by the rotor. The mechanical anchoring of the base of the generator mast and the mast itself must be able to withstand the mechanical loads that occur, especially in rough seas. We recommend additional double bracing to the railing if possible or, better still, directly to the deck of the ship. To prevent the mast from swaying, we recommend attaching the bracing to the mast approximately 25 cm below the rotor blades.



Note: Please bear in mind that the **SilentShark S401** can never achieve its full performance if it is not positioned in the main wind direction or is deflected. It is therefore important to find a suitable location that is free of obstacles in the main wind direction!

Once you have found the right location, you need to select the right pole and accessories.

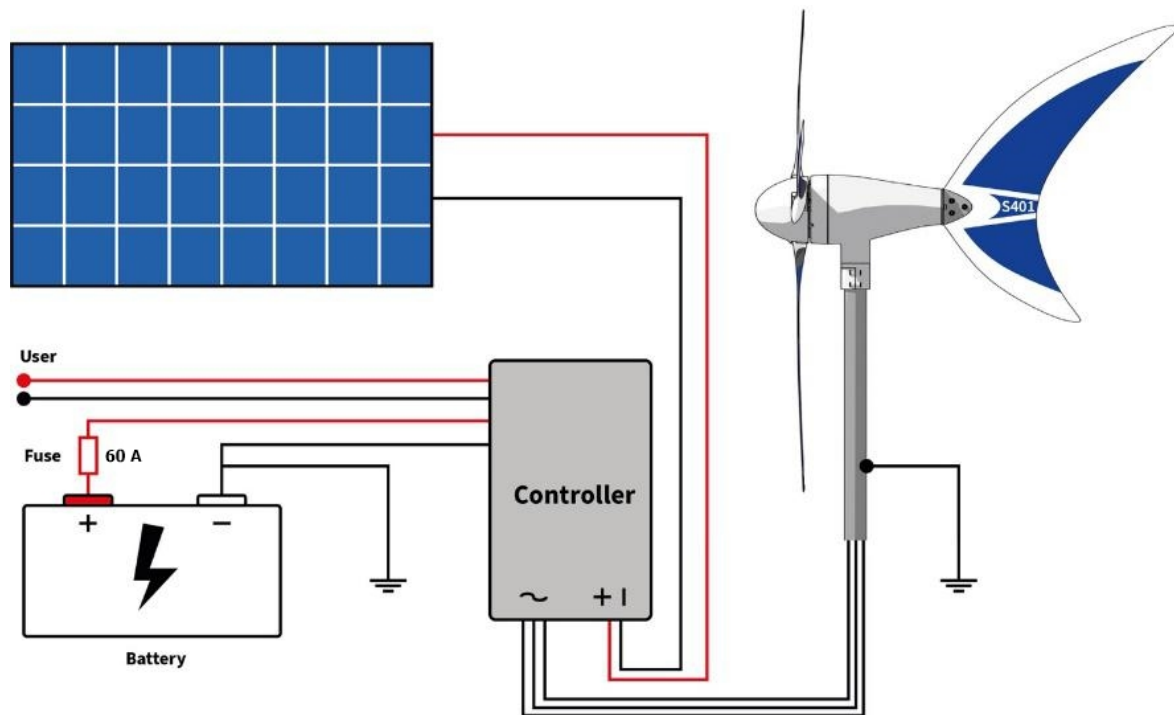
The pole outer diameter should be 48 mm and made of stainless steel with a wall thickness of at least 2.5 mm. Please also consider possible maintenance work. Earthing of the mast is also recommended. For sailing yachts, the earthed sail mast is suitable for this purpose.

5.5 Required tools

For installation, you will need wire end ferrules, cable connectors, stripping tool, crimping pliers for wire end ferrules, heat-shrink tubing or insulating tape, a set of wrenches if necessary, various screwdrivers

6. Mounting

The figure below provides an overview of the overall installation



Please follow the instructions for mast installation and for connecting the charge controller in the respective operating instructions! Please note the special features of earthing on metal ships!

6.1 Mounting the pole

Install the mast according to the mast manufacturer's specifications and ensure that it is sufficiently braced, preferably twice. The mast should have a diameter of 48 to 50 mm and a wall thickness of 2.5 mm.

When mounting on a boat, we recommend the use of screws bolted through the deck, as screwed-in screws tend to loosen under the constantly changing load torques. Observe the above safety instructions! Make sure that under no circumstances can the rotor circle be reached by a crew member during regular ship operation! There is a risk of serious injury!

Make sure that nobody is in the danger zone during mast assembly!

Once the mast is mounted in the correct location, the relatively simple installation of the **SilentShark S401** can begin.

