

Manual

Installation of WaterWorld
inboard engines



Dear reader,

Congratulations on your purchase! We are pleased that you have chosen a WaterWorld system.

The WaterWorld systems are designed and manufactured with the greatest care. Everything is aimed at providing you with a safe, reliable, environmentally sound and user-friendly system that you will enjoy using.

We do everything in our power to constantly improve the WaterWorld systems. If you have any comments on the design or use of the system, we would be grateful if you could let us know. You can find our contact details at the back of this manual.

We recommend that you read this manual carefully so that you can install and use this system properly. We sincerely hope you will enjoy it!

Team WaterWorld

CONTENTS

1. INTRODUCTION	p. 6
Using this manual	p. 7
Warning and symbols	p. 7
Serial numbers	p. 8
2. PRE INSTALLATION CHECKLIST	p. 10
Step-by-step installation plan	p. 11
3. SAFETY	p. 12
General guidelines	p. 13
Safety devices of the system	p. 14
Safety instructions of the system	p. 15
Safety instructions for the batteries	p. 16
Safety instructions for use	p. 17
4. SCOPE OF DELIVERY	p. 18
Step-by-step plan for installation	p. 19
5. SYSTEM INSTALLATION	p. 22
Connection diagram	p. 23
Positioning of the engine	p. 24
Batteries	p. 26
Battery charger	p. 27
Cable sizes	p. 27
Main circuit switch	p. 28
Main fuse	p. 28
Relais	p. 29
Throttle	p. 29
Display	p. 30
Ignition switch	p. 30
Connecting throttle, display and ignition	p. 30
Setting the display	p. 30
Adjusting the controller for different voltages of lithium batteries	p. 32
Testing and commissioning	p. 33

6. OPERATION THE ENGINE	p. 34
Starting and sailing away	p. 35
Explanation of the display	p. 36
Arriving and berthing	p. 37
7. MAINTENANCE AND SERVICE	p. 38
Inspections during the boating season	p. 39
Annual checks by you or your supplier	p. 40
Winter storage	p. 41
Operating the engine on saltwater	p. 41
8. TECHNICAL SPECIFICATIONS	p. 42
Engine specifications	p. 43
Electric engine	p. 43
Engine controller	p. 43
Control lever	p. 43
Relais	p. 43
Display	p. 44
Propeller selection guidelines	p. 44
9. ERRORS AND TROUBLESHOOTING	p. 46
Error codes for malfunction	p. 47
Problems	p. 49
10. WARRANTY	p. 50
Warranty periods	p. 51
Warranty conditions	p. 52
Warranty procedure	p. 53
ANNEXES	p. 54
Declaration of conformity	p. 55



1. INTRODUCTION

Using this manual

Warning and symbols

Serial numbers

Using this manual

This manual contains important information for the safe use of the WaterWorld electric drives. Maintenance and possible troubleshooting are dealt with in this manual.

It is imperative that any person installing this system, as well as anyone operating the engine, familiarize themselves with the manual and carefully follow and implement the warnings and safety instructions contained herein.

Installation and maintenance of WaterWorld engines must be carried out by specialised and skilled installers who are aware of the applicable laws and regulations in combination with the safety aspects mentioned in this manual.

Keep this manual with your system in a safe and easily accessible place!

Warnings and symbols



A warning signifies the risk of possible injury to the user/installer or of substantial material damage if the user or installer does not avoid the risk.



Special data or commandments and prohibitions with regard to damage prevention.

ATTENTION!

Instructions that deserve 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 and on the side of the engine. It shows the manufacturer, the type number and the unique serial number of the motor/controller. The serial number starts with the letters WW.



Engine



Motor controller



ATTENTION! Never remove the identification labels and/or other stickers on the engine.



PRE-INSTALLATION CHECKLIST

Step-by-step installation plan

Step-by-step plan for installation

- 1. Read the manual.**

We offer you a manual that is as complete as possible. This includes items that are not related to the WaterWorld engine, but to the whole boat, the propeller and the batteries. However, each installation is customised and must be installed by a competent person.
- 2. Check that you have received everything included in the scope of delivery.**

See page 18. Lay everything out clearly and compare it with the list in chapter 4 of this manual and your packing list. If you have any questions, please contact your supplier immediately.
- 3. Prepareer de boot om in een schone en droge omgeving het systeem aan te kunnen leggen.**

If the following points are not in order, they must be rectified before installation.

 - No permanent bilge water where the engine is installed.
 - Good protection against flooding of the boat, such as a functioning bilge pump in the right place in the boat.
 - When installing components, also consider leakage or condensation from above. For this reason, a component may have to be placed somewhere else or covered from above.
 - Ensure that the space or spaces in question are well ventilated so that moisture can evaporate and leave the area.
 - WaterWorld has developed a highly efficient motor that can do without air cooling. It is very important, however, that sufficient cold air can enter and hot air can be released.
 - A smooth-running propeller shaft system. A badly running propeller shaft system will cause the following problems:
 - Higher consumption, resulting in shorter sailing time
 - Overheating of the engine
 - Reacting to acceleration
 - Less throttle control, the engine will start with too much capacity once it has enough power
- 4. Choose the right propeller.**

Please see our advice on page 44.
- 5. Check the accessibility of the components.**

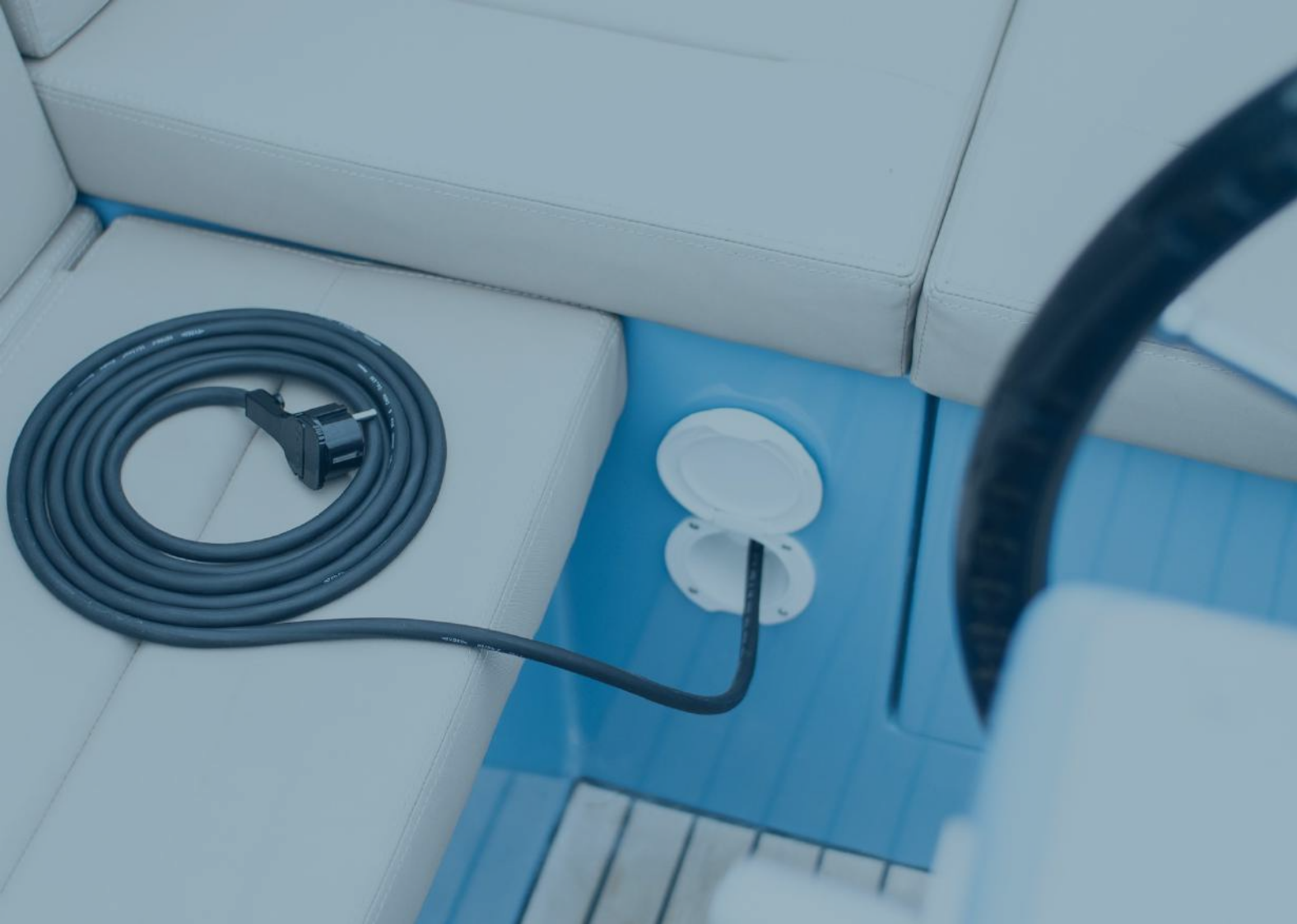
Will all components be accessible in the future so that everything can be serviced?
- 6. Ensure good weight distribution in the boat.**

