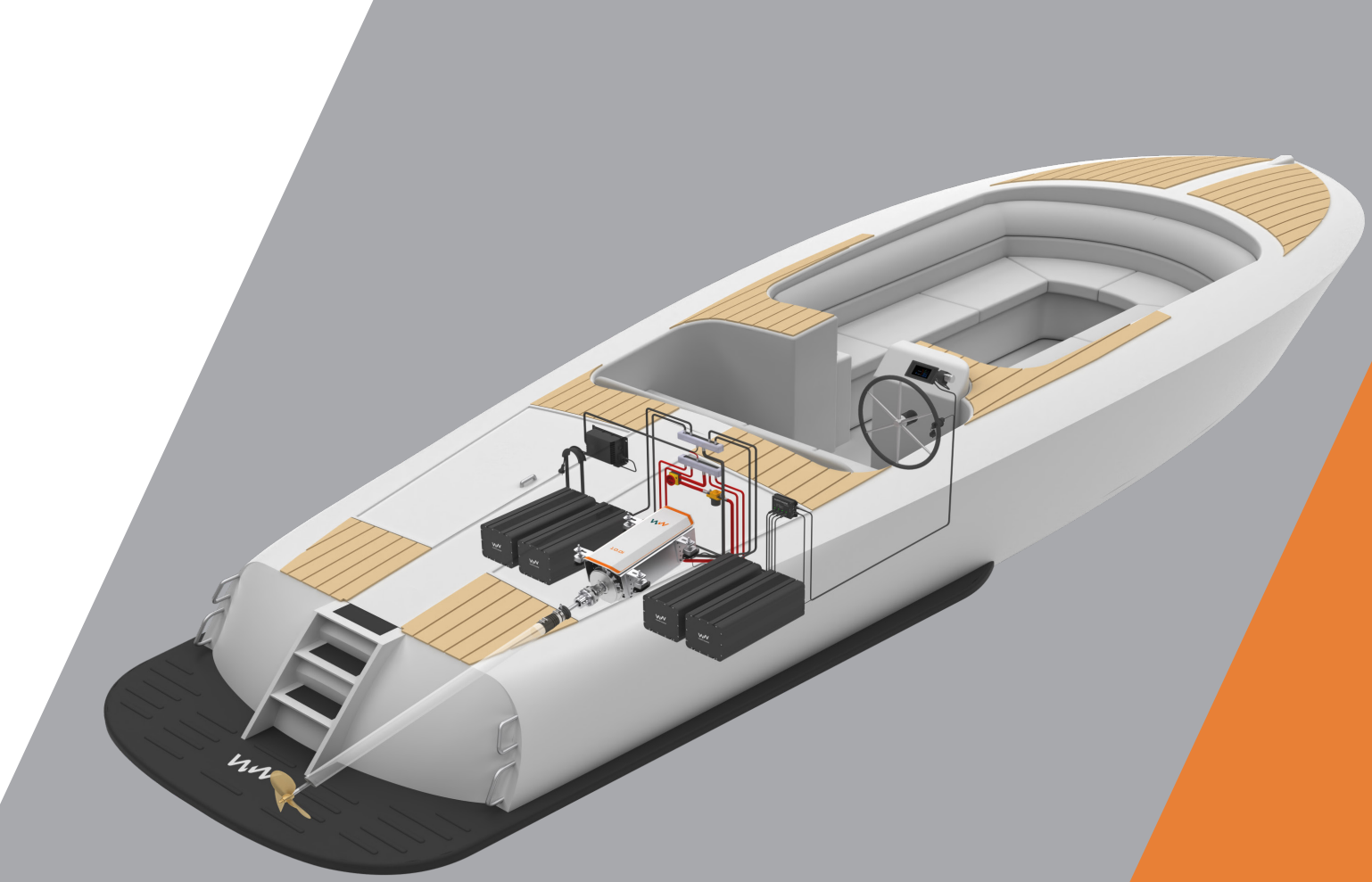


MANUAL INBOARD =2025

Installation of the CANopen
Inboard systems

waterworld
electrify your world

Congratulations on your purchase! We are delighted that you have chosen a WaterWorld's electric propulsion system.

The WaterWorld engines are designed and manufactured with the utmost care. Our focus is to provide you with a safe, reliable, environmentally friendly, and easy-to-use propulsion system you can enjoy.

We strive to continually improve WaterWorld propulsion systems. If you have any comments about the design or use of the system, we would greatly appreciate it if you could inform us. The contact details can be found on the back of this manual.

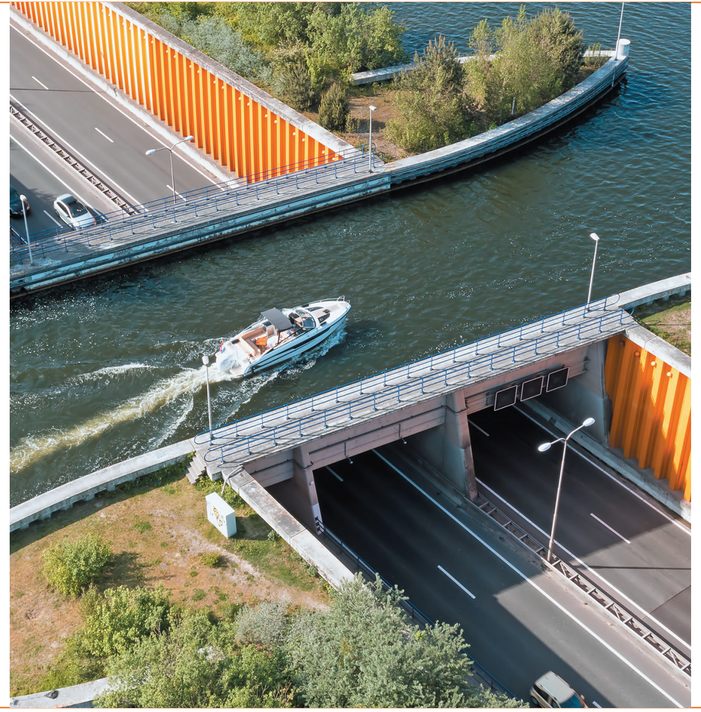
We recommend reading this manual carefully to ensure correct installation and use of the propulsion system.We wish you a lot of enjoyment with it!

Team WaterWorld Electronics

TABLE OF CONTENTS.

1. INTRODUCTION.

- Use of this manual
- Warnings and symbols
- Serial numbers



Use of this manual.

This manual contains essential information for the safe use of WaterWorld electric propulsion systems.
Both maintenance and troubleshooting are covered in this manual.

It is crucial that anyone responsible for the installation of this system, as well as anyone who will operate the motor, thoroughly studies this manual. It is necessary to closely follow and execute the warnings and safety instructions in this manual.

The installation and maintenance of WaterWorld motors should be carried out by specialized and skilled installers, adhering to applicable laws and regulations, in conjunction with the safety aspects listed in this manual.

Keep this manual with your system in a safe and easily accessible place!
You can download a copy or the latest version at www.waterworldelectronics.com.

Warnings and symbols.

DANGER!

A warning indicates that there is a potential risk of injury to the user/installer or significant material damage if the user or installer fails to avoid this risk.

WARNING!

Special information, respective requirements and prohibitions regarding damage prevention.

NOTE!

Instructions that require extra attention and must be followed.

Serial numbers.

You will find the identification label with the serial number on the top of the motor controller. It indicates the manufacturer, the model number, and the unique serial number of the motor or motorcontroller. The serial number starts with the letters WW and is listed after the text 'Serial:'. Below, there is another text starting with WW (21113085), which is the article number of the motorcontroller.

The inboard motor has its own serial number. This can be found on the port side of the motor house.

Both numbers should be found on your invoice. This can be important for warranty purposes.

WARNING! Never remove the identification labels and/or other stickers on the motor!

2. PRE-INSTALLATION CHECKLIST.

- **Step-by-step installation guide**

Installation step-by-step guide.

1. Read the manual
We aim to provide you with an extremely comprehensive manual. This includes not only aspects related to the WaterWorld inboard motor, but also information about the entire boat, propeller and batteries.
However, it is important to note that each installation is unique and should be carried out by a competent person.

2. Check if you have received everything that should be included in the delivery.
Lay out all parts and compare them with the list in chapter 4 and the accompanying packing slip. If you have any questions, please contact your supplier directly for clarification.

3. Prepare the boat to install the system in a clean and dry environment.
If the following aspects do not meet the requirements, they should be addressed before installation.

1. No permanent bilge water at the motor installation location:
Make sure that there is no permanent bilge water present at the location where the inboard motor is installed.
2. Effective protection against flooding:
Ensure a properly functioning bilge pump at the appropriate place in the boat to prevent flooding the boat.
3. Component placement considerations
Avoid leakage or condensation from above when placing components. If necessary, adjust placement or cover components from above.
4. Ensure good ventilation:
Ensure adequate ventilation in the relevant space(s) to allow moisture to evaporate and ventilate the space.
Ensure good “flow”.

5. Smooth-running and properly aligned propeller shaft system:
Check that the propeller shaft system runs smoothly and is properly aligned.
A heavily rotating propeller shaft system can lead to;
- Increased fuel consumption, resulting in reduced operating time.
- Engine overheating
- Slow response to throttle input.
- Less controlled throttle; the engine may start with too much power once sufficient force has been built up.
6. Make sure these points are in order before proceeding with installation.

4. Make the right propeller selection
Refer to our advice on page 87.

5. Check the accessibility of the components.
Ensure all components are easily accessible for maintenance and servicing.

6. Ensure proper weight distribution in the boat.
The (lead-)battery pack can be significantly heavy; ensure balanced weight distribution in the boat. Ensure that the batteries are accessible for maintenance of the battery terminals, wiring, and in the case of wet batteries, for topping up with distilled water. For WaterWorld LFP batteries, it is essential that the on/off switch is accessible at all times.

7. Choose the correct cable thickness.
Refer to page 48/49 for the correct cable selection. Ensure that cable lengths are not unnecessarily long if this can be avoided. To ensure equal discharge of potentially multiple batteries, it is important that the lengths of both the cable from the main positive terminal and the main negative terminal are equal.

8. Read the safety instructions in chapter 3 before connecting anything.
Then read the section of the manual that pertains to the respective component. Always connect according to the connection diagram on page 39/40.