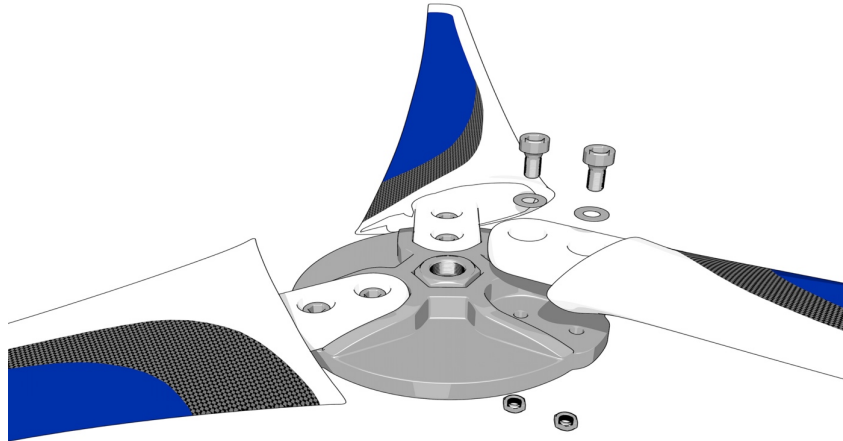
6.2 Mounting the generator

We recommend the following sequence:

1. mounting the rotor blades on the blade holder (hub)
2. mounting the fin on the generator
3. mounting the generator on the mast
4. mounting the hub with the rotor blades on the generator and the nose

6.2.1 Mounting the rotor blades in the blade holder

Make sure that the rotor blades are relatively sharp at the rear! Fit the three carbon fiber blades to the blade mounting plate using the respective screw set. Note - The screws must be well tightened (the tightening torque is 7 - 8 Nm).



The blades are automatically centered due to the shape and design of the hub disc (conical mount). The three blades in a set have exactly the same blade weight. Blades from different sets cannot be fitted together as this is likely to cause imbalances.

An incorrect tightening torque represents a considerable safety risk. Check the rotor blades regularly for tightness, visually and mechanically

If a blade is damaged due to external influences, a single blade can be ordered by providing the exact blade weight.

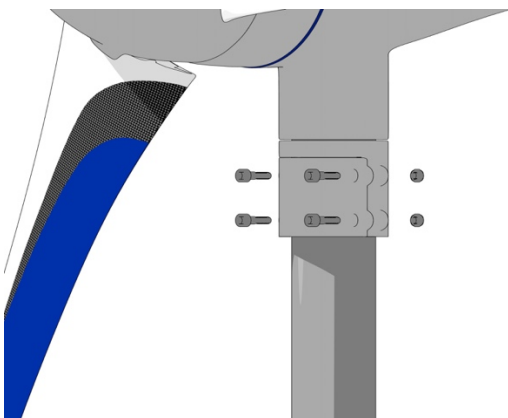
Check the screw connection after just one day of operation and then after one month. You can then switch to longer intervals.

6.2.2. Fitting the fin to the generator

Attach the fin to the generator using the screw set provided. The higher part of the fin is at the top.

6.2.3 Mounting the generator on the mast

When working on a boat, it is advisable to secure the generator against falling with a rope! Only work on the wind generator on windless days!



First connect the cables of the supply line to the charge controller. These are laid in the mast. We recommend that you allow sufficient reserve cable length to make installation and removal easier!