The (lead) battery pack is heavy, ensure proper weight distribution in the boat. Make sure that the batteries are accessible for servicing the battery poles, wiring and, in the case of wet batteries, filling them with distilled water.
- 7. Choose the right thickness of cabling.**

For cable selection, see page 27. Ensure that cable lengths are not unnecessarily long where this can be prevented.
- 8. Read the safety instructions in chapter 3 before you start to connect anything.**

Then read the section of the manual concerning that component. Always connect according to the connection diagram on page 23.
- 9. Start installation.**
- 10. Complete the online checklist.**

In order to ensure the proper functioning of the system, the checklist in the Annex must be completed online at www.ww-el.com



3. SAFETY

General guidelines

Safety devices of the system

Safety instructions of the system

Safety instructions for the batteries

Safety instructions for use

General guidelines

- The drive must be operated at the prescribed voltage.
 - In the standard setting, this is 48 Volt nominal. Minimum 42 Volts, maximum 60 Volts.
 - There is a special setting for 12 cell series lithium batteries operating at a lower nominal voltage of 44 Volts, this setting is 37 Volts minimum, see page 25.
- The drive is intended exclusively for driving boats. The manufacturer cannot be held liable for any other use and the warranty will lapse in all cases.
- Keep the electronics away from water.
- Installation and repair may only be carried out by an approved installer designated by WaterWorld.
- Only use original or recommended WaterWorld accessories and spare parts.
- If the drive must be repaired, only original replacement parts may be used. The use of non-original parts may lead to serious injury or damage and void any further warranty.
- Replacing the batteries may only be done by a authorised installer.
- The user must regularly check that the drive and the batteries are functioning correctly. The manufacturer is not liable for any damage resulting from the incorrect operation of the drive.
- The supplier, whether WaterWorld, the seller or the manufacturer, disclaims any liability for any damage suffered by the buyer or any third-party claims resulting from (the use of) the drive, whether direct or indirect and / or consequential damage, environmental, hearing, business and intangible damage, or incorrect advice, unless the damage is due to gross negligence or misconduct on the part of the supplier.
- Before use, you should take into account the legislation in the respective country, or at the location where the drive is located. The purchaser is hereby responsible for complying with all precautionary measures, legal or otherwise, at the location where the drive is used, regardless of whether the drive is operational at the time. This includes measures for fire safety and the safety of others in the vicinity of the drive.
- The manufacturer reserves the rights and authority to which it is entitled under European legislation. Reproduction or imitation of the device is expressly forbidden.
- For other battery packs, e.g. lithium batteries, please contact your supplier in advance.

Safety devices of the system

Your WaterWorld system is equipped with various safety devices:



- Over-temperature protection in engine and controller: The engine will reduce its power if the electronics detect too high temperatures.
- Fuse regulator: Varying according to motor power, a fuse is placed on the motor regulator.
- External fuse cabling: It prevents fire/overheating or overloading of the system. This external fuse is **not** included in the standard delivery scope, but must be installed.
- Main switch: Always switch off the main switch when leaving the boat or when working on the system. Not included in the system as standard.
- Battery overload protection: If your batteries are running low, the engine will automatically reduce power, allowing you to cruise longer and reach a safe harbour at low speed.
- Ignition key: Use this to switch off the system if there is any danger. Always switch it off when there are swimmers around the boat.
- Display: This continuously shows you the remaining sailing time so that you can plan your trip to reach your destination. In addition, the display warns of a too high or too low battery voltage. The low voltage warning is also given by an acoustic signal and an indication on the screen.
- Power cables connecting the motor, the controller and other components must be checked regularly for damage or breakage and for correct, firm fastening.
- The terminal lugs of live cables to which the motor, the controller and other components are connected must have terminal caps that also cover the battery terminals.
- If damage or breakage of the cables / wires is detected, the motor must be taken out of service immediately until the cable / wire in question has been replaced.

Safety instructions for the system

Follow the instructions in this manual



- In the event of overheating, smoke development or as soon as you recognise a fault, switch the system off immediately at the main switch.

The allowed ambient temperature during operation must not be lower than -20 degrees Celsius and not higher than 50 degrees Celsius.

- Do not touch the drive shaft, engine and battery parts during or immediately after sailing.
- Always switch the system off at the main switch during installation and dismantling work.

Safety instructions for the batteries

Observe all safety instructions concerning the batteries used in the battery manufacturer's operating instructions.



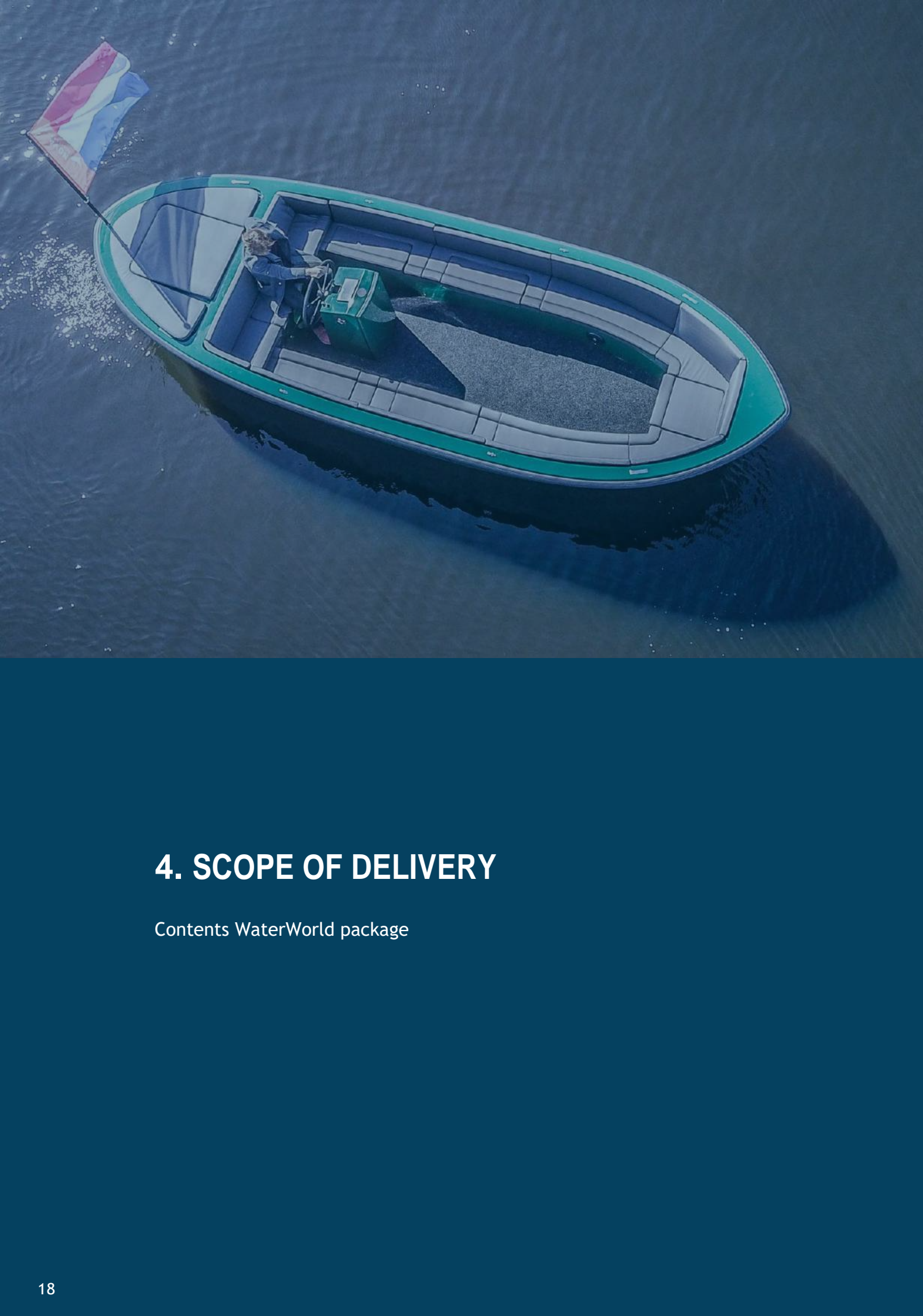
- Do not use the WaterWorld system if the battery is damaged and inform the system supplier or installer.
- Do not store flammable items near the battery.
- Never smoke- and avoid sparks or flames in the vicinity of the batteries.
- Have plenty of water available; if battery acid comes into contact with the skin or eyes, flush immediately with water and get medical attention.
- Only use charging cables suitable for outdoor use.
- Always unroll the reel of a 230V socket completely when using it.
- Avoid strong mechanical forces on the system's batteries and cables.
- Take off metal jewellery and watches before starting work on or near batteries and use insulated tools for this purpose.
- Never short-circuit the battery. Make sure that tools and metal objects never touch the battery. This may cause sparks or even an explosion or fire.
- When connecting the battery, ensure correct polarity and that the connections are firmly attached and make good contact.
- Battery poles must be clean, corrosion-free and covered with terminal caps.
- Do not place batteries in an insufficiently ventilated area. When batteries are placed in a box, the proper ventilation must be present.
- Connect only identical batteries (type, capacity, age and charge status).
- Connect only batteries with identical state of charge.
- Make sure that the battery terminals always make optimum contact with the cable lugs that are connected to them.

