



advanced electric  
inboard- and outboard engines

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## Operator's Manual

### Electric Outboard Motor AB13R & AB13T POWER AB22R & AB22T RACING AB22R – THRUSTER AB42R - FLASH



Dear Customer

Congratulations! You purchased a high quality product with exceptional performance. To ensure this for many years, we kindly ask you to read this document carefully and familiarize yourself with the motor before using it.

This manual has been compiled to help you install and operate your aquawatt motor with safety and pleasure. It contains details for the motor, all equipment fitted or optionally supplied and information on its installation, operation and maintenance.

Please note, that incorrect installation and operation can cause severe damages or injuries and will void any warranty from the supplier.

We wish you a lot of pleasure with this unique „green power“- motor.

Your aquawatt - Team

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Please note the following information in this handbook and report these, as well as any change of ownership to aquawatt ([service@all4solar.com.au](mailto:service@all4solar.com.au)) within 4 weeks of purchase to register for full warranty entitlement (see section 8).

- ◆ Owner: .....
- ◆ Phone/Email: .....
- ◆ Date of purchase: .....
- ◆ Dealer/point of sales: .....
- ◆ Serial number (see shaft): .....
- ◆ Type: ☐ remote ☐ tiller
- ◆ Main use: ☐ saltwater ☐ freshwater

Check the actual status of any motor before purchase – send an email to [service@aquawatt.com.au](mailto:service@aquawatt.com.au) indicating the serial number.

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## 1) Hazard communication

Before operating your motor you have to carefully read and understand this operator's manual.

As you read this manual, please note the hazard warnings which alert you to safety precautions related to unsafe conditions or operating procedures. We have included these warnings because we are concerned about your safety.

### 1.1 Hazard signs



#### **DANGER**

Calls attention to immediate hazards that **WILL** result in severe personal injury or death.



#### **WARNING**

Identifies hazards or unsafe practices that **COULD** result in severe personal injury or death.



#### **CAUTION**

Indicates hazards or unsafe practices that **COULD** result in minor personal injury or product or property damage.



#### **INFO**

Indicates important information for a safe and easy operation or highlights special circumstances.

For any third party equipment (batteries, switches, fuses, cables etc.) read the operations and instructions manual as well as the safety recommendations of those suppliers.

If at any point you do not understand this documentation or explanations seem unclear, do not proceed the installation or operation prior to contacting your aquawatt dealer!

## 1.2 Unpacking



### WARNING

Do not leave any small parts unattended as small children and animals could drown. Fix the motor to a stable frame that it cannot fall over. Always to be lifted by two. Always ensure that the skeg is set on a soft underground.

If any part of the motor is damaged, do not install or operate. Contact your aquawatt dealer.

***CHECK gear box oil. Some engines are shipped without oil due to IATA restrictions! See 6.1.1***

## 1.3 Eligibility of the boat / transom height



### WARNING

Only install your motor to boats where a maximum motor weight and power (56 kg / AB12/13 or 65 kg / AB 22 or 95 kg AB 22 Thruster or 98 kg AB 42 Flash) are indicated on the manufacturer specification plate of the hull.

Do not connect your motor to the battery or start your motor if not fixed to the hull or the antiventilation plate out of the water.

The aquawatt motor is a long shaft motor and fits to a transom height of 20 inches (530-560 mm).

If the transom is too low or too thick for the mounting bracket, an external board can be constructed to adapt the motor to the transom.

Adapter board



Carry the motor with care and store upright if possible.

Always ensure that the operator has a valid boat license and the boat is equipped with the necessary safety gear.

## 1.4 Open hood

When opening the motor hood, make sure the motor is disconnected from the battery system.

The motor has to be fixed in upright position on a stable construction if any work is executed.



Carefully remove the hood and unplug the connection to the display for the tiller motor.



When reassembled make sure, that the display is connected to the correct plug (mark with X).

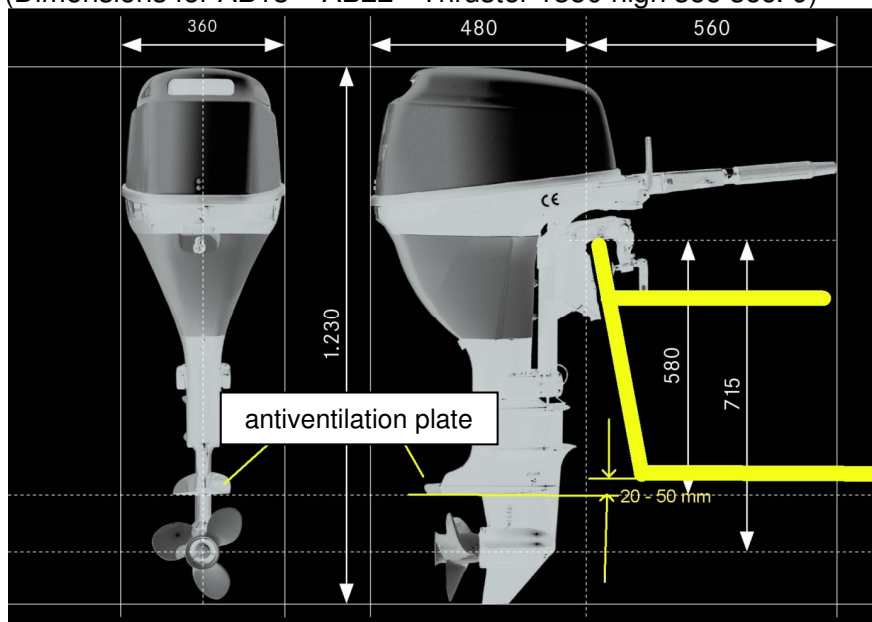
Always check the secure attachment to the motor base before you start operating!

## 2) Installation to the boat

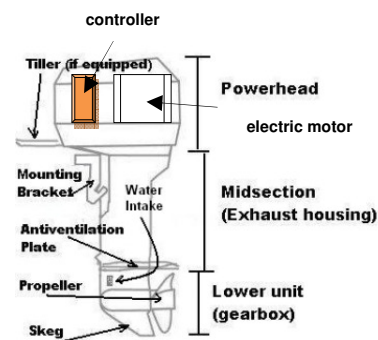
Place the motor with the mounting bracket to the middle of the transom top. The antiventilation plate has to be in the water at all times. It should be 20 – 50 mm deeper in the water than the bottom of the hull.

### 2.1 Installation to the transom

(Dimensions for AB13 AB22 - Thruster 1350 high see sec. 9)



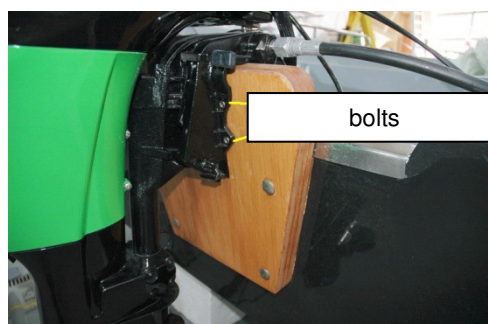
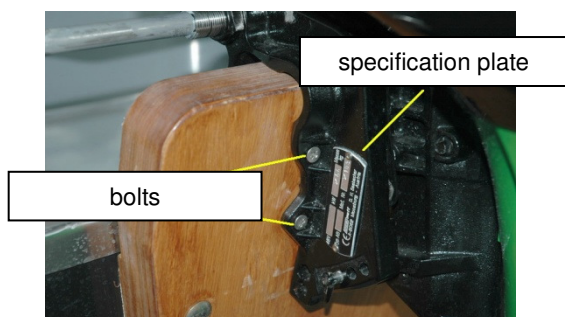
OPTION: power trim



Lift the motor always with suitable equipment and with two persons. Do not install the motor while the boat is in the water unless fully secured.

If any problem shows with the correct installation, you need to contact an authorized specialist.

To fix the motor to the transom, tighten the clamp bolts. Never operate the motor just with the clamp bolts. When correctly positioned, fix the motor with the 4 bolts to the transom.







## INFORMATION

Secure the motor to the hull with a cable to the mounting bracket to prevent loss during installation or de-installation process.

## 2.1 Electric power supply



## CAUTION

This guide helps you to setup your electric boat propulsion respecting the highest safety levels. You can connect the engine directly to a battery at your own risk, but we strongly recommend to use suitable fuses and switches.

The motor may only be connected to onboard power systems and accessories of 48/51 volts (13 KW engine) DC or 80 volts DC (22 KW engine) or 144 volts DC (42/50 KW engine) which comply with the CE / ISO standard.

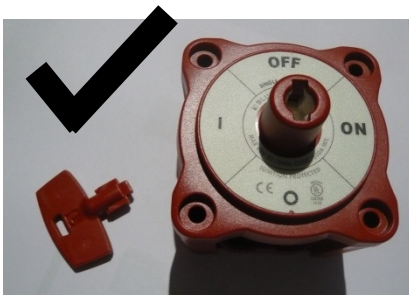
Between the battery and the main switch a 300-400 Amp fuse (suitable for 50 / 80 / 144 volts DC ) has to be connected.



cheaper alternative →



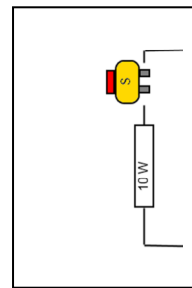
- All installations and insulations have to comply with 50 / 80 V DC low voltage and marine electric installation regulations or 144 V DC standard voltage.
- The main switch has to be rated for 50 / 80 / 144 volts DC / 300 Amp continuous load.
- A safety switch should be connected between the main switch and the battery.
- A resistor should be connected to the main switch to enable the precharge of the motor Controller capacitors.



300 A main switch 48 V DC



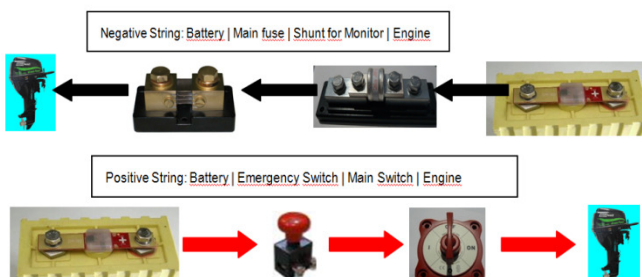
Non suitable battery switch



Resistor

Resistor to be connected to both terminals of the switch. If continuously connected, this can discharge the battery. Disconnect the battery with the emergency switch.

- The cables should be as short as possible. Cables are to be used with an Adequate square size of 50 mm<sup>2</sup> (for one motor only). For permanent full power use of 300 Amps or longer periods 65 - 95 mm<sup>2</sup> cables are recommended.