9. Start the installation.

3. SAFETY.

- General guidelines
- Safety features of the propulsion system
- Safety instructions for the propulsion system
- Safety instructions for the batteries
- Safety instructions for usage
- Safety device for rotation sensor

General guidelines.

Read and observe the safety and warning instructions in this manual!

- Adhere to local laws and regulations and the required qualifications.

- Ignoring the instructions may result in injury and material damage. WaterWorld Electronics cannot be held liable for damage resulting from actions contrary to this manual.

- **Prescribed voltage of the propulsion system:**

The propulsion system must operate at the prescribed voltage.
- In the default setting this is nominal 48 volts. Minimum 42 volts, maximum 60 volts.
- There is a special setting for specific lithium batteries that operate at a lower nominal voltage of 44 volts; at this setting, the minimum is 37 volts.

- **Specific use:**

The system is intended solely for powering watercraft. The manufacturer cannot be held liable for any other use, and in all cases, the warranty is void.

- Keep the electronics away from water.

- **Installation and repair:**

Installation and repairs may only be carried out by an authorized installer designated by WaterWorld.

- **Use of accessories ans spare parts:**

Only original replacement parts may be used for repairs to the propulsion system. The use of non-original parts may result in serious injury, damage, and voiding of further warranty.

- **Battery replacement:**

Battery replacement must be carried out exclusively by an authorized installer.

- **Regular maintenance:**

The user should regularly ensure the proper operation of the propulsion system and the batteries. The manufacturer is not liable for any damage caused by improper use or malfunction of the propulsion system.

- **Liability:**

The supplier, being WaterWorld, the seller, or the manufacturer, do not accept liability for any damage to the buyer, nor for potential claims from third parties arising from (the use of) the propulsion system, directly or indirectly, including consequential damage, environmental damage, hearing damage, business damage, and non-material damage, or incorrect advice, unless the damage is attributable to gross negligence or negligence of the supplier.

- **Legislation:**

Prior to use, you must consider the legislation in the respective country, both at the location where the propulsion system is located and where it is used. The buyer is responsible for complying with any legal precautions at the location where the propulsion system is used, regardless of whether the propulsion system is operational at that time. This also includes measures relating to fire safety and ensuring the safety of others in the vicinity of the propulsion system.

- **Rights and powers:**

The manufacturer reserves all rights and powers arising from European legislation. It is expressly prohibited to imitate or copy the device.

- **Non-standard battery packs:**

For non-standard battery packs, except WaterWorld LFP batteries, it is best to contact your supplier beforehand.

- **Repair work independently:**

Never attempt to carry out repairs on the WaterWorld system independently.

- **Damaged parts:**

Never touch loose, torn, or visibly damaged cables or parts.

- **Lifting the system:**

Never lift the WaterWorld system alone; always use suitable lifting equipment.

- **During sailing:**

During sailing, ensure that the risk of the propeller hitting the bottom is eliminated.

Safety features of the propulsion system.

Your WaterWorld electric drive system is equipped with various safety measures:

- **Overheating protection for motor and motorcontroller:**
The motor adjusts the power output when the electronics detect excessive temperatures.

- **Fuse on the motorcontroller:**
Depending on the motor power, a fuse is installed on the motorcontroller.

- **External fuse for wiring:**
This external fuse prevents fire, overheating, or overloading of the system.
WARNING! This external fuse is not included in the standard delivery but must be installed.

- **Main switch:**
Make sure to always turn this off when you leave the boat or when work is being done on the system.
WARNING!: This main switch is not included in the standard delivery but must be installed.
Consult your supplier for the appropriate main switch regarding the applied current strength.

- **Overload protection for batteries:**
If your batteries are nearly empty, the motor will automatically reduce power, allowing you to extend your sailing time and safely reach a harbor at low speed.

- **Ignition switch:**
This allows you to turn off the system in case of danger. Always turn it off when there are swimmers around the boat!

- **Display:**
This continuously shows the remaining sailing time, allowing you to plan your trip to reach your destination. Additionally, the display warns of excessively high or low battery voltage, with an indication on the screen for low voltage.

- **Checking voltage-carrying cables:**
Voltage-carrying cables that connect the motor, motorcontroller, and other components must be regularly inspected for damage, breaks, and proper, secure attachment.

- **Protection of cable shoes:**
The cable shoes of the voltage-carrying cables that connect the motor, motorcontroller, and other components must be equipped with pole caps that also cover the battery poles.

- **In case of damage or breakage:**
When damage or breakage is detected in the cables/wires, the motor must be immediately shut down and taken out of service until the respective cable/wire is replaced.

Safety instructions for the propulsion system.

Follow the instructions in this manual!

- **Switching off in case of overheating or defect:**

Immediately switch off the system via the main switch in case of overheating, smoke development, or if you detect a defect.

- **Ambient temperature:**

In use, the ambient temperature should not be lower than -20 degrees Celsius and not higher than 50 degrees Celsius.

- **Avoid contact during use:**

Do not touch the driveshaft, motor, and battery components during or immediately after sailing.

- **Switching off during assembly and disassembly work:**

Always switch off the system via the main switch during assembly and disassembly work.

- **Maintenance and cleaning work:**

Do not perform maintenance or cleaning on the propeller or driveshaft while the system is powered on.

- **WARNING! Turn off the engine when there are people near the boat.**

Safety instructions for the batteries.

- **Follow the battery manufacturer's manual:**
Take in all safety instructions regarding the used batteries as outlined in the battery manufacturer's manual.

- **Use with damaged batteries:**
Do not use the WaterWorld system if the battery is damaged, and inform the supplier or installer of the system.

- **Flammable objects:**
Do not store flammable objects near the battery.

- **Smoke and spark risk:**
Never smoke and avoid sparks or flames near the batteries.

- **Precautions for battery acid:**
Make sure you have enough water on hand; if battery acid comes into contact with the skin or eyes, immediately rinse with water and seek medical assistance.

- **Using charging cables:**
Only use charging cables suitable for outdoor use. Always fully unwind the reel from a 230 Volt power outlet.

- **Protection against mechanical forces:**
Avoid strong mechanical forces on the batteries and system cables.

- **Safety during work:**
Remove metal jewelry and watches before performing work on batteries and always use insulated tools for this purpose.

- **Prevent short-circuits:**
Never short-circuit batteries. Ensure that tools and metal objects never come into contact with the battery to prevent sparks, fire, or explosions.

- **Correct polarity when connecting:**
When connecting the battery, pay attention to the correct polarity and ensure that the connections are securely and firmly attached for good contact. Never reverse the polarity.

- **Order of connecting:**
When connecting the batteries, first connect the red positive cable and then the black negative cable. When disconnecting the batteries, ensure that you first disconnect the black negative cable and then the red positive cable.

- **Maintenance of battery terminals:**
Battery terminals must be clean, free from corrosion, and covered with terminal caps.

- **Ventilation:**
Do not place batteries in poorly ventilated spaces. When placing them in a locker, proper ventilation must be provided.

- **Identical batteries:**
Only connect identical batteries (type, capacity, age) and make sure they have identical state of charge.

- **Optimal contact:**
Ensure that battery terminals always make optimal contact with the cable eyes they are connected to.

- **Other consumers:**
Do not connect other consumers (e.g., fish finder, lights, radios, etc.) to the same battery bank used to power the inboard motor.

- **Replacing batteries:**
In case of battery failure, it is recommended to replace all batteries.

- **Switching off during work:**
When working on batteries, always switch off the system using the main switch.

- **WARNING! Always ensure that there are no stainless steel washers between the battery terminal and the connected cable.**

- **WARNING! More information about the batteries can be found in the manuals 48-6800 and 48/35 charger on www.waterworldelectronics.com**

Safety instructions for usage.

Read this manual thoroughly!

- **Qualified users:**
The WaterWorld system may only be used by individuals who are qualified and both physically and mentally fit.

- **National regulations:**
Always comply with the national regulations and rules of the respective country.

- **Safety for childeren:**
Keep the drive and control options out of reach of children or individuals who cannot handle them properly.

- **Instructions:**
Have the operation and safety regulations of the entire system explained by the shipyard or installer.

- **Inspection before departure:**
Inspect the system for mechanical damage before departure.

- **Check before each cruise:**
Check the condition and operation of all functions of the WaterWorld system at the start of each cruise at low speed.

- **Technical condition:**
Sail only with a system that is in perfect technical condition.

- **Battery charge:**
Ensure that the batteries are sufficiently charged.

- **Familiarity with controls:**
Familiarize yourself with all control elements of the WaterWorld system and know how to stop the system quickly if necessary.

- **Responsibility as a boat operator:**
As the boat operator, you are responsible for the safety of the people on board and for all boats and people around you. Therefore, adhere to the basic rules of boating.

- **Caution with people in the water:**
Be extra cautious when there are people in the water, even when sailing at low speed.

- **Sailing area information:**
Obtain information about the area where you will be sailing before departure and take into account the weather forecasts and sea conditions.

- **Familiarity with sailing area:**
Be familiar with the area where you will be sailing, as the range indicated by the onboard computer does not account for wind, current, and sailing direction.

- **Planning for range:**
Plan for a sufficient buffer for the required range.

- **Safety equipment:**
Ensure that, depending on the size of the boat, the specific safety equipment is available and accessible (life jackets, anchor, paddle, communication devices, etc.).

Safety device for rotation sensor.

It is possible to control the motor sensorless in case the rotation sensor fails.

What to do when the rotation sensor fails
By default, control is switched to sensorless control. When the motorcontroller detects a faulty sensor, the motor is switched off. An error message appears on the screen:

- EFS14 Position sensor fault
  Set throttle to neutral for sensorless drive

Now move the throttle lever to the neutral position. The engine is now controlled sensorlessly.

A warning remains active in the display from now on:

- EWS09 Position sensor fault (Sensorless drive active)

A hybrid system will now be unable to regenerate. When hybrid mode is enabled, the following warning will become active:

- EWS10 Charging disabled (Position sensor fault)

Try to solve the problem as soon as possible:
Check that the rotation sensor cable is properly connected. If it is not, connect it, restart the motorcontroller and see if the problem is solved. Otherwise, contact your supplier.
After restarting the motorcontroller, it will switch back to control with rotation sensor. If the problem is not solved, sensorless control will be switched back on.

4. DELIVERY CONTENTS.

- **Contents of the WaterWorld package**

Contents of the WaterWorld package.

