CLASS 40 RACING HYDROGENERATOR INSTALLATION AND USE MANUAL

HYDROGENERATOR SERIAL NUMBER

CONVERTER SERIAL NUMBER

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EEC patented DESIGN n°001783523

HYDROGENERATOR
Racing Class 40
Installation and use manual

Version	V1
Date	01/2025
Contact	contact@wattandsea.com

Congratulations !

You have just purchased the most powerful hydrogenerator of its kind. Inspired by the requirements of ocean racing yachts, designed to resist the stresses experienced by monohulls, this hydrogenerator will radically change your energy management at sea and become your main source of power while sailing.
This hydrogenerator has been thoroughly inspected. The product comes with the WATT&SEA warranty described in the "Warranty Terms" chapter of this installation guide. For traceability under the warranty, please register the product on our website: www.wattandsea.com

Designed & manufactured in France by:

WATT&SEA SAS
3 rue Jacques Cartier
17000 La Rochelle
FRANCE
www.wattandsea.com

CONTENTS

1. SAFETY PRECAUTIONS

While our primary concern in designing the hydrogenerator was your safety, certain precautions must nevertheless be taken when operating any mechanical or electrical equipment.

Please keep the following safety factors in mind when installing and operating the hydrogenerator and be aware at all times of the electrical and mechanical hazards inherent in operating the propeller.

1.1. Mechanical hazards

The hydrogenerator's blades are made of stainless steel and can rotate at a speed of over 100 km/h (62 mph).

At this speed, the blades are practically invisible and can cause serious injury.

WARNING:

- WHEN INSTALLING THE HYDROGENERATOR, MAKE SURE THAT THE PROPELLER IS SAFELY POSITIONED OUT OF REACH.

- DO NOT ATTEMPT TO STOP THE PROPELLER WITH YOUR HAND WHILE THE GENERATOR IS RUNNING.

1.2. Electrical hazards

Heat in wiring systems often results from undersized cables or faulty connections.

Batteries have a very high current-carrying capacity. A short-circuit in their cables may result in an outbreak of fire. To prevent this hazard, you must install a 50 amp fuse between the converter and each battery.

If the fuse is defective, you must determine the reason before resetting or replacing it.

WARNING:

- YOU MUST INSTALL AN EXTERNAL 50 AMP FUSE.

- ALWAYS LIFT THE HYDROGENERATOR BEFORE ANY WORK ON IT

1.3. Installation

Please observe the following precautions during installation:

- Remove the hydrogenerator from the water
- Always keep safety in mind! Have someone help you throughout the duration of the installation.
- Remember: the batteries should be connected last.

1.4. Operation

- Check the support structure, blades and electric circuits on a regular basis.
- Although the propeller blades are made of very strong materials, they may warp or break if they come into contact with a submerged object.

WARNING:

- NEVER TOUCH THE PROPELLER WHEN IT IS SPINNING.

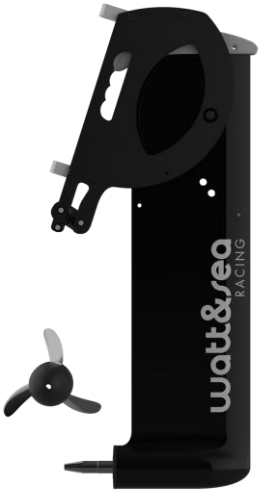
- NEVER USE THE HYDROGENERATOR TO STEP ONTO OR OFF THE BOAT AS THIS MAY WARP THE DRIVE SHAFT.

- WHEN RUNNING, THE CONVERTER CAN REACH VERY HIGH TEMPERATURES.

2. CONTENTS OF THE HYDROGENERATOR PACK

Check the contents of your pack against the list below:

- 1 HYDROGENERATOR with 4 metres of cable
- 1 LIFTING BRACKET
- 1 HIGH SPEED PROPELLER and its extraction kit
- 1 RACING CONVERTOR with its bag of connectors:
  - 1 hydrogenerator connector
  - 3 battery connectors (2 positive and 1 negative)
- 1 LOW FRICTION RING with rope
- 1 FASTENING KIT (F-03) with 2 stainless steel fork mountings and bolts
- 1 INSTRUCTION MANUAL



Components contents

3. ADDITIONAL EQUIPMENT REQUIRED

- Three-phase cable, minimum 3 x 1.5 mm^2, for connecting the hydrogenerator to the converter (if length <10m, otherwise please us a bigger section of 2,5mm^2)
- Black and red 10mm^2 cable to be connected to the batteries
- Battery terminals for the 10mm^2 battery cable
- 50 Amp fuse or thermal circuit breaker (for example : Series 187 from Blue Sea Systems)
- Junction box or waterproof connectors for three-phase cables. WATT&SEA offers an optional connection kit with cable and waterproof power socket (Ref. PL-04)

THE QUALITY OF THE POWER SOCKET IS PARAMOUNT: PREFERABLY CHOOSE A PLASTIC MODEL WITH GOLD PLATED CONTACTS QUALIFIED FOR 50 VCC - 12 AMP.

DO NOT USE METAL POWER SOCKETS WITH BRASS CONTACTS AS THESE CORRODE TOO QUICKLY.

- Bolts & screws to fix the fastening kit on the transom
- Lifting/lowering line (6:1 or 4:1 hoist) with a 6 mm diameter covered line (Réf PA-04 and PA-04-HS)
- Install phonic insulation between the transom and the mounting bracket to minimize vibrations.

4. MECHANICAL INSTALLATION

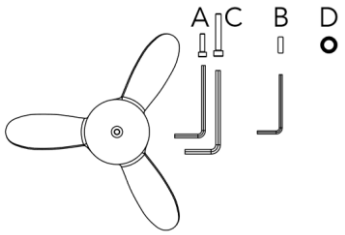
Your hydrogenerator is shipped partially disassembled. Please read the instruction manual carefully before starting installation.

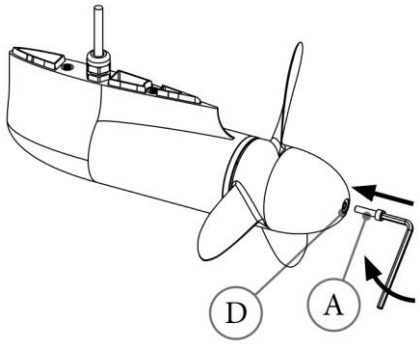
4.1. Assembling and dismantling the propeller

N.B.: Any method for assembling and dismantling the propeller other than the one described below may result in damage to the hydrogenerator.