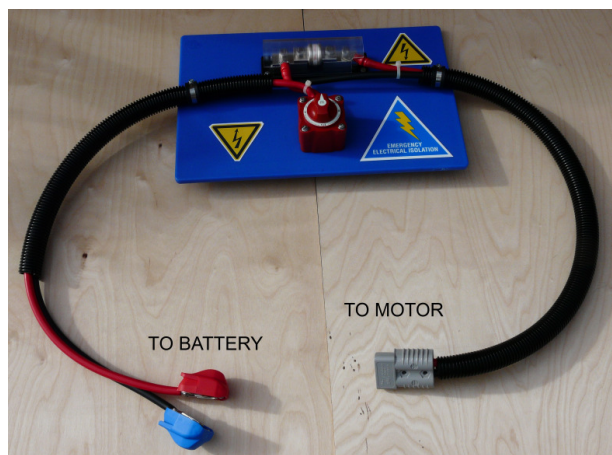
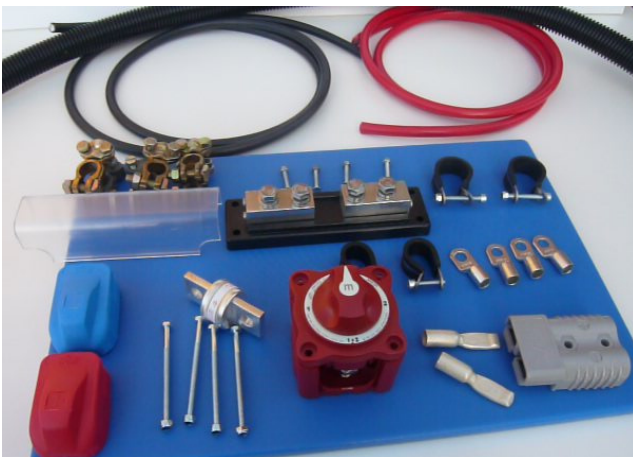
- 1 – Switch off main switch
- 2 – Switch off emergency switch
- 3 – Connect battery
- 4 – Connect engine
- 5 – Switch on emergency switch  
⇒ Wait a few seconds
- 6 – Switch on main switch
- 7 – Switch on engine

- ◆ The lugs and battery terminals need to be eligible for 300 Amp / 50 / 80 / 144 volts DC.
- ◆ The operator has to have access to the emergency switch at all times!
- ◆ The motor is supplied with a SB 175 or SB 350 plug. All connections have to be mounted at a dry place under deck / covered against rain and sea water. The switch board should be made of non conducting material (plastic or wooden board 10 – 15 mm).
- ◆ The maximum battery idle voltage may not be higher than 60 volts DC (or 90 volts for 22 KW).
- ◆ The maximum battery voltage under power is 54 / 86 volts DC. The minimum battery voltage is 40 volts DC (59 V for 22 kw version / 120 V for the 42/50 KW version). Variations to these voltages can cause severe damage to the motor.
- ◆ The onboard installation of the power supply should be supervised by an authorized specialist.

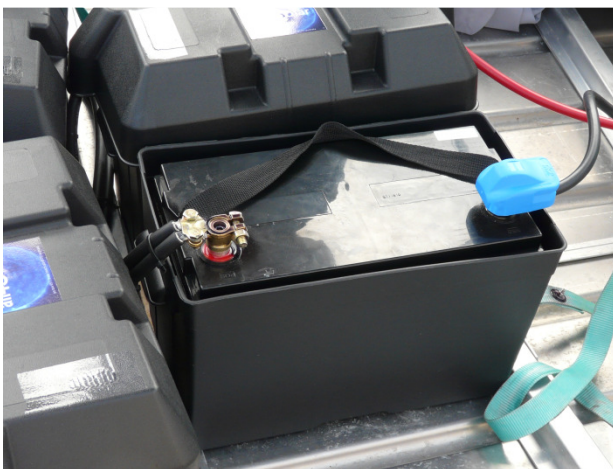
Operation is only allowed with a battery power supply. The direct supply from solar panels or generators can damage the controller. If the battery is charged with a battery charger or solar panels, the motor should be disconnected by the main switch unless suitable charge controllers are used.

Only use battery chargers and cables, suitable for the use in the marine environment. The safe installation and operation is not part of this manual.

### Overview material needed for a simple switch board & battery connection



secure batteries and protect terminals



**See aquawatt parts list and section 11 for more details**

## 2.2 Electric power supply for FLASH 144-volt DC

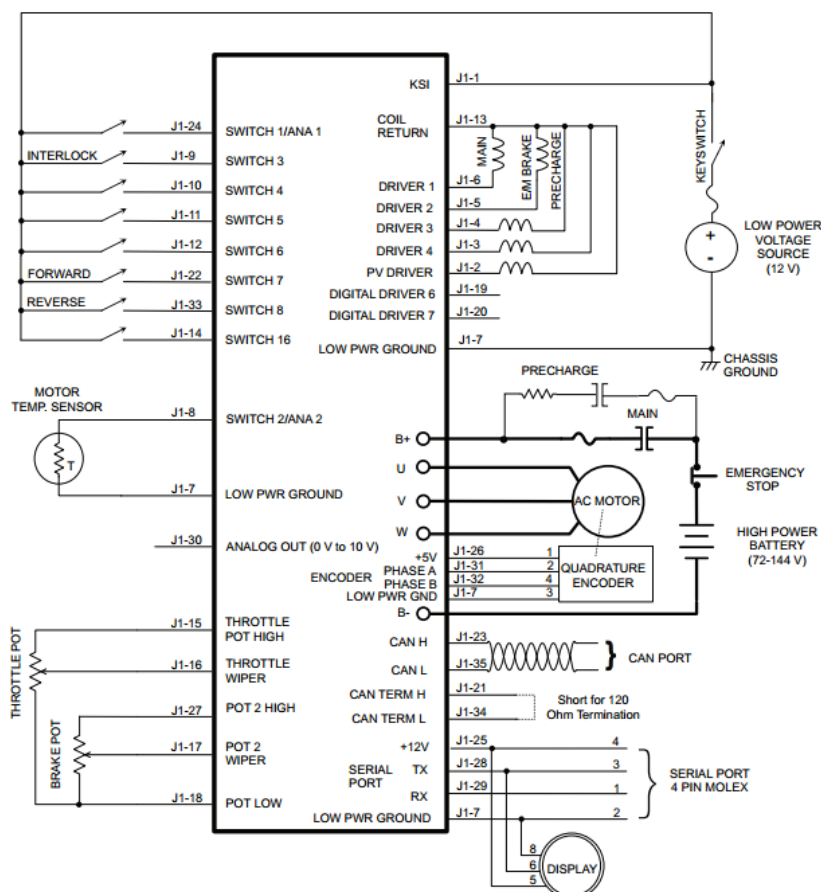


### WARNING

The aquawatt FLASH requires a nominal voltage of 144 volts DC.

For safety reasons, the controller (Curtis 1239E) needs to be supplied with 12 V DC from an external power source (f.e. via DCDC converter from the main battery). When this 12 V DC is supplied, the controller checks the system and will apply 12 V DC on a separate line back. This line should be connected to a suitable high voltage contactor. The contactor supplies the main power (144 V DC positive) to the controller (example: 12 V coil / 160 V switch voltage / 350 Amps – GIGAVAC GX14). We can supply the DCDC converter and the contactor pre wired as option.

Do not connect the 144 V DC power supply WITHOUT a contactor to the controller even though the Curtis manual does not show this.



## 2.3 Safety stickers

The following safety stickers are recommended to be fixed to the system. The operator is responsible for a safe installation, operation and proper indication of any dangerous parts.

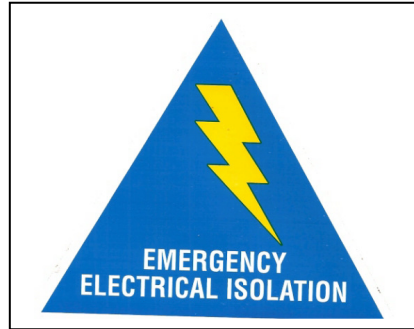
### High voltage sign (example only)

- On motor hood
- On battery box
- On switch board

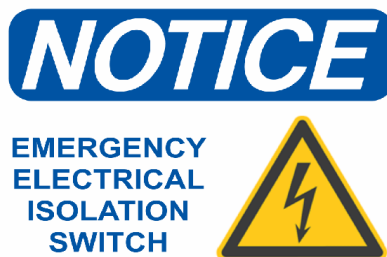


### Emergency switch (example only)

- On switch board



all4solar supplies a vinyl sticker on request (approx 18 x 25 cm)





## 2.4 Warranty information operation / installation

Incorrect installation, use of unsuitable accessories or variations in voltage voids the warranty.

Electrolysis is the decomposition of metals exposed to an electric current. When your boat is connected to a shore power AC electrical system, it is also connected to an earth ground circuit. This can cause an electrolytic current which causes the decomposition of all submerge metal. The manufacturer's warranty does not cover corrosion. Check and change anodes periodically.

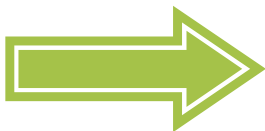


### WARNING – CAUTION – MOTOR OPERATION

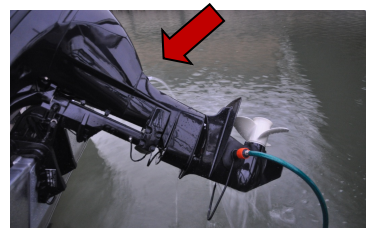
Never operate the motor out of the water. Not even for a few seconds. When turning the key switch, the electric motor turns at 600 revolutions per minute, even no gear is shifted. The electric motor also operates the water pump to cool the engine. If the water intake below the ant ventilation plate is not in the water, the impeller of the pump will be destroyed within seconds. This can also result in the damage to the seal of the gearbox.

To test your motor on land, the propeller needs to be dismantled and the water intake has to be put in a water tank at least 10 cm under water level.

Alternatively for a short run to clean the water system from salt water, an outboard flusher can be used. Sufficient water pressure has to be available. If water does not drain from water outlet after starting the motor, there is no sufficient water pressure. Stop immediately!



**DO NOT OPERATE  
BEFORE YOU HAVE  
READ THE ENTIRE  
MANUAL**



### 3) Installation of remote controlled motors

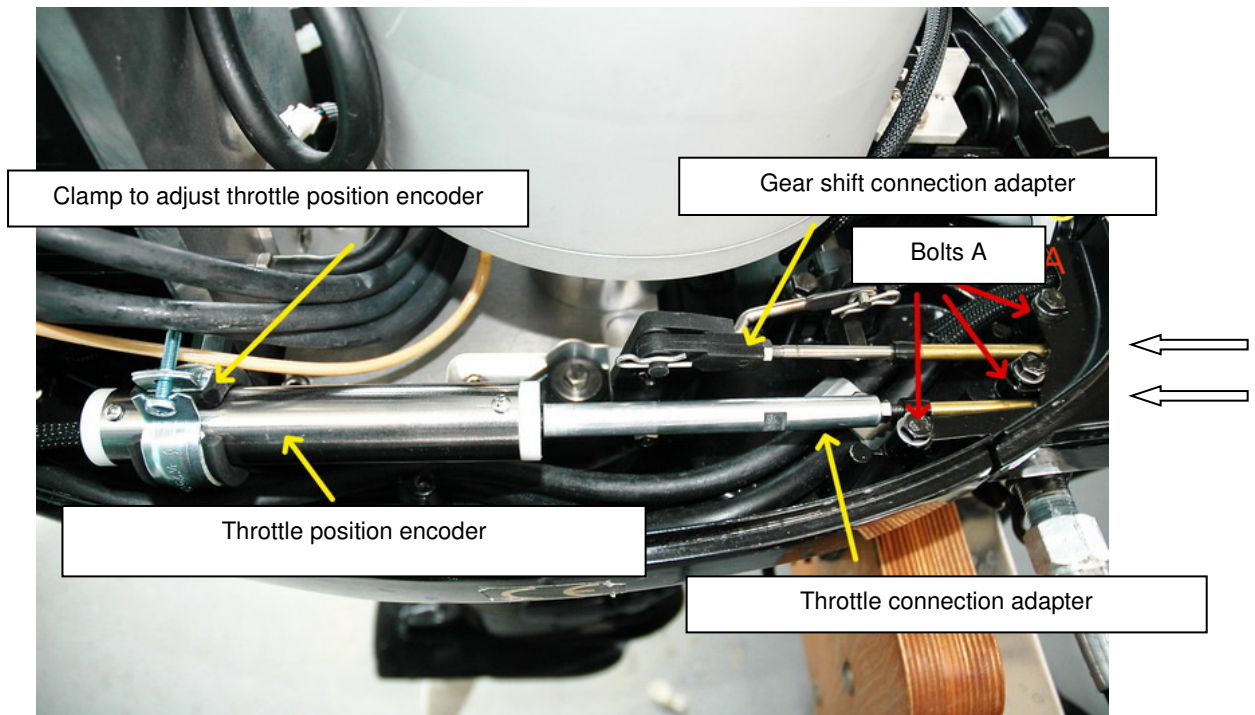
#### 3.1) Throttle and gear shift

For throttle and gear shift operation a single lever power engine control needs to be installed on the boat. Standard stainless steel throttle and gear shift cables to be used.



see aquawatt accessory list

Side view to throttle and gear shift connection



To fix the controller cables, unlock the 3 bolts “A” to remove the cover.

