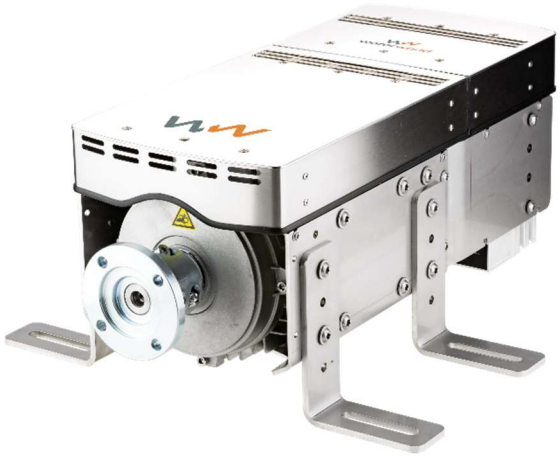
WW 4.0, WW 7.5, WW 10.0, WW 15.0

Manual



Version 3.0 – July 2020

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INTRODUCTION

Congratulations on your purchase. We are pleased to find that you opted for WaterWorld, the electric drive.

The WaterWorld motors are designed and produced with the utmost care. Everything is focused on ensuring you a safe, reliable, eco-friendly and user-friendly drive, that you will enjoy using.

We do our utmost to continuously improve the WaterWorld drives. If you have a comment about its design or use, we would highly appreciate it if you would inform us. The contact details can be found on the back of this manual.

We advise you to carefully read this manual, so you will be able to properly install and use this drive. We wish you a lot of reading pleasure!

The WaterWorld team

Contents

1. Introduction

How to use this manual

This manual contains important information for the safe use of the WaterWorld electric drives. Maintenance and possible remedy of failures are also discussed in this manual.

It is imperative that every person who will be installing this system, but also anyone who will be using the motor for sailing, familiarises with the manual and carefully observes and implements the warnings and safety instructions in this manual.

Installation and maintenance of the WaterWorld motors must be performed by specialised and competent installers who adhere to the applicable laws and regulations, in combination with the safety aspects stipulated in this manual.

Keep this manual with your system on a safe and easily reachable location!

Warnings and symbols

DANGER
A warning indicates the risk of possible injury for the user/installer or substantial material damage in case the user or installer does not avoid this risk.

WARNING!
Special details, commands and prohibitions respectively, in terms of damage prevention

PLEASE NOTE!
Instructions that require particular attention and must be followed.

Serial numbers

You can find the identification labels with the serial numbers on the top side of the motor controller and on the side of the motor block.

These mention the manufacturer, the type number and the unique serial number of the motor or controller. The serial number starts with the letters WWNL.

PLEASE NOTE!
Never remove the identification labels and/or other labels on the motor.

2. Pre installation checklist

1. **Read the manual**.
   We offer you an as complete as possible manual. This also includes items that do not concern the WaterWorld motor in particular, yet the entire boat, the propeller and the batteries. **However, each installation requires customisation and must be performed by a skilful person**.

2. Check whether you received everything that is included in the scope of delivery, see page 13. Lay down all parts in an organised manner and compare them with the list in chapter 4 of this manual, as well as with your packing slip. In case of questions, please contact your supplier immediately.

3. Prepare the boat for installation of the system in a clean and dry environment. If the following items are not in order yet, they should be resolved before installation commences.

   - No permanent bilge water where the motor will be installed.
   - Proper protection against flooding of the boat, for instance by a properly functioning bilge pump in the correct location in the boat.
   - When positioning the components, also bear in mind leakage or condensation water from above. This could be a possible reason to position a component elsewhere or have the top of it covered.
   - Ensure good ventilation of the relevant space or spaces, so moist has a chance to vaporise and escape from the space.
   - WaterWorld developed a very efficient motor, for which air cooling will suffice. It is imperative that sufficient fresh air is able to enter and that hot air is able to dissipate.
   - A smoothly running propeller shaft system. A heavily running propeller shaft system will cause the following problems:
     - Higher consumption and subsequently shorter sail trips
     - Overheating of the motor and the propeller shaft
     - Slower response during acceleration
     - Less dosed acceleration, the motor will start with too much power, as soon as it has gained sufficient capacity

4. Have you chosen the right propeller? Refer to our advice on page 32.

5. Are all components easily reachable after installation, so everything is accessible for service?

6. The (lead-)battery pack is heavy, ensure good weight balance in the boat. Make sure that the batteries are accessible for service on the battery poles, cabling and for

filling open battery packs with demineralised water.

7. Select the right cable diameter, for cable options also refer to page 20. Make sure that the cables are not of unnecessary length.

8. Read the safety provisions in chapter 3 before you start with any connections. Then read the section of the manual about that specific component. Always connect anything in accordance with the connection diagram on page 16.

9. Start the installation.

10. In order to safeguard the proper functioning of the system, the checklist in the appendix must be filled in online, on https://theelectricdrive.com/commissioning

3. Safety

General guidelines

- The drive must operate on the prescribed voltage.
    - In the standard setting, this is 48 Volt nominal. Minimum 42 Volt and 60 Volt maximum.
    - There is a specific setting for 12 cells of lithium batteries in series, that operate on a lower nominal voltage of 44 Volt, this setting is minimum 37 Volt, see page 25.
- The drive is exclusively intended for the propulsion of boats. The manufacturer is not responsible for any other type of use and in these instances, the warranty will always expire.
- Keep the electronics away from water.
- Any installation and repair may only be performed by an recognized installer, appointed by WaterWorld.
- Only use original or recommended WaterWorld accessories and spare parts.
- If the drive requires repair, only original parts may be used as a replacement. The use of other parts may lead to serious injury or damage and will cause warranty to expire.
- Replacing the batteries may be done only by a recognized installer.
- The user must frequently make sure that the drive and the batteries are functioning correctly. The manufacturer is not responsible for any damage as a consequence of the incorrect functioning of the drive.
- The supplier, either WaterWorld, the dealer or the manufacturer, cannot be held liable for any damage suffered by the purchaser, or any possible claims from third parties as a consequence of (the use of) the drive, direct or indirect and/or consequential damage to the environment, hearing, company and for immaterial damage, or incorrect advice, unless the damage is attributable to gross fault or negligence of the supplier.
- Before use, you must consider the legislation in the specific country, or at the location where the drive is situated. In this instance, the purchaser himself is always responsible for complying with all (legislative) precautions at the location where the drive is being used, regardless whether the drive is in operation at that particular time. This includes measures for the fire safety, as also providing safety for others in the vicinity of the drive.
- The manufacturer reserves the rights and powers for which he is entitled, on the basis of European legislation. Imitation or counterfeit of the device is expressly forbidden.
- In case of battery packs, for instance lithium batteries, please contact your supplier in advance.

Safety devices of the drive

WARNING!

