

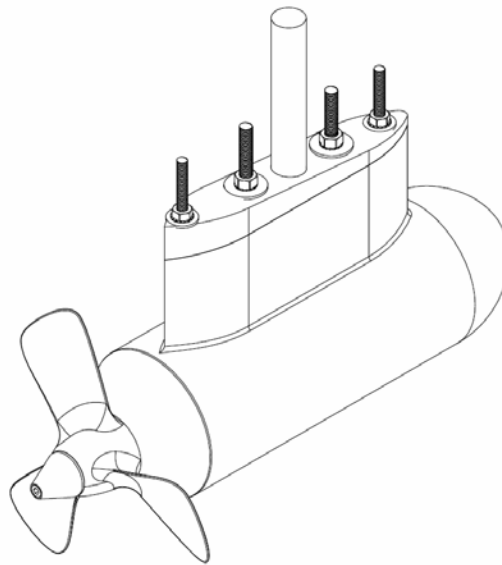
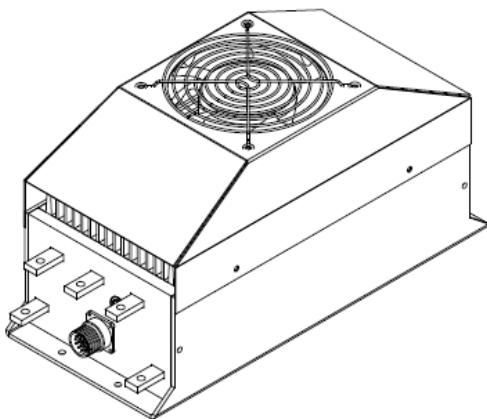


USER MANUAL

PodMaster

4.2, 6.5 & 10

ELECTRIC PROPULSION SYSTEM



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1 GENERAL INFORMATION

1.1 USE OF THIS MANUAL

Copyright © 2011 Mastervolt. All rights reserved.
Reproduction, transfer, distribution or storage of part or all of the contents in this document in any form without the prior written permission of Mastervolt is prohibited.

This manual contains important safety and operating instructions for the safe and effective operation, maintenance and possible correction of minor malfunctions of the PodMaster.

It is therefore obligatory that every person who works on or with the PodMaster is completely familiar with the contents of this manual, and that he/she carefully follows the instructions and important safety instructions contained herein.

Installation and maintenance of the PodMaster systems may only be performed by qualified and authorized personnel, in accordance with regulations and in compliance with the mentioned safety measures.

Keep this manual in a safe place!

1.2 VALIDITY OF THIS MANUAL

All of the specifications, provisions and instructions contained in this manual apply solely to standard versions of the PodMaster delivered by Mastervolt.

For other models see other manuals available on our website: www.mastervolt.com.

1.3 GUARANTEE SPECIFICATION

Mastervolt guarantees that this unit has been built according to the legally applicable standards and specifications. Should work take place, which is not in accordance with the guidelines, instructions and specifications contained in this user manual, then damage may occur and/or the unit may no longer meet its specifications. All of these matters may mean that the guarantee becomes void.

The guarantee is limited to the costs of repair and/or replacement of the product. Costs for installation labor or shipping of the defective parts are not covered by this guarantee.

During production and before delivery, all equipment is tested and inspected. The standard warranty period is two years after purchase.

1.4 LIABILITY

Mastervolt can accept no liability for:

- Consequential damage due to the use of the PodMaster;
- Possible errors in the manuals and their consequences.

2 SAFETY GUIDELINES AND MEASURES

2.1 WARNINGS AND SYMBOLS

The following warning, caution and attention symbols are used in this manual.

**WARNING!**

A WARNING refers to possible injury to persons if the user does not (carefully) follow the procedures.

**CAUTION!**

A CAUTION sign refers to possible significant damage to the equipment if the user does not (carefully) follow the procedures, restrictions and rules.

**ATTENTION!**

An ATTENTION sign refers to procedures, circumstances, etc. which deserve extra attention.

2.2 USE FOR INTENDED PURPOSE

The PodMaster may only be used for ship propulsion and according to the installation, operation and maintenance instructions of this manual.

2.3 GENERAL SAFETY AND INSTALLATION PRECAUTIONS

- Read this manual thoroughly before installing and/or using the electric components;
- Follow the assembly instructions carefully;
- Only work with the controller when the drive is switched off. It is important to switch off the power supply of the electric drive with the main switch. Remove the key and keep it with you so that nobody else can turn it back on;
- Be aware of your speed. The speed is often underestimated because of the lack of sound;
- Be alert to your surroundings; silent sail means that others can hardly hear you.

2.4 WARNING REGARDING LIFE SUPPORT APPLICATIONS

The PodMaster is not intended for use in any medical equipment that is intended for use as a component of any life support system unless a specific written agreement pertaining to such intended use is executed between the manufacturer and Mastervolt. Such agreement will require the equipment manufacturer either to contract additional reliability testing of the PodMaster and/or to commit to undertake such testing as a part of the manufacturing process. In addition, the manufacturer must agree to indemnify and not hold Mastervolt responsible for any claims arising from the use of the PodMaster in life support equipment.

2.5 WARNING REGARDING THE USE OF BATTERIES

Pay attention to the following when working with batteries:

- Someone should be within hearing range or close enough to come to your aid when you work near a lead-acid battery;
- Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes;
- Wear complete eye protection and clothing protection. Avoid touching eyes while working near a battery;
- If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters the eye, immediately flood the eye with cold running water for at least 10 minutes and get medical attention immediately;
- NEVER smoke or allow a spark or flame in the vicinity of a battery or engine;
- Do not short circuit batteries, as this may result in an explosion and fire hazard! Take extra care to reduce the risk of dropping a metal tool onto a battery. It might spark or short-circuit the battery or other electrical part and it may cause an explosion;
- Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a battery. A battery can produce a short-circuit current that is high enough to weld a ring or anything like it, to metal, causing a severe burn;
- NEVER charge a frozen battery;
- Excessive battery discharge and/or high charging voltages can cause serious damage to batteries. Do not exceed the recommended limits of the discharge level of your batteries;
- If it is necessary to remove a battery, always remove the grounded terminal from the battery first. Make sure all accessories are off, so as not to cause an arc;
- Be sure that the area around the battery is well ventilated while the battery is being charged. Refer to the recommendations of the battery manufacturer;
- Batteries are heavy! It may become a projectile if it is involved in an accident! Ensure adequate and secure mounting and always use suitable handling equipment for transportation.

3 HOW IT WORKS

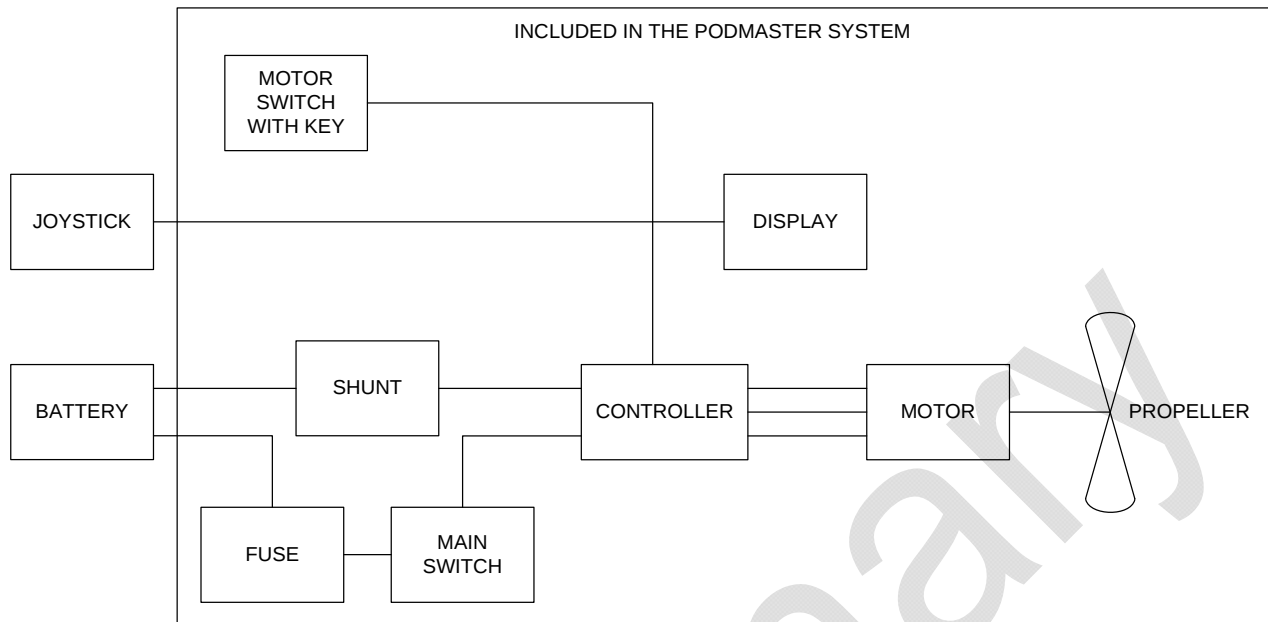


Figure 1: System block diagram

3.1 PODMASTER SYSTEM

The diagram of Figure 1 gives a simplified view of the PodMaster system.