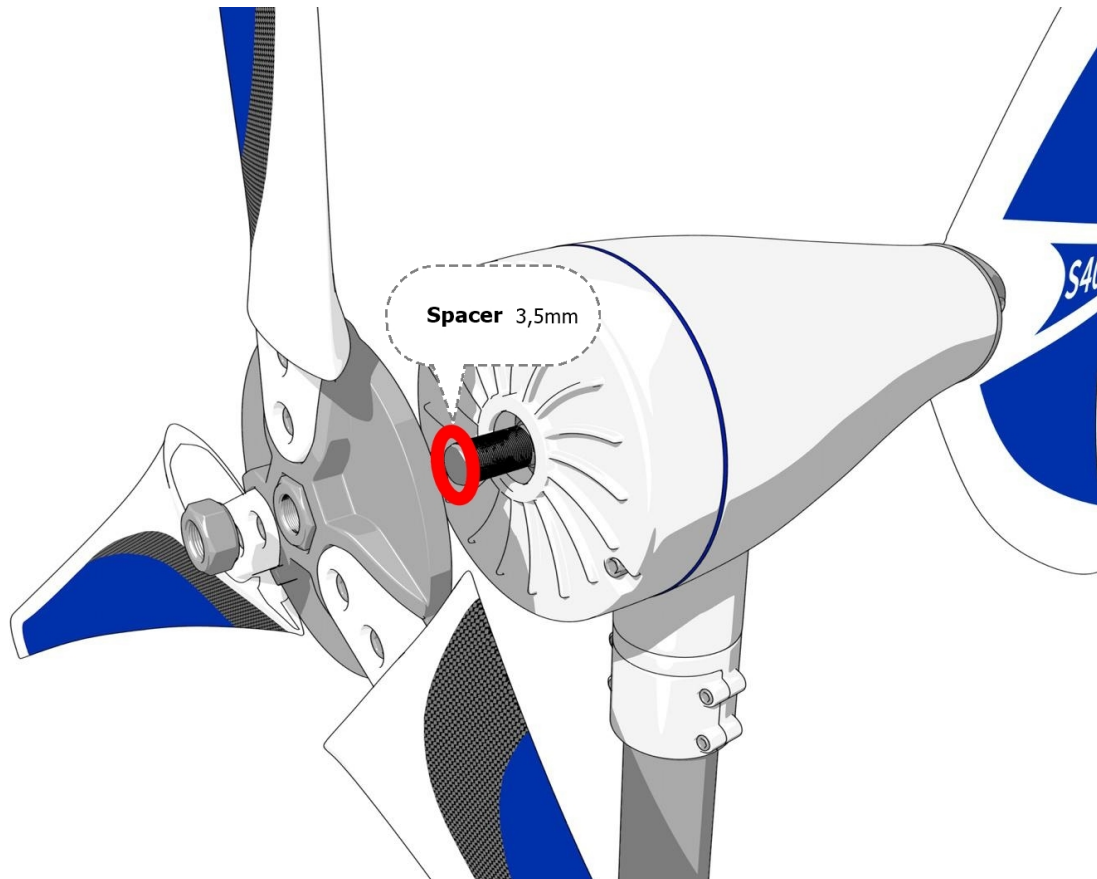
Now attach the plastic insert, which is used for noise decoupling, to the end of the mast. Tip: It may be easier if you fix the plastic insert with some adhesive tape first! Now push the generator over the plastic insert and tighten the 4 fastening screws evenly and alternately.

Check the tightness of the screws a few days after the first installation.

6.2.4 Mounting the hub with the rotor blades on the generator axis

Now place the supplied 3.5mm spacer ring and the blade set on the generator axle and screw it tight with the enclosed nut and the enclosed Allen key. Tightening torque approx. 30Nm. Then fit the nose (blade cover) onto it from the front until it is fully engaged on all three sides.

Caution: During this work on the rotor, it must be ensured that the rotor cannot start up. The 3-core AC cable must be short-circuited by securely connecting all three cable ends (near the charge controller). Otherwise the rotor may start running and you may injure yourself. **Alternatively**, you can also tie a rotor blade to the mast with a piece of rope.



If you dismantle the **SilentShark S401** from the mast, you must ensure that the blades do not start to move before you have completed the work (short-circuit 3 AC cables or activate the built-in brake). Dismantling is carried out in reverse order.

7. Start of operation

Before starting up your **SilentShark S401**, you must first connect the charge controller to the battery with the correct polarity (!). Do not forget the 60A fuse in the positive lead near the battery! Now connect the three AC cables coming from the generator to the charge controller. Polarity is not important here. **Follow the instructions in the charge controller manual!**

Before commissioning, please check the correct assembly and installation using the following **checklist**



O.K.	Check
	<p>Mast construction (not included in the scope of delivery); Check according to the enclosed instructions, in particular all screw connections, bracing, vertical alignment. Are earthing and lightning protection connected in accordance with local regulations?</p>
	<p>Electrical installation: Check battery condition. Is the charge controller connected to the battery with the correct polarity?</p>
	<p>Charge controller:</p> <p>Charge controller securely fastened at the installation location? (Choose a cool location)</p> <p>Connect the battery with the correct polarity, otherwise the controller will be destroyed (loss of warranty!). Attention: Always connect the battery to the charge controller first! Are all screw terminals firmly tightened? Is the external stop switch set to ON?</p> <p>CAUTION: No voltage may be applied to the socket of the external stop switch (additional part)! This will destroy the controller. Only connect the enclosed wiring harness with socket there.</p>
	<p>Fuse: Fuse, at least 60 amps, installed between battery and charge controller?</p>
	<p>Cables:</p> <p>Are all cables/wires connected according to the wiring diagram? Has the polarity of the cables been checked at all connection points? Is the three-pole cable from the generator to the charge controller connected?</p> <p>Are the cables crimped correctly?</p>
	<p>Mast support:</p> <p>Has the damping rubber on the mast mount been inserted correctly and accurately and has the mast mount been checked for tight fit?</p>
	<p>Rotor blades: Has the assembly been carried out according to the instructions?</p>
	<p>Blade hub disk: Is the hub disk mounted on the generator shaft? Is the spacer ring fitted (enclosed) or not necessary? Is the central fastening screw tightened to 30 Nm?</p>

If the checklist has been ticked off without any objections, **YOU CAN GO NOW!**

8. Starting and stopping

Set the external stop switch (provided by the user or optionally available from us in the store) to "ON". If the positive/minus cable is connected to the battery with the correct polarity, the wind generator should now run if there is sufficient wind. You can read this on the LCD display of the charge controller. (blade symbol rotates).