Your WaterWorld drive is equipped with various safety devices:

- Protection against too high a temperature in motor and controller: the motor will reduce the speed if too high temperatures are detected in the electronics.
- Fuse controller: depending on motor power, a fuse is installed on the motor controller.
- External fuse cabling: this will prevent fire/overheating or overload of the system. This external fuse is not in the standard scope of delivery, but does need to be installed.
- Main switch: this must always be disengaged when leaving the boat, or when work is being performed on the system.
- Protection against overloading of batteries: if your batteries are running empty, the motor will automatically decrease the capacity, so you can sail longer a find a safe haven at low speed.
- Ignition: this is to turn off the system in case of imminent danger. Always switch it off where there are swimmers around the boat.
- Display: this will continuously show you the remaining sailing time, so you can plan your trip such that you can reach your destination. In addition, the display gives a warning in case of a too high or too low battery voltage. The warning for too low voltage also includes a sound signal and an indication on the screen.
- Live cables that the motor, the controller and other components are connected with, must be checked frequently for damage or breakage and for correct solid fastening.
- The cable lugs of live cables that the motor, the controller and other components are connected with, must be equipped with pole covers that also cover the battery poles.
- When you identify any damage or breakage of the cables/wires, the motor must be turned off immediately, until the relevant cable/wire has been replaced.

Safety instructions for the drive

DANGER!

- Follow the instructions in this manual.
- Turn off the system immediately via both the ignition and the main switch, in case of overheating, smoke development, or as soon as you detect a defect.
- The permitted ambient temperature must be between -20 and +50 degrees Celsius during use. The temperatures prescribed for the batteries may deviate from this, refer to the manual of the batteries.
- Do not touch the prop shaft, motor and battery parts during or immediately after sailing.
- In the event of assembly or disassembly activities, always turn off the system by use of the main switch.

Safety instructions for the batteries

DANGER!

- Observe all safety instructions with respect to the batteries used, in the manual of the battery manufacturer.
- Do not use the WaterWorld system when the battery is damaged and inform the supplier or installer of the system.
- Do not keep flammable objects in the vicinity of the batteries.
- Do not smoke and avoid sparks or flames in the vicinity of the batteries.
- Make sure that you have sufficient water at hand; if battery acid comes in contact with the skin or eyes, immediately rinse with abundant water and call for medical assistance.
- Only use charging cables that are suitable for outdoor use.
- Completely unwind the cable reel from a 230 V socket when it is being used.
- Avoid strong mechanical forces on the batteries and cables of the system.
- Take off any metal jewellery and watches before you start working on batteries or near batteries and make use of insulated tools.
- Never short-circuit batteries. Ensure that tools and metal objects cannot touch the battery. This could lead to sparks or even an explosion or a fire.
- When connecting the battery, pay attention to the right polarity and to solid attachment of the connection, making proper contact.
- Battery poles should be clean, free of corrosion and covered by use of caps.
- Do not place batteries in an insufficiently ventilated space. When positioning batteries in a storage compartment with a hatch, they should be properly ventilated.

- Only connect identical batteries (type, capacity, age and charge status).
- Only connect batteries with identical charge status.
- Make sure that battery poles always make optimal contact with the cable eyes connected to them. Prevent the presence of Inox rings between the battery pole and the connected cable at all times.

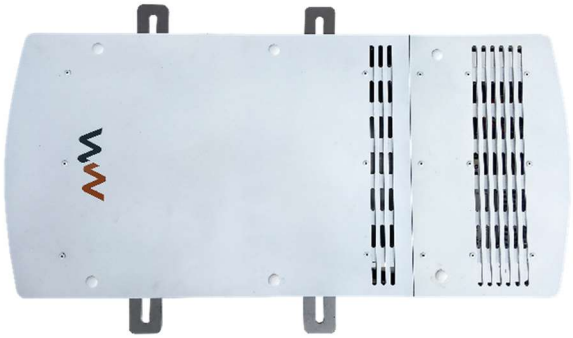
Safety instructions for use

- Carefully read this manual.
- The WaterWorld system may be used only by persons who are qualified and are also physically and mentally fit.
- Always observe the national regulations and rules of a country.
- Keep the drive and operation facilities out of reach of children or persons who are incapable of properly handling them.
- Allow the yard or installer to explain the operation and safety provisions of the entire system.
- Check the system for mechanical damage before you leave.
- Check the condition and the operation of all functions of the WaterWorld system at the start of every sail, at low speed.
- Only sail with a system that is technically in perfect condition.
- Make sure that the batteries are charged sufficiently.
- Make sure that you are familiar with all operating elements of the WaterWorld system. You should also be able to quickly stop the system, if necessary.
- As captain of the boat, you are responsible for the safety of the persons on board and for all boats and persons in your vicinity. Therefore, you should observe the basic sailing rules.
- Great care must be taken in case there are people in the water, also when sailing at low speed.
- Before you set out to sail, gather information about the area where you will be sailing and take account of any weather forecasts and seaway conditions.
- Plan sufficient buffer for the required action radius.
- Ensure, depending on the size of the boat, that the specific safety equipment is available and accessible (life jackets, anchor, oars, means of communication, etc.).

4. Scope of delivery

The WaterWorld motors are delivered, standard with

- Motor, mounted in a stainless steel frame



- Thrust bearing, integrated in the motor, shaft equipped with a flange for attachment of a counter flange (not included) to mount the propeller shaft (not included).

- Controller, mounted on the same frame (can optionally be supplied separately). Motor and controller have already been interconnected by use of cables. For the WW 15.0 the controller is supplied separately.

- Motor supports, variably attachable on the outside of the frame (PLEASE NOTE! During installation, the supports are usually reversed and the motor will hang inside as opposed to standing on it). Note: the displayed vibration absorbers are not included as standard.


- Power cables of 0.5 metre (red) and 1.0 metres (black) already connected to the motor controller

- 48 Volt Relay – the amperage is dependent on the selected motor power

- Digital display RJ45 2 x data cable (1 m and 3 m) and gateway



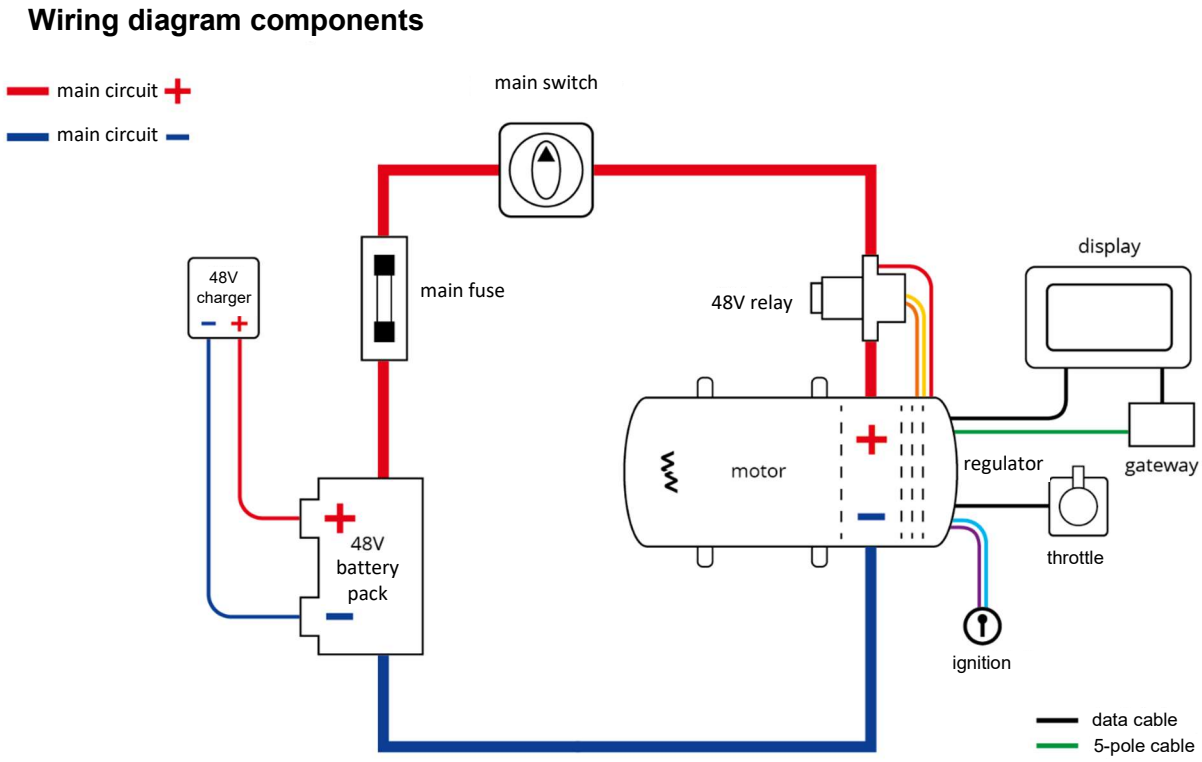
- Throttle and RJ45 data cable (3 m)