ATTENTION! Always ensure that there are no stainless steel rings between the battery terminal and the connected cable.

Safety instructions for use

Read this manual thoroughly.

- The WaterWorld system may only be used by persons who are qualified and physically and mentally fit to do so.
- Always observe the national regulations and rules of a country.
- Keep the drive and controls out of the reach of children and persons with limited capabilities.
- Have the operation and safety provisions of the entire system explained to you by the shipyard or installer.
- Check the system for mechanical damage before departure.
- Check the condition and operation of all functions of the WaterWorld system at the start of each voyage at low speed.
- Only sail with a system that is in a technically perfect condition.
- Make sure the batteries are sufficiently charged.
- Make sure you are familiar with all the controls of the WaterWorld system. You should also be able to stop the system quickly if necessary.
- As the pilot of the boat, you are responsible for the safety of those on board and of all boats and persons in your vicinity. Therefore, please observe the basic rules of boating behaviour.
- Special care must be taken when there are persons in the water, also when sailing at slow speed.
- Before setting off, find out about the area where you will be sailing and take account of the weather forecast and sea conditions.
- Plan enough reserve for the necessary range.
- Depending on the size of the boat, make sure that the specific safety equipment is available and accessible (life jackets, anchor, paddle, communication equipment, etc.).



4. SCOPE OF DELIVERY

Contents WaterWorld package

Contents WaterWorld package

WaterWorld systems are supplied as standard with



Engine

Secured in a stainless steel frame



Thrust bearing

Integrated in the engine, shaft fitted with a flange for attaching a counter flange (not supplied) to the propeller shaft (not supplied).



Controller

Mounted in the same frame (can also be supplied separately). Motor and controller are already connected by cables.





Engine mounts

Variable attachment to the outside of the frame.

ATTENTION! During installation, the supports are turned over and the motor will hang in them instead of standing on them.



Throttle

Throttle and RJ45 data cable 3 m.



Power cables

of 0.5 (plus) and 1.0 metres (minus) already connected to the controller.



48 Volt Relais

The amperage depends on the selected motor power.



Dashboard with ignition switch

Digital display

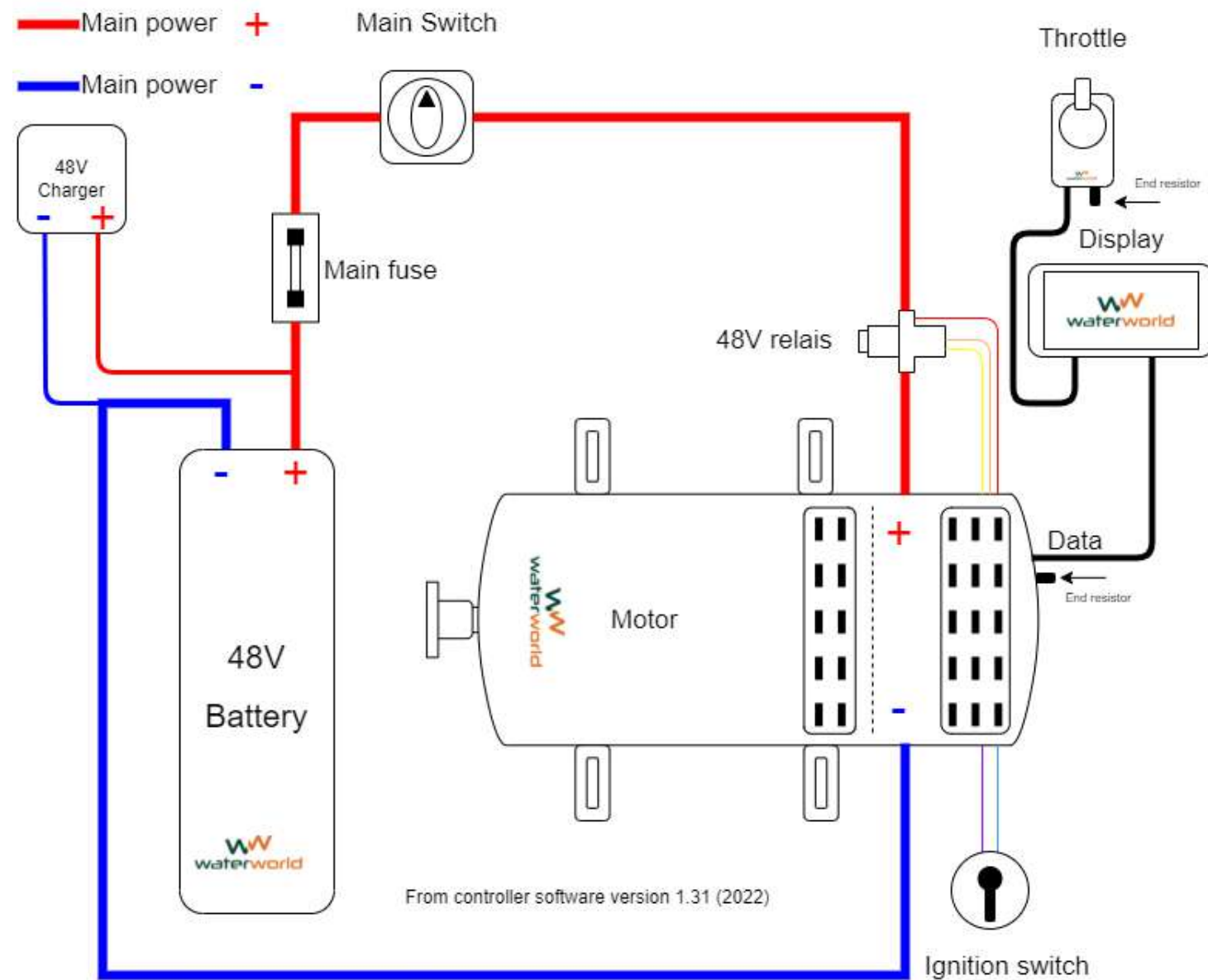
RJ45 2 x data cable (1 m. en 3 m.) and gateway



ATTENTION! Not included in the standard scope of supply are vibration absorbers, fuse with fuse holder for the battery cables, main switch and battery pack with charger.



Connection diagram



5. SYSTEM INSTALLATION

- | | |
|-------------------------|---------------------------|
| Placement of the engine | Connection diagram |
| Batteries | The Shunt |
| Battery charger | Display |
| Recommended cables | Throttle |
| Main circuit switch | Setting the display |
| Main fuse | Testing and commissioning |
| Relay | |

Placement of the engine

The WaterWorld drive can best be installed using the following step-by-step plan.