The battery pack supplies energy. The controller is the key element in the system. It manages operation, protection and information.

The motor with propeller provides the thrust for the propulsion. The motor consists of a seawater resistant aluminum body.

The system is operated by the joystick and the key switch. The joystick gives speed and direction information to the controller so it can give the right amount of power to the motor. With the key switch the system is turned on and off and its operating mode is selected.

Information about the motor speed, remaining battery charge, estimated remaining time of sailing, battery voltage, controller and motor monitoring and more is shown on the display.

Furthermore, there is a fuse for protection and a main switch for powering on and off. The shunt measures the current from and to the controller.

3.2 COMPONENTS

The PodMaster has the following components:

- Controller
- Submerged (pod-) AC synchronous motor, complete with 3-blade bronze propeller
- Display
- Key switch
- Shunt
- Fuse
- Main switch
- Several connection cables

Please check the contents of the box before you start with the installation. If any of the items is missing, please contact your supplier.

3.3 CONTROLLER AND MOTOR

The PodMaster controller is used to control and monitor the operation of the synchronous motor that is specifically developed for low voltage.

The controller also has software that allows various properties of the drive to be set. Some of these properties are:

- Maximum speed in various operation modes
- Joystick calibration
- Auto tuning and self-test functions
- Battery management

These properties and many others have already been set by Mastervolt.

3.4 DISPLAY, JOYSTICK AND KEY SWITCH

The display serves as a graphical interface between the user and the controller. The user can set and monitor a range of parameters such as:

- Current motor speed
- Battery voltage
- Battery current
- Motor current
- Remaining time of sailing at current consumption
- etc.

At the same time, the display tracks the state of charge (SOC) of the battery and has a built-in safety system that informs the user of errors.

The key switch is a three position switch that switches between the operation modes (Off – Drive – Eco / Regeneration).

The joystick is a lever which can be turned clockwise and counter-clockwise to move forward or backward. The settings can be adjusted to the preferred location in the boat.

There are several types of joysticks available, which is why the joystick is not a standard part of the system. In this manual a standard joystick is used as an example. Refer to the ordering information in chapter 9 for alternative types.

3.5 MAIN SWITCH, FUSE AND SHUNT

The main switch is mounted between the fuse and the motor controller in order to disconnect the batteries during emergencies and maintenance. The fuse is connected to the plus pole of the battery.

The shunt is mounted between the minus pole of the battery and controller. The shunt measures the current power consumption which is used by the display to show the current performance, battery state of charge and remaining sailing time.

3.6 CONNECTION CABLES

Figure 1 gives a simplified view of the components of the PodMaster with its cabling connections.

4 OPERATION

4.1 SWITCHING ON AND OFF

The motor is switched on by turning the key clockwise in the key switch and the system is switched off by turning the key counter-clockwise to the "off" position.

The key switch has three positions:
(From left to right position)

- Off: the motor is switched off;
- Drive: the full power of the motor is available;
- Economy/Regeneration: in Economy mode, the maximum speed of the motor is reduced, as well as the maximum power.



WARNING!

It is possible to switch between the two power programs while the motor is running. Be aware that switching from "Economy" to "Drive" will increase the speed of the motor and thus of the boat instantly.

4.2 USE OF THE DISPLAY

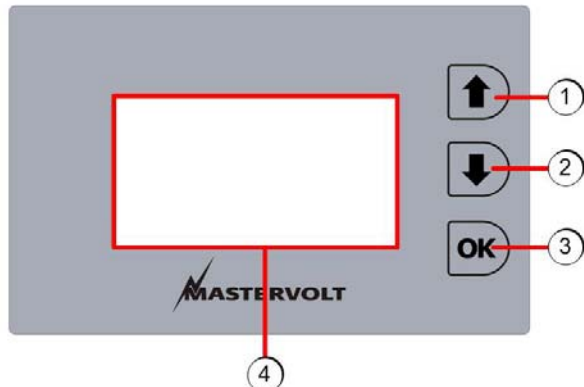


Figure 2: Display buttons and information area

Display buttons and information area:

1. Button UP
2. Button DOWN
3. Button OK
4. Information area

Standby mode

After the battery power is initialized, the display will be in the standby mode. From this standby mode, there are two operating modes:

- Setup personal preferences
- Normal operation:
 - Drive / Economy mode
 - Sleep mode

4.2.1 SETUP PERSONAL PREFERENCES

Before the display can be used, it must be properly configured to suit personal preferences. To enter the setup mode, press the OK button (Figure 2) and hold it while you (re-) start the system with the key switch.

To leave the setup mode, turn the key switch to the "off" position.

Navigation through parameter pages

Navigation is done using UP and DOWN (Figure 2) to select the next parameter. The parameter with focus will have a browse sign (>) in front of the value.

When you reach the last parameter on the page, press DOWN again to go to the next page. Or if you have reached the first parameter on the page, press UP to go to the previous screen. Holding UP or DOWN longer will let you jump to the next page directly without stepping through the parameters.

Edit the parameter

To edit parameters you have to enter a Write-access PIN code on the second page. Without the PIN code you can still browse through the parameters on the pages. However, you cannot change them. Only page 1 can be edited without a PIN code.



ATTENTION!

For a detailed description of all the parameters, see chapter 5.9.

Edit the parameter:

1. Press OK to edit the parameter.
The value to be edited will appear color inverted.
2. Change the value using the UP and DOWN keys.
3. Press OK to save the value.
4. Perform steps 1 till 3 to proceed with other parameters.

When an ON-OFF parameter is selected, just press OK to change the value. The value is 'ON' when the box is checked (☑).

4.2.2 NORMAL OPERATION

Drive / Economy mode

The Drive or Economy mode is switched on and off using the key switch without pressing any buttons while switching.



ATTENTION!

Make sure that the joystick is in the neutral position when you start the system. If not, the unit will show an error message.

In the drive mode, the display area has three different information pages, which can be scrolled between with the UP and DOWN keys:

- Main screen
- Battery information screen
- Controller information screen

Main screen:



Figure 3: Main information screen

1. Speed value (RPM)
2. Speed, direction and economy mode indication (RPM)
 - Arrow pointing up = forward
 - Arrow pointing down = backward
 - E = Economy mode
3. Remaining battery charge (State-of-charge)
4. Battery current
5. Estimated remaining time of sailing
6. Status line
 - 1st pos:
 - OK = Normal operation
 - REG = Regeneration mode
 - TRIP = Over voltage protection active
 - LOW = Low battery
 - 2nd pos: Background lights indicator
 - 3rd pos: display supply voltage

ATTENTION!

After not pressing any buttons on the Battery or Controller Information screen for 30 seconds, it will automatically return to the Main Screen. This can be changed on parameter page 1 (auto-return).



Battery information:

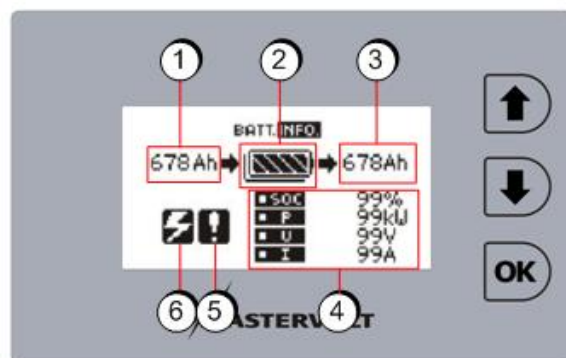


Figure 4: Battery information screen

1. Charged charge (Ah)
2. Remaining charge indicator
3. Used charge (Ah)
4. Battery measurements
 - SOC (remaining State of Charge) in %
 - P (Power) in kW
 - U (voltage) in Volts
 - I (current) in A
5. Low battery indicator
6. Charging indicator

Controller information:

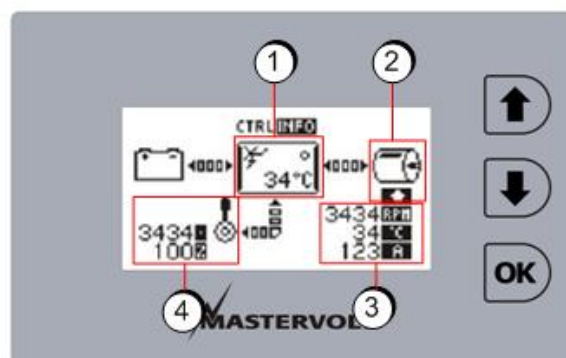


Figure 5: Controller information screen

1. Controller status
 - Bridge-on status indicator (red light)
 - Temperature in °C
2. Motor direction indication
 - Arrow pointing up = forward
 - Arrow pointing down = backward
3. Motor measurements
 - Speed in RPM
 - Temperature in °C
 - RMS current in A
4. Joystick position
 - • = position in quants
 - % = position forward (positive) or backward (negative) in percentage

Sleep mode

If there was no action from the user and the joystick is in the neutral position, then the display will go into sleep mode after a set period of time. This set period of time can be configured on parameter page 3 (see chapter 5.9), but as a standard, the sleep mode is disabled.