- Ignition switch with two keys

  PLEASE NOTE!
  Not included in the standard scope of delivery: vibration absorbers, fuse with fuse holder to be placed in the battery cables, main switch and battery pack with charger.

5. Installation of the system

Connection diagram



Positioning of the motor

The WaterWorld drive can be installed by means of the following step-by-step plan.

1. Remove the motor covers of the motor and place them in a safe place.

2. Install the motor on a foundation and on vibration absorbers suitable to absorb the thrust of the system and transfer it to the boat.
   PLEASE NOTE! Should you choose to install the motor without vibration absorbers, then it is imperative to perfectly align the motor and the shaft. Even if you do use a flexible coupling. In addition, particularly for aluminium boats, this could lead to additional vibrations and noise.

3. **PLEASE NOTE!** Given the weight, you had best hoist the WW 7.5, 10.0 or 15.0 into the boat. To do this, screw the included lifting eye into the hole in the top of the motor, provided with screw thread. That can be used to lift and lower the motor by use of a hoist.

4. The side supports on the motor are supplied with the supports directed downwards. In most cases, they should be turned, so the motor will hang in the supports, like in the following two examples:

Rest the supports on the vibration absorbers, in such a way that the motor is straight in front of and aligned with the propeller shaft.

5. Preferably use a flexible rubber coupling between the motor flange and the propeller shaft. This will prevent vibration in the boat and absorb imperfections created as a result of the propeller shaft system's quality or the alignment.
   PLEASE NOTE! If the propeller shaft is mounted directly on the motor, by means of a rigid attachment, the motor must be perfectly aligned in order to prevent damage to the electronics and connectors.

6. **PLEASE NOTE!** In case of a WW 7.5, 10.0 or 15.0 motor in a heavy boat or in case of professional use involving many sailing hours, it is recommended to apply an additional thrust bearing, so that the rubber supports and thrust bearing in the motor will not be overloaded over time. If you have doubts regarding this, please contact your supplier.

7. The WaterWorld motor controller is supplied with a red and black battery cable, already attached on the motor controller side.
   The red cable on the positive pole is connected to the relay, black cable on the negative side to the negative pole of the battery pack.

8. We recommend and use the following cable diameters:

4.0 kW	35 mm^2 cable
7.5 kW	50 mm^2 cable
10.0 kW	70 mm^2 cable
15.0 kW	95 mm^2 cable

   In case of applying cable lengths in excess of 5 metres we recommend the you use of thicker cabling. Please refer to the diagram on page 20 or, when in doubt, contact your supplier.

WARNING!

9. The motor and controller are cooled by ventilators: two at the rear of the controller (visible at the front of the system) and one on the motor. Ensure free flow of air to dissipate heat. The air flows from the front of the motor to the back, and enough supply

and discharge of warm air should be accomodated. If necessary, ventilation should be installed to increase the flow of air.

WaterWorld cannot be held liable for performance loss, damage or other problems in case of insufficient ventilation of the system itself, or of the compartment that houses the motor and batteries.

10. In the standard version, the motor and controller are assembled in a single frame (except for the WW 15.0) and these components were interconnected ex-factory. So this will not require any further action.
In case of insufficient space for the controller, directly behind the motor, or if batteries are positioned above the motor, you can separately install the controller in a different location of the boat. In this case, it can be detached from the frame, while the rear part of the frame can be removed on both sides.

Batteries

PLEASE NOTE! Make sure that the system is never electrically-live during positioning and installation!

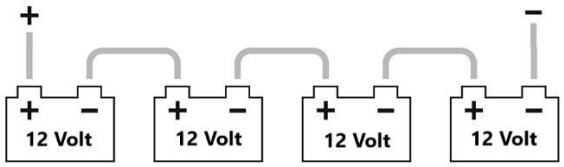
1. The drive operates on 48 Volt. Ensure a battery pack that is suitable for this application, in terms of quality and capacity. Make use of traction, semi-traction, deep cycle or lithium batteries that comply with the specifications. **PLEASE NOTE!** When in doubt about the use of lithium batteries, it is recommended to consult your supplier. The batteries could damage the motor, or conversely be damaged if they are not compatible.

2. Position the batteries in the boat, such that:
    a. the weight is balanced and the boat is neatly on the waterline
    b. the batteries cannot move around in the boat after installation
    c. the batteries can be accessed for connection of the cables, and for service tasks at a later stage
    d. the batteries are not in the way, in terms of everyday use of the boat
    e. cabling towards the motor and the charger is well possible without using excess length of cable

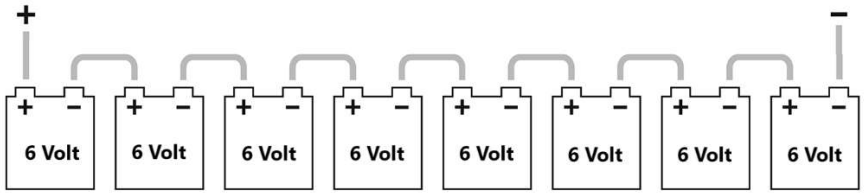
3. Check the individual voltage of all batteries and make sure that they are similar, with a tolerance of 0.1 Volt, before you interconnect the batteries. If this is not the case, then all batteries must be individually charged completely.

4. Interconnect the batteries in accordance with the applicable diagram.
Below, you can find examples of 4 x 12 Volt batteries in series and 8 x 6 Volt batteries in series.

Connect to 12V batteries

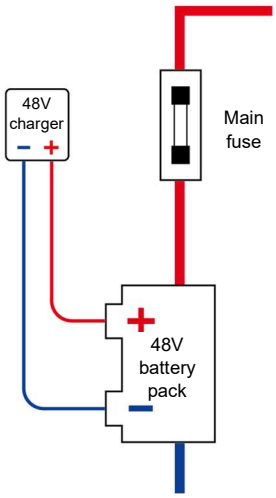


Connect to 6V batteries



Do not connect the batteries to the rest of the system until everything has been properly connected.

Battery charger



The battery charger must match the battery pack and be suitable in terms of voltage, charging capacity in amperes, type of batteries and use in a boat.

When positioning the charger, carefully consider the same matters as with the motor and batteries. Moist, accessibility, cabling, ventilation, etc.

Recommended cable sizes

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

Waterworld 7.5: to 8.25 kW power consumption, max. 172 Ampere.
For this, a cable thickness of 50 mm² is recommended.