Standard delivery package includes:

- Inboard base module
- Motorcontroller with stainless steel motor mounts
- Display
- Side-mount throttle lever (top-mount optional, ask your supplier)
- Relay (integrated in motorcontroller at type 4.0i)
- Ignition switch with 2 keys
- Data cables (included with the separate components)

Not included:
- **Main power switch**
- **Fuses for individual batteries**

Motor mounts:
Adjustable attachment to the outer side of the frame.

NOTE! During installation, the supports will be reversed, and the motor will hang in the supports instead of standing on them!

Propeller thrust bearing:

Integrated into the motor, the shaft has a flange for attaching a counter-flange (**not included)** to secure the propeller shaft (**not included**). In the image, you can see the flange.
It should only be removed, if necessary, using a pulley puller.

Never hit the flange with a hammer!

In case of continuous operation at 10 kW or 20 kW, it is recommended to use an external thrust bearing.

Ignition switch:

The ignition switch is supplied with 2 keys and a 3-meter cable (easily extendable if necessary).
Each set of keys is unique.
In case of key loss, it is best to purchase a new ignition switch.
The ignition switch has an IP65 rating.

Digital display:

The digital color display with touch functionality is supplied with a 3-meter RJ45 data cable. The display has an IP65 rating. When mounted in an open boat, please note that the display can become very hot in direct sunlight. We recommend covering the display with good ventilation to protect it from weather conditions when the boat is not in use.
When mounting in an aluminum console, ensure the console has (natural) ventilation to prevent moisture from entering through the back of the display.
Instructions for setting up and reading the display can be found on pages 54 and 56.

Throttle lever:

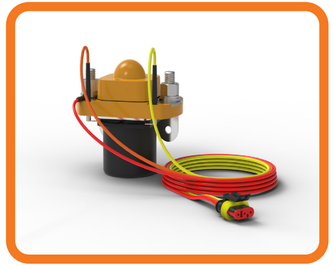
The standard delivery includes a side-mount throttle, with a RJ45 data cable (3 meters). In the network of a standard inboard system, you can connect and set up a maximum of two throttle levers.
Other types of throttle levers are available, for example for top mounting. Ask your dealer for more information.

Terminating resistors.

Depending on the type of system, one (4.0i) or two end resistors are included (10.0i and 20.0i). Place these end resistors in the remaining open data ports. The specific data ports in which you place them are irrelevant because all components can be connected in series with each other. The order in which you do this is also irrelevant. Refer to the wiring diagram on page 39/40 for more information.

Relay

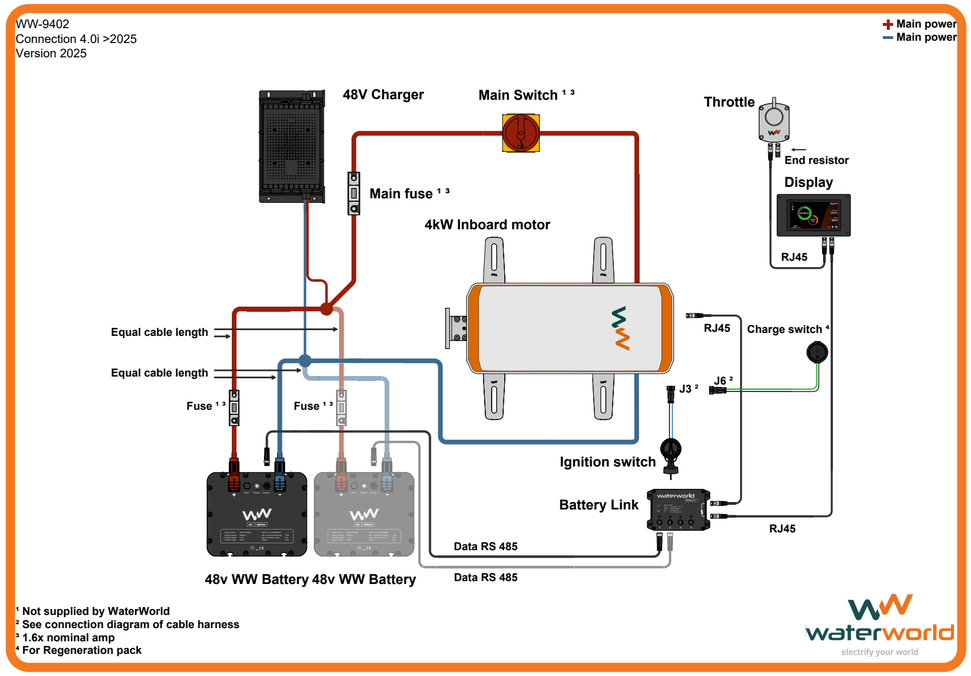
The relay comes with the 10.0i and 20.0i systems and fits the plug with like-colored wires on the 23- or 35-pin plug. On the 4.0i, the relay is integrated into the motorcontroller. The relay should be mounted with the red wire on the battery side. See the wiring diagram on page 39/40 for more information.

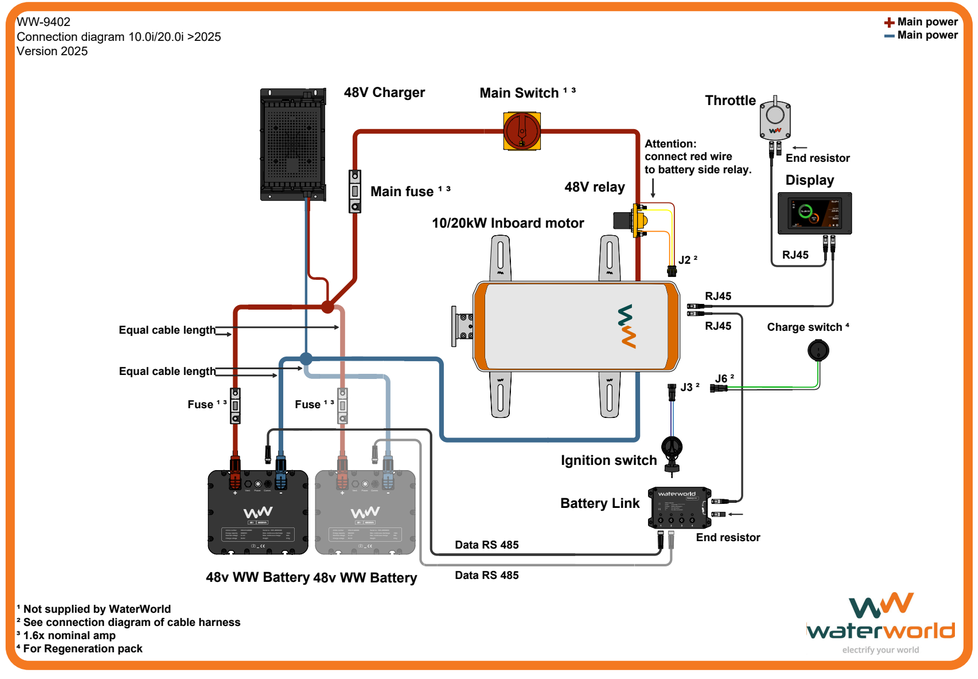


**IMPORTANT! Not included in the standard scope of delivery are vibration dampers, fuse with fuse holder for the battery cables, main switch, and battery pack with charger. From 2022, WaterWorld supplies its own lithium batteries.
Contact WaterWorld or your supplier and inquire about the possibilities.**

5. SYSTEM INSTALLATION.

- Connection diagram
- Placement of the inboard motor
- Batteries
- Battery charger
- Recommended cable thicknesses
- Main power switch
- Main fuse
- The relay
- The throttle
- The display
- The ignition switch
- Connecting the throttle, display and ignition switch
- Setting up the display
- Setting up for different voltages of lithium batteries
- Testing and commissioning





For the latest version of the wiring diagram, please consult our website: www.waterworldelectronics.com/downloads

Placement of the inboard motor.

The inboard motor is best installed using the following step-by-step plan:

- **Stability and safety:**

Ensure that you stand stably when attaching your propulsion.
Mount the motor only on land. Mounting the motor in the water may result in material damage.
Do not lift the WaterWorld system alone, and use a suitable lifting device.

- **Connecting components:**

Connect the throttle and batteries only after mounting the propulsion system on the boat. Drilling holes in the hull of the boat can potentially weaken the hull structure. This should be compensated for by adding extra crossbeams, frames, or other reinforcements. Depending on the hull structure, a sufficiently large backing plate may be needed between the hull and the locking nuts inside the boat. Ensure that the boat's hull is stable enough to withstand the drive unit and the resulting propulsive forces.

- **Removal motor coveers:**

Remove the motor covers from the motor and carefully place them in a safe location.

- **Mounting the motor:**

Mount the motor on a foundation and vibration dampers that are suitable for absorbing and transferring the thrust of the system to the boat.

Preferably, use a flexible coupling between the motor flange and the propeller shaft. This prevents vibrations in the boat and compensates for imperfections caused by the quality of the propeller shaft system or the alignment.

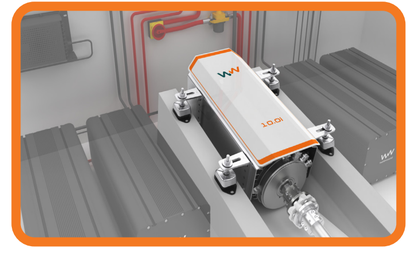
WARNING: If you choose to install the motor without vibration dampers, it is crucial that the motor is very well aligned with the shaft, even if you use a flexible coupling. Additionally, this may lead to extra noise, especially in aluminum boats.

CAUTION! Due to the weight, it is best to hoist the WW 4.0i, WW 10.0i or WW 20.0i into the boat. For this purpose, you can rotate the included lifting eye, as shown in the image, also located at the top of the motor where threaded holes are provided.
You can use a hoist to lift and lower the motor using this eye.

WARNING! Never lift the WaterWorld system alone. Always use appropriate lifting equipment.

- **Motor side supports:**

The side supports on the motor are supplied with the supports pointing downward. In most cases, these should be reversed, and the motor will hang in the supports as shown in the example.



- **Flexible coupling:**

Preferably use a flexible coupling between the motor flange and the propeller shaft. This prevents vibrations in the boat and compensates for imperfections caused by the quality of the propeller shaft system or the alignment.