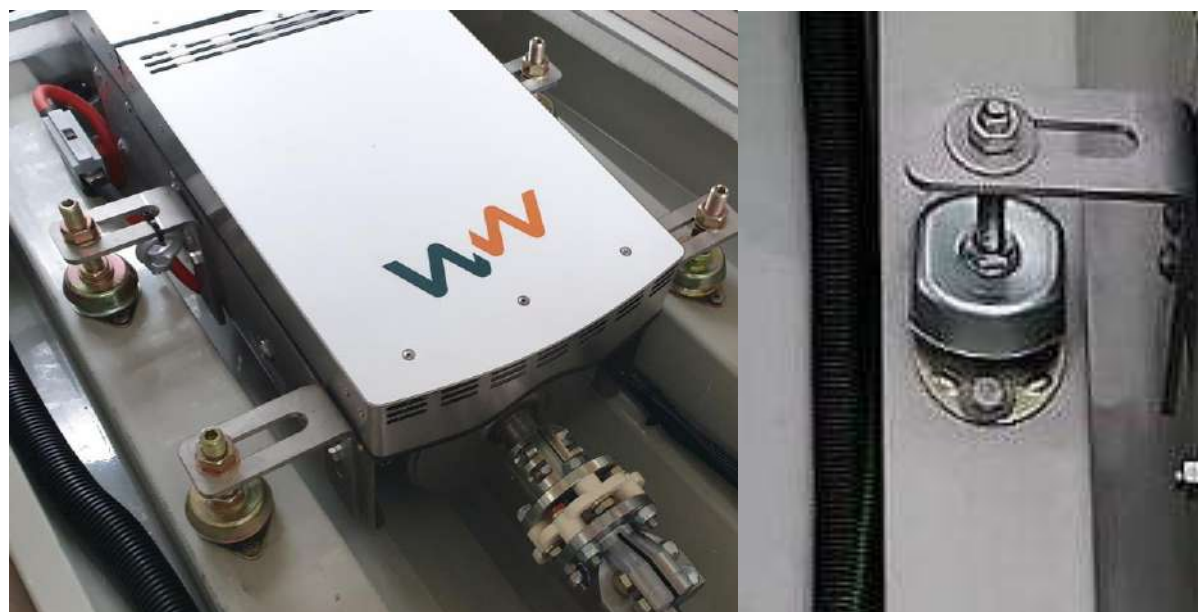
1. Remove the engine covers and carefully store them in a safe place.
2. Mount the engine on a foundation and vibration dampers that are suitable for absorbing the system's thrust and transferring it to the boat.

ATTENTION! Should you choose to mount the engine without vibration dampers, it is very important that the engine is very well aligned with the shaft. Even if you do use a flexible coupling. In addition, this can lead to extra noise, especially in aluminium boats.

ATTENTION! Given its weight, it is best to lift the WW 7.5 or 10.0 into the boat. To do this, screw the lifting eye supplied (see illustration on the right) into the top of the motor where it is threaded. You can then lift and lower the motor using a hoist..



3. The side supports on the engine are delivered with the supports pointing downwards. In most cases, these have to be turned around and the engine will hang in the supports as in these two pictures:



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

ATTENTION! If the propeller shaft is mounted directly on the engine with a rigid connection, the engine must be very well aligned to avoid damage to the electronics and connectors. Never hit the propeller shaft with a hammer, this can damage the bearings in your engine! Always use a pulley to disassemble the propeller.

ATTENTION! With a WW 7.5 and 10.0 engine in a heavy vessel, or professional use with many hours of sailing, it is advisable to use an external thrust bearing, so that the rubber engine mounts and the thrust bearing in the engine are not overloaded in the long run. If you have any doubts, please contact your supplier.

5. The WaterWorld controller comes with 2 metres of red and black battery cable already fitted to the motor controller side. The red cable on the + side is connected to the relay.

6. We recommend and use the following cable thicknesses:

4.0kW 35mm²
7.5kW 50mm²
10.0kW 50mm²

If you are going to use cable lengths longer than 5 metres, we recommend using thicker cabling.

7. The engine and controller are cooled by fans: two at the back of the drive (visible from the front of the system) and one on the engine. Make sure that there is free airflow to dissipate the heat. The air is sucked in at the front of the motor case or room and discharged at the back. If necessary, air vents should be installed to allow fresh air to enter and hot air to leave.



WARNING!

Waterworld takes no responsibility for loss of performance, damage or other problems caused by inadequate ventilation of the system.

8. In the standard version, the engine and controller are in one frame and these components are already interconnected at the factory. So there is no need to do anything else. If there is not enough room for the controller directly behind the motor, or if batteries are installed above the motor, you can install the controller separately at another place in the boat. To do this, it can be removed from the frame, and the rear part of the frame on both sides can also be removed. The phase cables may be up to 50% longer than at the factory. Always ask an expert.

ATTENTION! If you want to install the controller externally from the engine, this must be done in consultation with WaterWorld by a certified installer!

Batteries

ATTENTION! Ensure that there is never any power to the system during installation and assembly!

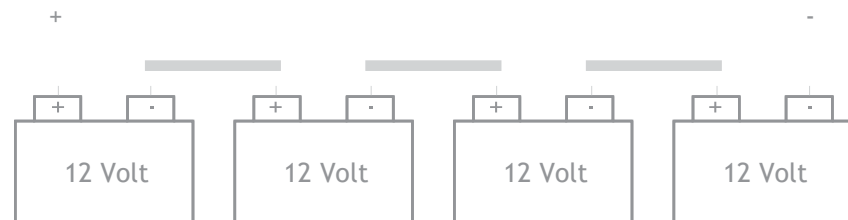
The drive operates on 48 Volts. Provide a battery pack that is suitable for this application in terms of quality and capacity. Use traction, semi-traction - deep cycle, or lithium batteries that meet the specifications.

ATTENTION! When in doubt about the specifications of lithium batteries, it is advisable to consult WaterWorld. It is possible that the batteries may damage the engine, or vice versa if the two are not compatible..

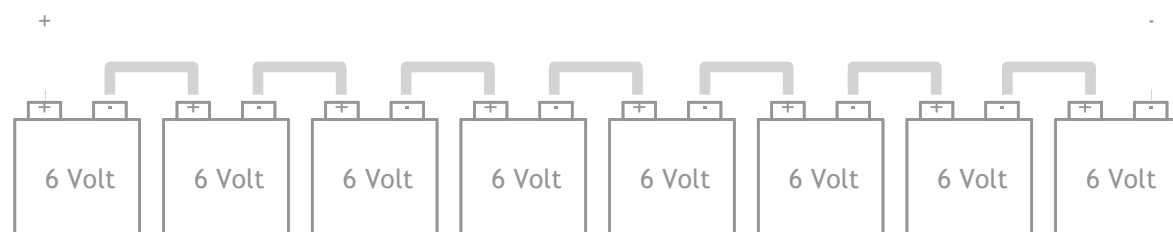
1. Position the batteries in the vessel in such a way that:
 - a. the weight is well distributed and the boat lies nicely on the waterline.
 - b. the batteries cannot move in the boat after installation.
 - c. the batteries are accessible for connection of the cables and for further maintenance work.
 - d. the batteries do not interfere with the daily use of the boat.
 - e. Cabling to the engine and to the charger is easily possible without unnecessary cable length
2. Check the individual voltage of all batteries and make sure that they are within 0.1 Volt of each other before connecting them. If this is not the case, all batteries must be charged individually.

Connect the batteries in accordance with the applicable diagram.
Below are examples of 4 x 12 Volt batteries in series and 8 x 6 Volt batteries in series.

Connecting with 12V batteries



Connecting with 6V batteries

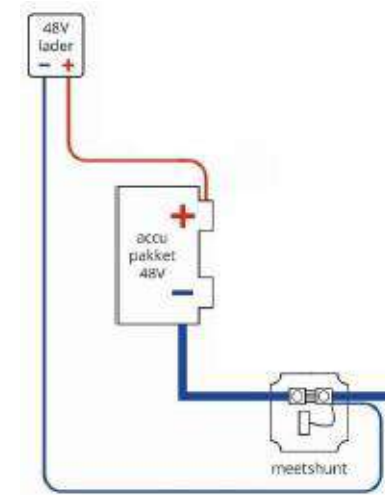


ATTENTION! Wait with connecting the batteries to the rest of the system until everything is connected properly.

Battery charger

The battery charger must be selected for the battery pack and be adequate in terms of voltage, charging capacity in amperes, battery type and use in a boat.

ATTENTION! When positioning the charger, think about the same issues as with the engine and batteries. Moisture, accessibility, cabling, ventilation, etc.



Recommended cables

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

Waterworld 7.5: up to 8.25 kW input power, max. 172 Amps.
For a 5.0, a cable thickness of 50 mm² is recommended.

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

WaterWorld 15.0: up to 20 kW input power, max 400 Amps.
For the 15.0, a cable thickness of 95mm² is recommended.