The remote operated outboard motor is equipped with a electronic throttle position encoder and an adapter for the gear shift cable. Both adapters are equipped with a 10 – 32 UNF standard thread.

( UNF = Unified Fine = 3/8” or 4.826 mm which is most similar to metric M5 \* 8)

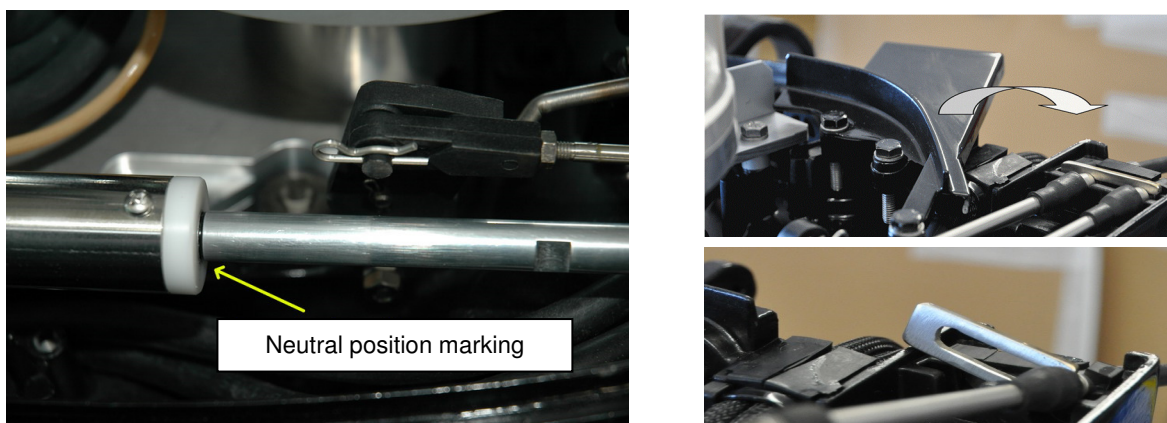
The throttle and gear cable need to have a nut to secure the connection.

To fix the cable to the throttle position encoder, the connecting rod can be turned. The u-head of the gear shaft can be removed to fix the cable.

The gear shift has to be adjusted that at the neutral position of the single lever, the u-head is in neutral position too and the bolt can be easily inserted.

For fine adjustment the thread at the end of the cable can be turned and secured with the nut.

The throttle position encoder has to be in the neutral position where marked when the single lever is in neutral position (see picture). The throttle is activated when the rod is moved in the encoder tube.



If this setting is not correct, the motor cannot be started. The fine adjustment can be done by turning the thread of the cable or by moving the encoder by loosening the clamp.

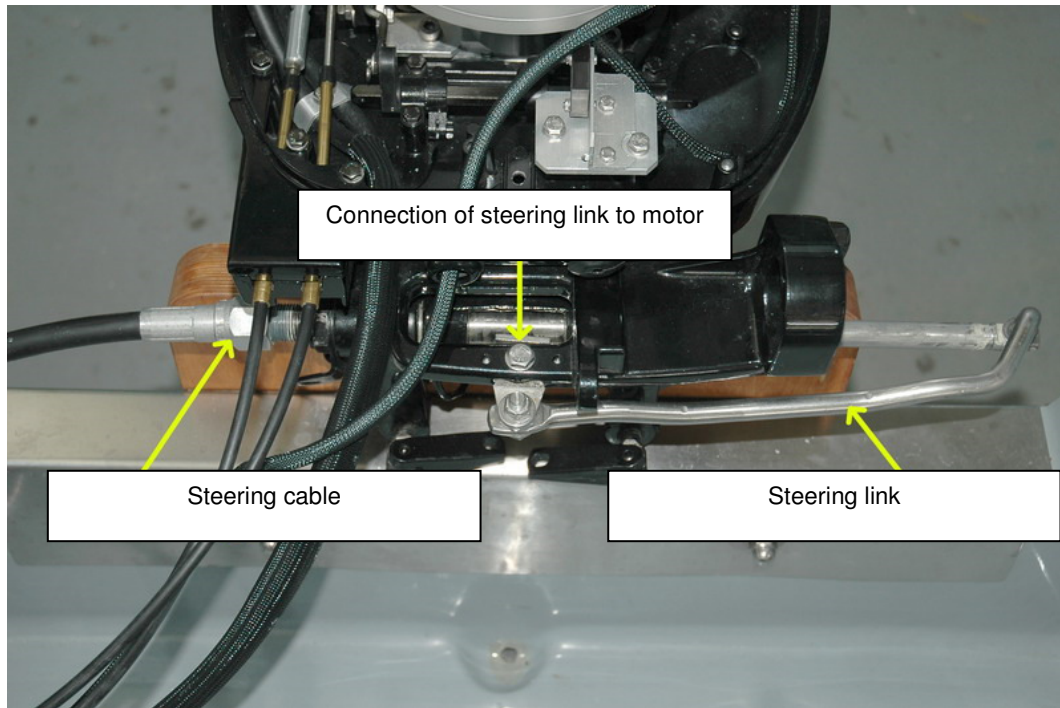
The key switch, the boat kill switch and the multi functional display are supplied separately for the remote controlled engine. These have to be mounted to the helm stand with the supplied cables. (See 3.3)

Suitable cables and single lever power engine controls can be purchased from aquawatt or marine supplier. Installation on the boat has to be done by an experienced person.

Installation and maintenance of lever and cables are not part of this manual. Please refer to the supplier's instructions.

### 3.2) Steering

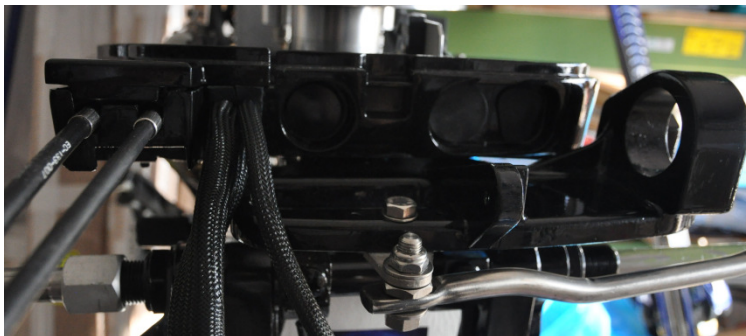
The motor needs to be equipped with a suitable, standardized and certified steering kit. The steering equipment should comply with CE / EN 28848.



There are two methods for the installation of the steering.

#### ***Tilt tube mounting***

The top end of the steering cable runs through the tilt tube of the motor. This method needs a suitable steering link. This is the most common and recommended method.





**Transom support mounting**

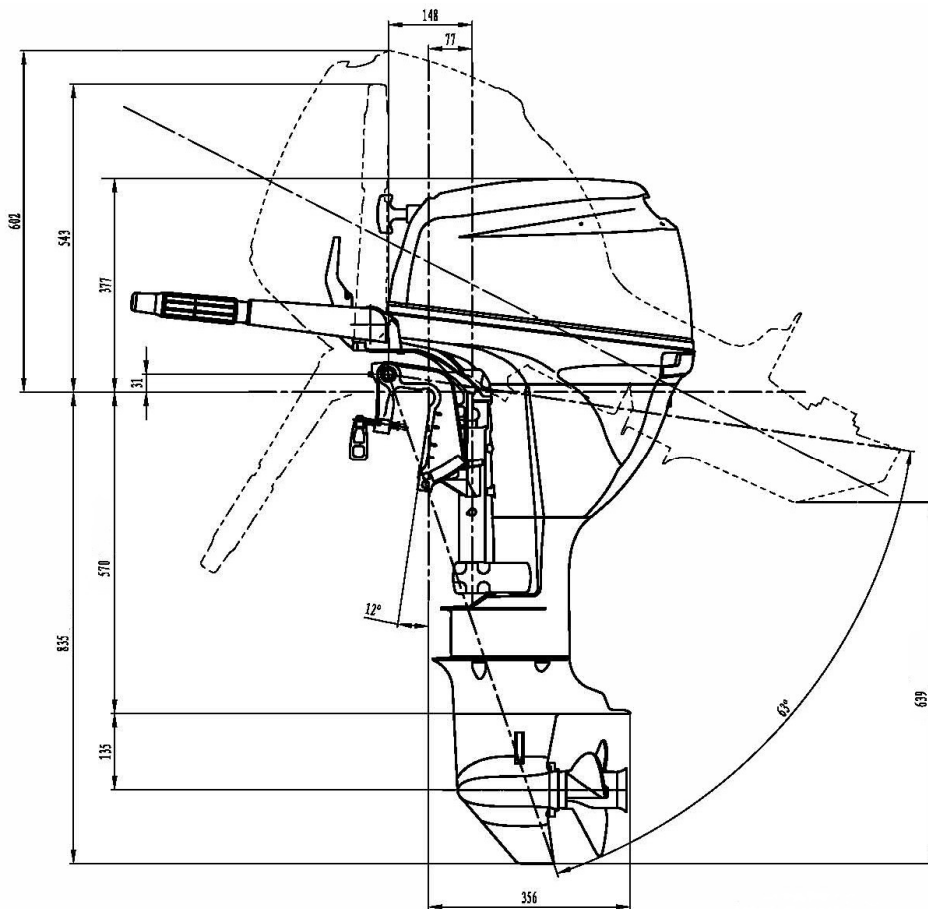
Alternatively the steering cable can be fixed at the transom of the hull. This needs a special support unit to hold the cable to the transom.

The installation and connection of the steering system should only be done by an experienced specialist.

**DANGER**

Faulty installations of steering, gear and throttle can result in severe or deadly injuries.

External gear and steering systems have to be maintained according to the instructions of the manufacturer. This is not part of this manual.



### 3.3) Display & switches

The wiring – kit is supplied with the 12R motor. If the cables are removed from the switches, ensure that they are remounted exactly as supplied.



Install the display; the key switch and the emergency switch to a stable, non conducting surface and make sure, the backside of the units are not exposed to water or humidity.



(Installation just for demonstration purposes)

Optional ampere hour meter recommended (use system capable to measure 60 V DC / 300 A or 90 V DC / 300 A). This is included in the lithium battery packs, if purchased from aquawatt.



The shunt included with the meter has to be installed between the negative battery pole and the fuse / main switch. The battery charger has to be connected on the fuse side and not directly to the negative battery pole, as otherwise the meter cannot count the amp hours charged.

See separate manual for battery installation and operation instructions.

## 4) Operational area

The aquawatt motor can be used in fresh water and if equipped with suitable anodes in salt water. If used in salt water, it has to be assured, that no salt water runs under the cover. The anode has to be cleaned or replaced if 25% is corroded.