The propeller is delivered with an extraction kit used for mounting and dismounting it on the transmission shaft.
The extractor kit is composed of:

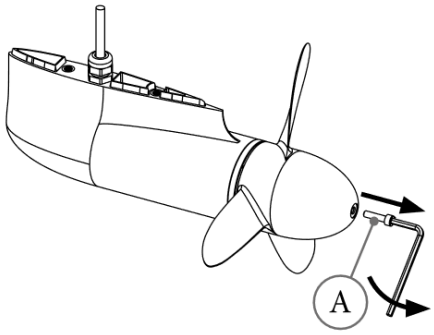
- 1 propeller
- 1 HSHC M5x20 inox screw (A)
- 1 M5x16 grub screw (B)
- 1 HSHC M6x40 inox screw (C)
- 1 M6 stainless-steel washer (D)
- 2 allen key (4mm et 5mm)

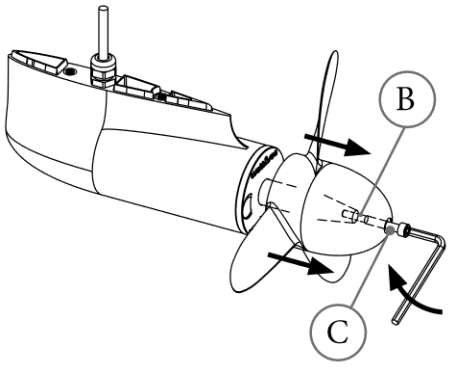




ASSEMBLING THE PROPELLER

▶ Slide the propeller onto the drive shaft
▶ Check that the stainless-steel washer (D) has been pre-mounted at the end of the propeller. If not, insert it
▶ Insert the HSHC M5x20 screw (A)
Hold the propeller with one hand and tighten the screw using the 4 mm (5/32") Allen key until the screw starts turning the propeller.





DISMANTLING THE PROPELLER

▶ Unscrew the M5 screw (A) that holds the propeller at the end of the drive shaft.
▶ In its place, insert the M5x16 screw (B) and tighten it.
▶ Then, insert the M6 screw (C) and tighten it using the appropriate key. This will effortlessly remove the propeller from its conical fitting.

4.2. Placing the device on the transom

Correctly positioning the hydrogenerator is crucial for optimizing its performance.

The following criteria must be respected during the installation:

- **Immersion depth:**

The hydrogenerator is supplied with a submerged aluminium leg measuring 610 mm (24 in) or 970 mm (38 in). The recommended depth between the surface and the propeller axis is 300 mm (12 in).
The greater the depth, the farther the propeller will be from the wake of the hull, and the better the performance of the hydrogenerator.

However, take care not to submerge the unit more than 300mm. The most important the lever arm is, the greater the force on the mountings and during lifting will be.

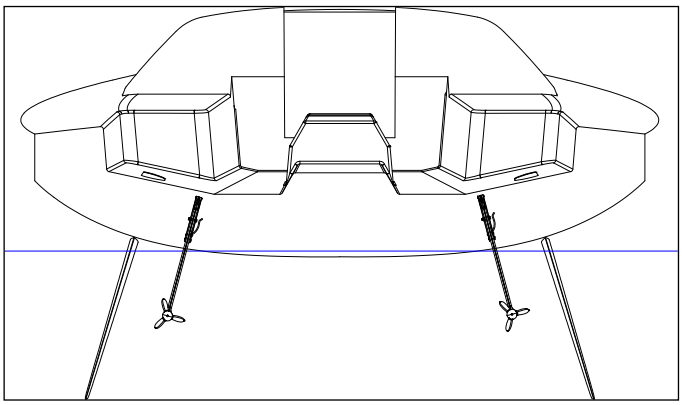
- **Flow quality:**

The quality of water flow is a key element for obtaining satisfactory power output.

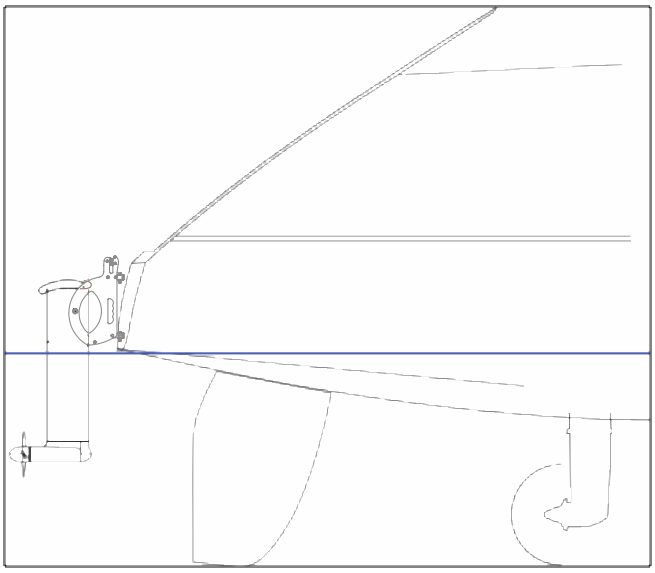
You need to position the hydrogenerator several inches to the side, in order to offset it from the rudder, the propeller or other appendix.

NOTE : Do not position the hydrogenerator directly in the wake of an appendage or too close to a saildrive.

- **Examples of installations**



Dual installation on a Pogo40 (© CN STRUCTURES)
The hydrogenerators are placed parallel to the rudders but approximately 30 cm (12 in) to the inside to avoid their wakes.



Installation on a catamaran (© OUTREMER YACHTING)

Here, the hydrogenerator is positioned to the side, out of the wake of the nearby rudder.

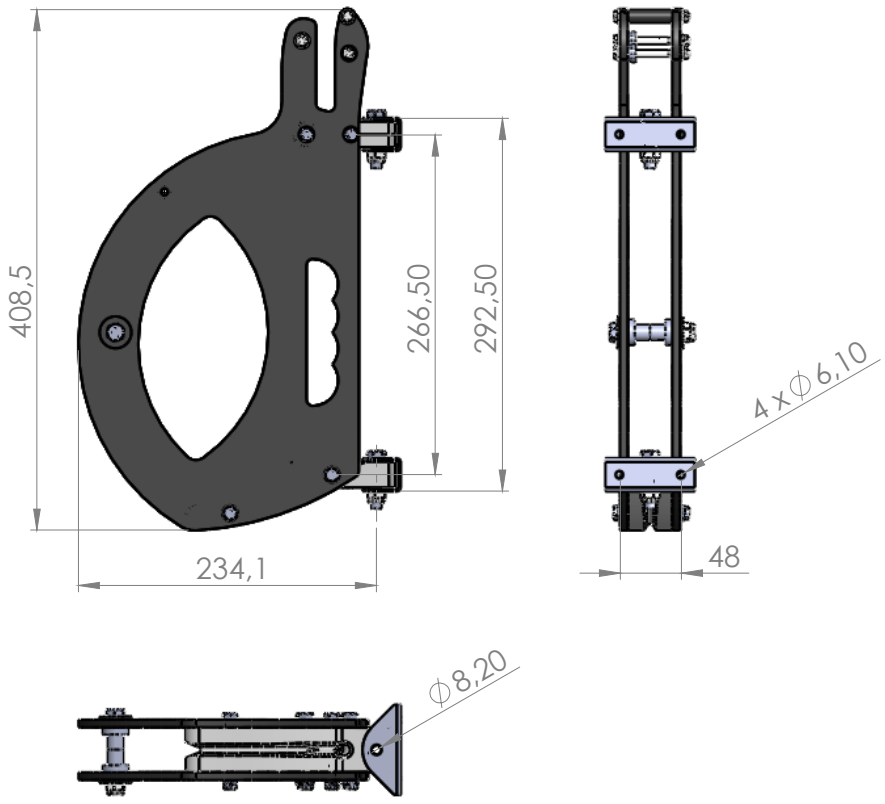
4.3. Installing the bracket on the transom

Depending on your boat's transom, its structure might need to be reinforced to take the stress on the mountings. Phonic insulation also reduces vibrations.