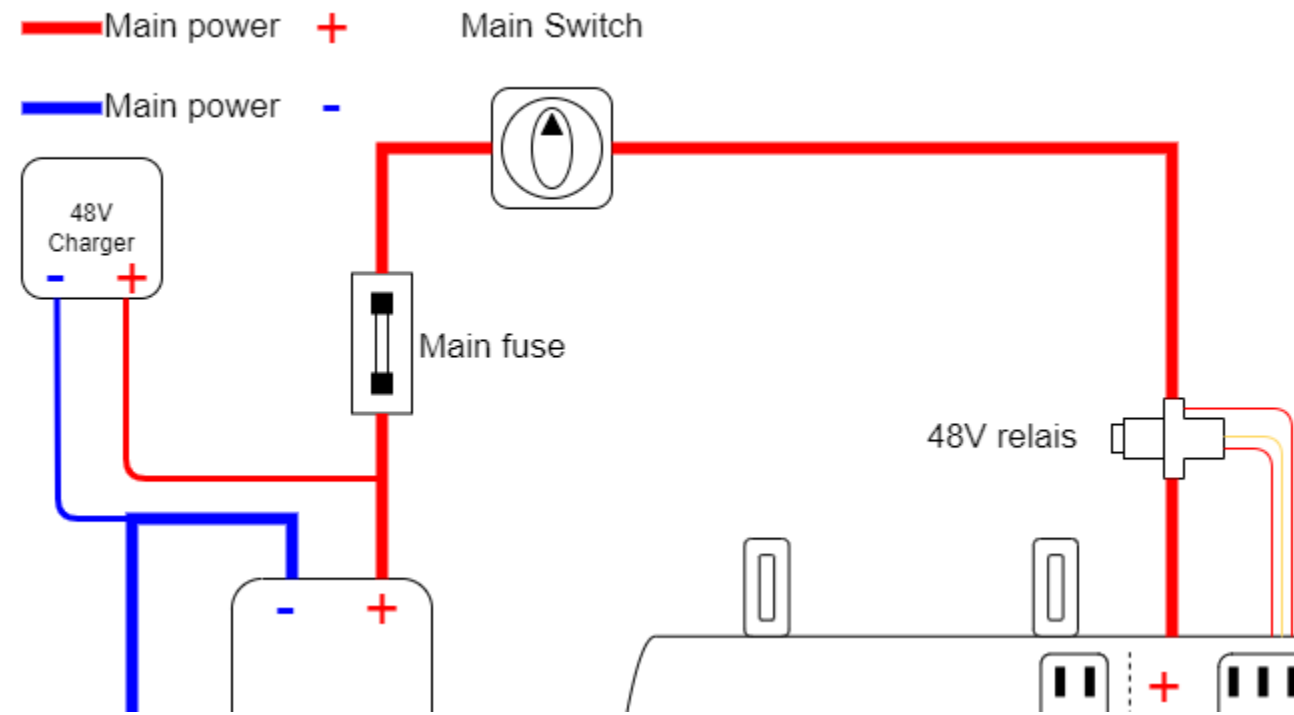
The above information is based on cable lengths up to and including 5 metres, for further advice for shorter and longer lengths please refer to the table below.

cable diam mm	cable section mm ²	L(+) + L(-) ≤ 5 meter	L(+) + L(-) ≤ 10 meter	L(+) + L(-) ≤ 15 meter	L(+) + L(-) ≤ 20 meter
		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

Battery cable selection; maximum current with a voltage drop of 0.259 Volt. The voltage losses across the connection contacts have not been taken into account. The total cable length from the + to the - terminal must be included.

Main switch

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



Once the system is installed, make sure the main switch is always OFF ("0" or "off" position) when working on the components and when disconnecting the power cables.



DANGER

ATTENTION! The main switch must be switched off when charging the batteries.

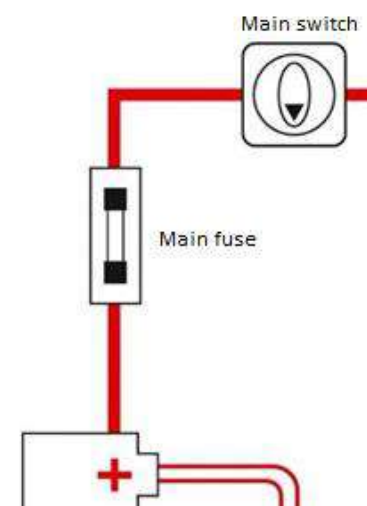
Main fuse

Mount the main fuse between the main power switch and the + pole of the batteries, as close to the battery as possible, preferably in the battery compartment.

Make sure that this main fuse is inside the boat, but remains visible by opening a hatch. The capacity of the fuse in amperes should be about 1.6 times the maximum amperes of the engine (see specifications).

You can order an ANL fuse holder + ANL fuse with the system. We supply the following values:

WaterWorld 4.0 kW	- 160A
WaterWorld 7.5kW	- 250A
WaterWorld 10.0kW	- 325A
Waterworld 15.0kW	- 600A

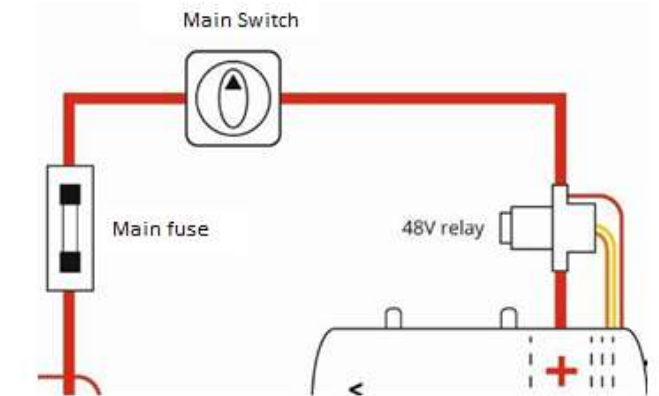


Relais

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

The loose red cable with M8 eye connects to the relay bolt on the battery side. Make sure that this red cable is well connected, as a bad connection can lead to engine failure when starting the engine.

The relay has a plug with 3 wires, which is connected to the controller on the mating plug. This has the same colour wires and fits only one way.



Throttle

1. Mount the throttle in the appropriate place, well accessible to the driver.

Ensure that the throttle is mounted in such a way that the boat's crew cannot easily bump into it, causing sudden departure or acceleration!



WARNING!

2. Fit the throttle in such a way that, in the neutral position, the throttle is vertical.

ATTENTION! The throttle is set as follows by default: moving the lever clockwise moves the boat forward, moving it anti-clockwise moves it backward. This is the correct position when the lever is mounted on the starboard side of the steering console.

If you want to use the lever differently, the phase cables can be reversed. See also the instructions for setting the display. This should only be done by an authorised dealer or installer.

Display

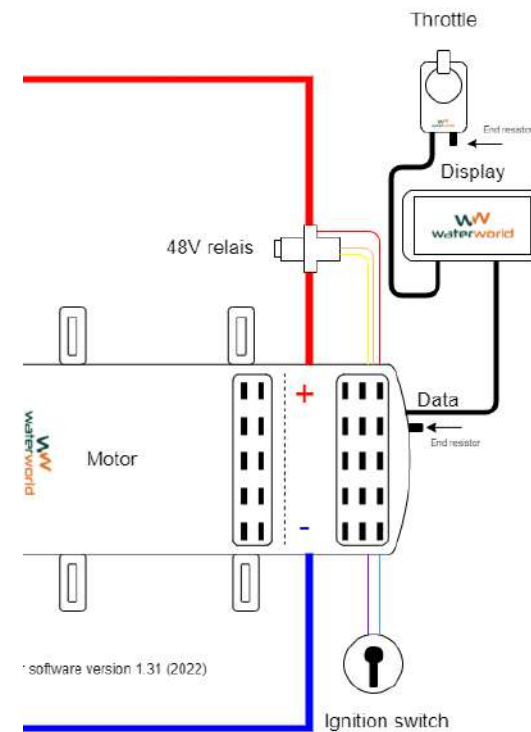
1. Mount the display in the appropriate place. It should be clearly visible to the driver of the boat.
2. Mount the Gateway close to the display, but in an indoor area, e.g. on the inside of a console.

Ignition switch


Mount the ignition lock in the appropriate place, well accessible to the driver, for example next to the display or under the throttle.

Connecting throttle, display and ignition switch

1. Connect an RJ45 cable from the display to the controller.
2. Connect a RJ45 cable from the throttle to the display.
3. Connect the plug of the ignition switch to the controller.



Setting the display

To get started, tap the settings icon in the lower right corner of the screen. NB: after completing each step, press  to save the values! Then scroll through the different settings:

Battery

Mode: Select: “stand alone” (in most situations) or “can bus” for some brands of lithium batteries (contact your supplier for this).