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

WaterWorld 15.0: to 20 kW power consumption, max 400 Ampere
For this, a cable thickness of 95 mm² is recommended.

Abovementioned details assume cable lengths up to 5 metres, for further advice, for **both shorter and longer lengths**, consult table below and, when in doubt, consult your supplier.

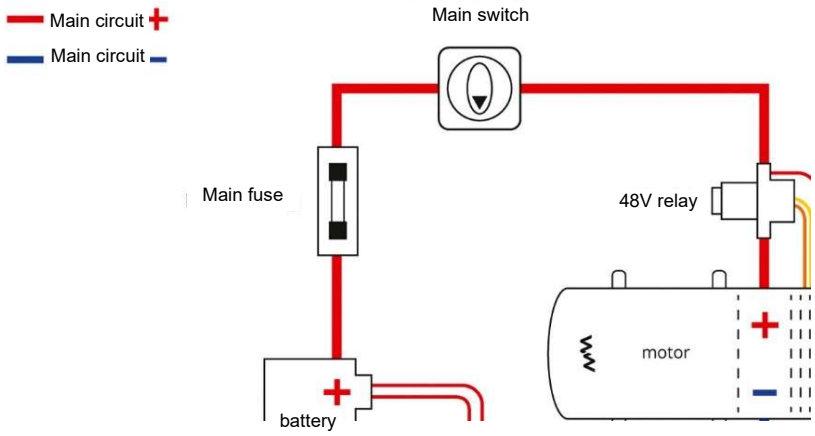
cable diam mm	cable section mm²	L(+) + L(-) tot 5 meters I max A	L(+) + L(-) tot 10 meters I max A	L(+) + L(-) tot 15 meters I max A	L(+) + L(-) tot 20 meters I max A
0.98	0.75	2.3	1.1	0.8	0.6
1.38	1.5	4.5	2.3	1.5	1.1
1.78	2.5	7.5	3.8	2.5	1.9
2.26	4	12	6	4	3
2.76	6	18	9	6	5
3.57	10	30	15	10	8
4.51	16	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

Choice of battery cable: maximum amperage with a voltage loss of 0.259 V
The voltage loss across connection contacts was not counted.
The total length of the + and – pole cable must be counted.

Translator:
tot = up to

Main power switch

Mount the main power switch in an easily accessible position in the (red) + cable between the motor controller and the batteries, so in case of an emergency or maintenance, the system can be disconnected from the batteries quickly and easily.



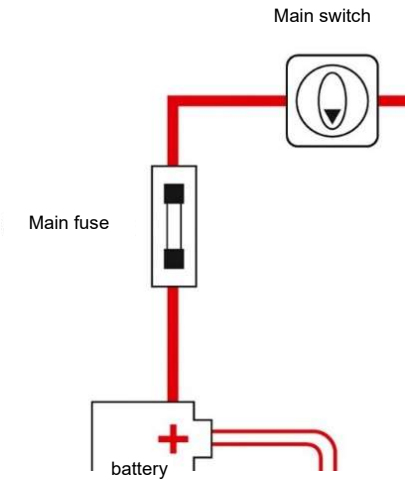
DANGER!

Make sure that the main power switch is always on OFF (“0” or “off” position) once the system has been installed, during work on components and when disconnecting and connecting cables.

PLEASE NOTE! The main switch must be off while the batteries are being charged.

Main fuse

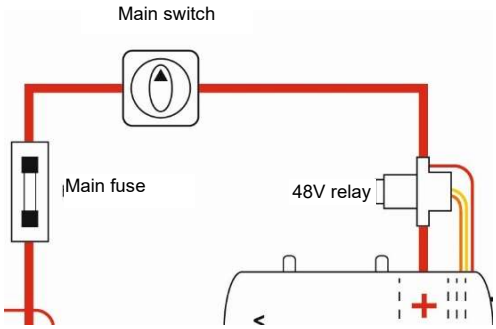
Install the main fuse between the main power switch and the + pole of the batteries, as close to the battery as possible, so preferably inside the battery compartment. Make sure that this main fuse is inside the boat, but remains visible when opening a hatch. The capacity of the fuse in amperes must be around 1.6 x as high as the maximum of amperes of the motor (see specifications).



You can order an ANL fuse holder + ANL fuse directly with the motor. We supply the following values:
WaterWorld 4.0 – 160 A fuse
WaterWorld 7.5 – 270 A fuse
WaterWorld 10.0 – 325 A fuse
WaterWorld 15.0 – 600 A fuse

Relay

Assemble the included relay in the (red) + cable, between the motor and the main power switch in, as close as possible to the motor.



The red wire with M8 eye, on the relay, will be attached to the relay bolt on the battery side. Ensure a good connection of this red wire, a poor connection may lead to failure when starting the motor.

On the relay, there is a plug with 3 wires, this is to be connected to the motor controller, on the connection socket. It has the same colour wires and will fit only one way.

Throttle

1. Mount the throttle on the designated spot, perfectly accessible for the captain.

WARNING
Make sure that the throttle is mounted in such a way that the boat's crew cannot accidentally hit it, leading to sudden acceleration of the boat!

2. Mount the throttle such that it is vertical when in idle (neutral) position.

PLEASE NOTE! The throttle is normally set as follows: by moving the handle clockwise, the boat will go forward, by moving it counter-clockwise, the boat will go backwards. This is the correct position if the handle is mounted to the steering console, on starboard side. If you wish to apply the handle differently, you can switch the phases of the cables on the motor controller. **See also the instructions for setting the display. This must be performed by a recognised dealer or installer.**

The display

1. Mount the display in the designated spot. It must be well visible for the captain of the boat.
2. Mount the gateway near the display, but in an internal space, e.g. the inside of a console.

The ignition switch

Mount the ignition in the designated spot, easily accessible for the captain, for instance next to the display.

Connecting throttle, display and ignition

1. Connect a RJ45 cable from the throttle to the motor controller
2. Connect a RJ45 cable from the display to the motor controller
3. Connect the round 5-pole cable from the gateway to the wiring harness on the motor controller
4. Connect the plug of the ignition switch with the motor controller

See the diagram on page 16.

Setting the display

To start, tap the settings icon at the right bottom corner of the screen. Note: click on **save, the disk icon**, after filling in each step to save the information! Subsequently, go through the different settings:

Battery

Mode: define here: **stand-alone** (in most situations) or **can bus** for a number of brands of lithium batteries (contact your supplier for more information).
Low voltage: define here, for which voltage you wish to see the message *drive slowly*; for lead acid batteries (AGM) this is usually 44 V. If necessary, consult your battery supplier about this.
High voltage: define here the voltage of a 100% charged battery; see specifications of the batteries.
Quality: fill in the aging percentage. This can be retrieved from the battery specifications, where the aging is indicated per year, or from a test at your battery supplier.
C value: fill in the C values of the battery in conformity with specifications; fill in all of them!
For lead batteries: does your battery manufacturer only provide a C20 and C5 value? Then, at C10, you fill in the average of C5 and C20 and, at the C1 value half of the C5 value.
Example:
C20 = 400 Ah
C10 = 350 Ah (between C20 and C5)
C5 = 300 Ah
C1 = 150 Ah (50% of C5 value)

For lithium batteries: all values equal the C1 value.