WARNING : Due to the size of the lever arm, the maximum theoretical stress on the bracket's fork mountings is estimated at around 300 kg. Your mounting system should be adapted accordingly.

The bracket must be adapted to the 8 mm diameter fork mountings that are securely mounted onto the transom. These fork mountings must be mounted in such a way as to compensate for any tilt of the transom. The diagram below will help you to adapt the mountings to your boat.

N.B. : The leg must be vertical in the lowered position, leading edge abutting lower gudgeon.



Lifting bracket dimensions

4.4. Rigging the immersion/lifting system

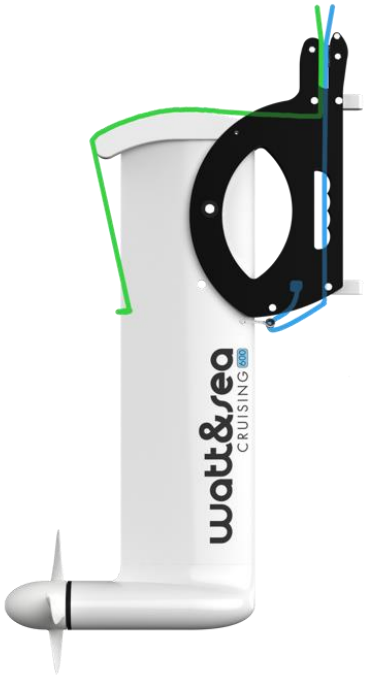
The hydrogenerator is supplied with a lifting bracket that functions in a similar way to the systems used on the rudders. It facilitates access to the propeller when the device is lifted, for the removal of seaweed for example. The lowering and lifting procedures are carried out using a hoist which is not included in the pack. The maximum traction during lifting is around 40 kg. It is therefore recommended to rig a 4:1 to 6:1 hoist with a 6 mm diameter sheathed line (hoist available in option at Watt&Sea, refs: PA-04 and PA-04-HS, depending on boat sailing speed).

- Assembly of the lowering rope (as per blue line below):

Pass the rope successively:

- in the cam-cleat of the bracket
- in the two gudgeons of the bracket
- through the low friction ring
- in the hole of the lower gudgeon
- Finish the assembly by an eight-knot (see picture below)

- Assembly of the lifting rope (please see in green below):



Assembly of the lowering line using a low friction ring

The cleat integrated into the bracket is used to lock the lowering and lifting line.

NOTE : To keep the hydrogenerator in the down position, you can use the blocking pin supplied in the pack (ref : PI-03).

Please take care in pull in a vertical way on the immersion and lifting lines to avoid the cleat from opening unexpectedly.

N.B. : When the hydrogenerator is submerged, the leg should sit flush in the groove of the gudgeon provided for this purpose. If this is not the case, the lateral support will be less efficient, and this may result in mechanical damage.

It is also advisable to hold the lifting end in place using an elastic cord to prevent it from leaving the groove.

Lifting the hydrogenerator

4.5. Mounting the electronical converter

The electronic converter is a box which is resistant to splashes and passive ventilation, guaranteeing long-term protection even in humid environments.

The converter must nevertheless be installed inside the boat, preferably in the mechanical room in close proximity to the batteries.

WARNING : WHEN RUNNING, THE CONVERTER CAN REACH VERY HIGH TEMPERATURES. AS SUCH, ASSEMBLY SHOULD BE CARRIED OUT IN A VENTILATED SPACE.

N.B. : To ensure proper ventilation, the converter must be mounted on a vertical bulkhead, with the ventilation grids in a vertical position. If you wish to get an access to the converter's status, keep in mind to get a visual access to the LEDS located on the top (white cover).

As it is so light, the converter can be securely attached using the Velcro provided.

- degrease the surface on which the converter will be installed
- remove the protective tabs of the strips of Velcro provided on the converter
- apply the quick-drying glue if the surface is very uneven (against plywood, fibreglass ...)
- firmly attach the converter to the surface

The converter is equipped with an RS485 output with a Deutsch plug. This cable allows you to retrieve and record information from the converter such as its temperature, the battery current, their voltage or the rotation speed of the hydrogenerator.

You can connect to the converter via the USB-RS485 adapter available in our shop. After cutting the USB-RS485 cable to the desired length, simply connect the DT-04-4P plug supplied with the cable, respecting the following color code:

- the yellow wire of the RS485 cable goes to input #1 of the socket
- the orange wire of the RS485 cable goes to input #4 of the socket

New: You can now connect your converter to the Adrena software via the RS485 cable.

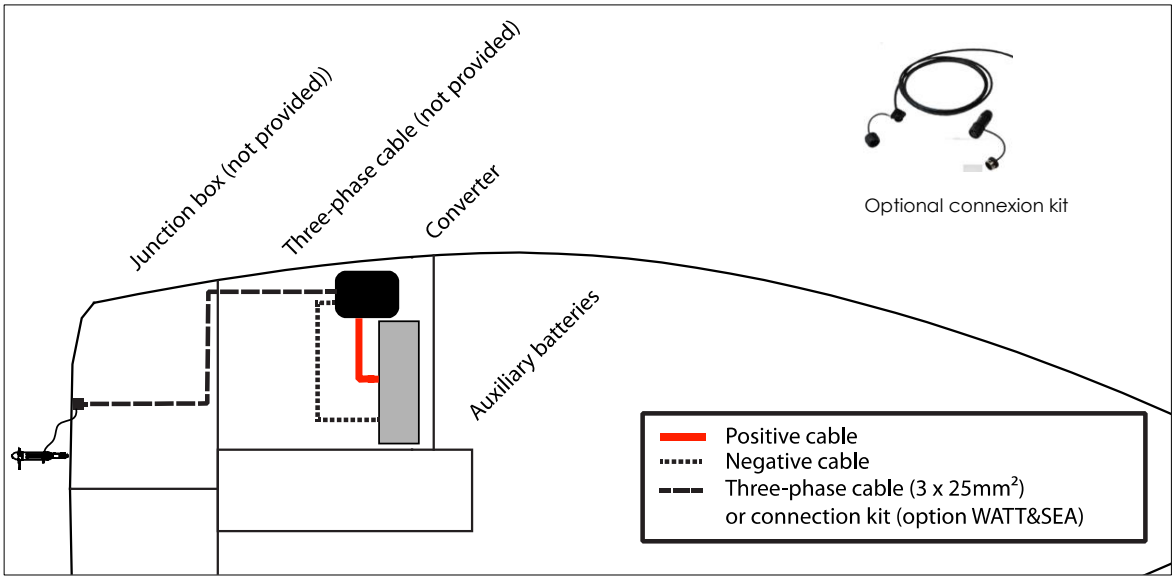
5. ELECTRICAL INSTALLATION

Recommendations for electrical connections :

Please consult local/national safety rules before installation.

All electric cables must be carefully insulated. For maximum protection, cover the cables with electrical cable sheaths.

WARNING : CONNECTIONS MUST BE INSPECTED REGULARLY TO DETECT SIGNS OF CORROSION AND CLEANED WHEN NECESSARY. DAMAGED OR CORRODED CONNECTIONS LEAD TO A SIGNIFICANT DROP IN PRODUCTION.