After the use in salt water, we recommend to flush the cooling system (see section 2.2 for details).

Never run the motor with removed hood!

If the boat is moored, the motor should always be lifted out of the water and set in the direction where wind and waves head to.



### ATTENTION

The motor should only be used in clear water which is not colder than 10 degrees Celsius and not warmer than 30 degrees Celsius. Variations of these limits can result in damage of the motor and the cooling system.

## 5) Drive with the aquawatt outboard motor



### DANGER

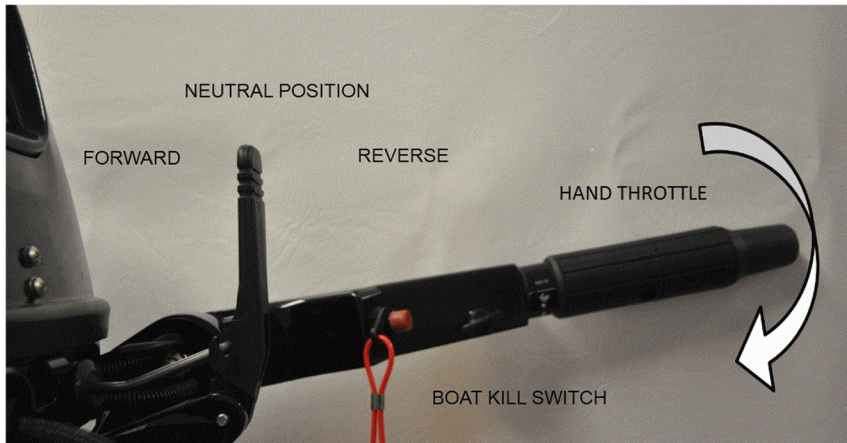
As boat operator you are fully responsible for the security of all passengers on board as well as to any other water craft, swimmers or animals within your area of operation. You have to be aware of all rules & regulations for operating a water craft. The detailed knowledge of this operator's manual and the instructions for the boat and all equipment is a very important part of your responsibility.

A swimming person cannot avoid very quickly even if a boat runs at low speed. Therefore you have to switch off the motor if a person is close to your boat.

ANY CONTACT WITH A MOVING VESSEL, THE PROPELLER OR ANY OTHER PART OF THE MOTOR OR THE BOAT CAN LEAD TO SEVERE INJURY.



Always equip your boat with safety gear



### 5.1) Turn-on procedure

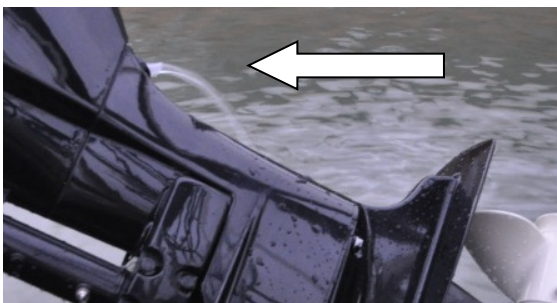
- ◆ Turn-on the battery main switch
- ◆ Connect boat kill key to the switch (see 2.1.)
- ◆ Turn tiller handle to the slow position or shift the engine control to the neutral position
- ◆ Move the gear switch to neutral position or the engine control lever to neutral position
- ◆ Switch the key to the ON position



The motor starts operating at 600 turns per minute to ensure the water flow through the cooling system.

The motor will not start, if a gear is shifted, the throttle is not in lowest or neutral position or the boat kill switch is off. If no gear is switched, the motor power cannot be increased!

If the motor runs after approximately 10 seconds cooling water has to run out of the water exit. This has to be checked on regular bases, as without water flow, the motor and the controller will be damaged due to overheating! When running at full throttle, do not switch the power off immediately, the motor needs to cool off with the cooling system running.



## 5.2) Drive forward

Turn the hand throttle to minimum speed or the engine control to the neutral position. Switch the gear to forward (in the forward direction) or move the engine control to forward. The boat starts to move slowly even the hand throttle has not been turned. To accelerate turn the hands throttle or move the engine control slowly.

*We recommend to not operate the engine at full power (300 Amps on display) for more than 20 minutes depending on the batteries and cables used for installation. If you need full power all the time, 2 x 32.5 mm<sup>2</sup> cables should be used for all connections from the controller to the batteries.*

## 5.3) Reverse

The same procedure as driving forward, but move the gear switch backwards or the power engine control backwards. Do not drive backwards at high speeds!

When changing from the forward to the reverse gear always stop at the neutral position for two seconds. ONLY SWITCH GEARS WHEN THROTTLE IS IN IDLE / NEUTRAL POSITION.



### CAUTION

Changing gears at high speeds can cause heavy damage or injury!

## 5.4) Safety Switch

If the lanyard is pulled from the kill switch the motor stops immediately. The line should be fixed to the operator in case of loss of control or passengers go overboard.

The use of the lanyard system is recommended but we need to highlight the risk of a sudden motor stop.



### CAUTION



An accidental activation of the boat kill switch can cause loss of control and injury to the passengers!

## 5.5) Multi functional display

If only the yellow light flashes, this shows a normal operation. The display indicates the most important information. Besides the selected information, the battery charge status is always shown on the top of the screen between 0 (empty) and 1 (full).

When turning the key switch, the system shows the motor rotation speed per minute.

To change to another reading, push the button to the right. To move back, push the left button.





Motor rotation speed / minute



Battery charge status in %



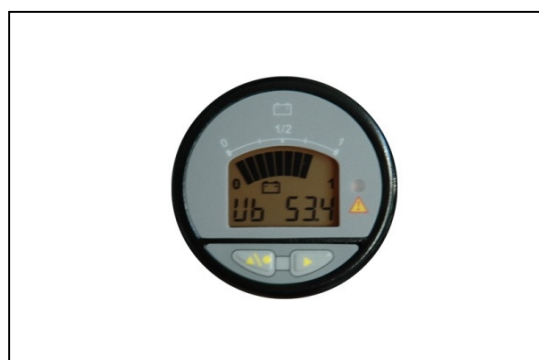
Hours of operation (full hours)



Battery power in Amps



Motor power in Amps



Battery voltage in volts

**IMPORTANT:** All values refer to AGM (lead acid) batteries. To indicated the battery charge capacity of a LI Ion or LIPO or LIFEPO battery pack, a separate instrument has to be Installed! (see 3.3 options)

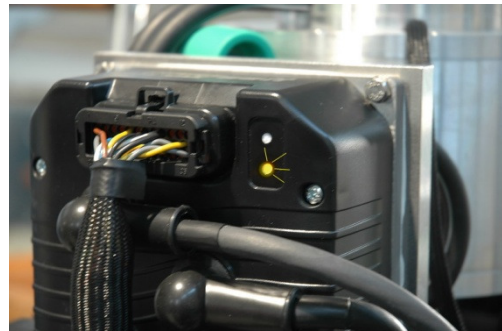
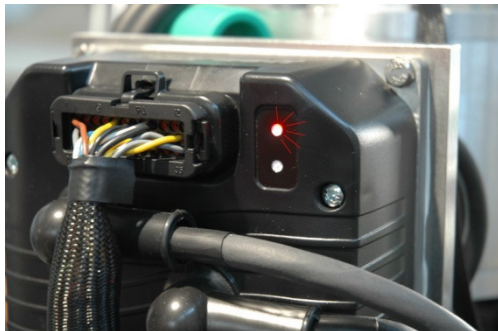
## 5.6) Error messages on display

An error or damage is reported by a red light. If the battery is completely empty this warn light is also switched on.



The housing of the motor controller has two indication lights. If the red light and the yellow light flash, this indicated an error.

Two signalization lights are integrated in the controller cover. Flashing of the red and the yellow light indicates a fault.



If both lights are switched of, the motor is not connected or insufficient voltage is supplied to the system.

## 5.7) Low voltage alert (optional)

If a battery is discharged under 42 / 68 volts this can damage the battery. If the voltage gets close to this value you will hear a warning sound. Slow down the motor to help the battery to regain voltage. We recommend using two battery blocks with two battery positions. So you can operate on one battery block and then switch to the second block as reserve.

## 5.8) Trim the motor



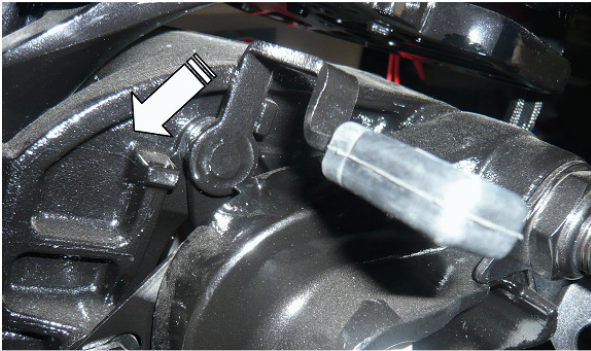
### CAUTION

Raise or lower the engine with care and if possible with assistance.

The drive angle can be adjusted by displacing the trim bolt. The antiventilation plate should be parallel to the water surface when driving.

To completely raise the motor, the blocking handle needs to be moved upwards and locked. Then the motor can be raised and locked at any position.

To lower the motor, move the blocking handle downwards and then carefully lift the motor and then lower to the standard position.



### WARNING

Raise or lower only with motor switched off. The outboard motor has to be moved very slowly. The person to move the motor has to be in a stable position and strong enough.

Always operate carefully in unknown or shallow waters. When the motor touches ground, stop the engine immediately. Ground contact can result in severe damage to the propeller and the boat.

## 5.9) Hand throttle

The hand throttle can be fixed in a dedicated position by tightening the bolt fixed to the handle.

Do not over tighten, as this could result in the fully and dangerous blocking of the handle.



## 5.10) Steering brake

At the left side of the midsection below the power head a hexagonal bolt allows to adjust the hard steering.

For the remote operated motor, this bolt has to be fully open.



If tightened too much, the throttle or the steering can get blocked!

## 5.11) Power and output

The aquawatt controller automatically adapts the power output to the boat you use. The motor works most efficient at speeds over 5 knots.

With slow and heavy boats the motor produces more thrust. If the boat floats easily, the motor speed is automatically increased.

If you operate the boat in areas with power restrictions, the power output can be reduced to 4 or 6 KW by the factory setup. The electric motor efficiency is around 90%.

### For technical details see section 9

With lithium batteries, the power output is increased by 20-25% compared to lead acid.

Please note, that lead acid batteries only supply about 60% of their capacity in 1-2 hours of use. Lithium batteries can be discharged upto 95% in one hour.

When using lithium batteries 50 mm<sup>2</sup> cables should be used.

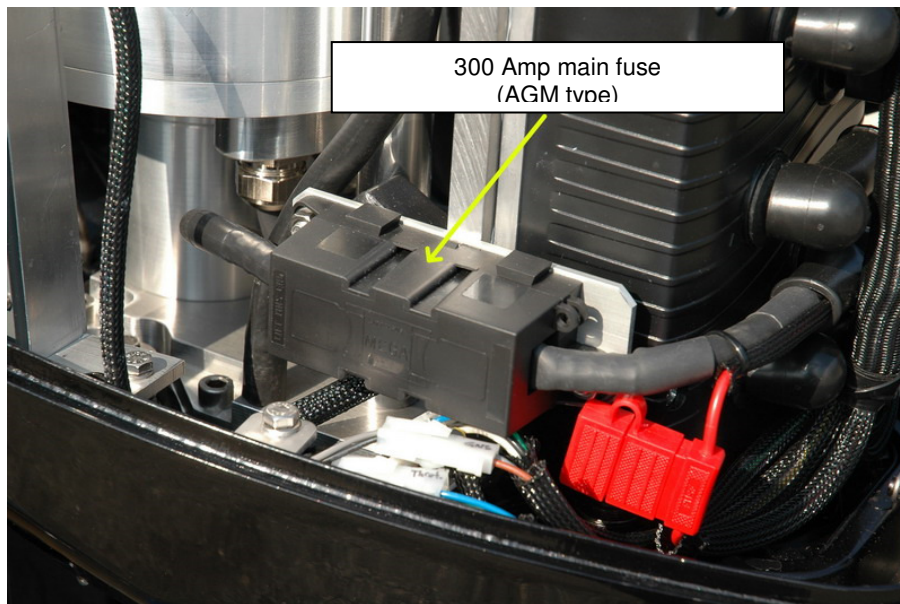
See our battery – information document for more detailed information.