In the sleep mode, the display is turned off, but it still remains active and monitors the battery voltage and current. Before it goes into sleep mode, it also disables the controller to save energy.

Return from sleep mode to drive mode

The sleep mode has to be switched off with the key switch to return to the stand-by mode, before it can be switched on again for the drive mode.

4.2.3 ALARM / ERROR CODES

The notification system informs you if there is something wrong with any part of the system. When such an error occurs, a message will appear on the display screen, titled "NEW MESSAGE".

When you have read the new message, confirm this with the OK button (see Figure 2). If there are any other messages, they will also be displayed. You will have to press OK to confirm them, until you will finally return to one of the three screens.

If you wish to see which errors are still present, press OK on any of the screens. You will now be able to browse the messages. The screen will be titled "Message List". Press the UP and DOWN keys to scroll between the messages.



ATTENTION!

When the cause of the error is removed, the message will automatically be deleted from the message list.

See chapter 7 for a list of all error messages.

4.3 USE OF THE JOYSTICK

The desired power and speed can be adjusted in forward and backward direction with the joystick, by turning it over the full stroke. This happens without intermediate steps.

Figure 6 shows the joystick with the default forward (clockwise) and backward (counter-clockwise) operation.

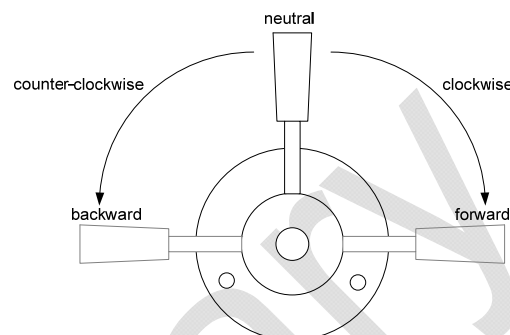


Figure 6: Use of the joystick

4.4 DEPARTURE

Before departure, always check the system for correct functioning.

Follow these steps before departure:

1. Disconnect the shore connection.
2. Turn the main switch to the ON position
3. Put the joystick in the neutral position.
4. Turn the key switch ON and choose the power program (Drive or Economy).
5. Check the battery condition.
6. Check the system's forward and backward.

4.5 ARRIVAL

Follow these steps after arrival:

1. Put the joystick in the neutral position.
2. Check the battery condition.
3. Turn the key switch to the OFF position.
4. Optional: Turn the main switch to the OFF position.
5. Connect the shore connection and make sure it works properly.
6. Recharge the batteries after arrival.

4.6 CHARGING BATTERIES

When charging the batteries, the display will give two confirmation beeps and will present the Battery Information screen (see page 10). Charging can be recognized from the blinking arrow that symbolizes charged Ah. After the charging is completed, the display returns to the standby mode.



ATTENTION!

Only connect the system to the batteries after they have rested for a couple of hours without any load. Otherwise, the SOC value will only be correct after the first full charge.

5 INSTALLATION

During installation and commissioning of the PodMaster, the safety instructions of chapter 2 must be followed.

5.1 GENERAL CONSIDERATIONS

The following points must be considered for safe installation and to make the (electric) sail real quiet.

- There must be enough space (at least 15% of the propeller diameter) between the propeller and the hull;
- Bolts must be tightened firmly and with an even pressure;

5.2 COMPONENTS

See the block diagram in chapter 3 and the wiring diagram in section 5.7.

5.3 CONTROLLER

Note the following when installing the controller:

- The controller must be mounted in a dry and accessible location in the boat;
- Make sure that the controller is well protected;
- Prepare for unforeseen circumstances like leakage. Suggestion: place a bilge pump;
- Take note of the length of the motor cables since these cables must not be shortened or extended;
- Never install a controller near (or in the same location) a so-called wet / open battery;
- Make sure that there is adequate ventilation and do not cover up the intake and outlet opening;
- The controller must be able to take in enough cool air;
- Ensure that the intake opening cannot be blocked.

After the most suitable location in the boat has been determined, the controller can be mounted in place.

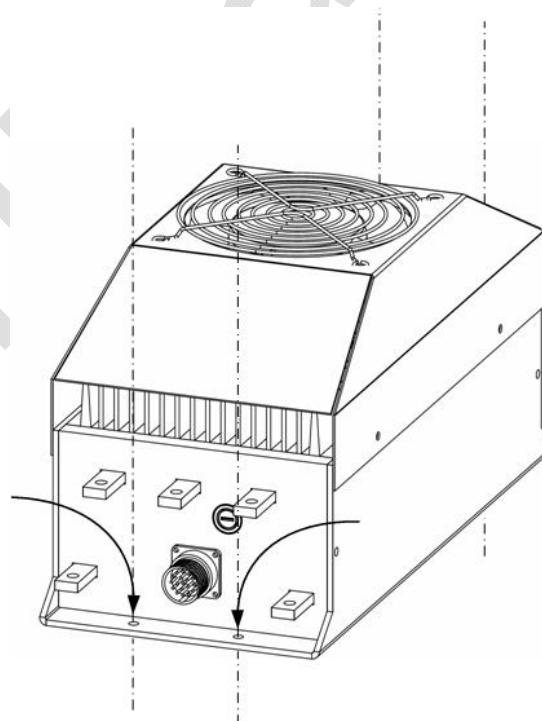


Figure 7: Mounting the controller

The controller must be mounted using four bolts, as shown in Figure 7.

See chapter 8 for the controller dimensions.

5.4 MOTOR

A PodMaster electric drive system is quiet and has little vibration when installed correctly. In order to achieve this, pay close attention to the placement of the motor.

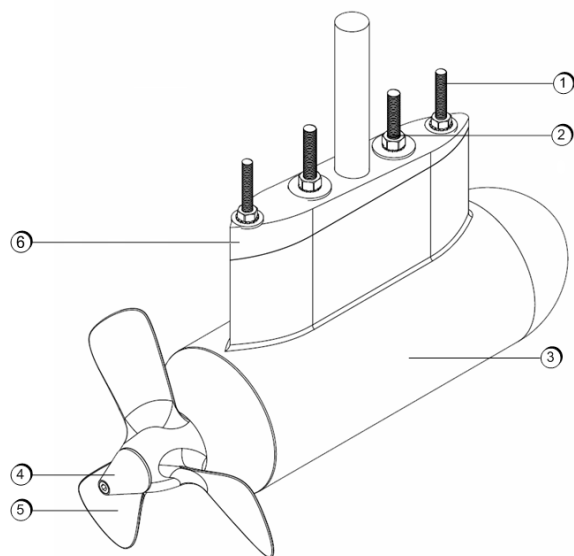


Figure 8: The PodMaster motor

1. M10 threaded stud and nut (2x)
2. M12 threaded stud and nut (2x)
3. Motor
4. Propeller anode
5. 3-blade bronze propeller
6. Angled rubber flange

The motor must be installed by qualified personnel. Below are some support guidelines for installation. First two preparatory actions need to be taken:

1. A sufficiently reinforced hull section needs to be prepared to mount the motor to, using the 2 M10 and 2 M12 bolts as indicated in Figure 8 (dimensions are given in Chapter 8.2)
2. The angled rubber flange needs to get the proper inclination to ensure most efficient operation of the motor. This efficient operation is achieved when the PodMaster motor is placed horizontally in the water in normal operation. As the hull might have an angle with respect to horizontal at the location the motor is mounted, the inclination of the rubber flange needs to be adjusted to the hull. Figure 9 shows how the proper inclination of the flange can be determined:
 - Hold the motor horizontally below the hull while the hull is positioned as it would normally be in the water.
 - Measure dimensions *a* and *b* as indicated in Figure 9 (the rubber flange is taken off during this measurement)
 - The height difference over the length of the rubber flange should be the same as $a - b$.