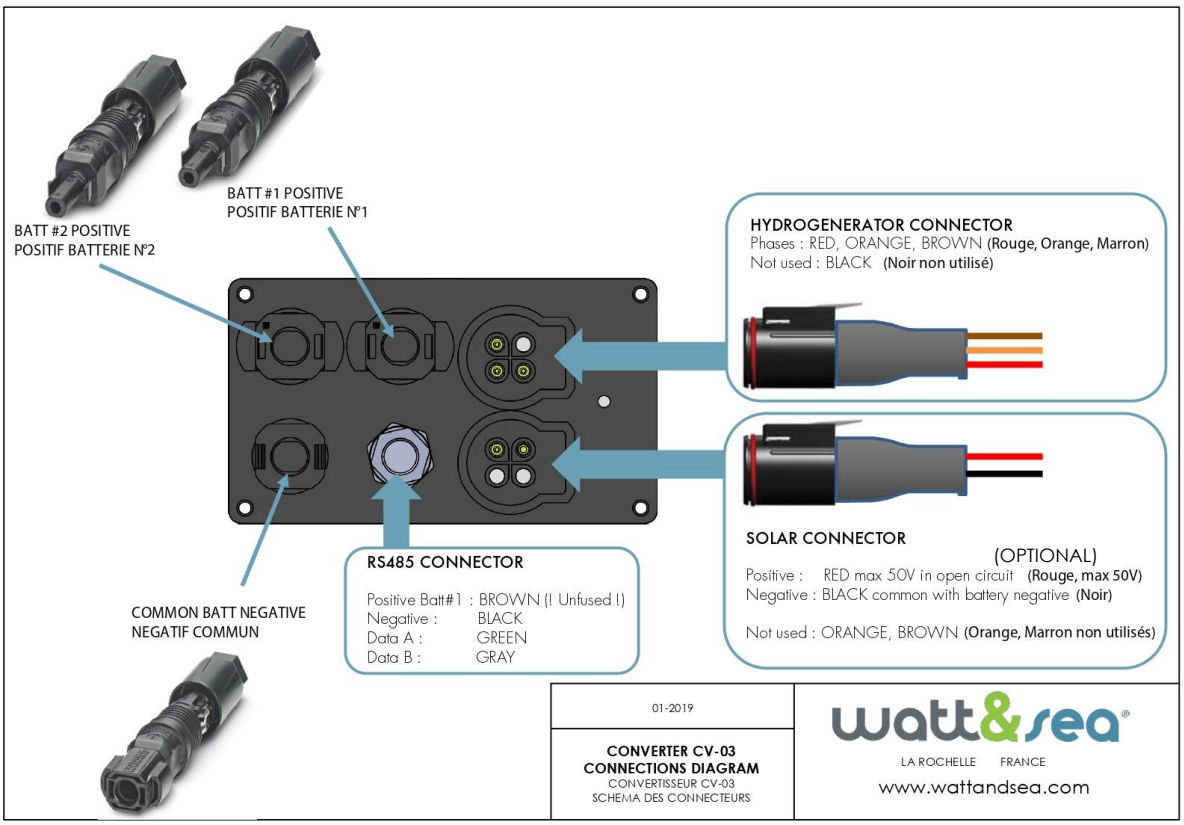
Wiring principle

5.1. Three-phase wiring of the hydrogenerator

WARNING : ALWAYS PLACE THE HYDROGENERATOR IN THE LIFTED POSITION BEFORE STARTING WORK ON IT.

The hydrogenerator is fitted with a small diameter electrical cable of sufficient length to pass through the transom. This is a three-phase cable.

- We recommend using the connection kit with a cable and waterproof power socket. (Ref. PL-04).
- From here, use a three-phase cable to connect the hydrogenerator to the converter. If the length of this cable is less than 10 metres, use a 3 x 1.5 mm² section. Above 10 metres, use a 3 x 2.5 mm² section.
- The converter is connected using the premounted plug CA-03 provided. Connect the 3 phases of the hydrogenerator (3 white wires) to the the 3 wires of the premounted cable CA-03 (BROWN, ORANGE, RED) using a WAGO 222 by example. There is no importance in the connection arrangement of this 3 wires.
  The black wire must not be connected, it is used to wire a solar panel (please see below).



Converter's connections

N.B. : Using a cable that is less than 3 x 1.5 mm2 in diameter will affect both the output and the performance of the hydrogenerator. The GND position must not be connected (ground terminal).

N.B. : The phase sequence is irrelevant. Therefore, there is no need to take into account the color or numbering of the cables.

5.2. Using a solar panel

The converter has 2 inputs: one for the hydrogenerator and one for the solar panel. The solar panel's maximum voltage must not exceed 50 VCC and the intensity must not exceed 14Amps. Minimum voltage to start producing with the solar panels is 7,5VCC.

Wire the solar panel using a 2nd premounted plug CA-03 (optional), taking care of the polarity:
NEGATIVE SOLAR: BLACK
POSITIVE SOLAR: RED

WARNING : RESPECT THE POLARITY OF THE SOLAR PANEL OTHERWISE THE EQUIPMENT WILL BE DAMAGED

When the hydrogenerator and the solar panel are able to generate power at the same time, priority is given to the hydrogenerator.

As soon as it is no longer generating power (lifted, the boat is moored) the converter automatically takes into account the solar panel's charge.

5.3. Connecting the converter to the batteries

The converter must be placed as close as possible to the batteries in order to minimize losses due to cable length. The maximum recommended distance is 2 meters.

The batteries are connected to the converter via solar connectors supplied (2 positive and 1 negative).

The converter has an internal 2 output isolator that makes it possible to charge two battery units separately. The 2 battery banks must be at the same voltage.

WARNING : RISK OF OVERLOADING AND FIRE. THE TWO BATTERY BANKS MUST BE THE SAME TYPE AND HAVE THE SAME VOLTAGE.

WARNING : EACH BATTERY BANK MUST BE PROTECTED WITH A 50 AMP FUSE.

We recommend connecting the hydrogenerator's converter directly to the service battery bank. The converter will monitor the batteries independently of the other on-board units and will charge them when required.

N.B. : Proper operation on one external battery isolator is not guaranteed and may require additional adjustment. Please contact your installer.

WARNING : NEVER REVERSE THE POLARITY OF THE CONVERTER. THIS WILL LEAD TO THE DESTRUCTION OF THE DEVICE.

Please see on next page how to properly dismount the solar connectors from the converter.

English

SUNCLIX connector for installation in photovoltaic systems

This manual describes the wiring under factory and field conditions ("factory and field wiring").

The plug connector may be connected only by trained electricians.

1 Safety notes

WARNING: Do not disconnect under Load! PV plug connections must not be disconnected while under load. They can be placed in a no load state by switching off the DC/AC converter or breaking the AC circuit.

NOTE: For copper stranded wire only.

NOTE: Do not apply cleaning agents, oil (contact oil), or grease to the surface of the plastic housings.

NOTE: The connector is considered to be in compliance with UL 6703 and IEC 62852 only when assembled in the manner specified by these assembly instructions.

2 Approved photovoltaic cables

This connector is suitable for tin-plated cables with a conductor cross section of 2.5 mm², 4 mm², or 6 mm² (AWG 14, 12, 10) .