WARNING! If the propeller shaft is directly mounted on the motor with a rigid connection, the motor must be very well aligned to prevent damage to the electronics and connectors. Never hit the propeller shaft with a hammer, as this can damage the bearings in your motor! Use a puller for removing the propeller.

WARNING! For a WW 4.0i, WW 10.0i, or WW 20.0i motor in a heavy boat or for professional use with many sailing hours, it is recommended to use an external thrust bearing. This ensures that the rubber motor mounts and the thrust bearing in the motor are not excessively loaded over time. If you have any doubts, please contact your supplier.

- **Motorcontroller and cabling:**

The motorcontroller of WaterWorld comes with a red and black battery cable already attached to the motor controller side. The red cable on the positive side is connected to the relay.

We recommend and use the following cable thicknesses:

- 4.0i : 35mm2 cable
- 10.0i : 70mm2 cable
- 20.0i : 90-120mm2 cable

You can find more information about cable thickness on page 46 of this manual.

If you are going to use cable lengths longer than 5 meters, we recommend using thicker wiring.
The motor and motorcontroller are cooled by fans: two or four units at the back of the motorcontroller, depending on the motor power (visible at the front of the system), and one on the motor. Ensure that there is free airflow to dissipate heat. The air is drawn in at the front of the motor housing or compartment and expelled at the rear. If necessary, ventilation grilles should be mounted at the top on the side to allow for the intake of fresh air and the exhaust of warm air.

WARNING! WaterWorld assumes no responsibility for performance loss, damage, or other issues due to inadequate system ventilation.

- **Mounting options:**

In the standard configuration, the motor and motorcontroller are mounted in a single frame, and these components are already connected to each other from the factory. You don't need to do anything about it.
If there isn't enough space for the motorcontroller directly behind the motor, or if batteries are placed above the motor, you can mount the motorcontroller separately in another location on the boat. To do this, it can be removed from the frame, and the rear part of the frame can also be removed on both sides. The phase cables may be extended by a maximum of 50% from the factory length. Always consult an expert for this.

WARNING! If you want to mount the motorcontroller externally from the motor, this must be done in consultation with WaterWorld by a certified installer!

Batteries.

WARNING! Ensure that there is never any voltage on the system during installation and mounting!

- **Battery pack for 48 Volt:**

The drive operates on 48 volts. Ensure the battery pack used for this application is suitable in quality and capacity.
Use traction, semi-traction - deep cycle, or lithium batteries that meet the specifications.

WARNING! If there is any doubt about the specifications of lithium batteries, it is advisable to consult with WaterWorld. It is possible that the batteries may damage the motor, or vice versa if they are not compatible with each other.

- **Battery placement:**

Place the batteries in the boat so that:

- the weight is evenly distributed and the boat sits level on the waterline.
- the batteries cannot slide after installation.
- the batteries are accessible for cable connection and future servicing.
- the batteries do not obstruct daily use of the boat.
- wiring to the motor and charger is easily achievable without unnecessary cable length.

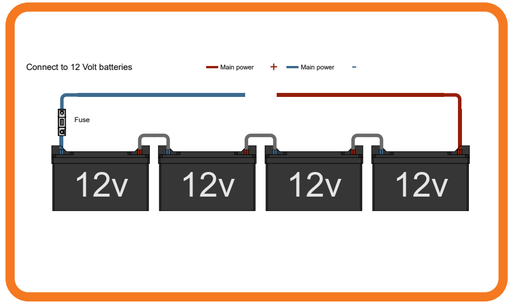
- **Checking the battery voltage:**

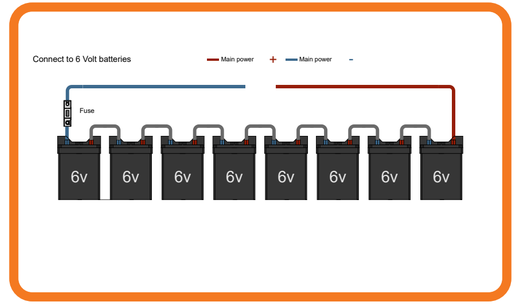
Check the individual voltage of all batteries and ensure they are within 0.1 volts of each other before connecting the batteries in parallel. If this is not the case, all batteries must first be fully charged individually.

- **Connection of the batteries:**

Connect the batteries together according to the applicable diagram.
Below are examples of 4 x 12 Volt batteries in series and 8 x 6 Volt batteries in series.

WARNING! Also, refer to the manual of the lithium batteries for correct installation.





WARNING! Wait to connect the batteries to the rest of the system until everything is connected and tested for shorts.

Battery charger.

The battery charger must be chosen according to the battery pack and be suitable in terms of voltage, charging capacity in amperes, battery type, and usage in a boat.

WARNING! When placing the charger, consider the same factors as with the motor and batteries. Moisture, accessibility, wiring, ventilation, etc.

WARNING! If using a WaterWorld battery charger, refer to the charger manual for more information.

Recommended chable thickness.

Waterworld 4.0i: up to 4.4 kW power consumption, max. 92 Ampere.
For a 4.0, a cable thickness of 35 mm² is recommended.

Waterworld 10.0i: up to 11 kW power consumption, max. 230 Ampere.
For the 10.0, a cable thickness of 70mm² is recommended.

WaterWorld 20.0i: up to 20 kW power consumption, max 450 Ampere.
For the 15.0, a cable thickness of 95-120 mm² is recommended.

The above data is based on cable lengths up to 5 meters.
For further advice on shorter and longer lengths, consult the table on the next page (page 49).

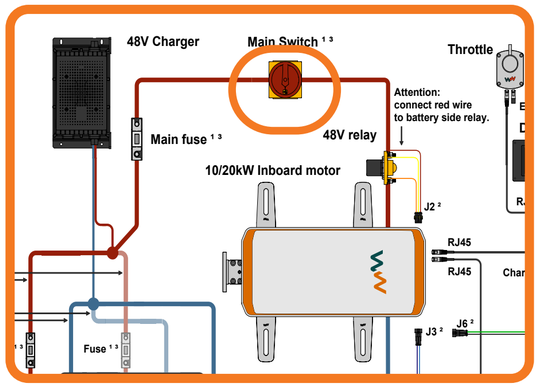
Cable Diameter	Cable Section	L(+) + L(-) up to 5 meter	L(+) + L(-) up to 10 meter	L(+) + L(-) up to 15 meter	L(+) + L(-) up to 20 meter
mm	mm²	I max A	I max A	I max A	I max A
0.98	0.75	2.3	1.1	0.8	0.6
1.38	1.5	4.5	2.3	1.5	1.1
1.78	2.5	7.5	3.8	2.5	1.9
2.26	4	12	6	4	3
2.76	6	18	9	6	5
3.57	10	30	15	10	8
4.51	16	48	24	16	12
5.64	25	75	38	25	19
6.68	35	105	53	35	26
7.98	50	150	75	50	38
9.44	70	210	105	70	53
11.00	95	285	143	95	71
12.36	120	360	180	120	90

WARNING! When determining the appropriate cable thickness, consideration must be given to the voltage drop across the battery cable. This voltage drop must not exceed 0.26 volts, including cable lug shoes. The total length of both positive and negative pole cables must be taken into account.

Main power switch.

Mount the main power switch in a readily accessible location in the (red) positive cable between the motorcontroller and the batteries, so that in case of emergency or maintenance, the system can be easily disconnected from the batteries.

WARNING! The main power switch is not included in the standard delivery scope.



Ensure that the main power switch is always turned OFF (“0” or “off” position) when working on the components and when disconnecting or connecting power cables, once the system is installed.

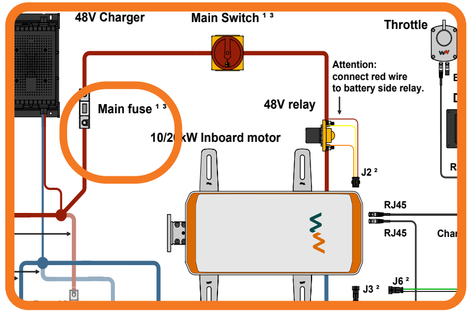
WARNING! The main switch should be able to be turned off during battery charging.

Main fuse.

Install the main fuse between the main power switch and the positive terminal of the batteries, as close as possible to the batteries, preferably in the battery compartment. Ensure that this main fuse is located inside the boat but remains visible by opening a hatch. The capacity of the fuse in ampere should be approximately 1.6 times the maximum ampere of the motor (refer to the specifications).

You can also order an ANL fuse holder and an ANL fuse for the motor right away.
We provide the following values:

- WaterWorld 4.0i: 160A fuse
- WaterWorld 10.0i: 325A fuse
- WaterWorld 20.0i: 600A fuse



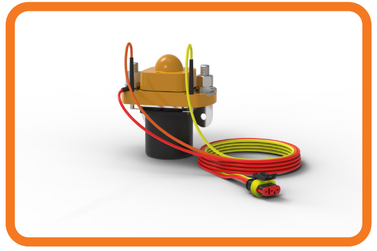
WARNING! The main fuse is not included in the standard delivery scope.

The relay.

Install the supplied relay in the (red) positive cable, between the motor and the main power switch.

The separate red wire with an M8 eyelet should be connected to the bolt of the relay on the battery side, above the battery cable.
Ensure a secure connection for this red wire; a poor connection may result in issues during motor startup.

The relay has a plug with 3 wires, which should be connected to the motor controller using the corresponding connector.
The wires have matching colors and fit in only one way.



The trottle.

- **Placement:**

Mount the throttle in a suitable location, easily accessible for the driver.
Refer to the website for the drawing of the throttle for the correct dimensions.

- **Safety:**

Ensure that the throttle is mounted in such a way that crew members of the boat cannot easily bump into it, which could result in sudden acceleration or increased speed! Mount the throttle in such a way that in the neutral position, the throttle lever is vertical.

- **Default setting:**

WARNING!: The throttle is set as follows by default: moving the lever clockwise moves the boat forward, while moving it counterclockwise moves it backward. This is the correct configuration when the lever is mounted on the starboard side against the steering console.

- **Placement on port side:**

When placing the throttle lever on the port side of the steering console, it works exactly the other way around. Moving the lever counterclockwise moves the boat forward and moving the lever clockwise moves the boat backward.