## 5.12) Main fuse

To give the motor a basic protection a 300 or 400 Amp fuse is installed inside the powerhead.

If the fuse blows do not install a new fuse unless the motor has been checked by a specialized engineer.



The battery connection has to be secured by another main fuse and a main switch (see 2.1).

Any battery charger connected has to be connected via fuse and a switch. Make sure the charger and the plugs are suitable for marine use.

### 5.13) Swimming & passengers



#### **WARNING**

Prior to swimming of the boat, always switch off the motor and pull the key. Do not leave children or untrained passengers in the boat without attendance.

While swimming close to the boat or while loading or unloading procedure any connection to a battery charger has to be disconnected.

All passengers should know the position and function of the emergency switch as well as the basic safety rules. Small children should always wear personal floating devices / life jackets.

## 6) Maintenance & inspection

The boat operator is fully responsible for the safety check and the maintenance of the motor, the boat and all equipment and accessories.

Make sure that all installations are in good condition prior to starting for a trip. Ensure the batteries have adequate charge for the distance planned to travel including reserve.

Periodical maintenance and inspection as well as treatment and operation according to this manual reduce problems and minimize of costs. This guarantees a long and reliable operation of your motor.

### 6.1) Service, spare parts and lubricants

Even these electric outboard engines require little maintenance, the service should only be done by an authorized service centre with original or recommended spare parts and lubricants. No special knowledge regarding the electric motor is required.

As owner of this outboard motor you should be aware of all recommended maintenance and repair instructions as mentioned below.

If the motor is not serviced, a safe and trouble free operation cannot expected.

The prescribed services will ensure that any costly repair is unlikely to be needed.

### 6.1.1 Gear oil

After the first 10 hours of operation the gear oil of the lower unit should to be changed. Only the following synthetic oils should be used:

If operated in Australian waters here some examples:

- ✚ Sierra Hi Synthetik (80W90)
- ✚ Caltex Delo Synthetic Gear Lub Oil 75/80W-90
- ✚ NUCON Gearbox Oil 75W/90 100% synthetic
- ✚ Castrol SAG XJ 75W - 140

If the wrong oil is used the gear box will be damaged and this will void any warranty!

Following the oil should be exchanged after every 100 hours of operation, but at least once a year.

To dump the oil, open the top bolt just above the antiventionation plate first. Remove the gasket and prepare a replacement gasket.



Then open the lower bolt. Collect the used oil in a suitable bin and absorb any spoil!



Then close the lower bolt with a new gasket attached.

Fill fresh oil through the top opening (230-240 ml).



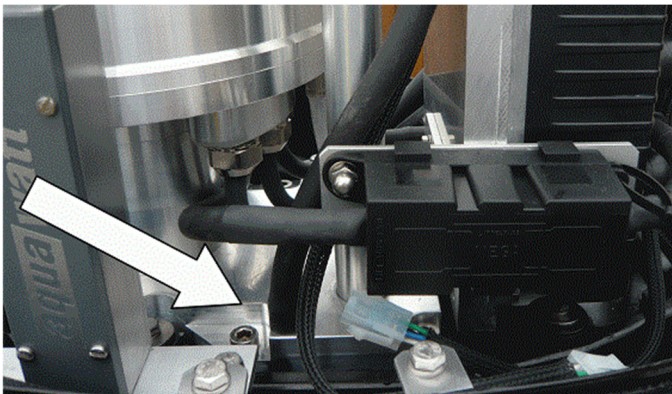
If the used oil shows a grey or milky color, this could be caused by water in the oil. Contact your service centre or dealer.

### 6.1.2 Cooling system

After each trip in salt water or at least twice a year, flush the cooling system with freshwater (see 2.2).

Check for any leaks in the power head after each trip.

If the motor is stored for a longer period or over winter in places, where the temperature falls below 5 C, the water supply hose at the motor base plate has to be carefully removed. Then blow out the whole system with air.



Exchange the impeller (rotor) every 12 months. Only use original parts as cheap duplicates are not of a compatible material which can cause damage to the cooling system.



use original Yamaha impeller (for 8 – 20 hp outboard motors)

### 6.2.3 Greasing & electric connections

Clean and then grease all joints and grease fittings every 2 months. All cable plugs, electric connections and main fuses to be checked for corrosion and to be treated with a protection and lubrication spray if necessary. Any damaged plugs, cables or connections to be replaced.

## 6.2) Service chart

<b>Shedule</b>	<b>by Operator</b>	<b>by authorized dealer or specialized workshop</b>	<b>by manufacturer</b>
After each trip	Flush the water cooling system (see 2.2) and check for leaks in the power head		
	Check & clean the inside of the power head		
	Check the propeller	Change propeller	
First 10 hours	Change lower gearbox oil (synthetic oil)	Change lower gearbox oil (synthetic oil)	
Each 100 hours or at least once a year	Change lower gearbox oil & gaskets	Change lower gearbox oil & gaskets	
Every 2 months	Grease joints & grease fittings	Grease joints & grease fittings	
	Check the electric cables & switches for damage or corrosion	Replace plugs / connectors	Replace internal sensors, switches, cables
	Check cooling system	Check cooling system Exchange water hoses cooling system	
Every 12 months		Change impeller	
Every 24 months		Full checkup of motor	
Mechanical repairs		Basic maintenance & replacements of mechanical parts	Repair after mechanical damage or overheat
Electrical repairs			Any repair on electric motor, controller, sensors, display, internal switches or cabling
Anode	Replace if used more than 75%	Replace if used more than 75%	
Propeller	Check after each trip – see section 12		
Water hoses	Check for water leaks near the motor	Replace with same size high quality hoses	

In case other spare parts are needed or the motor has any damage, send an email with a digital photo to [info@aquawatt.com.au](mailto:info@aquawatt.com.au) indicating the motor number, name of the owner and the parts needed or damaged.



## 7) Boat transport & trailering

When transported on a trailer, the motor has to be fixed in upright position.



### ATTENTION

If tilted forward during transport, the motor and the boat can be heavily damaged. When transported, the skeg should not be closer to the road surface than the trailer.

## 8) Warranty

Your aquawatt motor is backed by a 2-year warranty for workmanship and material for noncommercial use or 1 year for commercial use. The warranty does not cover any damaged which result from faulty handling, operating or maintenance. The following points will void the warranty:

- 1) Operation or maintenance differing from the information and instructions in this manual or any other manufacturer's documentation.
- 2) Preparation and participation in competitions or races or any form of competition.
- 3) Water damages to the motor.
- 4) Damages caused by collision, accidents, contact with any solid materials.
- 5) Capsize of the boat or drowning the motor into the water.
- 6) Grow of any kind of marine organism on the motor surface.
- 7) Incorrect use of the motor or use on unsuitable boats.
- 8) Normal aging process.
- 9) If serviced by none authorized or specialized workshop.
- 10) Damage by corrosion.

The warranty does not include wear parts such as: Anode, propeller, oil, splint pins, joints & gaskets, impeller, hose and rubber parts. The warranty only covers the motor. It does not cover damaged to the boat or and accessories, the batteries, switches, fuses, battery charger, trailer or any kind of equipment not supplied by aquawatt.

Transport to aquawatt is to be paid by customer. The redelivery to the customer is paid by aquawatt, if warranty applies.

If aquawatt supplies any third-party product (battery, chargers, cables etc.) the warranty conditions of this supplier apply.

Aquawatt cannot be held liable for any damage or injury caused by the use of this motor.

## 9) Technical data

X = Included / O = Option	POWER Type AB12/13	RACING Type AB22	THRUSTER	FLASH
Tiller control (tiller version)	X	X	n.a.	n.a.
Remote (Stand connectons C2)	X	X	X	X
Leg / weight	20' / 56 kg	20' / 60 kg	20' / 94 kg	20' / 98 kg
Key switch, security switch, LCD display	X	X	X	X
Zinc anode for salt water use	X	X	X	X
Propeller (Standard) 3 blades / 4 blades	9,25' , alu	9.25' , steel	12' max.	12' max.
Battery voltage (DC)	48 (12 KW) / 51.2 V (13 KW)	76 - 80 V	76 - 80 V	144 V
Max. current	240 / 300 A	300 A	300 A	360 A
Rotation per minute (propeller)	0-2400	0-3000	0-2500	0-2500
Gear box ratio / torque electric motor	1 : 2 / 25 Nm	1 : 2 / 35 Nm	1 : 2 / 50 Nm	1 : 2 / 90 Nm
Max. static thrust lb / N (ss propeller/lithium batt)	1095/1500	1250/1710	2193/3000	3070/4200
Minimal battery capacity recommended	100 ah	200 ah	200 ah	200 ah

*The maximum power output with lead acid batteries is 12/20 KW, but will drop with the voltage dropping. Only with lithium batteries the full output of 13/22 KW can be achieved. For the full output over longer periods, 300 Amp plugs and 95 mm<sup>2</sup> cables should be used. If supplied with larger cables & plugs, the weight of the engine will increase by approx. 1 kg.*

Modell	AB12/13 lead acid *	AB12/13 LiFePo4	AB22 LiFePo4	AB22 Thruster
Max. power output propeller shaft	10-12 KW	13 KW	22 KW	22 KW
Speed of test boat I** in knots***	10	n.a.	n.a.	n.a.
Speed of test boat II **** in knots ***	14	20	25	16
Speed of test boat III ***** in knots	8	10	12	14

**The full power output of 13 KW/22 KW is achieved with lithium batteries.**

\* To operate, four AGM batteries in series are required.