– **In order to comply with IEC 62852**, you must only use PV cables according to IEC 62930 with conductor class 5/6 in accordance with IEC 60228 and from insulation material group 1.
For approved PV cables, see Table 5.
Other PV cables with an outside cable diameter of 5.0 … 8.0 mm can be approved on request.

– **For UL 6703 compliance** use photovoltaic cable ("PV wire") acc. to UL 4703. Observe the approved conductor structure:

AWG	No. of strands / wire diameter	Outer cable diameter
AWG 14	19 / 0.37 mm ... 45 / 0.25 mm	5.97 mm ±0.30 ... 6,85 mm ±0.20
AWG 12	19 / 0.47 mm ... 52 / 0.30 mm	6.35 mm ±0.32 ... 7.05 mm ±0.20
AWG 10	19 / 0.59 mm ... 78 / 0.30 mm	6.86 mm ±0.34 ... 7.60 mm ±0.20

NOTE: When laying photovoltaic cables, observe the bend radii specified by the manufacturer.

3 Connecting connectors

You will need a bladed screwdriver with a 3-mm wide blade (e.g., SZS 0.5X3.0 VDE, 1207404).

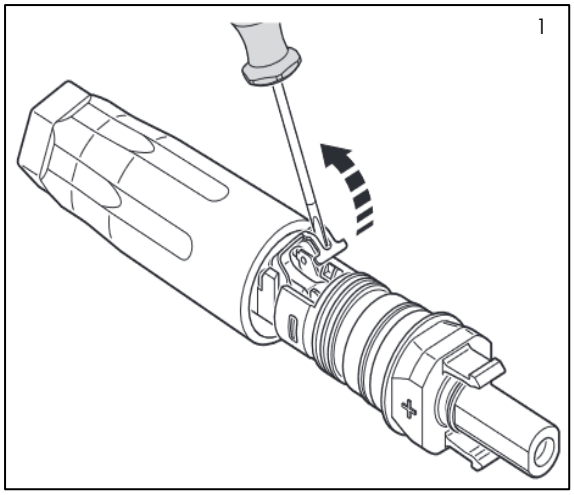
3.1 Connecting the conductor

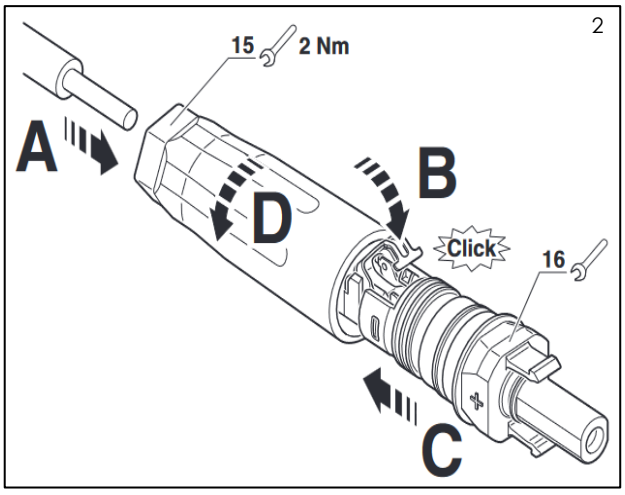
NOTE: During assembly, be careful not to contaminate, pull out, or shift, the seal in the cable gland. A contaminated or shifted seal impairs strain relief and leak tightness.

- Strip 15 mm off the conductor. Use a suitable stripping tool for this (e.g. "Knipex Solar 121211").
- Open the spring with the screwdriver (1).
- Carefully insert the stripped wire with twisted litz wires all the way in (2, **A**). The litz wire ends have to be visible in the spring.
- Close the spring. Make sure that the spring is snapped in (2, **B**).
- Push the insert into the sleeve (2, **C**).

3.2 Tighten the cable gland

- Tighten the cable gland to 2.0 Nm (2, **D**).
Use a suitable and calibrated torque wrench, size 15. Use an open-jaw wrench, size 16, to hold the connector in place.





English

4 Joining connectors

NOTE: Only connect these connectors with other SUNCLIX photovoltaic connectors. When making the connections, always observe the specifications regarding nominal voltage and nominal current. The smallest common value is permissible.

- Fit the two connectors together until the connection audibly locks into place.
- Check to make sure the connection is securely locked.

Tightness of unplugged connectors

When connected, but not plugged in, the connector has an IP20 degree of protection.

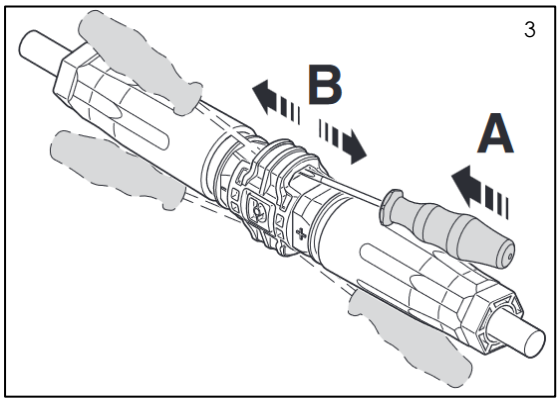
- For transport and maintenance, you can seal unplugged connectors with the IP65/67 protective cap (PV-C PROTECTION CAP, 1785430).
- For permanent sealing, use a suitable mating connector with screw-on IP67 filler plug (PV-C-PLUG-HV, 1623478).

NOTE: The use of other sealing components or materials such as silicone or glue is not permitted.

5 Separating connectors

Use a bladed screwdriver with a 3-mm wide blade (e.g. SZS 0.5X3.0 VDE, 1207404).

- Insert the screwdriver into one of the four openings (3, A).
- Leave the screwdriver in the opening. Pull the two connectors apart (3, **B**).



5.1 Releasing the conductor

- Unscrew the cable gland (4, **A**).
- Insert the screwdriver at the location that is marked with "lift here" (4, **B**).
- Use a screwdriver to lift the latch and pull out the insert (4, **C**).
- Open the spring with the screwdriver (4, **D**).
- Remove the cable (4, **E**).

6 Approved PV cables 5

A Manufacturer and type
B Standard
C Status
D Nominal cross-section [mm²]
E Outside diameter [mm]
F Manufacturer's item number

Status

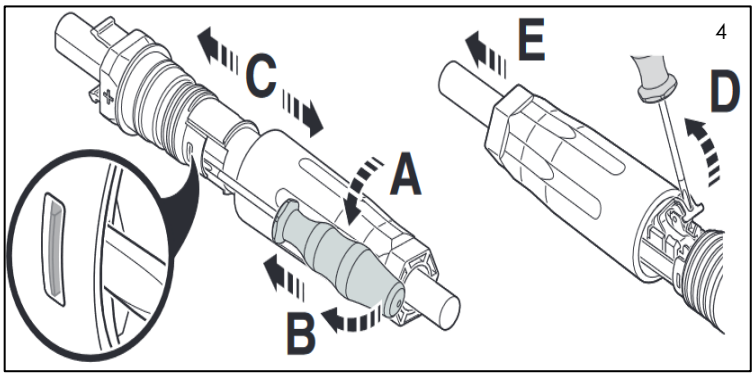
– Status = 1: Approved, part of the TÜV Rheinland certificate

– Status = 2: Approved (UL), not part of the TÜV Rheinland certificate

In accordance with IEC 62852:2014 + A1:2020 / EN 62852:2015 + A1:2020, only cables in accordance with IEC 62930 are allowed in combination with PV connectors.