Low voltage: Set the voltage at which you want the message drive slowly; for lead-acid batteries (AGM) this is usually 44V. Consult your supplier on this if required

High voltage: Enter the voltage of a 100% charged battery; see battery specifications. Quality: Enter the percentage of aging. This can be taken from the battery’s specification, which states an aging rate per year, or from a test by your dealer.

C value: Fill in the C values of the battery according to specifications; complete them all!
For lead-acid batteries: Does your battery manufacturer only give a C20 and C5 value? Then at C10 fill in the average of C5 and C20 and at C1 fill in half the C5 value..

Example:
C20 = 400 Ah
C10 = 350 Ah (between C20 and C5) C 5 = 300
Ah C 1 = 150Ah (50% of C5 value)

For lithium batteries: all values equal to the C1 value.

Control

Mounting side:

1. Right-handed propeller + right-hand throttle = do not adjust anything
2. Right-handed propeller + left-hand throttle = display setting + change phase cable
3. Left-handed propeller + right-hand throttle = change phase cable
4. Left-handed propeller + left-hand throttle = display setting

Reduce power warning

Here you can set the maximum power for a number of minutes. This is useful, for example, if you want to reduce the power after a few minutes to save the batteries. It can also be used with the WW 15.0, which can temporarily deliver up to 20 kW of power, if the battery pack allows it. Consult your supplier if necessary.

Display

Main screen

The screen default setting is “Basic”. Here you can see all information needed for standard operation. For “Basic” display see image below left.

The screen “advanced” mode, you can see more information that is not required for standard operation. For “Advanced” display see image below right.

Display time

Here you set the time and time zone. CAUTION: first set the date and then the time. Under the heading display you can determine whether the time is visible. Changing from summer time to winter time and vice versa is automatic.

System information

Here you can see the software version of the display, the controller and the serial number of the display. If CAN communicating batteries are connected, the customer ID is also displayed here..



Basic screen



Advanced screen

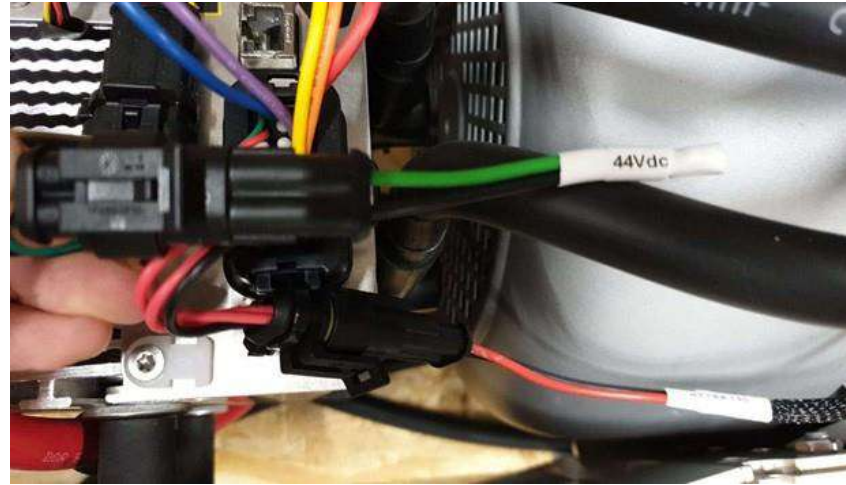
ATTENTION! The display has its own battery, which must be replaced every 5 years

Adjusting the regulator for different voltages of the lithium battery

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

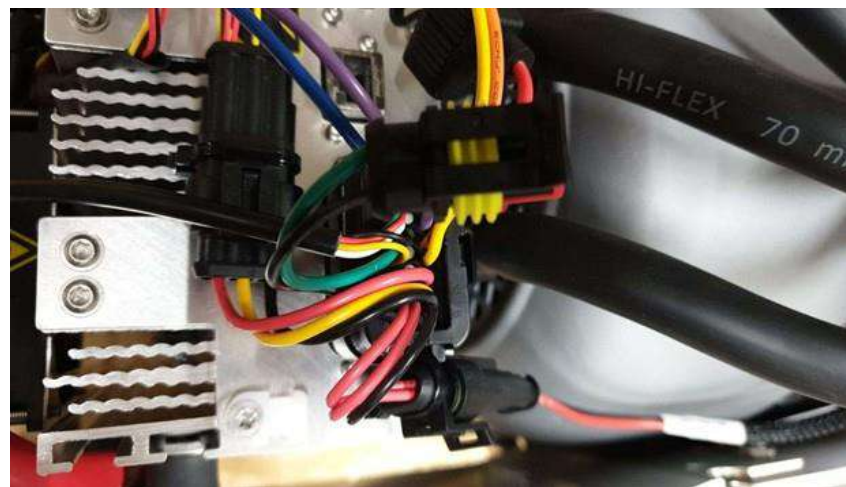
If the plug with the green/black cable is not connected, the system is suitable for standard voltages. The cut-off voltage, the minimum voltage below which the regulator stops working, is 42 V.

1.



2. If the green/black cable is connected, the "cut-off" voltage, the minimum voltage below which the regulator stops working, has been reduced to 37V.

ATTENTION!: Many lead-acid batteries go up to a load of 37V.



Setting 1

Suitable for: AGM and semi-traction lead-acid batteries, 2x Torqeedo Power 24-3500 batteries in series and Aces lithium batteries.

Setting 2

Suitable for lower voltages can be used with the Torqeedo Power 48-5000 battery and full-traction batteries. Also some AGM batteries are suitable for this setting.

ATTENTION! If this mode is used improperly, it can lead to irreparable damage to the battery pack. WaterWorld assumes no responsibility for damage caused by excessive discharge.

Testing and commissioning

To check the operation of the system after installation, please proceed as follows:

- Check whether the batteries are sufficiently charged by measuring the voltage at the terminals of the battery pack with a multimeter. The total voltage should be at least 48 Volts, but around 52 Volts is to be expected. With lithium batteries this can be up to almost 60 Volts.
- **ATTENTION!** Before connecting, always check that all batteries have the same voltage, maximum difference is 0.1 Volt.
- Check that the ignition switch on the dashboard is off
- Check that the throttle is in the neutral position
- Turn the main switch to "on" or I
- Turn the ignition switch clockwise to switch the system on, you will hear a clear click of the relay switching on.
- Check if the display is on. In the advanced setting of the display you can also see the voltage, does this correspond with what you measured?
- Gently open the throttle and check if the engine works correctly in both forward and reverse.
- Check that the display shows a certain number of kW when accelerating
- Return the throttle to the neutral position.
- **ATTENTION!** Check the engine and controller temperature in the dashboard. Is it approximately the same as the engine compartment temperature (engine and controller temperatures are never exactly the same).
- Turn off the ignition
- Turn off the main switch
- Connect the shore power cable
- Check that the charger starts and gives the right signals. Refer to the charger's manual.
- Check on the display whether the voltage of the battery pack goes up to the specified charging voltage. Consult the manual of the battery pack for this.
- Preferably charge the battery pack fully before the first trip and before setting up the display. See explanation of the use of the display below.
- Make a sea trial and check everything visually, also pay attention to sounds and vibrations.
- During the sea trial, check the number of revolutions (rpm) at full throttle and the maximum engine power at full throttle (kW) to determine whether you have the right propeller.
 - Max RPM should be 1400-1500.
 - Max power should be 100% to 110



6. OPERATION THE ENGINE

Starting and sailing away

Explanation of the display

Arriving and berthing

Starting and sailing away

1. **ATTENTION!** First disconnect the shore power.
2. Check that the ignition switch in the dashboard is off.
3. Check that the throttle is in the neutral position.
4. Make sure you have clearance to move away, or that the boat is securely tied up to test the system.
5. Turn the main switch to on or I.
6. Turn the ignition switch clockwise to turn the system on.
7. Check that the display turns on and shows the correct information.
8. Gently open the throttle.
9. Check that the throttle lever operates correctly in neutral, forward and reverse..

Explanation of the display



The characters **F N R (Forward Neutral Reverse)** in the upper left corner of the screen show whether your throttle is in forward, neutral or reverse.

The green circle shows the engine power in kilowatts that is currently being used. The orange circle shows you the indication of your remaining battery capacity in percent.

The "time left" shows the remaining sailing time in hours and minutes. It is only shown when the engine is in F (forward) and using power. If the engine is in N (neutral), no value is shown here. The meter starts from the last saved value. Also at restarting the counting starts from the last saved value unless you set it to 100% because the batteries are charged (see instruction below).

RPM shows engine speed.