9. Charging indicator

The charge quantity is shown on the charge controller display.

10. Inspections

Your **SilentShark S401** has been designed for years of operation without any maintenance. However, simple and regular checks are always required to ensure the necessary operational safety.

Attention



Your safety is very important to us!

Before starting the inspection, ensure that the rotor is first brought to a standstill and the battery is disconnected from the system during all work on the system.

The following checks should be carried out regularly every 12 months:

10.1 Rotor blades

Check the rotor blades for possible damage, such as broken edges, surface damage or cracks. If you notice any damage, the generator must not be operated any further. Check the screw connection after just one day of operation and then after one month. You can then switch to longer intervals.

10.2 Screwed connections

Check all externally accessible screw connections for tightness and correct tightening torque. In particular, check the rotor blade bolts, the central hub nut and the mast fastenings.

10.3 Bearings, seals

The generator shaft bearings and the azimuth bearing for wind tracking are designed as permanently lubricated, maintenance-free ball bearings. Please check these bearings for ease of movement, bearing play and tightness. Please replace defective bearings or have them replaced by a service center. The Sharky rotor has bearings on both sides and therefore has a longer service life and smoother running due to the more even load.

10.4 Anti-corrosion protection

All housing parts are made of a seawater-resistant aluminum alloy and are additionally treated with a powder coating (2-layer painting). If this layer is damaged, there is a risk of corrosion. Please repair with suitable paint.

10.5 Electrical system

Please first bring the wind generator to a standstill so that all cables are de-energized.

Check all connection points for tightness and corrosion. Remove any corrosion that has occurred and treat with contact spray. Pay particular attention to the battery connections. These must be cleaned and treated with terminal grease. The battery must be checked and repaired in accordance with the manufacturer's instructions. If you have several batteries, you should also check for different capacities (self-discharge). Only connect batteries of the same size (Ah) and the same age in parallel!

11. Maintenance work

Maintenance work is not required for the **SilentShark S401**.

The **SilentShark S401** has been designed for years of trouble-free operation. This goal was very important to us.

12. Troubleshooting

If a problem occurs, you should be able to solve it yourself using the following checklist:

Wind generator is not starting:

Possible cause	Test	Fixing the problem
Stop switch is set to "STOP"		Set to "RUN" or "On"
Generator shaft stiff	Turn by hand	Connection cable Generator to charge controller damaged, short circuit in AC cable, generator short circuit, customer service
Battery has reached end-of-charge voltage		Check voltage

Wind generator does not generate any power:

Possible cause	Test	Fixing the problem
Not enough wind	Measure the wind speed at the rotor. (Wind speed at the top of the main mast is higher)	Wait for more wind, start charging depending on the state of charge of the of the battery, Check charge controller setting
Electrical connection interrupted	Checking the electrical permeability of the cables	Replace defective cables or devices
Fuse interrupted	Check electrical continuity of the fuse	Replace fuse, or wait for automatic circuit breaker to cool down
Built-in current collector (slip ring unit) has no contact	Check carbon brushes and springs in the housing	Clean slip ring and/or replace carbon brushes, make springs workable

Battery is not fully charged:

Possible cause	Test	Fixing the problem
Battery old, defective	check battery voltage and capacity with battery tester (available in DIY stores). Acid test for open lead batteries	Replace battery, top up with distilled water (not for Gel or AGM or Lithium batteries)
Fuse defective	Check electrical continuity	Replace defective fuse and find reason for defect

All information is reliable. However, the manufacturer accepts no responsibility for any inaccuracies or omissions. The user of this information and the product bears full responsibility and risk.

All specifications are subject to change without notice.

If our hybrid charge controller is not used:

A connection to a three-phase rectifier (optionally available in our store) can be found in the respective operating instructions. This allows you to provide the energy generated by the wind generator directly to downstream systems, e.g. inverter input, energy management systems, stand-alone systems.

Proof of warranty:

Name	
Adress	
Purchase date	
SilentShark S401 Serial No.	
Charge controller Boost Serial No.	
Dealer	
Dealer's address	

14. Contact details

www.sprecowindgenerators.com

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90100 Songkhla / Thailand

Phone +66 (0)94 587 2899

Mail: mail@sprecowindgenerators.com

Time zone UTC +7 !

Please contact us by e-mail if possible!
We will get back to you as soon as possible!
Thank you very much!



A Thai company under German management

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