The H1Z2Z2-K cable type passed all Phoenix Contact tests in combination with PV connectors in accordance with IEC 62852:2014 + A1:2020 / EN 62852:2015 + A1:2020 and TÜV Rheinland testing in accordance with IEC 62852:2014 + A1:2020, Section 5.14.1.

Contact the cable supplier or manufacturer for details on the compatibility of the cable types in accordance with EN 50618 (type H1Z2Z2-K) and IEC 62930.



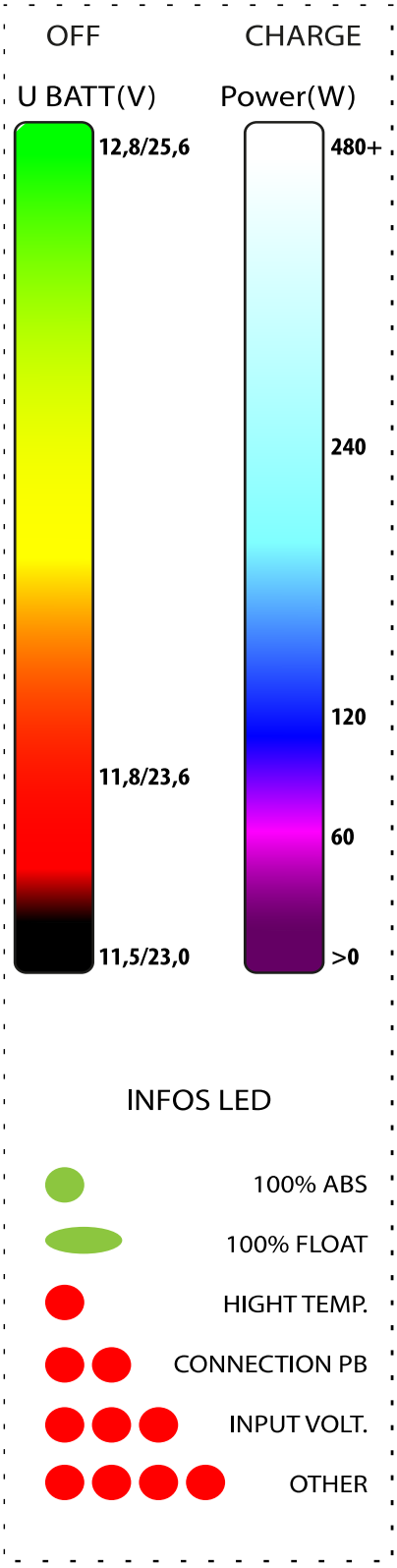
5.4. Interpretation of the converter's LEDs

- When the converter **is not charging**, the battery power is indicated by a **pulse** of colour which changes from green (12.8V) to red (11.5V).

- When the converter **is charging**, the output power is indicated by a **constant colour** which changes from violet to blue (120W), to light blue (240W) and finally to white (480W).

- Green or red coloured **flashes** may **overlay** the display of the constant colour to indicate states or anomalies:

SITUATION	VISUAL	COMMENTS
End of charge voltage reached	1 brief green flash every 5 seconds	The battery is full (end of charge voltage =14.3 V / 28.6 V)
Maintenance voltage maintained	1 long green flash every 5 seconds	The battery is kept at 100% (maintenance voltage = 13.8 V / 27.6 V)
Overheating	1 red flash every 5 seconds	The maximum box temperature has been reached
Generator anomaly	2 red flashes every 5 seconds	The hydrogenerator's connection is defective
Overvoltage at input	3 red flashes every 5 seconds	The solar panel or the hydrogenerator are applying a voltage that is too high
Other anomaly	4 red flashes every 5 seconds	Contact your reseller



5.5. Using Bluetooth

Since the end of 2019, Watt&Sea converters embed a Bluetooth chip (serial numbers above CV-03-1630).

The Watt&Sea application is available on Appstore® and Google Play®. It will allow you to track your hydrogenerator's production, make data records, and adjust charging settings.

To install and use the application:

- Download the application on Appstore® or Google Play®
- Fill in the profile page with the requested information
- Activate Bluetooth on your phone or tablet
- Connect to the converter via the application (the converter has a serial number of type CV-03-XXXX)
- When the connection is made, you will see the data (batterie voltage, Amps production, converter temperature)
- You can enable the Speed Over Ground display from the mobile GPS chip. (This requires the Location function)

To realize a data log, you just have to choose "store the data" in the application's parameters. You can then find all the logs in "history" and send them by mail easily.

6. INSTALLATION SUMMARY

The following instructions set out the main steps in the hydrogenerator installation procedure. This is only a summary. Please refer to the appropriate sections of this manual for detailed instructions.

1. Place the propeller onto the device. (See 4.1)
2. Mechanically mount the hydrogenerator onto the transom. (See 4.2)
3. Install a WATT&SEA connector kit with cable and waterproof power socket (Ref. PL-04).
4. Then, mechanically mount the converter onto a vertical bulkhead, as close as possible to the batteries. (See 4.5)

Make sure that the propeller is not submerged and that it is not possible for the alternator to run during installation.

5. Run the converter's power cables through to the batteries. (See 5.3)

DO NOT CONNECT the cables to the batteries before installation is complete.

6. Attach the battery connectors, then connect the power cables to the batteries : red wire to the positive terminal, black wire to the negative terminal. (See 5.3)
7. Once the converter is connected to the batteries, the LED will come on indicating the current battery power, from red to green. When the propeller starts turning, the color of the LED will change from violet (10W) to blue (120W) and finally to white (>300W)

7. SPECIFIACTIONS

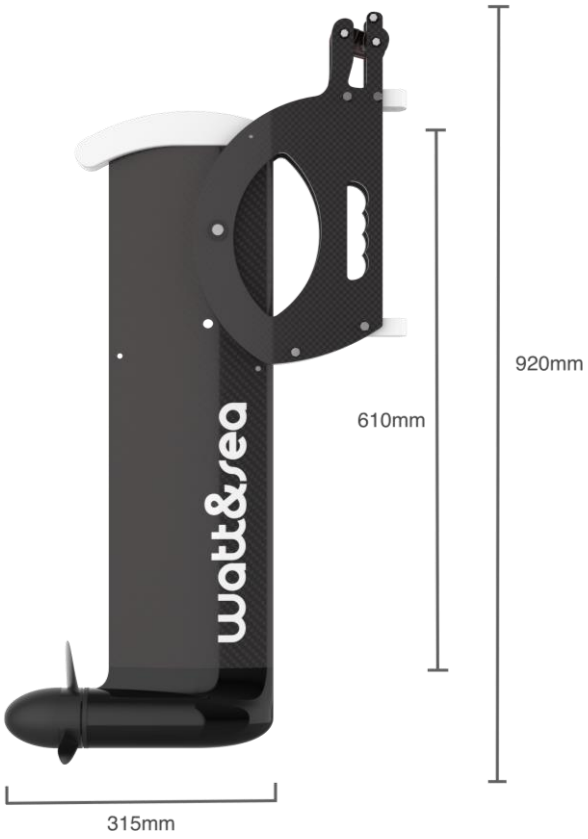
7.1. Technical specifications

- Hydrogenerator:

Nominal power: 600W in 12V, 700W in 24V
Nominal voltage: Three-phase 40V
Rated current: 9Amp
Weight: 6,05 kg (Carbon) / 7,05 kg (Aluminium)
Dimensions: 770 x 453 x 70 mm

- Converter :

Nominal power: 600 W
End of charge voltage: 14.3V / 28.6V
Maintenance voltage: 13.8V / 27.6V
Power limit: 600W or 40Amp
Solar input: 50 V / 14Amp max
Weight: 1.4 kg
Dim.: 210 x 105 x 60 mm



Dimensions of the Class 40 hydrogenerator

7.2. Operating principles

- The hydrogenerator:

The hydrogenerator consists of a permanent magnet alternator producing a very low three-phase current (0-40V). This alternator technology allows for very high output but has the disadvantage of generating high voltages during overspeed.