When the proper inclination of the rubber flange has been determined, there is two ways to get the right it onto the flange:

- Machining it with a saw. The saw needs to have sufficiently large teething in order to prevent the rubber (polyurethane) material from clogging the teeth during the cutting.
- Buying a standard 1cm, 2cm or 3cm inclined rubber flange through Mastervolt (see Chapter 9 for details).

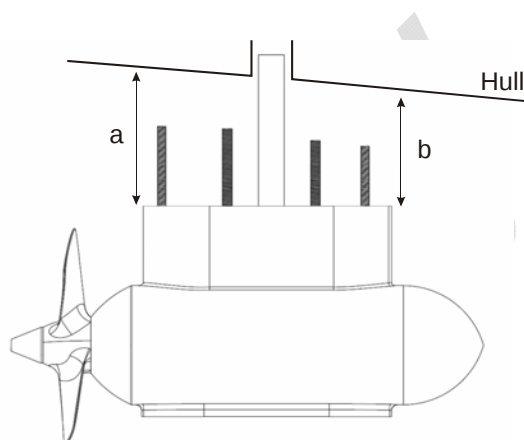


Figure 9: Measuring optimal inclination for rubber flange

After these preparations, mounting the motor is done as shown in Figure 10:

3. Place the motor with the rubber flange on top below the hull and fix it to the hull by the 4 nuts on the threaded studs.

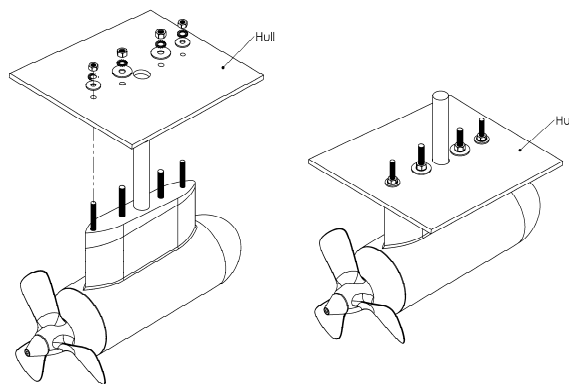


Figure 10: Mounting the motor

See chapter 8 for the motor dimensions.

5.4.1 ANODE PROTECTION

When two different metals are physically or electrically connected underwater, a current will flow between these two metals. The electrons that make up that current are supplied by one of the metals giving up bits of itself, in the form of metal ions. This is called galvanic corrosion and it destroys underwater metals.

The most common galvanic corrosion is present in case of a bronze or aluminum propeller on a stainless steel shaft, but other metal (motor) housings are also at risk. The best way to prevent galvanic corrosion is to add a third metal into the circuit, one that is potentially more reactive than the other two metals. This piece of metal is called a sacrificial anode.

With the PodMaster system, one sacrificial anode is included to protect the propeller. This is an aluminum anode and is to be placed on the shaft.

ATTENTION!

To protect the seawater resistant aluminum (AlMg-5) motor housing, a second (set of) sacrificial anode(s) needs to be placed on the boat near the motor housing and needs to be electrically connected to that motor housing. This anode is not provided with the system as the proper choice of anode depends on environment (water) conditions and other material use on the boat.

In general, we recommend:

- in fresh water: magnesium anodes
 - in brackish water: aluminum anodes (Mil-A-24779 SH)
 - in salt water: zinc anodes (Mil-A-18001K).
- Nevertheless it is always recommended to directly consult an expert (Mastervolt or your local expert on anode protection) on the specific situation at hand.

CAUTION!

Beware that properly placing a sacrificial anode on your boat to protect the aluminum motor housing is essential and failure to do so might cause severe damage to your system.

Damage to the motor caused by galvanic corrosion is not covered by our product warranty.

5.5 DISPLAY

The display is usually mounted in the control console of the boat. The location of the display is not critical, but it is important that rain water does not stay on the display, but can run off. Vertical or diagonal installation is recommended. This does not apply to an indoor arrangement.

The display requires a rectangular 122 mm by 76 mm (width by height) panel cut-out.

1. Place the display in the cut-out panel (see Figure 11).
2. Fix the U-shaped bracket at the back side of the display on the two threads using nuts.
3. Tighten the nuts until the display is well fixated to the panel.

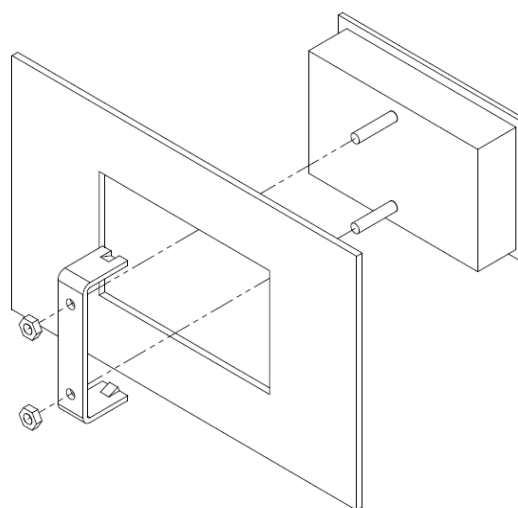


Figure 11: Mounting the display

See chapter 8 for the display dimensions.



5.6 JOYSTICK

The joystick can be mounted at any desired location.

Note the following:

- The Mastervolt joysticks are splash water proof only. Therefore the joystick may not be continuously in contact with water. Position the joystick correctly;
- The lever has to be able to rotate freely in both directions;
- Choose the location carefully so the risk of accidental turning the lever is minimal.

The joystick is not included in the system. For ordering information, see chapter 9.

5.7 WIRING

Each system has the following wiring:

- Pre-assembled motor cables
- Pre-assembled signal cable
- Main battery power connections, including the shunt, fuse and main switch

The power cables for connecting the batteries to the controller are not included in the delivery.

The connection of the cables is explained in the following sections. Connect the cables in the following order:

1. Connect the motor cables.
2. Connect the signal cables.
3. Connect the battery power cables.

See the block diagram in Figure 2 and the wiring diagram in Figure 12.