\*\* Test boat fishing barge 6,5 meter 900 kg

\*\*\* 1 knot equals 1,852 Km/h

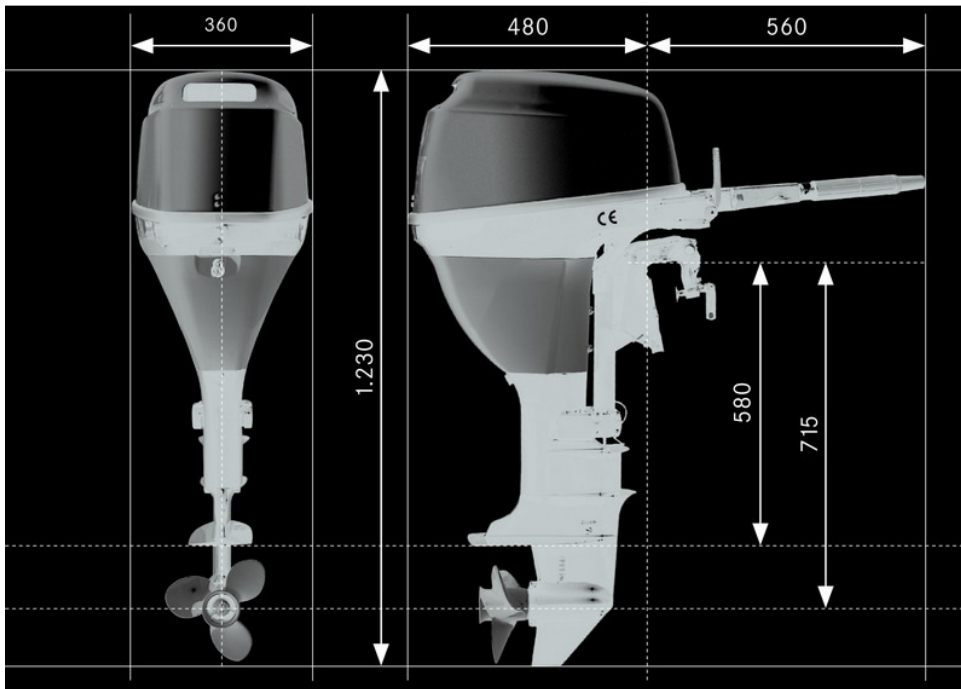
\*\*\*\* Test boat dinghy 4 meter 400 kg

\*\*\*\*\* Test boat 8 meter 3000 kg



## Dimensions

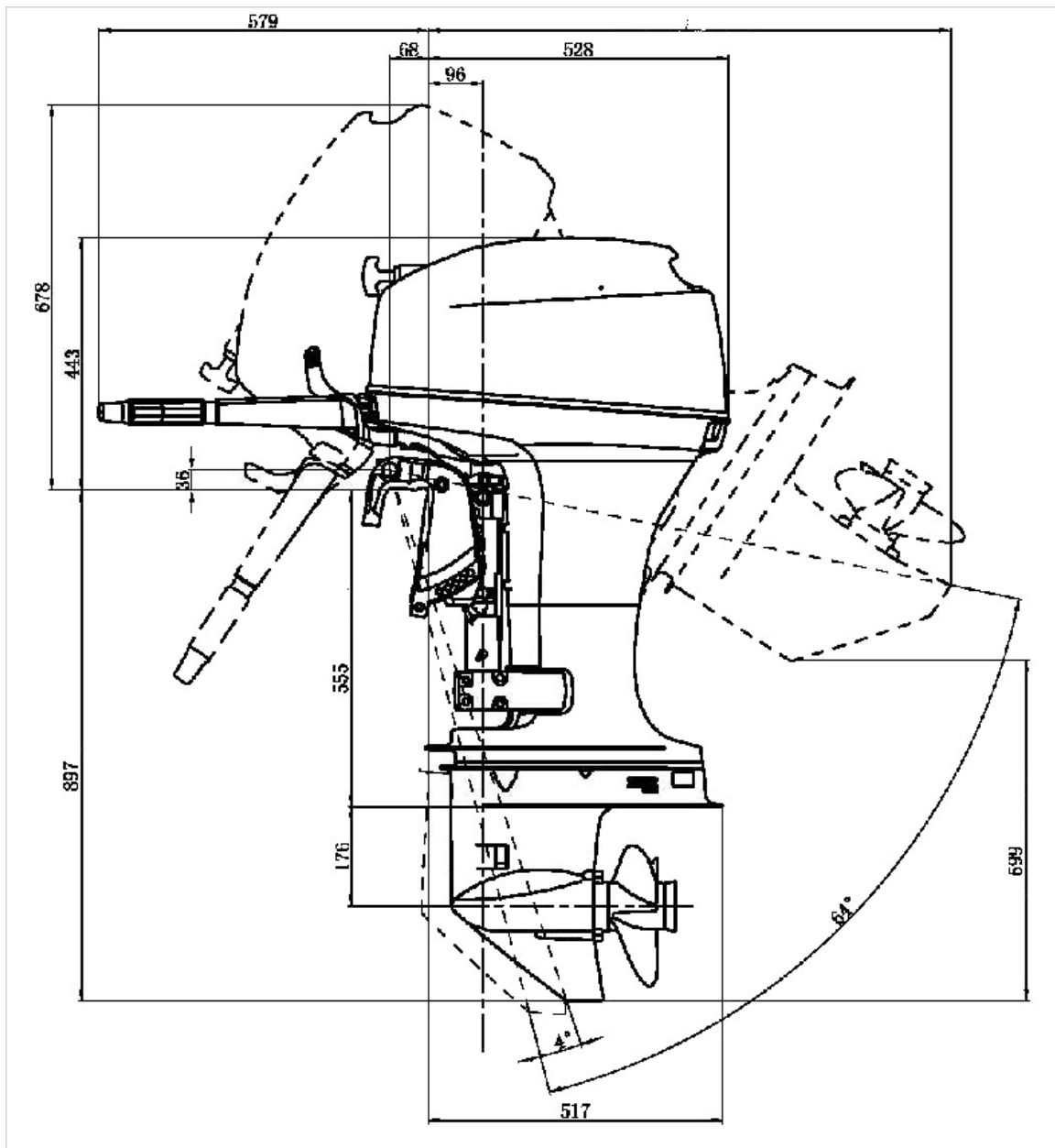
### POWER & RACING



Height overall: 1230 mm  
Weight: 56 / 60 kg

Top transom plate to cavitation plate: 580 mm

## THRUSTER / FLASH



Height overall: 1340 mm  
Weight: 94 kg Thruster / 98 kg Flash

## **Performance with AGM / lead acid batteries**

Operation time 13 KW - motor at 26 C – output 10-11 KW max.

⇒ *If operated at high speed, after the indicated time, the motor can still be operated at lower speed, but the lead acid battery will not supply the full current and voltage anymore.*

Power consumption 1 KW (Kilo Watt) = 1000 Watt 1 Ah = Ampere hours 1 Watt = Voltage * Amps	Battery 48 V 2 x 4 x 250Ah AGM 576 kg (23.5 KW H)	Battery 48 V 2 x 4 x 200Ah AGM 472 Kg (19.2 KW H)	Battery 48 V 4 x 105Ah AGM 120 Kg (5 KW H)	Speed 4 m dinghy 400 kg
100 % - 12 KW	55 min	45 min	15 min	16 knots
70 % - 8 KW	1 h : 36 min	1 h : 14 min	22 min	13 knots
45 % - 5 KW	3 h : 30 min	2 h : 03 min	40 min	9 knots
20 % - 2.5 KW	7 h : 45 min	6h	1 h : 25 min	5-6 knots

## **Performance with LIFEP04 battery packs**

Operation time 13 KW - motor at 26 C – output 13 KW max.

⇒ *LIFEP04 batteries serve the full current and voltage up to 95% of their capacity. So if the voltage drops, no more reserve is available to operate at low speed!*

Power consumption 1 KW (Kilo Watt) = 1000 Watt 1 Ah = Ampere hours 1 Watt = Voltage * Amps	Battery 51.2 V 220 kg (20 KW H)	Battery 51.2 V 120 kg (10 KW H)	Battery 51.2 V 65 kg (5 KW H)	Speed 4 m dinghy 400 kg
100 % - 14.5 KW	1 h : 25 min	40 min	20 min	20 knots
70 % - 10 KW	1 h : 50 min	55 min	25 min	15 knots
50 % - 7 KW	2 h : 40 min	1 h : 20 min	40 min	12 knots
25 % - 3.5 KW	5 h : 20 min	2 h : 40 min	1 h : 20 min	7 knots

*The speed for a 5-6 m boat with 600-900 kg will be about 30% less.*

*With lithium batteries use double cables of 32.5 mm<sup>2</sup> or 50 mm<sup>2</sup> if running at full power more than 10 minutes. For extended use at full power, use 65-70 mm<sup>2</sup>.*

*Please note, that above figures are indications only and can vary according to the various battery types and suppliers as well related to conditions and age of batteries.*

## 10.1) Spare parts AB13 Green Power and AB22 Green Racing

A lot of mechanical spare parts are similar to the MSHB 15 Yamaha or Parsun outboard motors and can be installed / replaced by an authorized dealer. The safety information and all instructions and recommendations in this manual have to be respected at all times.

All spare parts, related to the electric driving system need to be supplied and replaced by aquawatt. Always refer to the supplier's home page for the latest information before ordering parts or replace parts. Send an email with a digital photo if unclear to [info@all4solar.com.au](mailto:info@all4solar.com.au). The use of unsuitable spare parts will void the warranty.

Only use original spare parts and no cheaper copies! Use marine grade 316 stainless steel bolts and parts wherever possible.

If any part apart from the defined units mentioned in this manual needs replacement, we recommend to always contacting aquawatt.

### Lower Gearbox / Leg

1	F15-06000001	LOWER CASING
2	F4-03000023	PLUG, OIL HOSE Compatible with Tohatsu 332-60005-2
3	F4-03000024	GASKET Compatible with Tohatsu 332-60006-0
4	F15-06000010-1	SHIM(t:0.10mm) Compatible with Yamaha 664-45567-01
4	F15-06000010-2	SHIM(t:0.12mm) Compatible with Yamaha 664-45567-10
4	F15-06000010-3	SHIM(t:0.15mm) Compatible with Yamaha 664-45567-20
4	F15-06000010-4	SHIM(t:0.18mm) Compatible with Yamaha 664-45567-30
4	F15-06000010-5	SHIM(t:0.30mm) Compatible with Yamaha 664-45567-40
4	F15-06000010-6	SHIM(t:0.40mm)

Compatible with Yamaha 664-45567-50

4	F15-06000010-7	SHIM(t:0.50mm)
Compatible with Yamaha 664-45567-60		
5	HR30205J	BEARING
6	F15-06010000	GEAR, FORWARD
Compatible with Yamaha 6E7-45560-01		
7	F15-06070004	PIN, CLUTCH
Compatible with Yamaha 90250-05010		
8	F15-06070003	CLUTCH, DOG
Compatible with Yamaha 682-45631-00		
9	F15-06070005	RING, CLUTCH
Compatible with Yamaha 648-45633-00		
10	F15-06070006	PLUNGER, SHIFT
Compatible with Yamaha 650-45635-00		
11	F15-06070002	SPRING, CLUTCH
Compatible with Yamaha 90501-14M06		
12	F15-06070001	SHAFT, PROPELLER
Compatible with Yamaha 683-45611-00		
13	F15-06070007	WASHER, REVERSE GEAR
Compatible with Yamaha 90201-17682		
14	F15-06080005	GEAR, REVERSE
Compatible with Yamaha 6E7-45571-00		
15	F15-06080006-1	SHIM(t:0.10mm)
Compatible with Yamaha 626-45577-00		
15	F15-06080006-2	SHIM(t:0.20mm)
Compatible with Yamaha 626-45577-10		
15	F15-06080006-3	SHIM(t:0.30mm)
Compatible with Yamaha 626-45577-20		
15	F15-06080006-4	SHIM(t:0.40mm)
Compatible with Yamaha 626-45577-30		
15	F15-06080006-5	SHIM(t:0.50mm)
Compatible with Yamaha 626-45577-40		
16	GB/T276-6005/P63	BEARING 6005
17	F15-06080002	O-RING A, COVER

Compatible with Yamaha 93210-57M09

18	F15-06080003	O-RING B, COVER
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Compatible with Yamaha 93210-56M80

19	F15-06080001	COVER, LOWER CASING
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Compatible with Yamaha 683-45361-02-4D

20	GB/T290HK1712	BEARING HK1712
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21	F15-06080004	OIL SEAL
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Compatible with Yamaha 93101-17054

22	F15-06080000	COVER ASSY, LOWER CASING
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23	GB/T97.1-6	WASHER 6
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24	GB/T5783-M6X20	BOLT, HEXAGON M6X20
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25	F15-06000005	WASHER
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Compatible with Yamaha 63V-45315-A0