- **Direction adjustment:**

To achieve this, the phase cables can be reversed so that the propeller turns the other way. In addition, the position of the throttle in the display can be adjusted. See also the instructions for adjusting the display. This should only be done by an authorized dealer or installer. More information on page 57.

The display.

Mount the display in the appropriate location. It should be clearly visible for the boat's driver.
If it is mounted in an open boat, consider that the display can get very hot in direct sunlight.
We recommend covering the display adequately and providing ventilation when the vessel is not in use to protect it from weather conditions.

When mounting in an aluminum console, ensure the console has (natural) ventilation to prevent moisture from entering through the back of the display.

Make sure the display is oriented correctly to avoid installing it upside down!
CAUTION: Improper installation of the display will void the warranty.

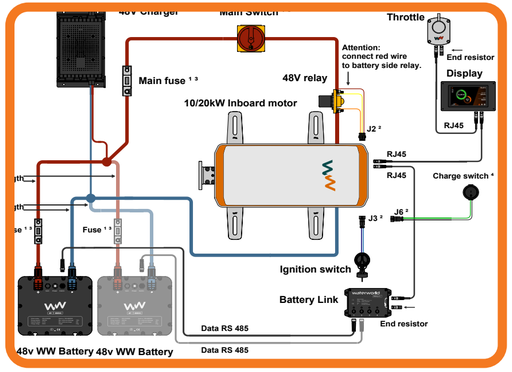
The ignition switch.

Mount the ignition switch in the appropriate location, easily accessible for the driver, for example, next to the display or below the throttle lever.

The cable can be extended if necessary.

Connecting throttle, display and ignition switch.

The throttle lever, the display, and any other network components, such as a Batterylink, can be connected in various ways.
This can be done using the daisy-chain principle. The order in which the components are connected does not matter, as long as a terminating resistor is applied at the last component.
The image next to this text shows an example of a connection diagram, with the corresponding step-by-step plan below.



Example step-by-step connection plan
1. Connect an RJ45 cable from the throttle lever to the display.
2. Connect an RJ45 cable from the display or the display to the motorcontroller, depends on what is most convenient.
3. Insert the end resistor into the remaining RJ45 contact.
4. Connect the plug from the ignition switch to the connector on the motorcontroller.

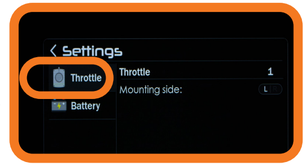
WARNING! The terminating resistors are located, in a new delivery, in the RJ45 connectors of the motorcontroller. Silicone protective covers are placed over the terminating resistors. During the assembly of the boat and the installation of the WaterWorld system, keep these items in place as long as possible. They protect the RJ45 connectors from construction debris.

Setting up the WaterWorld display.

To start, tap on the settings icon , at the bottom right corner of the screen.
The overview screen will appear. Under 'Settings', changes can be made to the settings.
After completing each step, press the "save" icon , to save the values!
Then, proceed through the different settings:

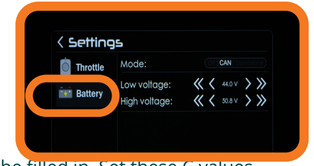
Throttle:
To the right of "Throttle", you'll see a "1". When two WaterWorld throttle levers are connected, you'll also see a "2" appear*. "Mounting side" indicates which side of the steering console the selected throttle lever is mounted on. You can use this to adjust the mounting side to the right, but it doesn't change the rotation direction of the propeller.

* The second throttle lever should be set at the factory for this purpose.



Battery:
To the right of "Mode:", you can adjust the setting for the batteries.
You can choose from;

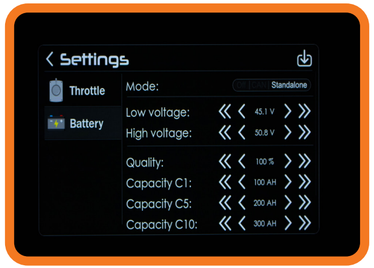
- "Off" No battery data is displayed on the screen.
- "CAN" This displays battery information via CAN communication. The measurements from the Batterylink or Smartshunt will be displayed.
- "Standalone" This refers to an unmeasured, set battery capacity. For this, C values must be filled in. Set these C values according to the specifications of the battery. Fill in all values! For lead-acid batteries, if the battery manufacturer only provides a C20 and/or C5 value, then for C10, fill in the average of C5 and C20. For the C1 value, fill in half of the C5 value.



Example:

C20	=	400 Ah
C1	=	350 Ah (between 20 en C5)
C5	=	300 Ah
C1	=	150Ah (50% van C5 value)

For lithium batteries: all values equal to the C1 value
With each change, the icon appears in the upper right corner.
Click on it when you want to save the changes.



Low Voltage**: Set this to the minimum Voltage the batteries can reach.
Refer to the battery's specifications for information..

High Voltage**: See Startop ask if full.

** For WaterWorld batteries, these settings do not apply.

"Startup ask if full": Receive a notification at startup asking if the battery is fully charged.
This is determined by the "High Voltage" setting.
For WaterWorld batteries, you only need to set "CAN," after which the BatteryLink takes care of all communication.
You can then also skip the "High and Low Voltage" settings.

Screenlock:
By tapping on 'Screenlock' in the menu, the main screen is locked. All buttons disappear, and the screen no longer responds to touches. This function is useful when cleaning the display or when it is exposed to moisture. To disable the lock, the padlock icon on the right side of the screen can be slid all the way up.

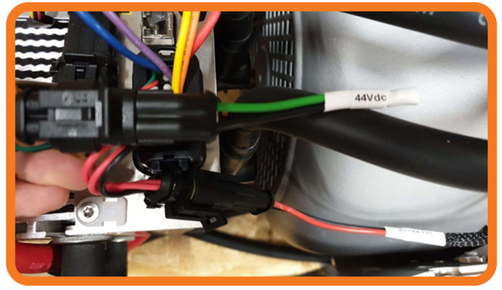
Alarm:
Under 'Alarm,' all possible warnings and error messages are displayed.

Info:
By clicking on the 'Info' icon, more information about the entire system, the display, the throttle lever, and the battery will appear, including version numbers.

Setting up the motorcontroller for different voltages of lithium batteries.

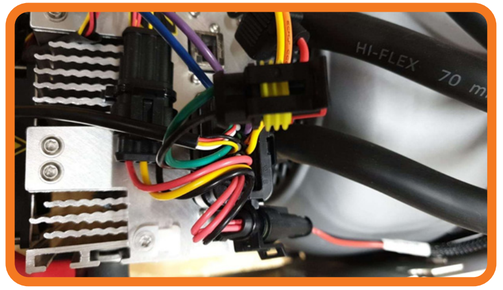
It is possible to use the WaterWorld system with different battery configurations.
To do this, a setting on the motorcontroller can be modified.

1. If the plug, with green/black cable and indication “44Vdc,” is connected to the counter plug on the motorcontroller, then the system is suitable for standard voltages.
The “cut-off” voltage, the minimum voltage at which the motorcontroller stops working, is then 37 Volts. A warning on the display appears from 39 Volts.



2. If the green/black cable is not connected, then the “cut-off” voltage, the minimum voltage at which the controller stops working, is 42 Volts, and the warning on the display appears at 44 Volts.

WARNING! Many lead-acid batteries go down to a loaded power of 37 Volts.



Setting 1
Suitable for: Full-traction batteries, some AGM, and lithium batteries are suitable for this setting.
Consult your battery supplier for more information.

Setting 2
Suitable for: AGM, semi-traction lead-acid batteries, and various lithium batteries.

WARNING! Improper use of this setting can lead to irreversible damage to the battery pack.
WaterWorld is not responsible for damage caused by deep discharge.

Step-by-step explanation for testing and commissioning.

Step 1: Battery check

- Measure battery voltage:

Check if the batteries are sufficiently charged by measuring the voltage across the terminals of the battery pack using a multimeter. The total voltage should be at least 48 volts, but around 52 volts is expected. For lithium batteries, this can go up to nearly 60 volts.

WARNING! Ensure that all batteries have the same voltage. The maximum difference allowed is 0.1 volt.

Step 2: Preparation

- **Turn off ignition :**

Ensure that the ignition on the dashboard is turned off.

- **Check throttle lever:**

Ensure that the throttle lever is in the neutral position. The display will show a notification if this is not the case.

Step 3: System activation

- **Turn on main switch:**

Turn the main switch to “on” or “I”.

- **Activate ignition switch:**

Turn the ignition switch clockwise to turn on the system. You should hear a clear click from the relay.

- **Check display:**

Ensure that the display is on. By clicking on the icon at the top right of the screen, you can check the voltage. This should match the measured value.

Step 4: Engage forward

- **Throttle forward:**

Gently move the throttle lever one click forward. Check if there is propeller water flow behind the boat.

- **Check RPM and power:**

Check on the display if there is an RPM (revolutions per minute) and power (kW) visible.

- **Throttle neutral:**

Return the throttle lever to the neutral position.

Step 5: Temperature check

- **Check temperatures:**

Check the motor and motorcontroller temperature on the display. The motorcontroller temperature is approximately equal to the temperature of the compartment where the motorcontroller is mounted. The temperature of the motor will initially be approximately equal to the outside water temperature.

Step 6: Shutdown

- **Turn off ignition switch**

Turn of the ignition switch.

- **Turn off main switch**

Turn off the main switch.

Step 7: Connect shore power

- **Connect shore power:**

Connect the shore power cable.

- **Check charger:**

Ensure that the charger activates and provides the correct signals according to the charger manual.

- **Check battery voltage:**

After activating the system, check on the display if the battery pack voltage is reaching the prescribed charging voltage. Refer to the battery manual for this information.

Step 8: First charging

- **Charging the battery pack:**

Charge the battery pack fully for the first voyage and for setting up the display. See chapter 6 for instructions on using the display.

Step 9: Conduct test run

- **Perform a test run:**

Take a test run and visually inspect everything. Pay close attention to sound and vibrations.

- **Check RPM and Ppwer:**

During the test run, check the number of revolutions (RPM) and kW at full power to determine if you have the correct propeller. The maximum RPM should be between 1400-1500 RPM and the maximum power between 100% and 110% of the nominal specified power.

WARNING!
- High RPM with low power indicates a propeller that is too small.
- Low RPM with high power indicates a propeller that is too large.
Refer to page 87 for propeller advice.