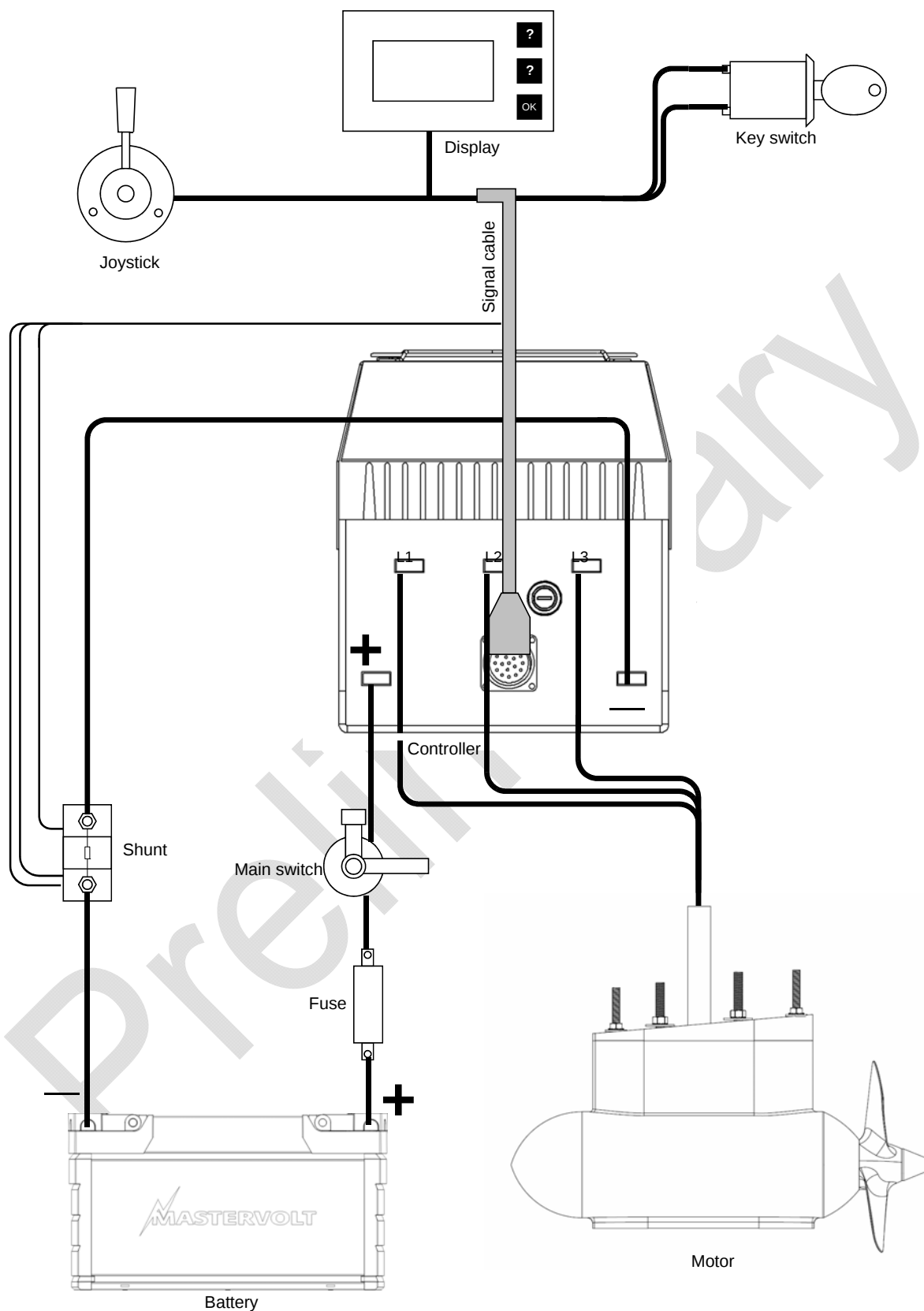


Figure 12: Wiring diagram

The battery and joystick are not included in the system. For ordering information, see chapter 9.

5.7.1 CONNECTIONS TO CONTROLLER

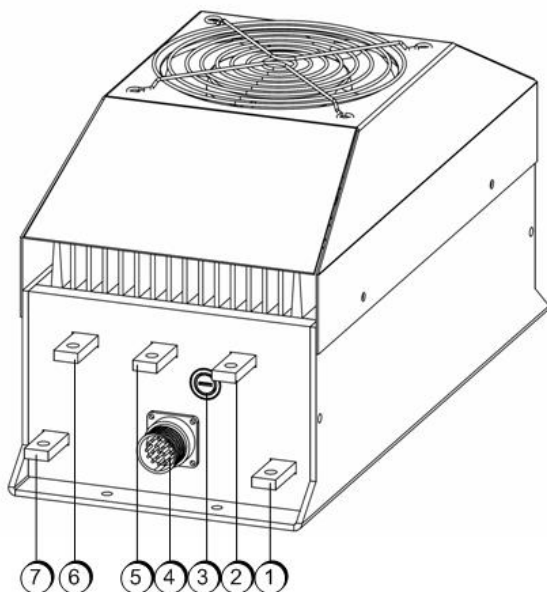


Figure 13: Connecting the controller

Figure 13 shows an overview of the connection points on the controller. These connections are:

1. – Pole of battery
2. Motor connection
3. Fuse holder
4. 19-pin connector for display, joystick and key switch
5. Motor connection
6. Motor connection
7. + Pole of battery

5.7.2 CONNECTING MOTOR CABLES



CAUTION!

Motor cables must not be shortened or extended.



CAUTION!

Connections can be preserved with acid-free Vaseline.

Connect the pre-assembled motor cables to the three motor connections (L1, L2 and L3) on the controller. The ends of the cables can be mounted to the controller by M6 bolt/nut combinations.

5.7.3 CONNECTING SIGNAL CABLE

After the display, joystick and key switch have been installed, they have to be connected. The signal cable provides the following connectors.

At one end:

- For the display: Molex 12-pin and Molex 10-pin connector;
- For the key switch: Molex 6-pin connector;
- For the joystick: 3-pin connector.

At the other end:

- For the temperature sensor cable: Molex 6-pin connector;
- For the controller: 19-pin plug (see Figure 14).



CAUTION!

Make sure you do not mistake the connector of the joystick for the 3-pin Molex connector of the Ubatt.

Display, key switch, joystick

Connect the display, joystick and key switch with the pre-assembled (Molex) connectors. The Molex connectors on the display can be found on the back side.

Controller

Connect the 19-pin plug (see Figure 14) with the 19-pin connector at the front side of the controller (see Figure 13, number 4). Lock the connector by turning the chrome ring a quarter of a stroke.

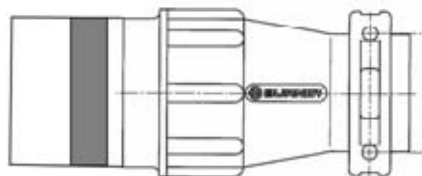


Figure 14: Connector for signal cable



CAUTION!

CAN-bus control signals are transferred through this cable. Therefore, never run this cable along power cables or 230 Volt wiring.

Secure cables properly; loose cables can eventually cause malfunctions.

5.7.4 CONNECTING BATTERY CABLES

**WARNING!**

Make sure that when connecting the battery and the controller, the fuse has been removed and/or the main switch is switched off.

Notice the following when connecting the cables to the batteries:

- The positive terminal is marked with a plus sign on the controller and the negative terminal is marked with a minus sign;
- The main switch must be mounted at an accessible location between the fuse and the controller, so that the system can be disconnected from the battery in case of an emergency or in case of maintenance;
- The fuse must be placed as close as possible to the battery to ensure maximum wiring protection;
- The + cable runs from the battery to the fuse and the – cable runs from the battery to the shunt.

Refer to your battery manual for more information about the connection and location of the battery.

The power cables are connected to the controller by M6 bolt/nut combinations.

5.7.5 BEFORE SWITCHING ON THE POWER

Follow these steps after installation and before switching on the power:

1. Check all connections again.
2. Check the voltage of the battery.
3. After you are convinced that everything has been properly connected, turn the main switch on.

5.8 CALIBRATION

On Page 6 of the parameter setup (see page 22) the joystick can be calibrated. The neutral position of the joystick and how far you must move the joystick to reach full RPM can be set.

The values can only be changed by moving the joystick itself. They cannot be changed with the UP and DOWN keys. The position of the joystick is measured in small steps, called quants. The joystick can occupy any up to 1024 positions of the quants.

Calibrate the joystick in the following way:

1. Put the joystick in the physical neutral position.
2. Select the 'Neutral' parameter in the joystick setup mode and press OK.
3. Put the joystick in the desired forward position.

ATTENTION!



When calibrating, the display will recognize automatically if the joystick is mounted on the right or left side of the boat.

4. Select the 'Max forward' parameter in the joystick setup mode and press OK.
5. Put the joystick in the desired backward position.

ATTENTION!



It is only allowed to move the joystick in the opposite direction of the forward position.

6. Select the 'Max backward' parameter in the joystick setup mode and press OK.

The joystick is now calibrated and ready for use.

Setting the backlash

The small area near the neutral position is called 'backlash'. The purpose of this area is to compensate for mechanical construction of the joystick. After calibrating the joystick, the settings of the backlash area is compensated automatically.

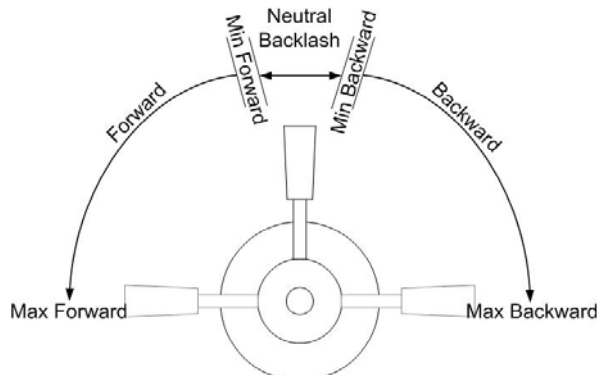


Figure 15: Setting the joystick backlash

5.9 COMMISSIONING

PIN code

To edit parameters you have to enter the Write-access PIN code on the second page. Without the PIN code you can still browse through the parameters on these pages. However, you cannot change them. Only page 1 can be edited without a PIN code.

The PIN code for the PodMaster is 4134.

To enter the PIN code:

1. Press OK to enter the edit mode.
2. Select the first digit with UP and DOWN.
3. Press OK to proceed to the next digit.
4. Repeat until all the digits are entered.

If you entered a valid PIN code, you will be granted permission to edit. If not, you have to wait 30 seconds to try again. Once a valid PIN code is entered, the field will show OK.

Edit the parameter

If you have permission to change the parameters, the edit sign (➤) in front of the parameter value will be shown.

Edit the parameter:

1. Press OK to edit the parameter.
The value to be edited will appear inverted.
2. Change the value using the UP and DOWN keys.
3. Press OK to store the value.
4. Perform steps 1 till 3 to proceed with other parameters.

Not all parameters can be directly edited with the UP and DOWN keys. An open arrow sign (⇨) in front of the parameter value indicates a value needs to be calibrated.