- The converter:

Transforms the alternating current coming from the alternator into a continuous current compatible with the batteries. This voltage is regulated at several levels depending on the state of charge of the batteries. During charging, voltage is regulated at 14.3V / 28.6V (absorption phase). When conditions allow for fully charging the batteries, the converter regulates to a lower voltage (13.8V / 27.6V) to maintain the batteries without damaging them (maintenance/floating phase).

- Protection against overvoltage:

To prevent the voltage from surging over 40V, the hydrogenerator is equipped with an electronic system that momentarily short-circuits the alternator during overspeed. This embedded circuit protects the systems located downstream of the alternator.

When the device works over-speed, it produces a specific and audible rumble.

This may happen for one of the following reasons:

1 – A cable has been disconnected or the fuse has blown and the converter is no longer connected to the batteries. The hydrogenerator is freewheeling and is no longer slowed by the electromagnetic force. The converter is possibly switched off.

2 – The three-phase cable has become completely disconnected. In this case, the LEDs flash from red, to orange and then to green, indicating that the battery is connected but that there is no power input.

3 – A three-phase wire has become disconnected. In this case, the converter continues to charge but less efficiently. The LEDS display a constant colour ranging from violet, to blue and then to white which is replaced by 2 red flashes every 5 seconds (cf. paragraph 5.4).

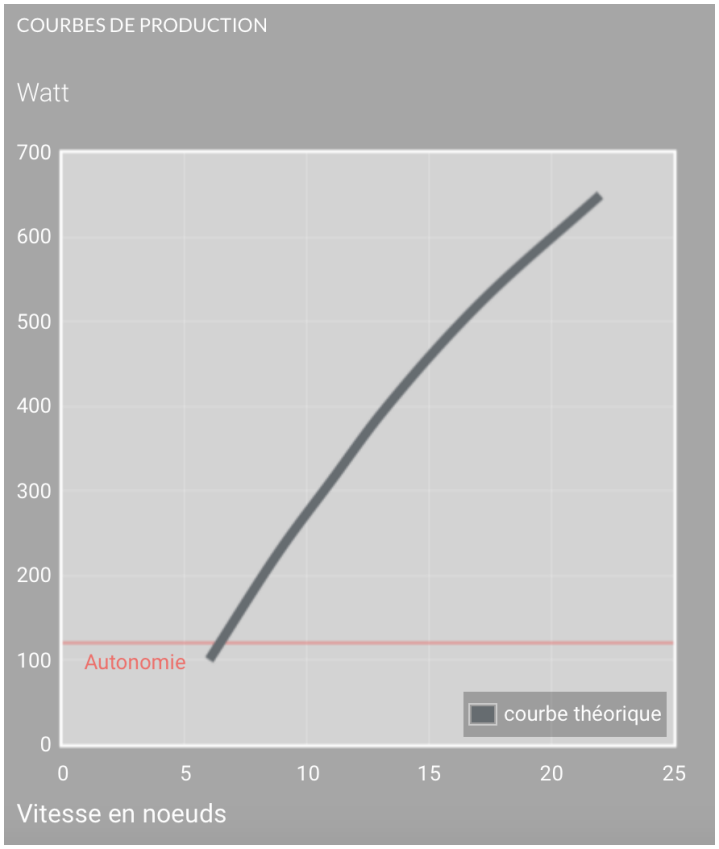
4 – The batteries are charged, or the battery capacity is too weak. The converter has finished charging the batteries or the batteries cannot absorb enough energy to prevent the propeller from freewheeling. The converter indicates this status with a green flash every 5 seconds.
In this instance, we recommend lifting the device. If not possible, see our recommendation about the dump load.

5 – The boat is sailing faster than the propeller speed range and the converter is running at maximum capacity.

• The high-speed propeller:
This propeller is designed to operate over a wide speed range from 5 to 30 knots without resorting to the complexity of a variable pitch.

Designed to develop 300W at 12 knots, it can however develop 700W at peak and absorb large speed differentials.

For specific performances, we can design **custom blades**.



Useful power depending on the boat speed
The average production values are given as an indication and may vary depending on the sea state and the quality of the installation.

8. MAINTENANCE

Originally designed for ocean racing, the hydrogenerator benefits from the latest technology in terms of resistance and reliability. All metallic parts are made from either specially treated aluminium or A4 stainless steel.

Watertightness is guaranteed using cutting-edge industrial gaskets that have a service life of several thousand hours and can easily support circumnavigation of the globe.

The housing is filled with a lubricating oil to prevent any water seepage.

To maintain your hydrogenerator in good working conditions, please follow the instructions below:

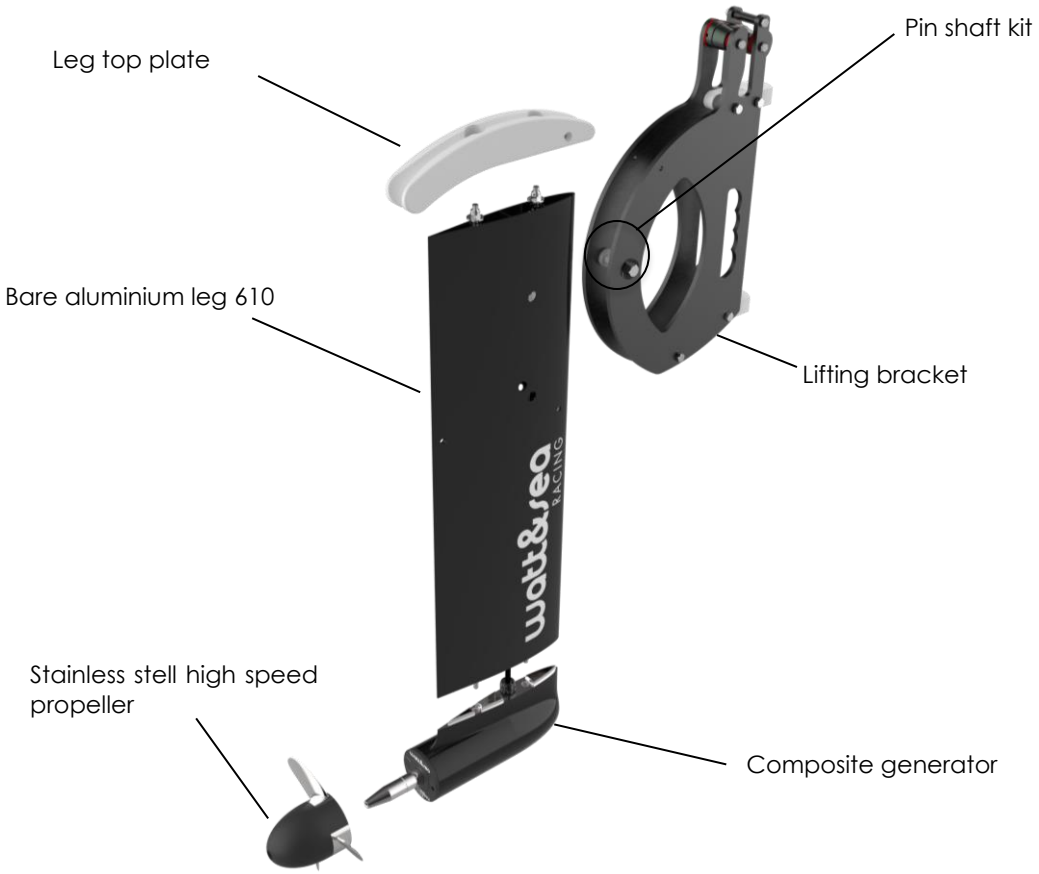
- **The generator housing should be regularly cleaned and rinsed with fresh water.**
- **Dismont regularly the propeller to clean the shaft from potential dirts.**
- **The generator and propeller mountings should be regularly inspected to ensure that they are tight.**
- **Inspect the tightness of the two M6 nuts at the head of the mast at regular intervals**
- **The electrical connections should be inspected to ensure that they are tight and corrosion free.**
- **Check regularly the electrical cable at the exit of the leg (no cuts, pinching).**