The **orange warning triangle** shows the presence of any **error codes**. If an error or malfunction occurs, a pop-up will inform you of the meaning of the error. If it is an error that will allow you to continue sailing, you can click on it to delete it. An orange warning triangle will appear at the bottom of the screen. There will also be an acoustic signal, which you can also switch off when you have read the message. An overview of the codes can be found in chapter 9.

By tapping the "sun" you can adjust the brightness of the screen.

If your charger has switched off after charging and shows the indication of a full battery, the motor controller registers the higher voltage. At that moment a battery icon appears at the bottom of the screen. When you click on this icon, you will be asked whether you really want to confirm that the battery is full. If you click yes, the percentage will go up to 100%. This message does not work if the voltage is too low, so that the battery is not reset to full by mistake. You only need to do this reset if the charger has gone out after a charging session and finished charging. If you make a stop without charging, the display will continue from where it left off when you turned off the engine.

When charging is still in progress, the battery icon may also appear, because at that moment a higher voltage is also being registered temporarily. If you then click on "battery full", the low voltage message will appear more quickly than usual during use, as well as the indication "drive slowly". The battery indication will then no longer be correct until you have recharged the batteries to 100%.

Arriving and berthing

- When docking, ensure that the throttle is in the neutral position.
- Turn the system off using the ignition switch.
- Turn off the main power switch. NOTE: Also turn the system off at the main switch when swimming around the boat or carrying out repairs and maintenance.
- Connect shore power and check whether the charger is working properly.



7. MAINTENANCE AND SERVICE

Inspections during the boating season

Annual inspections by you or your supplier

Winter storage

Operating the engine on salt water

Inspections during the boating season

Give your WaterWorld system and its energy system regular attention, even during the boating season. We recommend paying attention to the following points:

- Make sure that the space underneath the boat and under the engine is kept dry so that the engine and controller are not flooded or excessive condensation can form. It is advisable to install an automatic bilge pump at the deepest point of the boat and to check its correct operation at regular intervals. Check this before every sailing trip. If there is water in the boat and the electronics have become wet, dry them and contact your installer. Do not switch on the engine in this situation.
- Keep engine and controller as well as the other parts of the system clean and dry. You can clean it with a slightly damp cloth. Do not use water to clean the system.
- Always keep your system connected to shore power when you are not sailing. This prevents empty batteries. The charger will stop automatically when the batteries are full. Always check if the charger turns on when you switch it on.

Attention! Before carrying out inspections or maintenance, always switch off the system at the main power switch.

Annual inspections by you or your supplier

Preferably have your system inspected every year by your supplier or installer. He will check the system on the following points:

- Proper functioning of all components.
- Possible moisture problems, corrosion of contacts, battery poles or plugs. Preventive application of contact spray and lubrication of battery poles.
- Greasing the shaft from the engine.
- All terminal clamps and connectors are securely in place.
- All fixing bolts and nuts must be properly tightened.
- Possible damage to cables and components.
- The condition and correct voltage of all batteries.
 - **Load:**
If you have a multimeter, check the voltage of each battery by putting the meter on the + and - terminals of one battery while the engine is running. There should be no difference between the batteries greater than 0.1 Volt. If this is the case, please contact your supplier or installer.
 - **No-load:**
After charging the batteries, measure them individually and check again that the difference between them is not too great. Check the specifications of your battery, or ask your supplier, if the voltage is high enough.
- Any imbalance in the engine/propeller shaft system.
- The correct settings of the display.

Winter storage

During and after winter storage, the same recommended checks apply as above. Pay special attention to charging the batteries and keeping them charged. If your boat has a power point during winter storage, leave the shore power connected. Your charger will automatically switch on and off when needed. It is recommended that you check your boat and batteries at least twice during the winter to make sure the charger is connected and the batteries are still charged.

If there is no power point near your boat, put the boat away with fully charged lead-acid batteries and disconnect the main + and - of the battery pack. Make sure that no consumers are connected to the battery pack. With lithium batteries, it is wise to store the boat in the same way, but with batteries that are around 50% charged. This extends the service life of these batteries.

Using the engine on salt water

When operating on salt water, it is important to pay extra attention to the following points.

- Close the installation area(s) tightly to salt water.
- Ensure that these areas are ventilated.
- Check all components regularly for corrosion.
- Clean thoroughly twice a year.
- Grease the shaft.
- Use protective spray for the rest of the engine if necessary..



8. TECHNICAL SPECIFICATIONS

Engine specifications

Electric motor

Motor controller

Throttle

Relay

Display

Inspections

Dimensions

Propeller advice

Engine 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
Nom. RPM	1450	1350	1450	1450
Voltage	48 V			
Max. current (Ampères)	92	172	230	400
Type	Asynchronous			
Sensor	Sensorless			
Weight (kg)	39	76	76	100
IP rating engine	IP 65			
IP rating controller	IP 65			

ATTENTION! Stroom kan bij accelereren tijdelijk hoger zijn.

Electric engine

Voltage: 3 X 34 Vac @ 50 Hz

Speed: 1350 / 1450 RPM (depending on engine type)

Max speed: 1500 RPM

Insulation class: H (180 °C)

Thermal protection: PTY84-130 °C

Max temperature: 135 °C

Outgoing shaft: 38MM / 28MM

Cooling: Air-cooled, shaft-mounted fan

Engine controller

Voltage: 48V

Max temperature: 80 °C

Cooling: Air, 2 fans

Electric motor control: sensorless

Control lever

Type: WaterWorld basic control.

Controller: Rotation and hall sensor determined forward / reverse. (WW-017)

Potentiometer + hall sensor for additional control and safe operation. (WW-016)

Relais

Voltage: 48V DC

Max continuous current: 200A / 400A (depending on engine type)

Display

Power supply via motor controller

In the appendices to this manual you will find the dimensional drawings of the various models of WaterWorld motors. On www.ww-el.com you will find the drawings and also 3D files.

Propeller selection guidelines

Below is a guideline for the choice of propeller size. NB: the optimum propeller for an individual boat may differ from this, every boat is different.

4.0 kW motor and a boat travelling slower than 11 km/h

- 12 x 7 3 - blade propeller
- 12 x 8 3 - blade propeller

4.0 kW motor and a boat travelling at over 11 km/h

- 12 x 8 4 - blade propeller

7.5 kW motor and a boat travelling slower than 10 km/h

- 14 x 9 3 - blade propeller
- 13 x 10 3 - blade propeller

7.5 kW motor and a boat travelling at over 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 travelling at less than 10 km/h

- 14 x 9 3 - blade propeller

10 kW motor and a boat travelling at more 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/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

15 kW motor for higher speeds (approx. 15 km/h.)

- 15 x 11 3 - blade propeller
- 16 x 10 4 - blade propeller



9. FAULTS AND PROBLEMS

Faults and Problems

Problems

Error codes for malfunction

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

In case of the following errors, check the data in the display regarding temperature, voltage, the smooth running of the propeller shaft installation and the correct connection of all cabling. If the problem cannot be solved, please contact your supplier.

Voltage too low

The controller measures a voltage below 46 Volts (minimum start-up voltage) or has measured a voltage below this.

Voltage too high

The controller measures or has measured a higher voltage than the settings allow (70V = max voltage).

Throttle lever

The controller detects a problem in the signal from the throttle, usually a bad connection in the cabling.

Engine temp.

The temperature sensor in the engine block is above 130 °C.

Blocked engine

The measured engine rpm is less than 70% of the expected rpm and less than 500 revs.

Speed too low

The measured engine rpm is less than 85% of the expected rpm at maximum power.

Insufficient torque

The measured engine rpm is equal to the expected rpm, but the amperage is at less than 80% at maximum power.

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

An orange LED always flashes for 1 second, even if there are no errors. If the controller gives an error, the 1-second blink is followed by one or more short blinks of 200ms, the number of short blinks indicates the error.

Examine the following diagram to find out what is going on:

Aantal korte pulsen	Error	Uitleg
0	Geen error	Only a long blink of 1 second can be seen, the system is working properly.
1	Low Voltage	The controller measures a voltage below 46 Volts (minimum start-up voltage) or has measured a voltage below that. In this case, you should solve the voltage problem by charging the batteries or checking the quality of the connections..
2	High Voltage	The controller measures or has measured a higher voltage than the settings allow (70V = max voltage). In this case, there is no proper battery pack connected and this needs to be fixed before the motor can be used..
3	No Throttle	The controller detects a problem in the signal from the throttle, usually a bad connection in the wiring. Dismantle the wiring from the throttle to the controller, inspect it and reconnect it.
4	High engine temp.	The temperature sensor in the engine block is above 130 degrees. Find out what is causing it, e.g. no ventilation of the engine compartment, and fix the problem.
5	Jammed engine	The measured engine rpm is less than 70% of the expected engine rpm and lower than 500 rpm. This usually indicates a blocking of the propeller shaft, for example by a rope in the propeller, or a defective bearing.
6	Low RPM	The measured engine rpm is less than 85% of the expected engine rpm at maximum power. See section 5.
7	Insufficient torque	The measured engine rpm is equal to the expected engine rpm, but the amperage is less than 80% at maximum power. The engine can deliver its power too easily. You may have a propeller that is a few sizes too light, or the propeller may be rotating on the shaft..