26	GB/T290F1420	BEARING
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27	F15-06000006	BUSHING, NYLON
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Compatible with Yamaha 63V-45536-00

28	F15-06020001	BASE, DRIVE SHAFT
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29	F15-06020004	O-RING
----	--------------	--------

Compatible with Yamaha 93210-08ME6

30	GB/T97.1-8	WASHER 8
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31	GB/T5783-M8x25	BOLT, HEXAGON M8x25
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32	F15-06020002	BEARING
----	--------------	---------

Compatible with Yamaha 626-45316-09

33	F15-06020003	OIL SEAL, DRIVE SHAFT
----	--------------	-----------------------

Compatible with Yamaha 93101-20001

34	F15-06040000	DRIVE SHAFT ASSY L
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Compatible with Yamaha 6D4-45510-10

34	F15-06040000S	DRIVE SHAFT ASSY S
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Compatible with Yamaha 6D4-45510-00

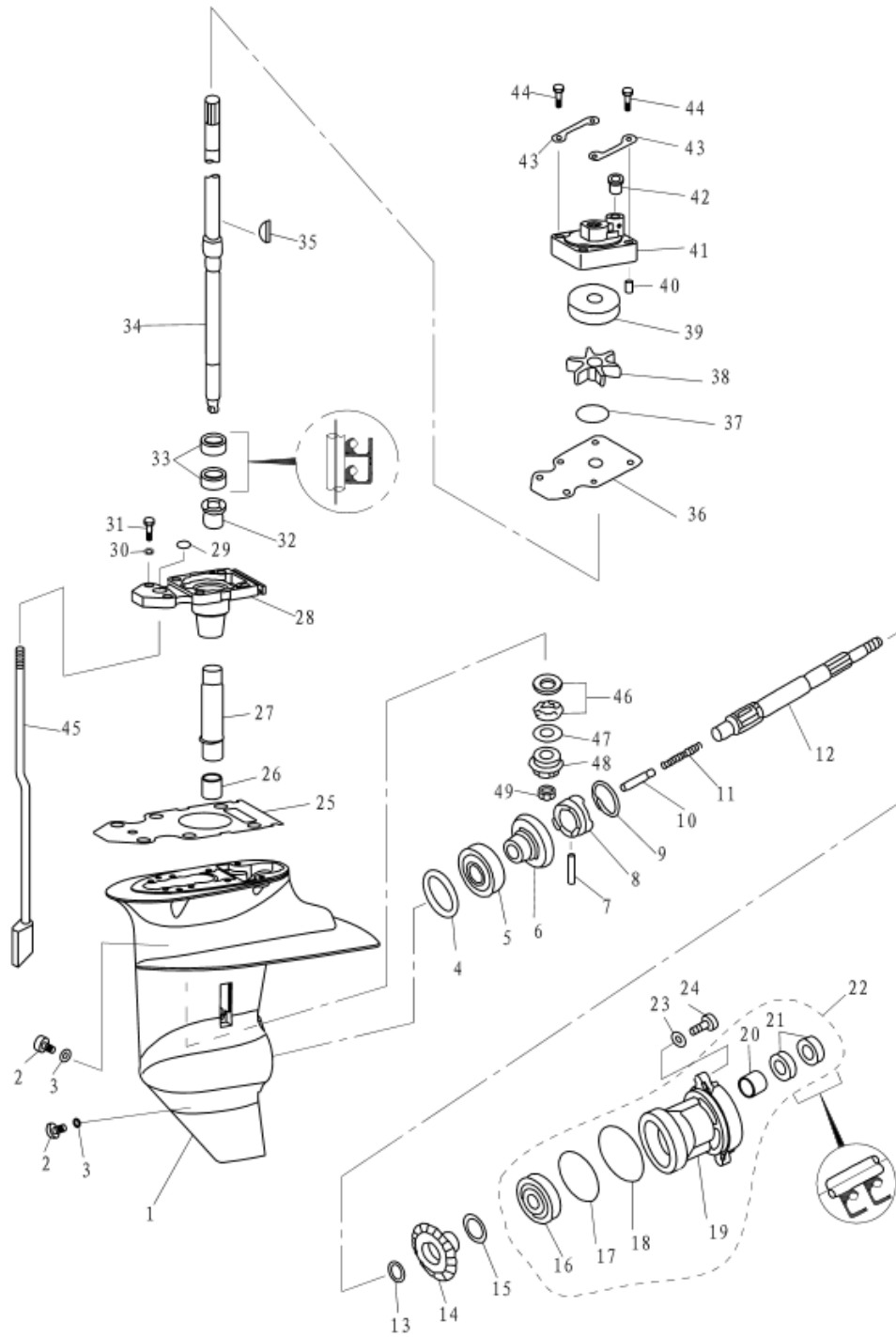
35	F15-06000013	KEY, WOODRUFF
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Compatible with Yamaha 664-44338-00

36	F15-06000007	OUTER PLATE
----	--------------	-------------

Compatible with Yamaha 63V-44323-40

37	JASOF404-31-045	O-RING
38	F15-06050000	IMPELLER Compatible with Yamaha 63V-44352-01
39	F15-06060002	INNER SHELL, WATER PUMP Compatible with Yamaha 63V-44322-40
40	F15-00000013	PIIV, DOWEL Compatible with Yamaha 93604-12M07
41	F15-06060001	WATERPUMPHOUSIFIG
42	F15-06060004	SEAL Compatible with Yamaha 647-44366-00
43	F15-06000014	FIXED PLATE, WATER PUMP Compatible with Yamaha 63V-44328-00
44	GB/T5783-M8x45	BOLT, HEXAGON M8x45
45	F15-06030000	CAM ASSY, SHIFT ROD L Compatible with Yamaha 66M-44150-10
45	F15-06030000S	CAM ASSY, SHIFT ROD S Compatible with Yamaha 63V-44150-00
46	F15-06000020-1	WASHER, BEARING
46	TE15-04000018	WASHER, PINION
47	F15-06000008	SHIM, PINION(t:1.13mm) Compatible with Yamaha 6E8-45587-10
47	F15-06000009	SHIM, PINION(t:1.20mm) Compatible with Yamaha 6E8-45587-30
48	F15-06000011	PINION Compatible with Yamaha 63V-45551-00
49	F15-06000012	NUT, PINION Compatible with Yamaha 90179-08M06





## 10.2) Spare parts AB22 Green Thruster and AB40 Green Flash

A lot of mechanical spare parts are similar to the T40 BML 40 hp Yamaha / Parsun outboard motors and can be installed / replaced by an authorized dealer. The safety information and all instructions and recommendations in this manual have to be respected at all times.

All spare parts, related to the electric driving system need to be supplied and replaced by aquawatt. Always refer to the supplier's home page for the latest information before ordering parts or replace parts. Send an email with a digital photo if unclear to [info@all4solar.com.au](mailto:info@all4solar.com.au). The use of unsuitable spare parts will void the warranty.

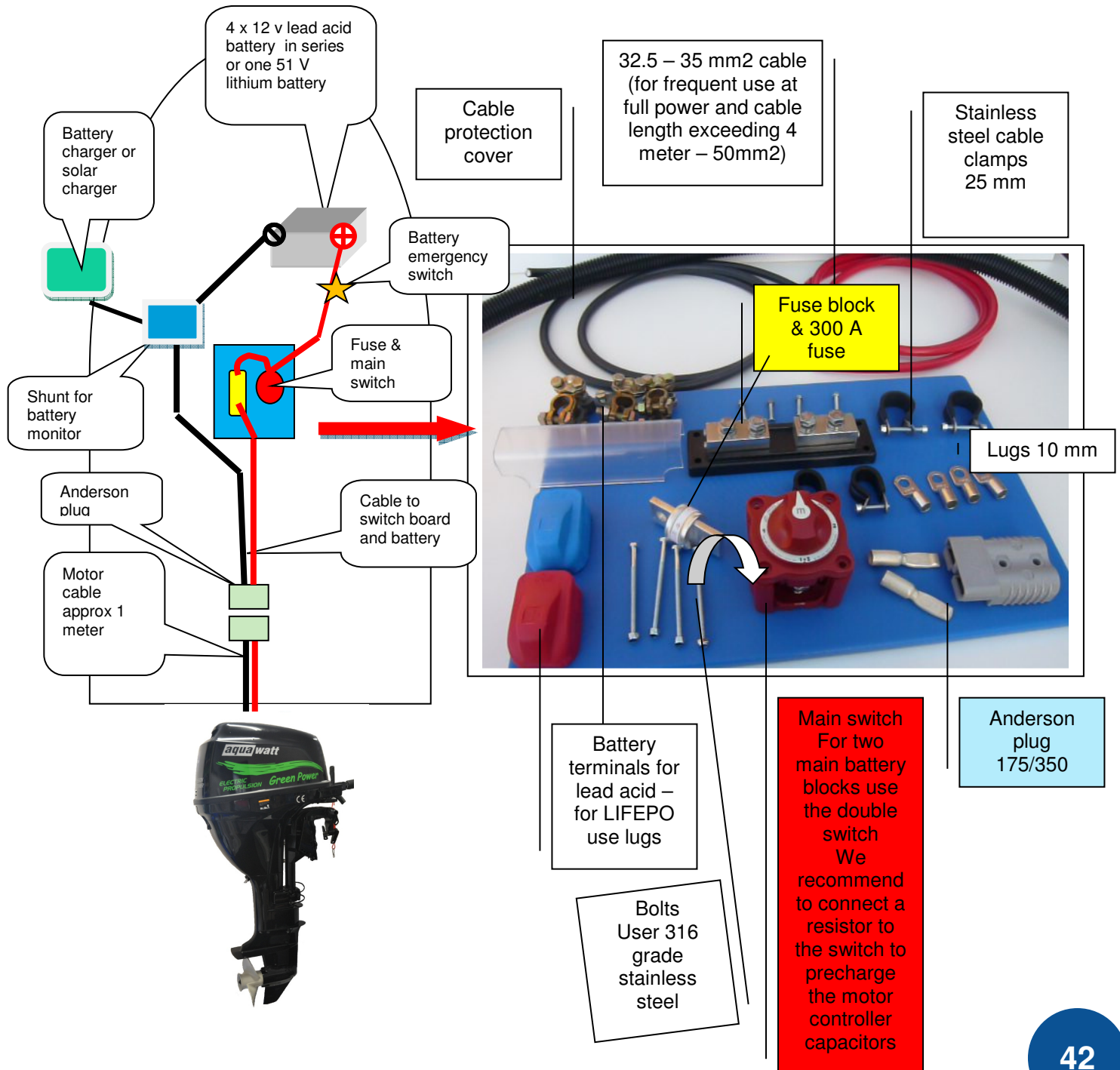
Only use original spare parts and no cheaper copies! Use marine grade 316 stainless steel bolts and parts wherever possible.

If any part apart from the defined units mentioned in this manual needs replacement, we recommend to always contacting aquawatt.

## 11) Installation diagram

Please check to ensure you have ordered all parts and accessories needed for the installation of your aquawatt motor. For the length of the electric cables we recommend to order + 10%. If two motors are used, you need to install two strings and at least two battery blocks. The battery blocks can be connected via a selection switch.

Here all you need for the basic installation of the electric propulsion system on your boat





## 12) Propeller information

### 12.1) Choice of propellers for AB 13 and AB 22 Racing

The supplied standard aluminium propeller (3 x 9.25 x 8) has fairly thick blades which results in a continuous stream. For speeds over 8 knots this is a certain disadvantage which can be optimized by the use of different propellers if a top performance is required. Please note that all information is subject to the type of boat used, the weight of the boat and the circumstances such as weather, streaming etc. The user has to individually evaluate the best setup for his boat.