6. OPERATION OF THE MOTOR.

- Starting and setting of
- Explanation of the display
- Boost function
- Arrival and mooring

Starting and setting of.

1. **WARNING! First, disconnect the shore power connection.**
2. Check if the ignition switch of the system is in the “off” position.
3. Ensure that the throttle lever is in the neutral position.
4. Make sure you have enough free space to set off, or that the boat is securely moored to test the system.
5. Turn the main switch to “on” or “I”.
6. Turn the ignition switch clockwise to turn on the system. You may hear a “click” from the activating relay.
7. Check if the display turns on and shows the correct information.
8. Verify if the throttle lever operates correctly in the neutral, forward, and reverse positions.
9. Gently engage the throttle lever forward or backward and apply a little throttle.
10. We wish you a safe journey!

Explanation of the display.

figure 1.0

The display provides a clear overview of the key parameters for operating the electric propulsion.

The information on the display in figure 1.0 is as follows:

Battery level:	100% charged
Time:	7:01. This is the time that can still be sailed with the current consumption, based on the specified battery capacity. When the battery is being charged, you will not see the time.
Direction:	The propulsion is in reverse, indicated by the “R” on the left side of the display. “N” is neutral and “F” is forward. The blue radius icon indicates that the throttle lever has instructed the motorcontroller to rotate
in	reverse. This is a so-called “feedback” signal.
Power:	The current consumption is 1.20 kW. When the power is less than 1 kW, the display indicates the power in watts. Here, the orange radius icon represents power sent from the throttle lever to the motorcontroller. A half circle represents 100% power.

Additionally, there are several icons on the right side of the display:

Icons on the display:

Battery icon:
This icon is used when you have entered a standalone battery. It allows the State of Charge (SoC) percentage to be corrected to 100% after the charger has fully charged the battery. Refer to the charger’s user manual for this.

Sun icon:
This allows you to adjust the brightness or illumination of the display.

Settings icon:
This icon provides access to advanced settings or configurations.

Arrow icon:
This allows you to slide in a menu from the right side of the screen that provides information about the engine and, when connected to CAN, the battery(ies).

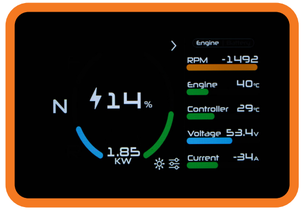


figure 1.1

By tapping on the arrow icon at the top right of the display, a screen slides in from the right with information about the engine, “Engine”, and possibly the battery, “Battery”, when communicating via CAN

- ”RPM”: Engine revolutions per minute
- “Engine”: Engine temperature in degrees Celsius
- “Controller”: Motorcontroller temperature in degrees Celsius
- “Voltage”: Bus voltage in Volts
- “Current”: Current drawn in Amperes measured by the motorcontroller
- “Phase”: Phase current measured on the bus in Amperes

figure 1.2

In the bottom right corner of the screen, you can see a little sun figure 1.2).
By clicking on it, you can adjust the brightness of the screen.
Next to the sun, there’s the settings icon .

figure 1.3

In contrast to figure 1.0, in figures 1.1 and 1.3, you see a green radius bar on the right side of the screen instead of an orange one. This indicates that, if your system is capable, it is generating power that is being stored in the battery(ies). In this case, 1.85 kW is the generated power. At this moment, you also don’t see a time because it is “infinite” as long as you are regenerating.

figure 1.4

When you click on , you will be taken to the screen where you can learn more about;

- “Settings”
- “Screenlock”
- “Alarm”
- “Info”

(figure 1.4).
More about this on page 71.

figure 2.0

“Screenlock” (figure 2.0)
When you press the “Screenshot” icon, you return to the main screen and most icons disappear. You can read the most important data, but the screen cannot be operated. To exit the “screenlock” function, you need to swipe the arrows from bottom to top on the right side of the screen in one smooth motion.

figure 2.1

“Alarm” (figure 2.1)
In case of a malfunction, a flashing hazard triangle appears at the bottom of the display, orange or red, depending on whether it is a warning or an error.
To see what the error message means, you can tap on ‘**Alarm**’ in the menu.
Refer to chapter 9 for an overview of all warnings and errors.

figure 2.2

“Info” (figure 2.2 & 2.3)
Under “Info”, you can find all information about;
- “Engine”
- “Display”
- “Throttle”
- “Battery”

figure 2.3

This information may include;
- Software versions
- Firmware versions
- Hardware versions
- Hardware names

When discussing your system with your supplier, having this screen available is handy.

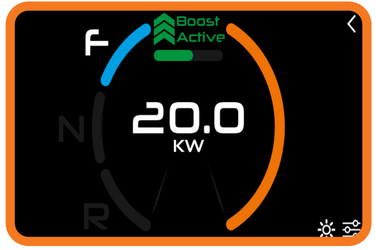
Boost function.

When the system is configured with a boost function, it means that extra power can be used temporarily. An example is a 15 kW engine with the possibility of boosting to 20 kW. A maximum of 5 minutes can then be sailed at 20 kW, after which the engine is reset to 15 kW. The boost function can be set for different sailing directions (forward, reverse or both).

The display shows ‘Boost Active’ when the boost function is active. Below this is a green bar indicating the remaining boost time. After the boost time expires, the ‘Boost Active’ indication and the green bar disappear. The boost function becomes available again after some time. The available boost time rebuilds at a certain speed. This time and speed are set by the manufacturer or installer.

Usual values are:
- After 10 seconds, the boost function becomes available again
- Every second, 1 second of boost time is built up

To use the boost function again, the throttle must be turned back so far that the requested power is below the normal power. In this example, that would be 15 kW. After that, the green bar becomes visible again.



Arrival and mooring.

1. Ensure that after mooring and securing the boat safely, the throttle is in the neutral position.

2. Turn off the system using the ignition switch.

3. Now, switch off the main power switch.

WARNING! Also turn off the system using the main power switch when swimming around the boat or when repairs or maintenance are being performed on the boat

4. Connect shore power and check the proper operation of the battery charger.

7. MAINTENANCE AND SERVICE.

- Checks during the sailing season
- Annual inspections by you or your supplier
- Winter storage
- Use of the motor in saltwater

Checks during the sailing season.

Regularly pay attention to your WaterWorld propulsion system and its associated energy system, even during the boating season. We recommend focusing on the following points:

- **Moisture and condensation:**

Ensure that the area where the motorcontroller is installed remains free from moisture and condensation. If there is water in the boat and the electronics have gotten wet, dry them off and contact your installer. Do not turn on the system in this situation! Excessive condensation in the areas where WaterWorld components are installed indicates insufficient ventilation; in that case, provide additional ventilation.

- **Motor cables:**

Regularly check the motor cables for wear.

- **Lead-Acid batteries:**

When not sailing, keep your system connected to shore power as much as possible to prevent the batteries from draining. The battery charger will automatically stop when the batteries are full. When turning the system on, check that the battery charger activates. We recommend disconnecting shore power during thunderstorms.

- **WaterWorld batteries or other lithium batteries:**

Carefully consult the manual for these batteries for specific instructions and recommendations.

WARNING! Always turn off the main power switch before cleaning or inspecting the system.

Annual inspections by you or your supplier.

Preferably, have your system inspected annually by your supplier or installer. They will check the system for the following points:

- **Proper functioning of all components:**
Ensure that all parts are functioning correctly.

- **Moisture problems and corrosion:**
Check for any moisture issues and corrosion on contacts, battery terminals, and/or connectors. Apply contact spray preventively and grease battery terminals if necessary.

- **Tightening of terminal clamps and connectors:**
Ensure all terminal clamps and connectors are securely fastened.

- **Tightened mounting bolts and nuts**:
Make sure all mounting bolts and nuts are firmly tightened.

- **Damage to cables and components:**
Inspect for any damage to cables and components.

- **Condition and voltage of all batteries:**
Check the condition and correct voltage of all batteries*.

Under load:
If you have a multimeter, check the voltage of each battery by setting the meter to the voltage setting and placing it on the positive and negative terminals of one battery while the motor is running. The difference between the batteries should not exceed 0.1 volts. If it does, contact your supplier or installer.

Without load:
After charging, measure the batteries individually again and check that there is no significant difference between them. Refer to your battery specifications or consult your supplier to ensure the voltage is sufficient.

- **Imbalance in the motor/propeller shaft system:**
Check for any imbalance in the motor or propeller shaft system.

- **Correct settings of the display:**
Ensure the display is correctly set.

*** NOTE: These checks apply to lead-acid batteries connected in series.**

Winter storage.

During and after winter storage, the same recommended checks as in the previous inspections apply.

For lead-acid batteries, it is especially important to ensure that the batteries are charged and remain charged.

- **If a power source is available:**

If there is a power source available for your boat during winter storage, keep the shore power connected.
The charger will automatically turn on and off as needed. However, it is advisable to check the boat and batteries at least twice during the winter to ensure that the charger is connected and that there is still sufficient voltage in the batteries.

- **If no power source is available:**

If there is no power source available for your boat, make sure the boat is stored with fully charged lead acid batteries. Then disconnect the main positive and negative terminals of the battery pack to ensure that no device is connected to the battery packs.

Refer to the battery manual for more information about winter storage.

Use of the motor in salt water.

When using in saltwater, it's important to pay extra attention to the following points:

- **Sealing of enclosures:**

Ensure that the enclosure(s) are properly sealed against saltwater.

- **Ventilation:**

Ensure that these areas are well ventilated.

- **Corrosion inspection:**

Regularly inspect all components, especially the contacts, for corrosion.

- **Cleaning:**

Thoroughly clean the components twice a year.

8. TECHNICAL SPECIFICATIONS.

- Technical specifications
- Relay
- Display
- Propeller selection guidelines

Technical specifications.