Control

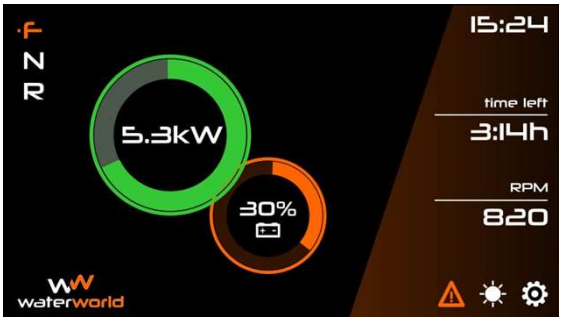
Mounting side:
1. Clockwise rotating propeller + throttle to the right = do not adjust anything
2. Clockwise rotating propeller + throttle to the left = setting display + phase cable alternation
3. Counter clockwise rotating propeller + throttle to the right = phase cable alternation
4. Counter clockwise rotating propeller + throttle to the left = setting display

Reduce power warning
Here you can set the maximum power for a number of minutes. This can be used in case of rental boats, if you want the power to be reduced after a few minutes, for instance to save the batteries. It is also usable for the WW 15.0, that is able to temporarily provide up to 20 kW of power, if the battery pack allows that. Consult your supplier if necessary.

Display

Main screen
Set the screen to “basic” or “advanced” as standard. Normally you would choose “basic” here. This will display all necessary information for sailing, see image below, on the left.
In the position “advanced”, you will be shown more detailed information, see the image below on the right. Not all of this information is necessary while sailing.
Display time
Here, you can set the time and time zone. Please note: first set the date and then the time. Under the header display, you decide whether the time is visible. Switching from summer- to winter time and vice versa will go automatically.
System information
This shows the software version of the display, the motor controller and the serial number of the screen itself. If communicating batteries were connected via CAN, you will also find the customer ID here.

Basic screen



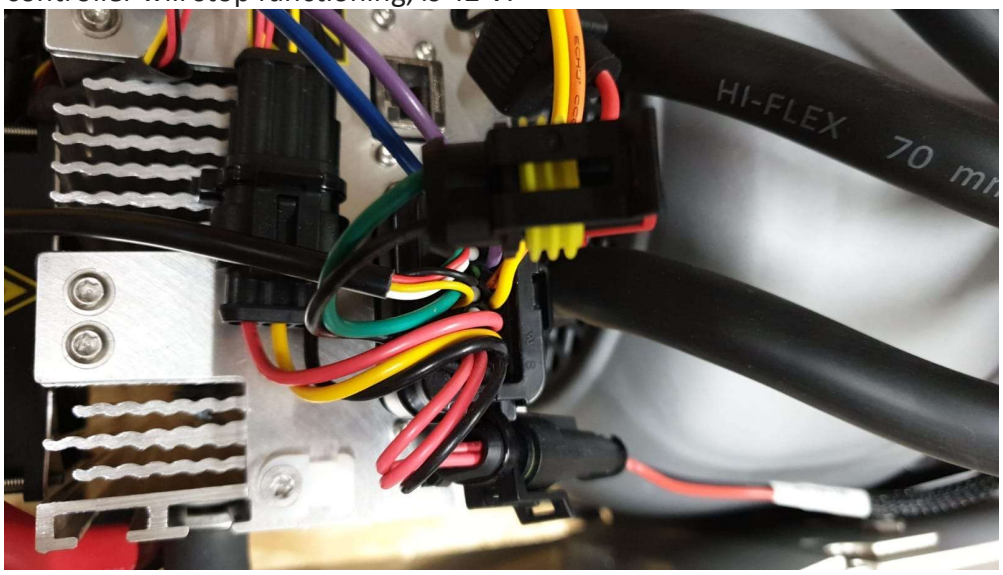
Advanced screen

Note: the display has its own battery, which needs replacing every 5 years.

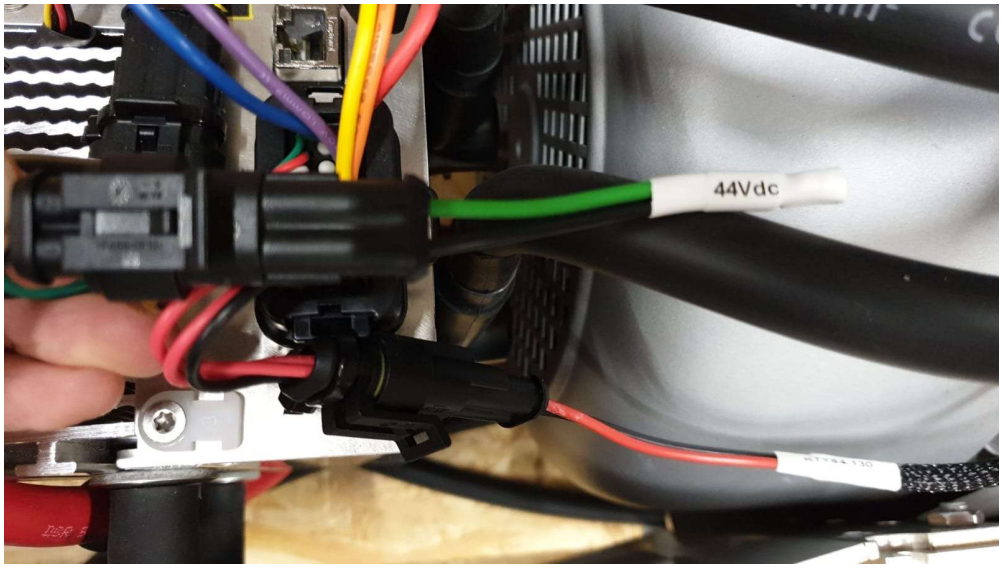
Setting the controller for different voltages lithium battery

It is possible to use the WaterWorld motor with a 12 cell in series lithium NMC battery pack. For this, a setting in the controller must be changed.

1. If the plug with the green/black cable is not connected, then the system is suitable for standard voltages. The “cut-off” voltage, the minimum voltage under which the controller will stop functioning, is 42 V.



2. If the green/black cable is connected, then the “cut-off” voltage, the minimum voltage under which the controller will stop functioning, is reduced to 37 V.



Setting 1
Suitable for: AGM and deep cycle lead-acid batteries, 2x Torqeedo Power 24-3500 batteries in series and LifePo4 and 13 cell NMC lithium batteries.

Setting 2
Suitable for lower voltages, can be used for the Torqeedo Power 48-5000 battery and full-traction batteries.

PLEASE NOTE if this setting is wrongly used, this may lead to irreparable damage to the battery pack. WaterWorld cannot be held liable for damage to the batteries as a result of too deep discharge.

Testing and first use

In order to check the functioning of the system after installation, you can go through the following steps:

- Check whether the batteries are sufficiently charged, by measuring the voltage with a multimeter, on the poles of the battery pack. The total voltage must be at least 48 Volt, but a figure of around 52 Volt can be expected. For lithium batteries this could be up to 60 Volt.
  PLEASE NOTE before connection, always check whether all individual batteries have the same voltage, maximum difference is 0.1 Volt.
- Check whether the ignition switch in the dashboard is off.
- Check whether the throttle is in neutral position.
- Turn the main switch to “on” or I.
- Turn the ignition key clockwise to turn on the system, you will hear a loud click when the relay is engaged.
- Check whether the display is on. In the advanced setting of the display, you can also see the voltage; does this correspond with what you measured in the first step?