When an ON–OFF parameter is selected, just press OK to change the value. The value is 'ON' when the box is checked (☑).

Page 1 – User Setup (without PIN code)

- Language: choose language of preference
Range: ENG / DEU
- Contrast: select contrast of LCD module
Range: 0 – 80
- Backlight (always on): backlight for LCD module
Range: ON / OFF
- Speaker: turn speaker on or off
Range: ON / OFF
- Auto-return: automatically return to main screen
Range: ON / OFF
- Serial number: serial number of the display.
Read-only
- Firmware version: software version of the display unit.
Read-only

Page 2 – Battery Setup (with PIN code)

- Batt. Ah C/20: total capacity of the battery pack, measured for 20h discharge rate.
Range: 1Ah – 1999Ah
- Peukert: rate of discharge affecting remaining charge in the battery. Typical value is 1.13 for Lead-Acid batteries and 1.02 for Lithium batteries.
Range: 1.00 – 1.49
- Charging ends at voltage: voltage at which the display detects end of charging when charging current is lower than end of charging current and restores charging counter to 100%.
Range: 1.0V – 340.0V
- And current: current threshold at which the display detects end of charging when charging voltage is greater or equal to charging end voltage and restores charging counter to 100%.
Range: 0.1A – 9.9A
- Ubatt at 50%: battery voltage at which the remaining charge in the battery is at 50%. the display has a fixed programmed battery voltage to State-of-charge relation.
Range: 1.0 – 300.0V

Page 3 – System Setup (with PIN code)

- Charging threshold: current at which the display considers that the battery is being charged.
Range: 0.1A – 9.9A
- Discharging threshold: current at which the display considers that the battery is being discharged.
Range: 0.1A – 9.9A
- dU/dt threshold: reserved for future use
- Shunt: current flowing through shunt resistor that produces voltage drop of 50mV. You should never overload the shunt resistor.
Range: 20 – 600A
- Standby after: set time for sleep mode
Range: (mm:ss) 00:01 – 59:59 (--- Off)

Page 4 – Low Battery SOC Alarm (with PIN code)

- SOC alarm ON: remaining charge in the battery when low-battery alarm should go on.
Range: 00 – 90% (Set 00 for Off)
- SOC alarm OFF: remaining charge in the battery when low-battery alarm should go off. When it is set lower than the “SOC Alarm on”, the parameter is ignored.
Range: 00 – 90%
- Min On Time: minimum time alarm stays activated.
Range: (hh:mm) 00:01 – 12:00
- Max On Time: maximum time alarm stays activated.
Range: (hh:mm) 00:01 – 12:00
- Enable MSG: low battery SOC alarm message display
Range: ON / OFF
- Enable ECO: ECO mode with low battery SOC alarm. Torque ctrl mode must be switched on.
Range: ON / OFF
- Enable RE2: low battery alarm RE2 output.
Range: ON / OFF

Page 5 – Battery Low Voltage Alarm (with PIN code)

- Alarm ON: when the battery voltage has fallen below this value, the low-battery alarm will be activated.
Range: 0.0 – 340.0V
- Alarm OFF: battery voltage threshold when low-battery alarm is released.
Range: 0.0 – 340.0V
- On delay time: time the low battery “alarm ON” condition must be met before the alarm is activated.
Range: 0 – 300s
- Min on: minimum time that the alarm relay stays activated
Range: (hh:mm) 00:01 – 12:00
- Enable MSG: low battery voltage alarm message display
Range: ON / OFF
- Enable ECO: ECO mode with low battery voltage alarm. Torque ctrl mode must be switched on.
Range: ON / OFF
- Enable RE2: low battery alarm RE2 output.
Range: ON / OFF

Page 6 – Throttle (Joystick) Setup 1/2 (with PIN code)**ATTENTION!**

For actual calibrating, see section 5.8.

- Neutral: neutral position for joystick.
Range: 1 – 1023
- Max. forward: full RPM or torque in forward position
Range: 1 – 1023
- Max. backward: full RPM or torque in backward pos.
Range: 1 – 1023
- Backlash: manual correction of joystick backlash
Range: 0 – 99
- Q-filtering: when enabled, small changes of joystick value due to electric noise are ignored.
Range: ON / OFF

Page 7 – Throttle (Joystick) Setup 2/2 (with PIN code)

- Fwd speed: speed of the motor when full forward is selected with joystick.
Range: 1 – 9999 RPM
- Bwd speed: speed of the motor when full backward is selected with joystick.
Range: 1 – 9999 RPM
- ECO speed: speed of the motor when ECONOMY mode is selected.
Range: 1 – 9999 RPM

**WARNING!**

ECO speed must always be lower than any other maximum speed value.

ECO speed does not apply when sailing in the Torque drive mode.

- FWD torque: torque of motor when full forward torque is selected with joystick. Only active when "Torque ctrl" mode is set.
Range: 0.1 – 999.9 Nm
- BWD torque: torque of motor when full backward torque is selected with joystick. Only active when "Torque ctrl" mode is set.
Range: 0.1 – 999.9 Nm
- Torque ctrl mode: drive motor torque instead of speed mode (RPM)
Range: ON / OFF

**WARNING!**

If the Torque drive mode is switched OFF, make sure that the Forward and Backward speed have correctly been configured.

If the Torque drive mode is switched ON, make sure that the Forward and Backward torque have correctly been configured.

Page 8 – Regen Setup (with PIN code)

- Ov speed trip: maximum allowed motor speed during generator mode.
Range 1 – 9999 RPM
- Regen torque: maximum braking torque during REGEN mode.
Range: 0.1 – 999 Nm

**CAUTION!**

The REGEN torque should be lower than the nominal motor torque to prevent motor damage.

- Max batt volt: maximum voltage for braking torque
Range: 0.1 – 399.9V
- Gain: rate at which applied braking torque to the motor is reduced. Default value is 16.
Range: 1 – 255
- Generator mode: Enables REGEN mode
Range: ON / OFF

Table 1 Default parameter settings

Parameter	Default setting
Page 1: User Setup	
Language	ENG
Contrast	38
Backlight	ON
Speaker	ON
Auto-return	ON
Serial Number	xxxx
Firmware version	xxxx
Page 2: Battery Setup	
Batt. Ah C/20	System dependent
Peukert*	System dependent
Charging ends at voltage	System dependent
And current	4.0 A
Ubatt at 50%	System dependent
Page 3: System Setup	
Charging threshold	3.0 A
Discharging threshold	1.0 A
dU/dt threshold	00
Shunt	300 A / 50 mV
Standby after	--:-- (disabled)
Page 4: Low battery SOC alarm	
SOC alarm ON	20 %
SOC alarm OFF	25 %
Min On Time	--:--
Max On Time	--:--
Enable MSG	ON
Enable ECO	OFF
Enable RE2	OFF
Page 5: Batt Low Voltage Alarm	
Alarm ON	42.0 V
Alarm OFF	44.0 V
On delay time	10 s
Min ON	00:01
Enable MSG	OFF
Enable ECO	OFF
Enable RE2	OFF
Page 6: Joystick Setup 1/2	
Neutral	See 5.8
Max. forward	See 5.8
Max. backward	See 5.8
Backlash	25
Q-filtering	ON
Page 7: Joystick Setup 2/2	
Fwd speed	1800rpm
Bwd speed	1800rpm
ECO speed	1200rpm
FWD torque	20.0 Nm
BWD torque	10.0 Nm
Torque ctrl mode	OFF
Page 8: Regen Setup	
OV speed trip	1500 rpm
Regen torque	Press to calculate
Max. batt volt	System dependent
Gain	16
Generator mode	OFF

* Peukert values: 1.02 MLI / 1.15 AGM / 1.27 Gel / 1.27 2V Gel

Default parameters

The default parameter settings for the PodMaster are given in Table 1. Some values are indicated as 'System dependent' as their value should be set according to the installed battery pack.



CAUTION!

Never set the parameters to values other than indicated in the Default parameter settings table without consulting your Mastervolt distributor

5.10 REGENERATION (REGEN) MODE

The generator principle allows recharging of the batteries from mechanical power obtained from the motor shaft. The application is suited for sailing boats. During sailing periods, the REGEN mode can be enabled on the display (section 3.4). Successful setting of the REGEN mode is indicated on the display by showing "REG" on the status line in the main screen (Figure 3, item 6)

When the REGEN mode is enabled on the display, the Economy (most clockwise) position of the key switch will become the REGEN mode position. The Economy mode cannot be enabled manually.

When the REGEN mode is enabled both on the display and with the key switch, the amount of regeneration is controlled by the joystick as shown in Figure 16. With turning the joystick further clockwise the regeneration torque (and thus braking) will increase.