4.0i

Length	525 mm
Width	240 mm
Height	229 mm
Weight	34 kg
Nominal speed	1500 rpm
Maximum power	4.4 kW
Nominal voltage	48 Volt
Maximum current	85 Ampère
Max. °C motor	140 °C
Max. °C controller	88 °C
Cooling	Air-cooled
Type	Asynchronous
Control mode	Sensorless
IP rating motor	IP 65
IP rating controller	IP 65
Communication	CANopen
Hybrid possible	Yes
Regeneration possible	Yes

10.0i

Length	719 mm
Width	290 mm
Height	296 mm
Weight	76 kg
Nominal speed	1500 rpm
Maximum power	11 kW
Nominal voltage	48 Volt
Maximum current	200 Ampère
Max. °C motor	140 °C
Max. °C controller	88 °C
Cooling	Air-cooled
Type	Asynchronous
Control mode	Sensorless
IP rating motor	IP 65
IP rating controller	IP 65
Communication	CANopen
Hybrid possible	Yes
Regeneration possible	Yes

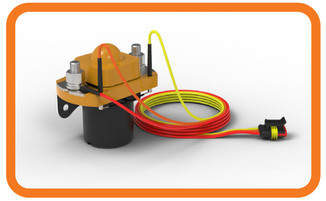
20.0i

Length	769 mm
Width	290 mm
Height	301 mm
Weight	100 kg
Nominal speed	1600 rpm
Maximum power	20 kW
Nominal voltage	48 Volt
Maximum current	400 Ampère
Max. °C motor	140 °C
Max. °C controller	88 °C
Cooling	Air-cooled
Type	Asynchronous
Control mode	Sensorless
IP rating motor	IP 65
IP rating controller	IP 65
Communication	CANopen
Hybrid possible	Yes
Regeneration possible	Yes

Relay.

Relay is only for 10.0i and 20.0i.

- Voltage: 48V DC
- Maximum continuous current: >400A



Display.

The display is a 5-inch colour screen with touch function.
The power supply to the display is via the motorcontroller.

In his manual, you will find the dimensional drawings of the various models of WaterWorld motors. You can find the drawings and also 3D files on www.waterworldelectronics.com.

Propeller selection guidelines.

Below are guidelines for choosing a propeller size.
The type and brand of the propeller can influence the sound it produces when rotating.
For the correct choice, contact an expert in this field.
Note: The optimal propeller for an individual boat may vary from this, as each boat is different.

For a WW4.0i system and a boat that travels at speeds slower than 11 km/h.
- 12 x 7 3-blade propeller
- 12 x 8 3-blade propeller

For a WW4.0i system and a boat that travels faster than 11 km/h.
- 12 x 8 4-blade propeller

For a WW10.0i motor and a boat that travels at speeds slower than 10 km/h.
- 14 x 9 3-blade propeller

For a WW10.0i system and a boat that travels faster than 10 km/h.
- 14 x 10 3-blade propeller
- 15 x 9 3-blade propeller
- 14 x 10 4-blade propeller (only for lighter boats)
- 15 x 9 4-blade propeller (only for lighter boats)
- 16 x 8 3-blade propeller (only for lighter boats)

For a WW20.0i system for lower speeds (approximately 11 km/h).
- 14 x 11 3-blade propeller
- 16 x 9 3-blade propeller
- 16 x 9 4-blade propeller
- 15 x 10 4-blade propeller

For a WW20.0i system for higher speeds (approximately 15 km/h).
- 15 X 11 3-blade propeller
- 16 X 10 4-blade propeller

9. TROUBLESHOOTING AND PROBLEM SOLVING.

- Error codes for faults
- Warnings
- Errors
- Problems

Error codes for faults.

In case of malfunctions, a flashing hazard triangle with an exclamation mark appears at the bottom of the display:

- **Orange exclamation mark:**

This indicates a warning. The system is not functioning properly, but can still be used. Depending on the warning, power may be reduced.

- **Flashing red hazard triangle:**

This indicates a critical error. The system is currently not functioning correctly.

- **Viewing error messages**

Open the menu and select ‘Alarm’ to see what the error message means.

- **Inspection for error messages**

Check the data on the display, including temperature, voltage, smooth operation of the propeller shaft, installation, and connections of all wiring.
If the problem cannot be resolved, contact your supplier.

- **Possible warnings and errors**

On the next pages are the possible warnings and errors.

Warnings.

Engine Warning (EW)

Indication	Meaning	Solution
EWS01 No fan feedback	No feedback from fans.	Check fans and their connections.
EWS02 Controller temperature too high	Motorcontroller temperature is too high.	Check fans or reduce the power.
EWS03 Controller temperature too high (Limited power)	Motorcontroller temperature is too high (limited power).	Check fans or reduce the power.
EWS04 Motor temperature too high	Motor temperature is too high.	Check fans or reduce the power.
EWS05 Motor temperature too high (Limited power)	Motor temperature is too high. (Limited power)	Check fans or reduce the power.
EWS06 Phase current too high	Phase current is too high.	Reduce power.
EWS07 Throttle not present or neutral	Throttle not present or neutral.	Connect a throttle to the motorcontroller and put the throttle in neutral.
EWS08 No valid system parameters loaded	No valid system parameters loaded.	Contact the supplier.
EWS09 Position sensor fault (Sensorless drive active)	Position sensor fault. Sensorless sailing possible.	Connect or replace position sensor. Switch motorcontroller off and then on again.
EWS10 Charging disabled (Position sensor fault)	Charging battery disabled due to position sensor error.	Fix position sensor fault.
EWS11 Controller temperature sensor read fault	Motorcontroller temperature cannot be read.	Contact the supplier.
EWS12 Motor temperature sensor not present (Limited power)	Motor temperature sensor not connected.	Connect the motor temperature sensor to the motorcontroller.
EWS14 Power consumption limited by battery	Power drawn from the battery is limited.	Reduce power and recharge battery if needed.
EWS16 Drive disabled. Ensure external drive is in neutral position.	For hybrid systems: sailing is not possible because the external drive (such as a diesel engine) is not in neutral.	Put external drive gearbox in neutral position. Check if the neutral sensor is properly connected.
EWSnn Please contact supplier	There is a warning, but the display has outdated firmware. EWSnn contains the number of the warning.	Check warning number with supplier.

Battery Warning (BW)

Indication	Meaning	Solution
BWS01 Temperature too low	Temperature is too low.	Use the battery in a warmer environment.
BWS02 Temperature too high	Temperature is too high.	Let the battery cool down.
BWS03 Bus voltage too low	Bus voltage is too low.	Charge battery.
BWS04 Bus voltage too high	Bus voltage is too high.	Stop regenerating (from motor).
BWS05 Bus current too high	Bus current is too high.	Reduce power / Reduce number of devices.
BWS16 Vendor specific: 0x<value>	Supplier specific: 0x<value>.	Contact the supplier. Meaning of <value> 0x0000nnbb nn: composite error code (addition of the following numbers): 01: Timeout RS485 02: Communication failed 04: Discharge MOSFET disabled 08, 10, 20, 40, 80 : RS485 fault code bb: battery number indication 01: battery 1 10: battery 2 02: battery 3 20: battery 4 04: battery 5 40: battery 6 08: battery 7 80: battery 8

Display Warning (DW)

Indication	Meaning	Solution
DWS01 Battery not present	No battery is present.	Check communication cable connection to batterylink.
DWS02 No valid system parameters loaded	No valid parameters loaded.	Contact the supplier.
DWS03 Battery voltage too low, drive slowly	Battery voltage is too low, sail slowly.	Sail slowly.
DWS04 Standalone battery monitor not initialized	Independent battery monitor not initialised.	Reset battery capacity to 100% (button in main menu).

Errors.

Engine Faults (EF)

Indication	Meaning	Solution
EFS01 Configured motor type not supported	Configured motor type is not supported.	Contact the supplier.
EFS02 Configured motor current is too high	Configured motor current is too high.	Contact the supplier.
EFS03 Hardware is not supported	Hardware is not supported.	Contact the supplier.
EFS04 No valid parameters loaded	No valid parameters loaded.	Contact the supplier.
EFS05 No valid motor parameters loaded	No valid motor parameters loaded.	Contact the supplier.
EFS06 Serial not present	Serial is not present.	Contact the supplier.
EFS07 Controller temperature sensor not present	Motorcontroller temperature sensor is not present.	Contact the supplier.
EFS08 Controller temperature sensor not configured	Motorcontroller temperature sensor is not configured.	Contact the supplier.
EFS09 Controller temperature too high (Shutdown)	Motorcontroller temperature is too high (Exit).	Let the motorcontroller cool down and then try again.
EFS10 Motor temperature sensor not present	Motor temperature sensor is not present.	Connect the motor temperature sensor to the motorcontroller.
EFS11 Bus current too high (Shutdown)	Bus current is too high. (Exit)	Switch the motorcontroller off and then on again.
EFS12 Bus voltage too low (Shutdown)	Bus voltage is too low. (Exit)	Check the battery voltage and then switch the motorcontroller off and then on again.

Indication	Meaning	Solution
EFS13 Bus voltage too high (Shutdown)	Bus voltage is too high. (Exit)	Check the battery voltage and then switch the motorcontroller off and then on again.
EFS14 Position sensor fault	Position sensor fault.	Connect the motor's encoder/hall sensor to the motorcontroller
EFS14 Position sensor fault - Set throttle to neutral for sensorless drive	Position sensor fault. Sensorless control is activated.	Move the trottle lever to the neutral position.
EFS15 Parameters config not supported	Configuration of parameters is not supported.	Contact the supplier.
EFSnn Please contact supplier	There is an error, but the display has outdated firmware. EWSnn contains the number of the error.	Check fault number with the supplier.

Throttle fault (TF)

Indication	Meaning	Solution
TFS01 No valid parameters loaded	No valid parameters loaded.	Contact the supplier.
TFS02 Serial not present	Serial is not present.	Contact the supplier.
TFS03 Parameters config not supported	Configuration of parameters is not supported.	Contact the supplier.

Display fault (DF)

Indication	Meaning	Solution
DFS01 No valid parameters loaded	No valid parameters loaded.	Contact the supplier.
DFS02 Serial not present	Serial is not present.	Contact the supplier.
DFS03 Engine not present	Motor is not present.	Check if motorcontroller is switched on. Check communication cable to motorcontroller.

Problems.

Below are discussed some possible issues and their solutions.

My engine is losing power rapidly:

1. Battery pack nearly empty:
- Check the remaining percentage on the display along with the voltage while the motor is running.
- If the voltage drops below 46 volts, the motor will reduce power.
- Once the voltage drops below 42 volts, depending on the settings, the motor may stop completely.

2. Insufficient cooling:
- If the motor overheats, it will reduce power and eventually stop.
- Common causes include a heavy running propeller shaft or an oversized propeller.
- Also, check if there is any line or rope caught in the propeller.

WARNING! Turn off the system before approaching the propeller shaft!