The Solas Amita is somewhat more efficient than the original propeller.

Can be used with any kind of boat if a standard performance is suitable  
Example: 300-700 kg / 3.5 – 5 meter / mono hull



💧 SOLAS AMITA 3 3111-093-08 / 3 blade 3 x 9.25 x 8 - R

💧 SOLAS AMITA 3 3111-093-07 / 3 blade 3 x 9.25 x 7 – R ➔ recommended

For light and fast boats, which reach 10 or more knots with 10 KW power output a 3 blade stainless steel propeller with thin blades can achieve up to 1 knot higher speed.

Can be used with light boats if a top performance & speed is required / inflatable or speed boat  
Example: 300-600 kg / 3.5 – 5 meter / mono hull



💧 SOLAS SATURN 3121 093 – 08 / 3 blade 3 x 9.25 x 7 – R

For very light boats and fast boats which reach 12 knots or more with 10 KW+ the somewhat larger propeller is more efficient (lithium batteries recommended)

Can be used with very light boats if a top performance & speed is required / inflatable or speed boat / aluminum boat with less than 400 kg



💧 SOLAS SATURN 3121 093 – 09 / 3 blade 3 x 9.25 x 8 - R

💧 SOLAS SATURN 3121 093 – 10 / 3 blade 3 x 9.25 x 9 - R

For heavy, slow boats where high thrust is required a 4 blade thrust propeller is recommended.

💧 SOLAS AMITA 4 3113 093 – 07 / 4 blade

Can be used with heavy boats or as trolling motor for heavy boats such like small cruisers, multihull, sailing boats etc.



4 x 9.25-10 x 7 - R

Also Yamaha original propellers 3 x 9.25 x 7-9 can be used.

## 12.2) Choice of propellers for AB 22 Thruster / AB 42 Flash

For the Thruster Motor we recommend the following propellers:

### **For heavy applications at low speeds**



12.1 x 9 Aluminium

12.1 x 9 Niro

### **For thrust & speed**

12.1 x 9 Stainless Steel prop for speeds upto 14 knots

### **For high speed**

11.6 x 11 Aluminium for high speeds

### **Definitions:**

Diameter in inch f.e. 9 ¼ inch = around 235 mm

Pitch f.e. 9 inch = in one revolution the propeller would push forward 9 inch if it were to be used in a sold substance (like a screw through a piece of wood).

The larger the pitch, the faster the boat will move – as long as there is sufficient power. Every additional inch reduces the output by around 200 rpm or vice versa.

But this also depends on the blade size and thickness.



## 12.2) Replace propeller

Always replace damaged propellers. A propeller should be removed at least every 6 months just to grease the axle.

Always grease the axle when replacing a propeller. The splint needs to be replaced when either broken or used more than 2 times. Only use stainless steel washer and splint!

Do not replace or change the propeller over water to avoid loss of any parts.



### 13) High power batteries

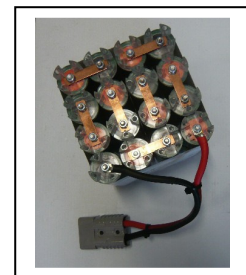
Instead of lead acid batteries, lithium – based systems offer a much higher energy density and a stable power output as well as much higher efficiency.

A 100 Ah lead acid battery can only supply approximately 60 Ah in one hour with a voltage dropping continuously.

Lithium based batteries can deliver up to 95% of their capacity within a very short time and with a stable voltage. The disadvantage of this effect is the lack of reserve, if the battery is discharged.

Some important information related to lithium based batteries:

- 💧 LIPO batteries need a controller (BMS) which checks the single voltage of each unit and keeps the voltage leveled. These battery packs supply up to 180 watt-hours per kilo weight, but need attention. We actually do not recommend using these packs for marine installations.
- 💧 LiFePo batteries do not essentially require a controller (even this is recommended) and are not as sensitive as LIPO batteries. They supply about 100 watt-hours per kilo weight and can last over 2000 cycles. We recommend to use this reliable technology for power supply for boats.



16 cells normally deliver between 51 and 53 volts which enables the motor to deliver his full power – potential of up to 13 KW. Use total cable diameter of at least 50 mm<sup>2</sup> (or 32.5 if two packs are used in parallel).

Make sure, your battery pack allows discharging with 300 amps nominal.

If you use LIFEPO4 batteries, we recommend to carry a second battery as backup as well as a suitable battery monitor to measure the battery capacity.

## 14) Battery charging / solar power

### 14.1) Standard grid chargers

For charging the batteries you must use a suitable charger. Always make sure, the charger is fully protected from water and covers the battery voltage and type. If AGM lead acid batteries are installed, each battery can alternatively be charged individually with a 12 volt battery charger, but all batteries must be charged up to the same level to keep the full potential of the batteries and assure the maximum power output.

Always use automatic digital chargers with several charging modes (charge, float etc.) to extend the life of your batteries and get the complete charge at all times.

48 V chargers used for golf carts are powerful, reliable and economic. For Lithium batteries use suitable digital chargers (We supply those with our batteries).

Do not use cheap 12 V chargers for car batteries.

Maximum charge voltage for a 48 V battery:

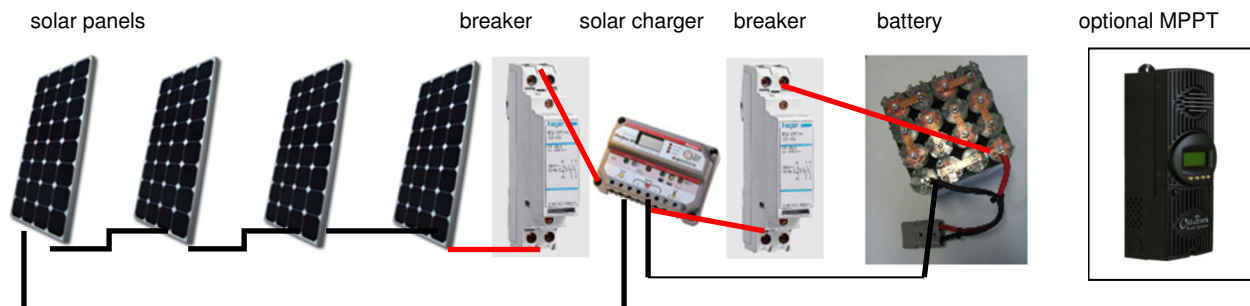
59 Volts max. charge voltage	Lithium 3.7 volts/cell
54 Volts floating	Lithium 3.4 volts/cell



### 14.2) Charging with solar power

Charging your batteries with solar power is the perfect solution for the all4solar concept of sustainable boat propulsion. Either you mount light weight panels on your boat or use a fix solar system on shore.

Any type of photovoltaic solar panels can be used, but we recommend a minimum power of 200 Watts (4 x 12 Volts nominal / 50 Watts in series). Please note, that at full sunshine a 48 V / 100 Ah battery pack needs 2-3 days for a 50% charge with a 200 watt (4 x 50 watt panels) solar system.



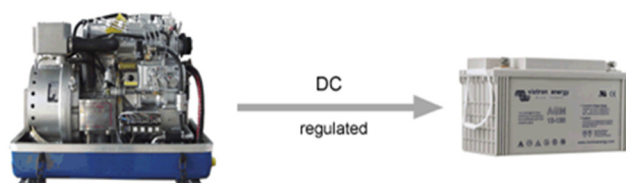
We recommend that you install an automatic circuit breaker between the battery and the solar charge controller and between the solar charge controller and the solar panel (Either DC breakers or 250 V AC automatic breakers).

Do not connect the solar panels directly to the batteries always use either a charge controller (48 V DC) or a Maximum Point Power Tracker System MPPT (to optimize the solar power output).

All4solar is not responsible for any installation of batteries or battery charge systems on your boat. Always contact a specialized or authorized (if applicable) installer prior to any installation or purchase.

### 14.3) Generators

The generator should be suitable to charge the DC voltage or to supply the 240 V battery charger. Remote control option with battery monitor available.



## 14.4) Solar panels

There are different types of photovoltaic solar panels on the market. The sunlight has a maximum power of 900 – 1100 Watts per m<sup>2</sup> when shining on a surface. If 10% can be converted to electricity, that means that about 90 – 110 Watts output can be produced per m<sup>2</sup> of solar panels.



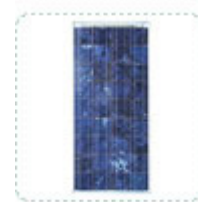
### Mono Crystalline

High efficiency – converts upto 20 % of solar light  
To use if only limited surface is available (f.e. on a boat)  
Best solution for a fix long term installation



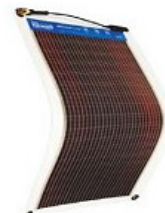
### Poly Crystalline

Less efficiency – converts upto 16 % of solar light  
Somewhat cheaper than mono crystalline – needs more space  
Economic solution for fix long term installation



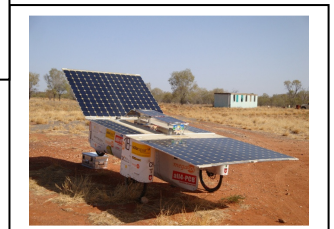
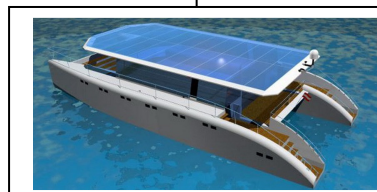
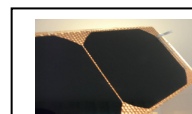
### Thin film

Converts between 5 – 10% of solar light  
Very light and flexible constructions possible  
Many different types available  
Best solution for transportable systems or mounting on vehicles



### Individual solar panels

Can convert upto 28% of the sunlight  
Very light and flexible constructions possible  
For integrated projects  
More expensive solution



## 14.5) Wind generators

Wind generators generate free power for 24 hours and are the ideal solution in combination with a solar pv system.

Silentwind offers high tech wind generators which are not only light and quiet, but also very efficient. The system includes the controller which can be directly attached to the all4solar battery- and electric propulsion systems.

[www.silentwind.com.au](http://www.silentwind.com.au)



Example power calculation:

600 watt / 48 volt DC system

10-14 knots wind output average 300 watts over 24 hours = **7.2 KW**

## 15) CE conformity declaration for aquawatt electric – outboard motor

According to EU-directive 98/37/EG

Valid for motor type AB13R and AB13 T / AB22R and AB22T / AB22 Thruster

**Manufacturer:** D.H. Seebacher – Mechatronik, Wasserstrasse 1 ,  
9062 Moosburg Austria

**Type of machine:** Electric outboard motor

### The machine complies with the following regulations:

EG 98/37/EG (mechanics) Inspection authority Amitri Veritas 0463  
73/23/EWG changed by RL 93/68/EWG ( E – motor )

The E – motor complies with :  
EN 60204-1, EN 50081-2 EN 50082-2

The electronic controller complies with :  
EMC emission EN 50081-2/08.93, EN 12895/2000  
EMC Imunity : EN 50082-2 1995  
Safety EN 1175  
UL listed Ref. AU1841, complies with UL 583 dielectricity

### The conformity declaration is subject to the following conditions:

The electric outboard motor may only be used with boats and with connected to batteries which are secured by a safety switch.

The cables have to be equipped with suitable fuses. Positive and negative cables are to be installed side by side.

The motor may only be powered by batteries and not by generators, chargers etc.

  
Dieter Seebacher