- Carefully accelerate and occasionally check whether the motor is functioning properly when going forward and backwards.
- Check whether the display shows a certain number of W or kW when accelerating.
- Set the throttle back into idle position.
- Turn off the ignition key.
- Turn off the main switch.
- Now connect the shore power cable.
- Check whether the charger engages and if it shows the right signals. Consult the manual of the charger for this.
- Check on the display if the voltage of the battery pack goes towards the prescribed charging voltage. Consult the manual of the batteries for this.
- Preferably charge the battery pack entirely for the first sail for setting the display. Refer to explanation of the use of the display below.
- Make a test run and thoroughly check everything visually, also pay attention to any sounds and vibrations.
- During the test run, check the number of rpm when fully accelerating and the maximum motor power (kW) when fully accelerating, to determine whether you are using the right propeller.
  Max rpm must be 1,400-1,500 revs
  Max power must be 100% to 110%, so 4, 7.5, 10 or 15 kW

6. Operation of the motor

Turning on and sailing away

1. **PLEASE NOTE!** First disconnect the shore power connection
2. Check whether the contact in the dashboard is off
3. Check whether the throttle is in neutral position
4. Make sure that you have sufficient space to sail away, or that the boat is properly tied, to be able to test the system
5. Turn the main switch to “on” (“I”)
6. Turn the ignition key clockwise to turn on the system; do you hear the click of the relay?
7. Check whether the display turns on and provides the correct information
8. Carefully accelerate
9. Check whether the throttle functions as it should, in neutral, forward and backwards
10. Rescue facilities and other safety measures must be in order
11. You can now sail away

Explanation of the display

The letters **F N R (F**orward **N**eutral **R**everse) at the top left of the screen show whether your throttle is in forward, neutral (idle) or backwards position.

The **green circle** shows the motor power in watts/kilowatts that is being used at that particular moment.

The **orange circle** shows you the indication of your remaining battery capacity in percent.

Time left shows the remaining sailing time in hours and minutes. Something will be shown here only if the motor is in F (Forward) and capacity is being used. If the motor is in N (neutral), no value will be shown. The meter starts from the most recently saved value. Also after restart, the counting starts from the most recently saved value, unless you set this to 100% because the batteries were charged (see instruction below).

RPM shows the revs of the motor.

The **orange hazard triangle** shows the presence of possible **error codes**. If an error or failure occurs, a pop-up will show with the message explaining the error. If this is an error that will not stop you from sailing, you can continue and click it away. At the bottom of the screen, an orange hazard triangle will be shown. Also an acoustic signal will sound, which can also be turned off after you have read the message. An overview of the codes can be found in chapter 9.

By clicking on the **sun**, you can set the brightness of the screen.

If your charger is switched off after charging and indicates a full battery, the motor controller will register the higher voltage. At that moment, a **battery icon** will appear at the bottom of the screen. When you click on it, you will be asked whether you wish to click on "**battery full**". If you click on "Yes", the percentage will go towards 100%. This notification will not work in case of too low a voltage, so as to prevent wrongful resetting to full. You only need to perform this reset if the charger is switched off after a charging session and has indeed finished charging. During layovers without charging, your display will just continue from the percentage that was indicated when you turned off the motor.

If the charging is still ongoing and hasn't totally charged the batteries, the battery icon may also appear, because at that moment a temporarily higher voltage is being registered. If you click on "battery full" at that moment, the notification "low voltage" will show sooner than normally, as will the indication "drive slowly". The battery indication will no longer be correct, until you charge the batteries up to 100% again, and then perform the reset to 100%.

Arriving and berthing

- Make sure that the throttle is in neutral position when you berth
- Turn the system off by use of the ignition key
- Turn off the main power switch. **Note: also turn off the system by use of the main switch if there are swimmers around the boat or when repair or maintenance is being performed on the boat.**
- Connect the shore power and check the proper functioning of the charger

7. Maintenance and service

Inspections during the sailing season

Also during the sailing season you should frequently pay attention to your WaterWorld drive and the accompanying energy system. We recommend you pay attention to the following:

- Make sure that the space on the bottom of the boat, below the motor, remains dry, so the motor and controller are not flooded and no excess condensation can be formed. It is recommended to install an automatic bilge pump at the lowest point of the boat and also to check if it functions properly.
  Check this prior to any sailing trip. If there is water in the boat and the electronics have become wet, you must dry them and contact your installer. Do not activate the motor in this instance.

- Keep the motor and controller, as well as the other components of the system, clean and dry. You can clean them by use of a damp cloth. Do not use water to clean the system.

- Always keep your system connected to the shore power when you are not sailing. This will prevent empty batteries. The charger will stop automatically when the batteries are full. When activating the charger, always check if it is actually working.

PLEASE NOTE! Before performing inspections or cleaning activities, always disconnect the system by use of the main power switch.

Annual inspections by you or your supplier

Have your system inspected by your supplier or installer, preferably every year. This person will check on the following items:

- Proper functioning of all components.
- Any moisture problems, corrosion of contacts, battery poles or plugs. Preventive application of contact spray and greasing of the battery poles.
- Lubrication of the motor block shaft.
- The proper fixing of all pole clamps and plugs.
- Check tightness of all fixing bolts and nuts.
- Any damage on cables and components.

- The condition and the correct voltage of all batteries
  Under load:
  If you have a multimeter, then check the voltage of the batteries per battery, by switching the meter to voltage and place it on the + and – pole of one battery, while the motor is running. There should be no difference between the batteries of more then 0.1 Volt. If the difference is higher, you can contact your supplier or installer.
  Without load:
  After charging the batteries, also measure the batteries individually and check again that there are no excess differences in Voltage. Determine whether the voltage is sufficiently high, on the basis of the specifications of your battery, or by enquiring with your supplier.
- Any imbalance in the motor/the propeller shaft system.
- The proper settings of the display.

Winter storage

During and after the winter storage, recommended inspections similar to those mentioned above apply. Pay special attention to batteries being and kept charged. If an electrical outlet is available near your boat during winter storage, then leave the shore power connected. Your charger will automatically activate when necessary. It is recommended to have the boat and batteries checked at least twice during winter, to see if the charger is connected and that the batteries are sufficiently charged.

If there is no charger connection point available near your boat, then store the boat with fully charged lead batteries and disconnect the main + and – of the battery pack. Make sure that no current running from the battery pack. For lithium batteries it is sensible to store the boat in a similar way, however in this case the batteries should be charged to around 50%. This will lengthen the lifespan of these batteries.

Use of the motor in salt water

During use in salt water it is important to pay additional attention to the following.