Watt&Sea recommends **servicing** every **two years** or every **10,000 miles and before a round the world or ocean race.**

For this, Watt&Sea offers different servicing packages.
For information visit www.wattandsea.com or contact your distributor.

To ease the return of your hydrogenerator and reduce shipping cost, it is recommended to send the generator only (lower part, without propeller and leg).

9. LIST OF SPARES



Exploded view of a hydrogenerator

REFERENCE	DESIGNATION
G-C40-03	Composite generator (no propeller)
CV-03-PV	12-24 VCC auto-detected converter
K-03	Lifting bracket with cam cleat
P-C40-03	High speed propeller
EP-03	Cruising propeller extraction kit
F-03	Transom mounting kit
FS-03	Upper gudgeon
FI-03	Lower gudgeon
WS-SK-C-001	Pin shaft kit
MA-610-03	Bare aluminium leg 610 mm (24 in) with 2 washers and threated rods
TM-03	Leg top plate
PI-03	Locking pin
AN-03	Low friction ring

10. F.A.Q

- What drag is to be expected?

The drag depends on the speed of navigation. At 6 knots, we estimate that the average drag is 10 kg. To calculate the loss of speed for a particular boat, you need to compare the total drag of the hull at 6 knots with 10 kg of drag of the hydrogenerator at the same speed. Our immersion and lifting trials at a constant speed on lifting hydrogenerators have not shown any significant difference on the speedometer.

- What happens when the batteries are charged?

The electronic regulator automatically charges the batteries. When they are fully charged, the propeller freewheels and the noise produced by the hydrogenerator changes (thudding sound). **Hydrogenerator must then be lifted out of the water** (or, if installed, **use the relay that routes the load through the dump load**); otherwise you risk irreversible damages on the generator.

- The hydrogenerator is producing a rumbling sound?

This means that the batteries are fully charged. The hydrogenerator starts to freewheel and produces a thudding, almost rumbling sound. **Hydrogenerator must then be lifted out of the water** (or, if installed, **use the relay that routes the load through the dump load**); otherwise you risk irreversible damages on the generator.

- Is it possible to use the hydrogenerator with the engine?

No, the converter will see full batteries and put hydrogenator in freewheel mode. **Hydrogenerator must then be lifted out of the water** (or, if installed, **use the relay that routes the load through the dump load**); otherwise you risk irreversible damages on the generator.

- Is it possible to use the hydrogenerator in reverse?

The hydrogenerator must be lifted when reversing the boat in order to avoid any possible damage to the leg and cradle mountings.

- The hydrogenerator does not charge as much as is shown in the charts, why is this?

The two most common causes of under-production are:

- An electrical connection problem: poorly connected/assembled power socket, damaged/corroded socket, cut or pinched cable.
- The hydrogenerator is positioned along the axis of an appendage (rudder, keel, etc.) which is disrupting the flow of water and affecting production.
- We suggest that you consult the help center on our website to check that your device is operating correctly: http://www.wattandsea.com/help-center

- Do the converter's LEDs consume energy?

The converter has a residual consumption as one LED is always lit. It cuts out in the event of low voltage (11.9V). Consumption ranges from 0.05 to 0.1Amps.

- Ion lithium batteries?

The converter is designed to charge lithium batteries as its voltage is regulated and cannot exceed the maximum value of 14.3V (or 28.6V).
It can be programmed with specific voltages through the Watt&Sea application. **Be careful not to exceed the maximum recommended voltages for your batteries, to avoid any risk of damage or fire.**

- Sailing in Sargassum?

The hydrogenerator is not designed to cross seas of sargassum. The drag induced by the Sargassum could cause irreversible damage, it is recommended to raise the unit.

- Is the propeller replaceable?

The propeller is simply removed using an M6 extraction screw, supplied in the pack (see chapter 4.5).

11. WARRANTY

Coverage and warranty period:

Our products are designed for very specific conditions of use. It is the responsibility of our customers to ensure the appropriate use of our products. Our systems are covered by a two-year warranty against any manufacturing defect. The warranty period starts on the date of purchase of our products by the distributor.

The warranty is limited to the standard replacement of a defective part or, if necessary, the entire system, upon receipt of the part in question. Under civil law, it is the responsibility of the purchaser to fulfil the burden of proof regarding the previous nature of the claimed latent defect.

Any returned systems or parts must be accompanied by the warranty returns form (see below), duly completed as follows: name and address of the customer, date of purchase, type of boat, defective parts, description of the structural or design defect, and description of the conditions under which the system was used.

Returned systems or parts shall only be accepted with the prior written consent of WATT&SEA and must be returned by prepaid delivery. Should the replacement of the WATT&SEA product prove to be due to a defect covered by the warranty, these delivery costs shall be refunded.

Under no circumstances shall returned systems or parts be refunded; they shall only be replaced.

Situations not covered by the warranty:

This warranty shall not apply if the system in question:

- has suffered an accident or undergone unauthorised alterations or repairs.
- has not been installed by a professional installer in strict compliance with the procedure specified by WATT&SEA in the installation and user manual supplied with the generator.
- has been:
    - installed or serviced in an inappropriate manner or used under too high a charge.
    - subjected to abuse or neglect

The warranty shall not take into account any failures due to simple wear and tear or normal ageing of the structures and materials, any scratches, or any cracks or starring that may appear following an impact.

Under no circumstances shall WATT&SEA be liable for any special, incidental or consequential damages.

Should you encounter a problem with your WATT&SEA hydrogenerator, please contact your distributor/installer who will help you find a solution.

REGISTER YOUR PRODUCT ONLINE:

For traceability under the warranty, please register the product on our website: www.wattandsea.com.