Problems

The following are some of the problems that may occur.

My engine quickly loses power

- It is possible that the engine control unit is reducing the power because your battery pack is low. Check the remaining percentage on the display combined with the voltage while the motor is running. If the voltage drops below 46 Volts, the motor will reduce power for that reason. As soon as the voltage drops below 42 Volts, depending on the setting, the motor will stop completely.
- - The cooling is insufficient. When the engine heats up too much, it will also reduce its power output and eventually stop. The most common causes of this are a badly running propeller shaft and a propeller selected too heavily. See also the propeller selection table on page 35.

My engine vibrates and makes too much noise

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

- the engine is not properly aligned with the propeller shaft
- the engine is mounted too high on the engine foundation
- the flange is not straight, or not mounted straight on the engine
- the propeller shaft is not straight and needs to be aligned
- there is damage to the propeller underneath the boat.

My engine has less power

You may have something in the propeller or it may be out of balance.

If the propeller shaft can be turned very slightly by hand and this problem is present immediately after installation, a heavier propeller can probably be chosen.

- **ATTENTION! Be sure to first turn of your system before you put your hands anywhere near the propeller shaft!**

I have lost my key

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



Warranty

Warranty periods

Warranty conditions

Warranty procedure

Warranty periods

The warranty period is 24 months and covers all parts of the WaterWorld system. The warranty period begins on the day the WaterWorld system is delivered to the end customer.

For WaterWorld systems that are used - even temporarily - in commercial operation, the warranty period is adjusted to one year after delivery of the product to the customer.

In all cases, the warranty is voided six months after the discovery of the defect.

Warranty conditions

Water World Electronics BV guarantees the end customer of a WaterWorld system that the product will be free from defects in material and workmanship during the warranty period. WaterWorld will assume the cost for the end customer to correct any material or workmanship defects.

This acceptance of costs does not apply to any collateral damage caused by a warranty issue and does not apply to any other financial damage (e.g. costs for towing, telecommunication, meals, lodging, loss of use, loss of time, etc.).

Water World Electronics BV decides whether defective parts will be repaired or replaced. Distributors and dealers, who perform repair work on WaterWorld motors, have no authority to make legally binding statements for Water World Electronics.

Wearing parts and routine maintenance work are excluded from the warranty. Cables and fasteners are also excluded from warranty.

Your supplier or WaterWorld has the right to refuse warranty if,

- The warranty has not been properly filed (see under warranty procedure).
- The product has not been handled properly.
- The safety, operating and maintenance instructions in the manual were not observed.
- Prescribed maintenance has not been performed or documented.
- The product has been damaged by external influences, an accident or in some other way beyond WaterWorld's control.
- The WaterWorld system has been modified in any way or equipped with parts or accessories not expressly permitted or recommended by WaterWorld.
- Prior maintenance or repair work has not been carried out by companies authorised by WaterWorld, or original spare parts have not been used unless the customer can prove that the facts giving rise to the refusal to grant a warranty had no effect on the occurrence of the fault.

Warranty procedure

The observance of the following warranty procedure is a prerequisite for making a warranty claim.

- Contact your WaterWorld supplier in case of complaint.
- Have your purchase invoice at hand, the supplier will need it to check where and when your WaterWorld system was purchased.
- **ATTENTION!** Your purchase receipt or invoice is your guarantee certificate. So be sure to store it carefully after purchase!
- Also keep the serial number of the engine at hand, if it is not already on the purchase invoice.
- Send or give a good description of the complaint, the circumstances under which it occurs and further any relevant information that may help your supplier to assess the nature and seriousness of the complaint. If necessary and possible, take photographs of the system and the overall situation that may help.
- The supplier may ask you to carry out a number of checks on the system first, in order to better assess the complaint.
- Please note that incorrect transport of products to the WaterWorld supplier is not covered by warranty.

Decommissioning of the product/recycling

WaterWorld engines have been constructed in accordance with the EC directive 2002/96. This directive regulates the recycling of electrical and electronic appliances in order to protect the environment. In accordance with the regional regulations, you can dispose of the engine at a collection points. From there it will be professionally recycled.





ANNEXES

Declaration of conformity

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.

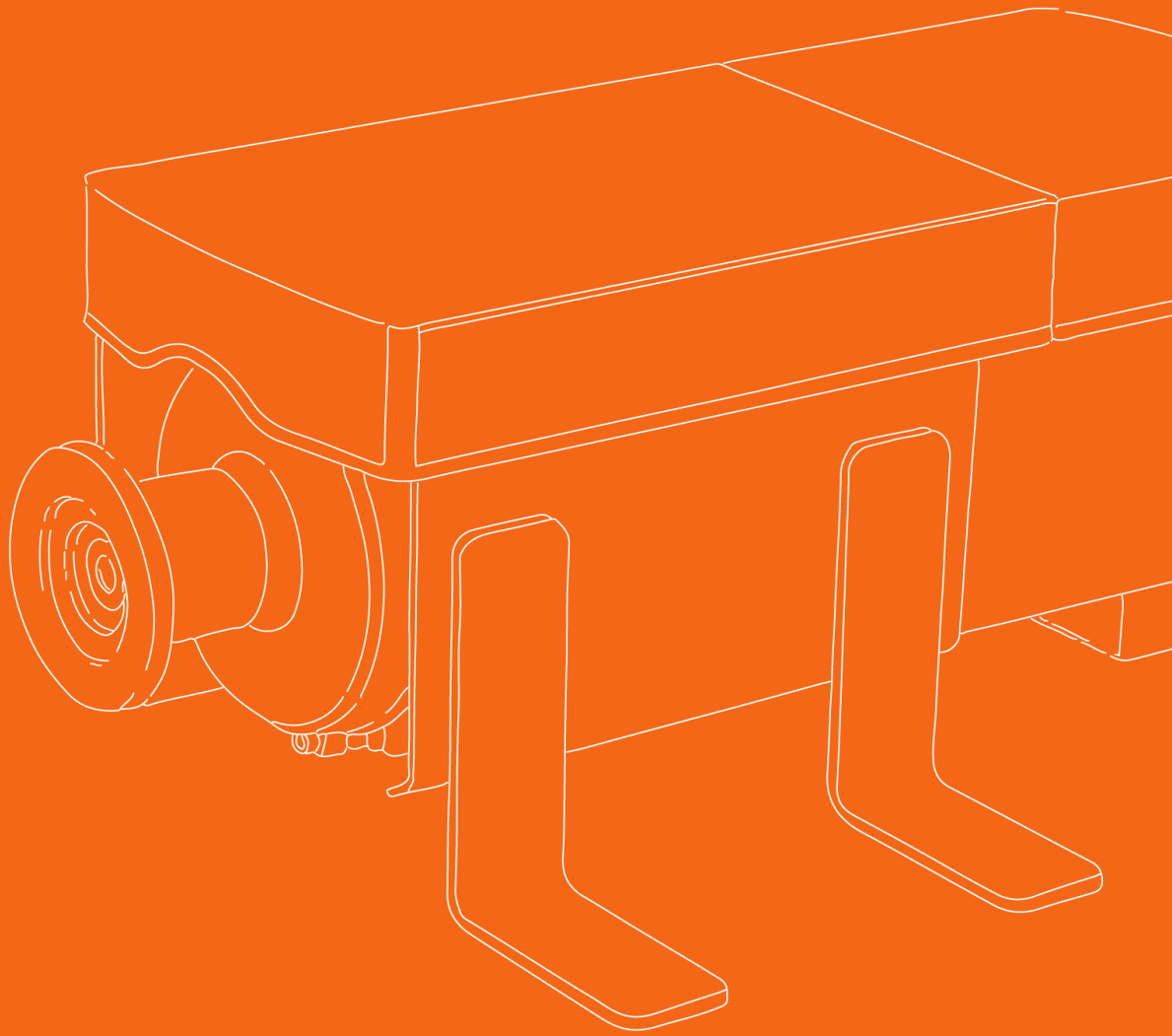
This declaration is made for and on behalf of the manufacturer

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.



Questions? Feel free to contact us.

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