- Properly seal the installation space(s) against salt water
- Ensure proper ventilation of these spaces
- Frequently check all components for corrosion
- Clean thoroughly twice per year
- Lubricate the shaft with grease
- Possibly use protective spray for the rest of the motor and the contacts

8. Technical specifications

Motor specifications

Model	**WW 4.0**	**WW 7.5**	**WW 10.0**	**WW 15.0**
Max. power consumption (S1)	4.4 kW	8.25 kW	11 kW	16 kW
Max. power consumption (temp.)				20 kW
Nom. rotations/min.	1,450	1,350	1,450	1,450
Voltage	48 V			
Maximum current (Amperes)	92	172	230	400
Type	Asynchronous			
Sensor	Sensor-less			
Weight (kg)	39	76	76	
IP rating motor	IP 65			
IP rating controller	IP 67			

Electric motor

Voltage: 3 X 34 Vac @ 50 Hz
Rotational speed: 1350/1450 RPM (depending on motor type)
Max rotational speed: 1500 RPM
Insulation class: H (185 degrees)
Thermal protection: PTY84-130 C

Maximum temperature: 135 °C
Output shaft: 38 mm/28 mm
Cooling: Air cooled, ventilator on shaft

Motor controller

Voltage: 48 V
Maximum temperature: 85 °C
Cooling: Air, 2 x ventilator
Propulsion electric motor: sensorless

Throttle

Type: Water World Basic control.
Regulation: rotation and hall sensor determines forward/backwards. (WW-017)
Potentiometer + hall sensor for extra control and safe operation. (WW-016)

Relay

Voltage: 48 V DC
Maximum continuous current: 200 A/400 A (depending on motor type)

Display

Power supply via motor controller

In the appendices of this manual, you will find the dimensioned drawings of the different models of WaterWorld motors. On www.destilleboat.nl/waterworld/waterworldservice/ you can find drawing and also 3D files.

Guidelines for choice of propeller

Please find below a guideline for the choice of propeller size. Note: the optimal propeller for an individual boat may deviate from this, after all every boat is different.

4.0 kW motor and a boat that sails slower than 11 km/h.
- 12 x 8 3-blade propeller

4.0 kW motor and a boat that sails faster than 11 km/h.
- 12 x 8 4-blade propeller

7.5 kW motor and a boat that sails slower than 10 km/h.
- 14 x 9 3-blade propeller
- 13 x 10 3-blade propeller

7.5 kW motor and a boat that sails faster than 10 km/h.
- 14 x 9 4-blade propeller
- 13 x 10 4-blade propeller
- 15 x 8 4-blade propeller
- 15 x 9 3-blade propeller

10 kW motor and a boat that sails slower than 10 km/h.
-14 x 10 3-blade propeller
-15 x 9 3-blade propeller

10 kW motor and a boat that sails 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)

15 kW motor for lower speeds (approx. 11 km/u.)
14 x 11 – 3 blade
16 x 9 – 3 blade
16 x 9 – 4 blade
15 X 10 – 4 blade

15 kW motor for higher speeds (approx. 15 km/u.)
15 X 11 3 blade
16 X 10 4 blade

9. Failures and troubleshooting

Error codes for failures

These codes appear in your display (see also chapter 6 under “explanation of the display”).

For below mentioned errors, inspect the details in the display about temperature, voltage, the smooth running of the propeller shaft installation and the proper connection of all cabling. If the problem cannot be resolved, then contact your supplier.

Voltage too low
The controller measures or has measured a voltage below 46 Volts (minimum start-up ok voltage)
Voltage too high
The controller measures or has measured a higher voltage than the settings allow (70 V = max voltage)
Throttle lever
The controller detects a problem in the signal from the throttle, usually a poor connection in the cabling
Engine temp.
The temperature sensor in the engine block is above 130 ℃
Blocked engine
The measured speed is less than 70% of the expected speed and less than 500 revs
Speed too low
The measured speed is less than 85% of the expected speed at maximum power
Insufficient torque
The measured speed is equal to the expected speed, but the amperage is at less than 80% at maximum power

On the left RJ-45 CAN-connector, the motor controller is able to display error codes (the two inputs on top of the controller that you can insert a network cable into).

A continuous orange flash, for 1 second, will show as long as there are no errors. Should the motor controller give an error, then the 1 second flash will be followed by 1 or more brief flashes of 200 ms. The number of brief flashes corresponds to a specific error.

Number of brief pulses	Error	Explanation
0	No error	Only the longer, 1 second flash is visible, the system works as it should.
1	Too low voltage error	The controller measures or has measured a voltage below 46 Volt (minimum starting ok voltage) In this case you must resolve the too low voltage by charging the batteries, or checking the quality of the connections.
2	Too high voltage error	The controller measures (or measured) a higher voltage than the settings (70 V = max voltage).

		In this case, an incorrect battery pack was connected and this must be resolved before the motor can be used.
3	Throttle error	The controller detects a problem in the signal from the throttle, usually a poor connection in the cabling. Disconnect the cabling of the throttle towards the controller, inspect it and reconnect the cable.
4	Motor temp. error	The temperature sensor in the motor block is above 130 degrees. Determine the cause, for instance no ventilation of the motor space, and resolve the problem.
5	Blocked motor	The rotational speed measured is less than 70% of the expected rotational speed and lower than 500 revs. Usually this indicates a blocking of the propeller shaft, for instance due to rope in the propeller, or a defective bearing.
6	Too low rotational speed	The rotational speed measured is less than 85% of the expected rotational speed at maximum power. See point 5.
7	To little torque	The rotational speed measured is equal to the expected rotational speed, but the amperage is less than 80% at maximum power. The motor can easily deliver its capacity. Possibly you propeller is a few sizes too light, or the propeller is slipping on the shaft.

Troubleshooting

Below, several problems that may occur will be discussed.

My motor's capacity is rapidly decreasing

- Possibly the motor controller is decreasing the power because your battery pack is nearly empty. Check the remaining percentage on the display, in combination with the voltage, while the motor is running. If the voltage drops below 46 Volt, it will be a reason for the motor to reduce the capacity. As soon as the voltage drops below 42 Volt, the motor will stop entirely.
- The cooling is insufficient. If the motor gets too hot, it will reduce the capacity and stop eventually. The most common causes for this are a heavily running propeller shaft and the selection of too heavy a propeller. See also the propeller selection table on page 32/33.

My motor is vibrating and makes too much noise

There may be different causes for this, which you can rule out one by one:

- the motor is not properly aligned with the propeller shaft
- the motor was assembled too high on the motor foundation
- the flange is not straight, or mounted straight onto the motor
- the propeller shaft is not exactly straight and should be adjusted
- there is damage on the propeller under the boat

My motor has less capacity

Possibly there is something in the propeller or it is imbalanced.

If the propeller shaft can be rotated lightly by hand and this problem occurred immediately after the installation, perhaps a heavier propeller can be opted for.

I have lost my key

Always make sure you have a spare key. So have one made in case you lost one.
Should you still require a new key, then contact your supplier.

10. Warranty

Warranty terms

The warranty term is 24 months and includes all components of the WaterWorld system. The warranty starts from the day that the WaterWorld system was delivered to the end customers.

For WaterWorld systems that are used professionally – including temporarily – a one year warranty applies, after delivery of the product to the customer.

In all cases the right to warranty will expire six months after the identification of the defect.

Warranty conditions

Water World Electronics BV. guarantees the end user of a WaterWorld system that the product will be free from material and manufacturing defects during the warranty term. WaterWorld will take over the costs of resolving material and manufacturing defects, from the end customer.
This covering of costs does not apply to all additional costs that arise in a warranty matter and not to all other financial disadvantages (incl. costs for towing, telecommunication, meals, lodging, missing usability, time loss, etc.).
Water World Electronics BV will decide whether defective parts will be repaired or replaced.
Distributors and dealers, who perform repairs on WaterWorld-motors, are not authorised to issue legally binding statements on behalf of Water World Electronics.
Wear and tear of parts and routine maintenance activities are excluded from the warranty.
Cables and fastening materials are also excluded from the warranty.