My motor vibrates and/or makes excessive noise

1. Propeller damage:
- Check for damage to the propeller beneath the boat.

2. Insufficient water flow to the propeller:
- Check for any obstruction in front of the motor that hinders water flow.

My motor has reduced power

1. Propeller issues:
- Check if there is anything stuck in the propeller or if it is unbalanced
- The propeller may be too large.

WARNING! Turn off the system before putting your hands near the propeller shaft!

I have lost my key

- Always have a spare key. Get one made if you have lost one.
- If you need a new key, contact your supplier.

10. WARRANTY.

- Warranty periods
- Warranty terms
- Warranty procedure
- Disposal of the product / recycling

Warranty periods.

The warranty period is 24 months and covers all components of the WaterWorld system.
When you have combined a WaterWorld system with WaterWorld lithium battery(ies), the warranty period is 36 months.
The warranty period begins from the day of delivery of the WaterWorld system to the end customer.

For WaterWorld systems used commercially, even temporarily, there is a modified warranty period of one year from the delivery of the product to the customer.

In all cases, the right to warranty expires six months after discovery of any defect.

Warranty terms.

WaterWorld Electronics BV guarantees the end user of a WaterWorld system that it is free from material and manufacturing defects during the warranty period. WaterWorld will cover the costs to remedy any material or processing defect for the end customer.

This cost coverage does not apply to any incidental expenses arising from a warranty case, nor to any other financial losses (e.g., towing costs, cranes, telecommunications, meals, lodging, loss of use, time loss, etc.).

Travel and/or transportation costs are not reimbursed by WaterWorld Electronics BV.

WaterWorld Electronics BV decides whether defective parts will be repaired or replaced. Distributors and dealers performing repair work on WaterWorld motors are not authorized to make legally binding statements on behalf of WaterWorld Electronics.

Wear parts and routine maintenance are excluded from the warranty. Cables and fastening materials are also excluded from the warranty.

Your supplier or WaterWorld has the right to refuse warranty when:

- The warranty claim was not submitted according to the instructions (see warranty procedure).
- The product was not handled according to the instructions.
- The safety, usage, and maintenance instructions from the manual were not followed.
- Prescribed maintenance was not performed or documented.
- The product is damaged due to external influences, an accident, or where the defect is not attributable to WaterWorld in any way.
- The WaterWorld system has been modified, altered, or equipped with parts or accessories that are not explicitly permitted or recommended by WaterWorld.
- Prior servicing or repair work was not carried out by WaterWorld authorized companies or original spare parts were not used, unless the customer can demonstrate that the circumstances leading to the warranty refusal did not affect the occurrence of the defect.

Warranty procedure.

Adherence to the warranty procedure described below is a condition for making a warranty claim.

- Contact your WaterWorld supplier in case of a complaint.

- Keep your purchase invoice handy, as the supplier will need it to verify where and when your WaterWorld system was purchased.

NOTE! Your purchase receipt or invoice is your proof of warranty. Therefore, keep it safe after purchase!

- Also, have the serial number of the motor available, if it is not already listed on the purchase invoice.

- Provide a clear description of the complaint, the circumstances under which it occurs, and any other relevant information that can help your supplier assess the nature and severity of the issue. If possible, take photos of the system and the overall situation that may assist.

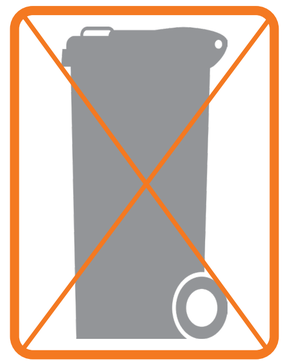
- Your supplier may ask you to perform additional checks on the system before assessing the complaint thoroughly.

- When transporting products to the WaterWorld supplier, ensure correct handling as incorrect transport is not covered by warranty.

Disposal of the product/ recycling.

The WaterWorld motors are designed in accordance with EU Directive 2012/19/EU. This directive governs the recycling of electrical and electronic equipment to protect the environment. Disposed electrical and electronic equipment should not be thrown away with normal household waste, as it can release harmful substances into the environment, which can affect the health of humans, animals, and plants. These substances accumulate in the food chain and the environment, leading to the loss of valuable resources.

In accordance with regional regulations, you can deposit the motor at a collection point where it will be recycled in an environmentally responsible manner.



11. ATTACHMENTS.

Ray-link.

Integration with Raymarine Axiom+ Multifunction display.

It is possible to connect the WaterWorld system to a Raymarine Axiom+ multifunction display using a WaterWorld Ray-link.

Follow the steps below to make the WaterWorld page visible on the screen of the Raymarine Axiom+.

1. Placement of the Ray-link:
Ensure that the Ray-link is installed correctly to make the WaterWorld page available on the Raymarine Axiom+ display.

2. Accessing the WaterWorld page:
- From the main page, select the dashboard.
- In the top right corner of the dashboard, you will find a button with three horizontal lines stacked vertically.
- Click on this button to open the option to select the WaterWorld page.
- Choose the WaterWorld page to set it as the main dashboard.

Note: The WaterWorld page must be installed beforehand. Please inquire with your supplier.

3. Required parts for installation:

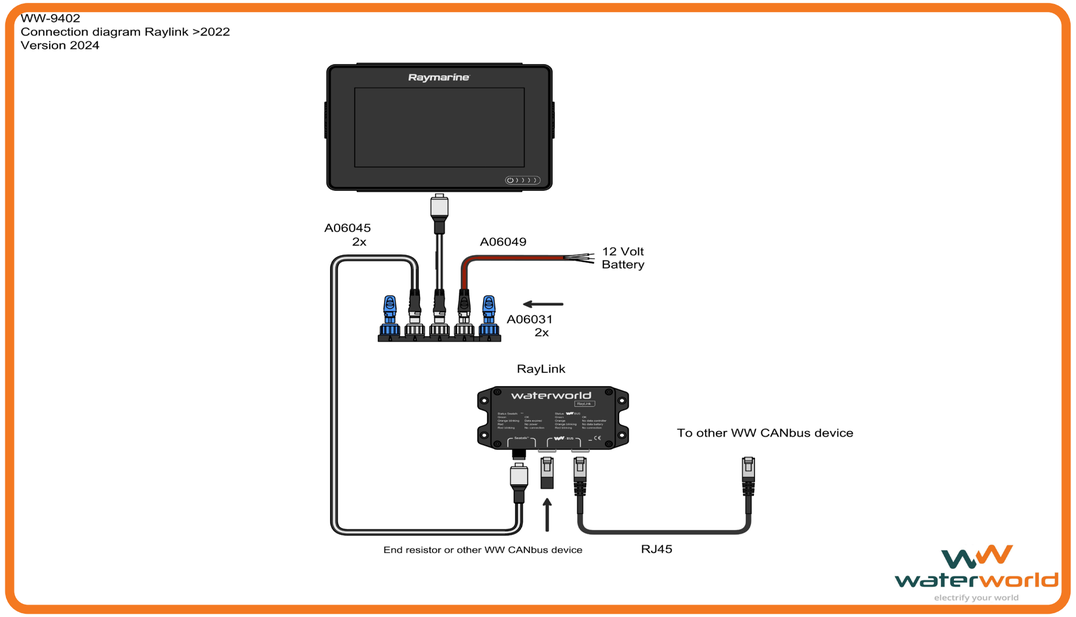
- Raymarine SeaTalkng Starter Kit
- A06045-cable
- RJ45-cables
- The Raymarine Axiom+ multifunction display comes with a shorter version of the A06045 cable.

4. Connecting the cables:

- Ensure all cables are connected correctly according to the illustration below.
- Place end resistors in any remaining RJ45 openings.

These steps enable you to integrate and display the WaterWorld page on your Raymarine Axiom+ multifunction display, providing easy access to all relevant information from the WaterWorld system.

WARNING! Refer to the manual of the Raymarine Axiom+ multifunction display at www.raymarine.com for correct screen installation.



VE-link.

Integration with Victron SmartShunt

When a WaterWorld system is installed and a Victron SmartShunt is used, these systems can be connected via a VE-link. The SmartShunt acts as a battery monitor, measuring battery voltage and current. Based on these measurements, it calculates the battery's state of charge and remaining time. Additionally, it records historical data such as deepest discharge and average discharge. By installing a VE-link, all this data can be displayed on the WaterWorld display.

Installation of the VE-link

1. Connecting the VE-link:
- The VE-link has an opening for the VE-direct cable. Connect this cable to the SmartShunt.
- Use RJ45 cables in the remaining openings of the VE-link to establish connections with the motorcontroller and the display.

Refer to the connection diagram below for correct connections.

2. Display configuration:
- After all cables are connected according to the diagram, a setting on the display needs to be changed to view the retrieved data.
- Go to settings by clicking on the gear icon at the bottom right corner of the screen.
- Click on 'Battery'.
- Under 'Mode', select the 'CAN' option.
- An icon will now appear at the top right of the menu. Click on it to save the adjustment.

After completing these steps, the information from the SmartShunt will be displayed on the WaterWorld display, providing easy access to all relevant battery data.

Connection diagram

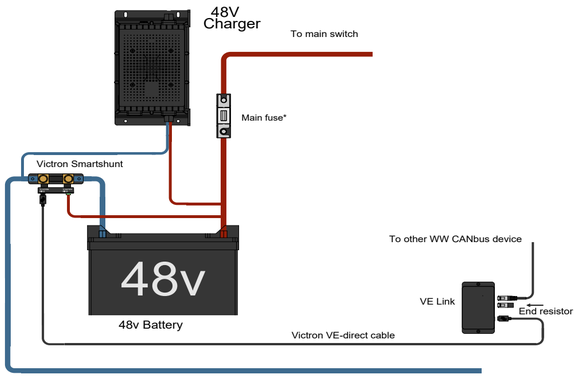
Ensure you follow the correct connections as per the provided connection diagram to ensure proper linkage between the VE-link, the SmartShunt, the motorcontroller, and the display.

*** Note: At the time of writing, the VE-link only works with the first generation of Victron SmartShunt.**

WARNING! Refer to the manual of the Victron SmartShunt at www.victronenergy.com for mounting and setting up the SmartShunt, and using the VictronConnect app.

WW-9402
Connection diagram VE link

Main power
Main power



[1] Not supplied by WaterWorld
[2] See connection diagram of cable harness
[3] 1.6x nominal amp

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