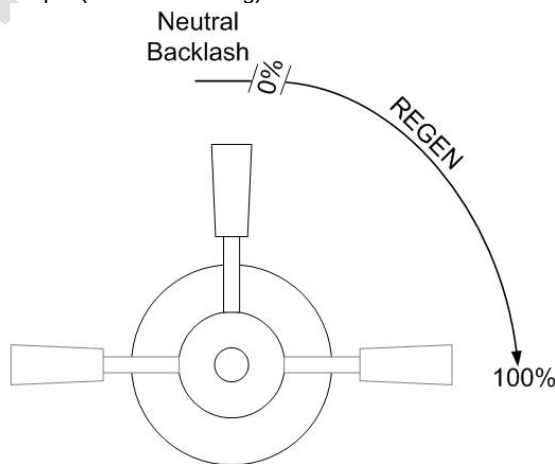


Figure 16: Controlling regeneration torque

ATTENTION!

Do not fake the regeneration mode by setting the motor to a low RPM in the normal Drive mode while sailing faster. The excessive energy will charge up your batteries. However there is no battery monitoring possible. The battery will therefore be overcharged and damaged..



6 MAINTENANCE

6.1 PREVENTIVE MAINTENANCE

Check your whole system regularly on the following points:

- Check the bilge and controller compartment for unwanted moisture or water;
- Check the operation of the automatic bilge pump;
- Check the system for irregularities, such as abnormal noise, vibration and wear;
- Check the anodes regularly.

Always keep the system connected to the shore connection, even in winter storage. This will keep the batteries in 100% condition and prevents self-discharging of batteries.

If the system is not going to be used for a long time and a permanent shore connection is not available, charge the batteries for 100% and remove the fuse.

6.2 MAINTENANCE

The PodMaster is a low maintenance system. However, you should be alert for moisture and salt, which can permanently damage your system.

The controller can be cleaned with a dry or slightly damp cloth. Never use water or a solvent to clean the controller.

Always contact your dealer if you notice strange noises, vibrations or non-traceable error messages on the display.

Have the whole system checked by a qualified installer every two years. This will keep the system in optimal condition.

6.3 SYNCHRONIZING BATTERY MONITOR

It is important to regularly synchronize the battery monitor with the battery, in order to keep the battery monitor delivering accurate information.

Therefore, perform a complete charge cycle on the battery. The charge cycle is complete and the battery is full when:

- the charging current drops below the set parameter (*parameter page 2: and current*), and
- the battery voltage is higher than the set parameter (*parameter page 2: charging ends at voltage*).

The State-of-charge readout will be set to 100%.

6.4 ANODE PROTECTION

The motor housing and propeller shaft are protected with sacrificial anodes. Check the anodes for corrosion on a regular base; at least once every year.

Replace the sacrificial anodes when half of the anode has been lost to corrosion.



CAUTION!

Never coat anodes with paint or anything else, for it will lose its function.

7 TROUBLE SHOOTING

In case of a failure, the PodMaster display shows an error code to help you find the cause. If you cannot solve a problem with the aid of the fault finding table below, contact your local Mastervolt Service Centre. See www.mastervolt.com.

Make sure you have the article and serial number close at hand when contacting the Mastervolt Service Centre.

A leakage in a seal can be detected by either

- oil in the water, or
- water on top of the oil in the rudder trunk.

A leaking seal is not directly damaging for the motor, as long as there is enough oil left in the motor, but it should be replaced as soon as possible.



CAUTION!

To prevent a leaking seal at the propeller shaft connection or at the rudder trunk connection, replace the seals every four years.

The following table shows the most common errors.

Error Code	Error	Solution
ERR 001	The joystick is not in the neutral position	Move the joystick to the neutral position
ERR 002	Joystick error / disconnected	
ERR 003	CAN bus timeout	
ERR 004	Battery low	Charge the battery
ERR 005	Motor temperature high.	Power will be reduced
ERR 006	High voltage PCB timeout / no link	
CONTROLLER ERR 001	Over current	
CONTROLLER ERR 002	Over voltage	
CONTROLLER ERR 003	Under voltage	
CONTROLLER ERR 004	Voltage low at the start	
CONTROLLER ERR 005	Potentiometer error during operation	
CONTROLLER ERR 006	Potentiometer not at zero at the start	
CONTROLLER ERR 007	Controller over-temperature	
CONTROLLER ERR 008	Controller under-temperature	
CONTROLLER ERR 009	Controller temperature sensor error	
CONTROLLER ERR 010	Current offset error	
CONTROLLER ERR 011	DC link charging error	
CONTROLLER ERR 012	Relay error	
CONTROLLER ERR 013	PDPINTA (shortcut or mosfet / driver error)	
CONTROLLER ERR 014	Bad user parameter CRC	
CONTROLLER ERR 015	Bad system parameter CRC	
CONTROLLER ERR 016	Bad flash CRC	
CONTROLLER ERR 017	Wrong parameter version	
CONTROLLER ERR 018	Invalid motor type	
CONTROLLER ERR 019	Auto tuning error	
CONTROLLER ERR 020	Boost error	
CONTROLLER ERR 021	Motor over-temperature	
CONTROLLER ERR 022	Motor temperature sensor failure	
CONTROLLER ERR 023	Internal error	

8 TECHNICAL DATA

8.1 TECHNICAL SPECIFICATIONS

Model	PodMaster		
	4.2	6.5	10
Article number	140600420	140600650	140601000
MOTOR			
Type	AC synchronous		
Nominal power	4.2 kW	6.5 kW	10 kW
Speed	1500 RPM	1500 RPM	1800 RPM
Rated torque	27 Nm	38 Nm	52 Nm
Motor efficiency	94%	94%	94%
System efficiency	90%	90%	90%
Motor weight	35 kg	35 kg	35 kg
Total system weight	41 kg	41 kg	41 kg
CONTROLLER			
Nominal battery voltage	48 V		
Minimal input voltage	19 V		
Maximum input voltage	57.6 V		
Switch-off input voltage low	19 V		
Switch-off input voltage high	63 V		
Rated output current	200 A		
Maximum output current	300 A		
Rated power	11.2 kVA		
Maximum power	19.5 kVA		
IP enclosure rating	IP44		
Weight	5.8 kg		
DISPLAY			
Type	Graphic LCD monochrome 128 x 64 pixels		
Operating voltage range	18.0 to 75.0 VDC		
Maximum operating current	26.5 mA @ 48 V		
Standby current	2.9 mA @ 48 V		
Current measurement method	SHUNT		
Current measurement range	± 20.0 to ± 600.0 A (configurable)		
Backlight	Low power white LED		
Panel cutout	122 mm x 76 mm		
Mating connector	Molex Mini Fit 12 pin, Female Crimp Terminals Molex Mini Fit 10 pin, Female Crimp Terminals		
ENVIRONMENT			
Temperature range	-25°C to +35°C		
Relative humidity	9% to 95% (vapor)		
Enclosure protection	IP65 (face), IP40 (rear)		