Your supplier of WaterWorld is entitled to reject the warranty, if

- The warranty was not claimed in accordance with the regulations (see the warranty procedure).
- The product was not handled in accordance with the regulations.
- The instructions in the manual were not observed.
- Prescribed maintenance was not carried out or documented.
- The product is damaged due to external influences, as a result of an accident or in another way so that the defect cannot be attributed to WaterWorld.
- The WaterWorld system was converted, modified or equipped with parts or accessories that are not part of the equipment expressly accepted or recommended by WaterWorld.
- Service or repair actions were performed by companies not authorised by WaterWorld, or when non-original parts were used, unless the end customer is able to demonstrate that the abovementioned facts did not influence the emergence of the defect.

Warranty procedure

Observing the warranty procedure is a condition for asserting a warranty claim.

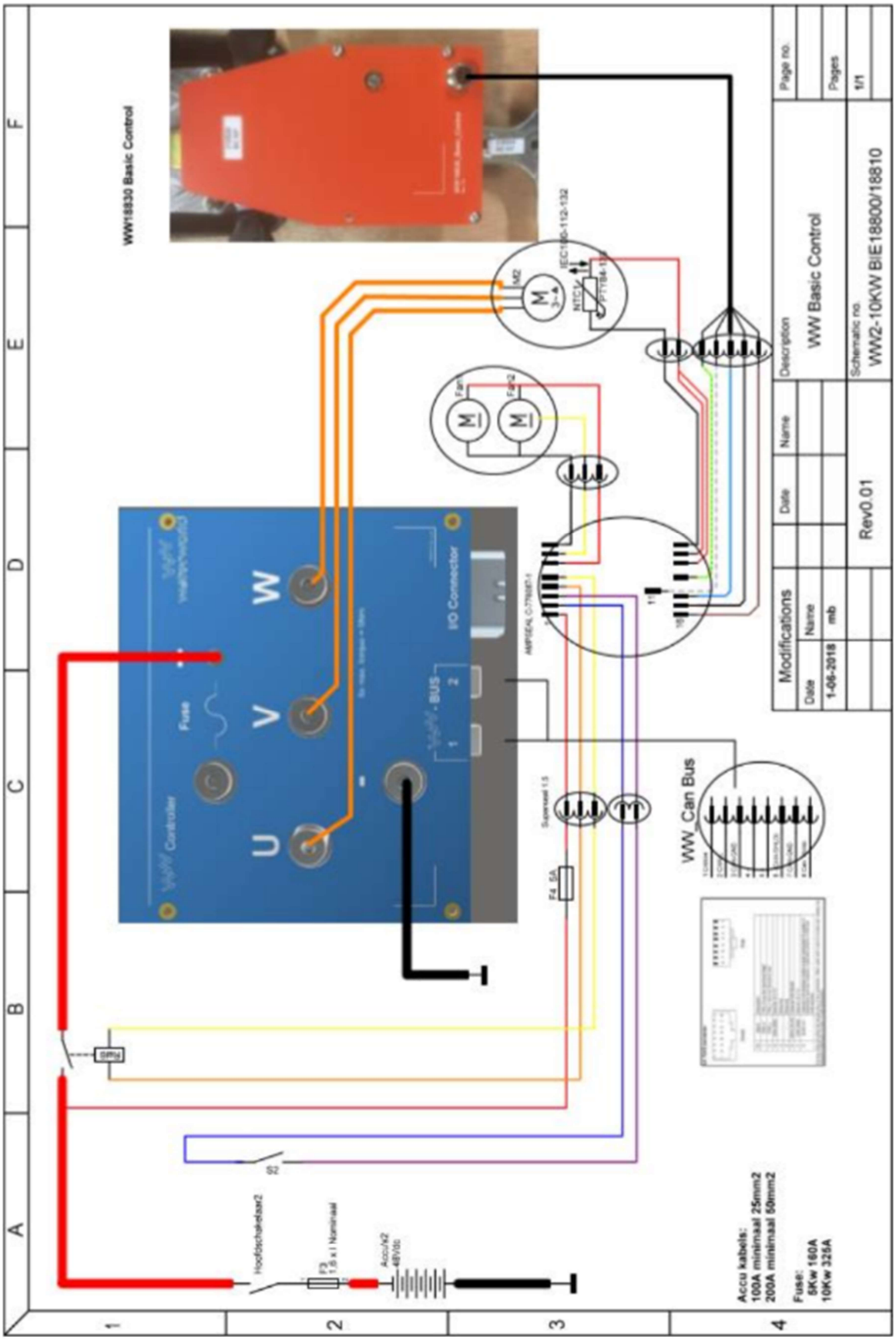
- Contact your WaterWorld supplier in case of a problem.
- Keep your purchase invoice at hand, the supplier will need it to check when and where your WaterWorld system was purchased.
  PLEASE NOTE! Your purchase receipt or invoice is your warranty. So carefully keep this after the purchase!
- Also keep the serial numbers of the motor at hand, if they are not already stated on the purchase invoice.
- Submit or provide an accurate description of the issue, the circumstances under which it occurred and additionally all relevant information that could help your supplier to determine the seriousness of the issue. If necessary and if possible, make photographs of the system and the entire situation, that could be useful.
- The supplier may ask you to first perform a number of inspections on the system, in order to be better able to assess the problem.
- In case products are transported to the WaterWorld supplier, be aware that incorrect transport is not covered by the warranty.

Decommissioning of the product/Recycling

The WaterWorld motors were constructed in accordance with the EG-directive 2002/96. This directive regulates the recycling of electric and electronic devices, in order to protect the environment. You can present the motor at a collection point, in conformity with the regional regulations. From there, it will be recycled professionally.

11. Appendices

Wiring diagram



12. Declaration of conformity

EC Declaration of Conformity

For each of the products listed below:

WW-001, WW-002, WW-003 (excluded Simarine) and WW-004, WW-005, WW-006.

We hereby state that they fulfil the principal requirements specified in the following harmonisation legislation:

DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL OF 17 May 2006 on machinery, and amending Directive 95/16/EC (recast) Applicable harmonised standards:

- EN ISO12100:2010 – Safety of machinery – general principles for design – risk assessment and risk reduction

DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast) Applicable harmonised standards:

- EN 61000-6-2 (2005) + AC (2005) - Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments.
- EN 61000-6-4 (2007) + A1 (2011) - Electromagnetic compatibility (EMC) – Part 6-4: Generic standards– Interference emission for Class / Level A.

ES-TRIN

- Chapter 10 electrical installations 10.20 and 10.21. (before chapter 9 paragraph 2B, 2C, 2D, 2E, 2F,2G and 9.21)

Person with responsibility for documentation as per annex II item 1 section A. no. 2, 2006/42/EC:

Surname, first name: Van der Veen, Martijn.
Position in the manufacturer's operation: Chief R&D

This statement applies to all examples which were manufactured as per the corresponding production drawings, which are a component of the technical documentation. Date certification EN 61000-6-2:2005, EN 61000-6-4:2007+A1:2011 and ES-TRIN: 25-01-2018. Date second check for EN ISO12100:2010: 16-01-2019.

This declaration is made for and on behalf of the manufacturer

Name: Water World Electronics B.V.
Address: Weerdijk 14, 8375 AX, Oldemarkt, Netherlands.

Issued by: Mario Bor, Technical Director, Oldemarkt, 24-01-2020.

Document number: 2020005.