8.2 DIMENSIONS

8.2.1 CONTROLLER

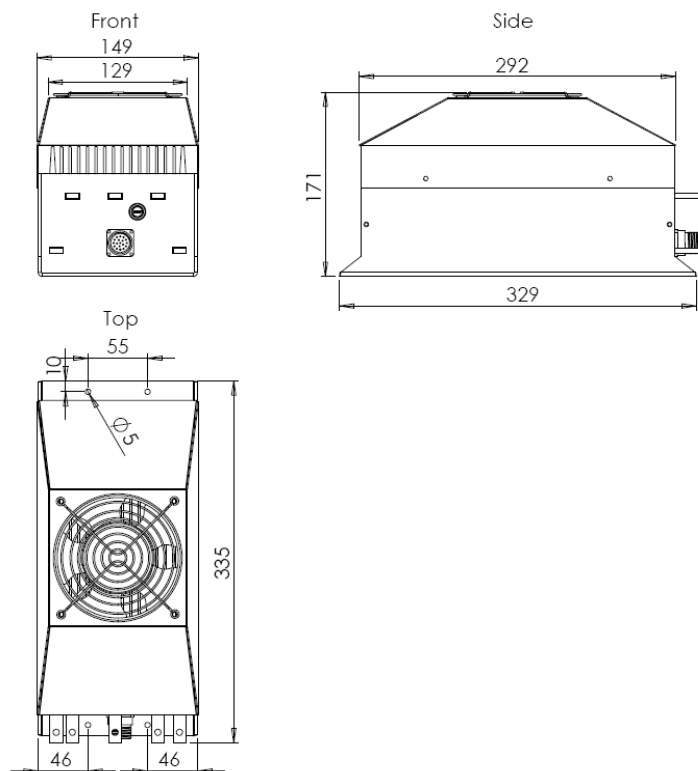


Figure 17: Dimensions of the controller in mm

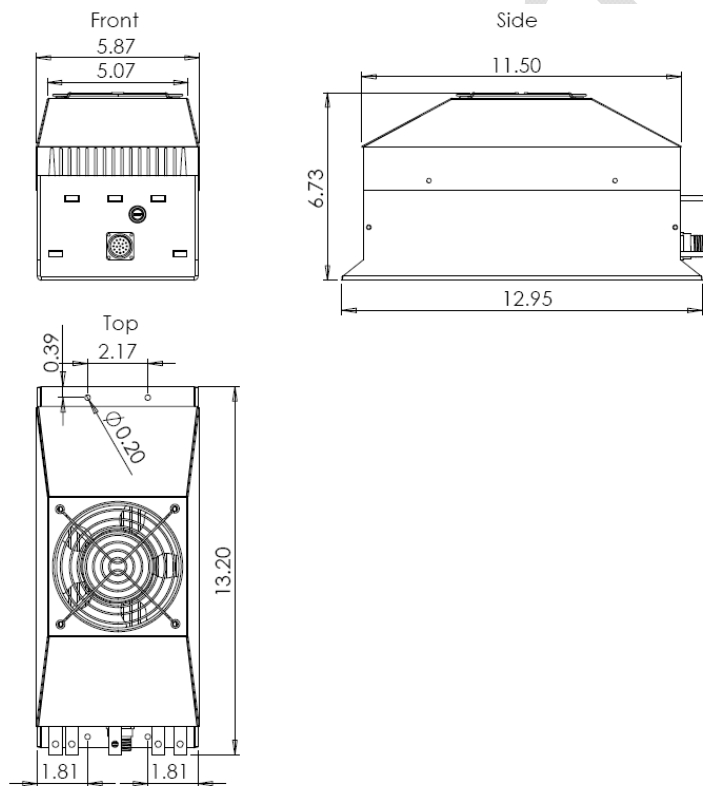


Figure 18: Dimensions of the controller in inches

8.2.2 MOTOR

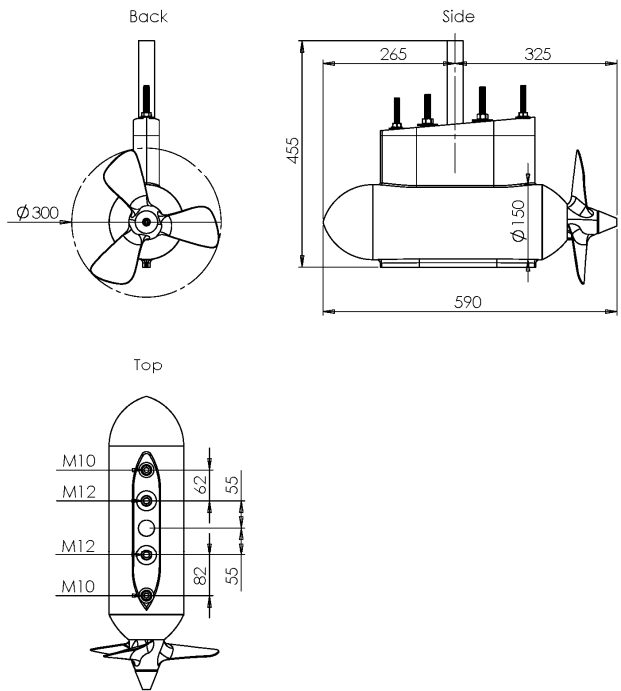


Figure 19: Dimensions of the motor in mm

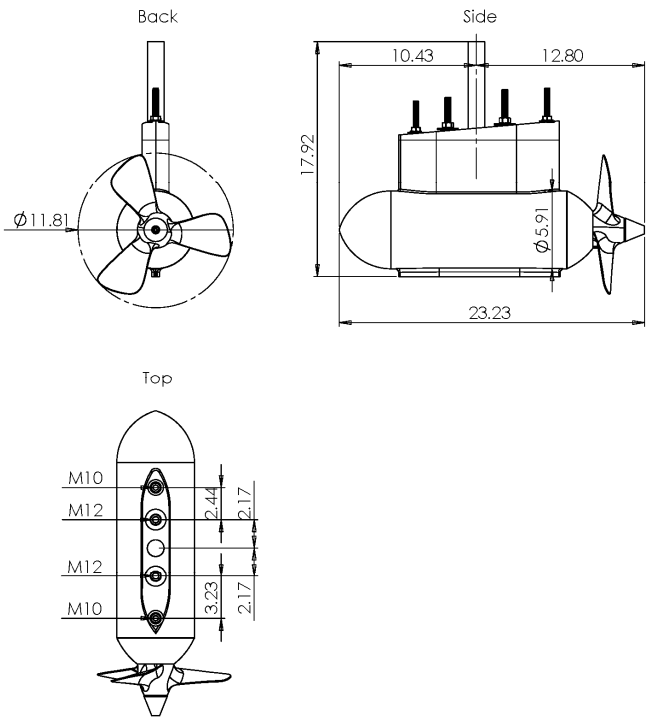


Figure 20: Dimensions of the motor in inches

8.2.3 DISPLAY

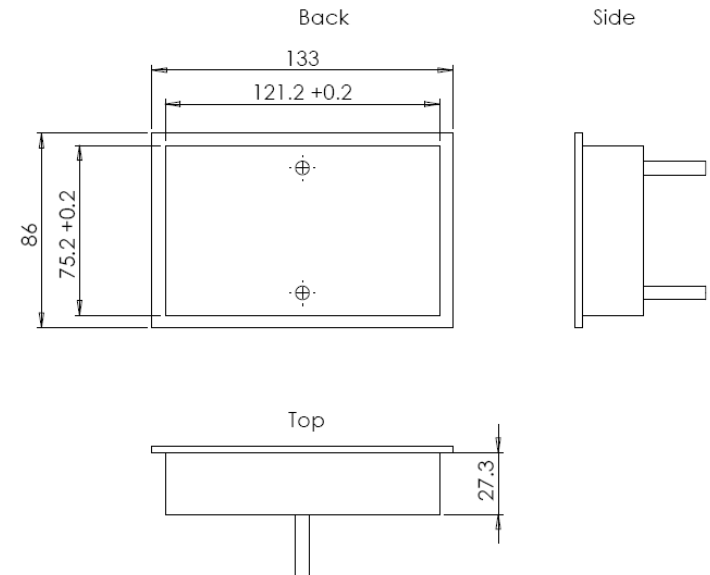


Figure 21: Dimensions of the display in mm

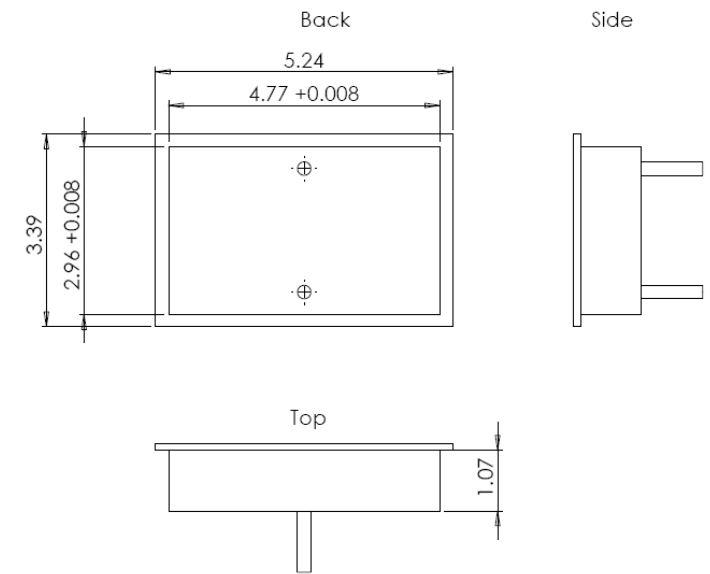


Figure 22: Dimensions of the display in inches

9 ORDERING INFORMATION

Part number	Description
141500010	ControlMaster Casual – single version, side mount
141500030	ControlMaster Sport – single version, side mount
141500120	ControlMaster Sport T – single version, top mount
141500220	ControlMaster Sport TD – double version, top mount
142000734	Rubber flange for PodMaster 4.2, 6.5 & 10, 1cm height difference
142000735	Rubber flange for PodMaster 4.2, 6.5 & 10, 2cm height difference
142000736	Rubber flange for PodMaster 4.2, 6.5 & 10, 3cm height difference