

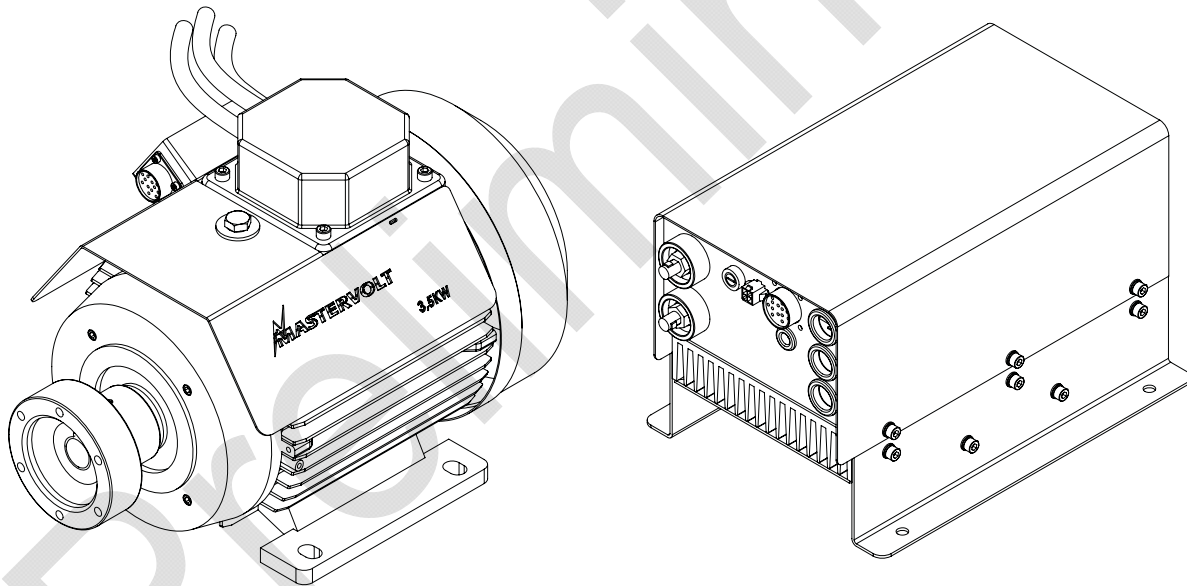


USER MANUAL

# DriveMaster Ultra

3.5, 5, 7.5, 10 & 20

ELECTRIC PROPULSION SYSTEMS



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## 1 GENERAL INFORMATION

### 1.1 USE OF THIS MANUAL

Copyright © 2010 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 of the DriveMaster Ultra series.

Also maintenance instructions and possible correction of minor malfunctions of the DriveMaster Ultra series are included.

It is therefore obligatory that every person who works on or with a DriveMaster Ultra 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 a DriveMaster system 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 DriveMaster Ultra series delivered by Mastervolt.

For other models see other manuals available on our website: [www.mastervolt.com](http://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 a DriveMaster Ultra system;
- 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

A DriveMaster Ultra system 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 DriveMaster Ultra 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 DriveMaster Ultra 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 DriveMaster Ultra 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 (AGM or gel) or Li-Ion 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

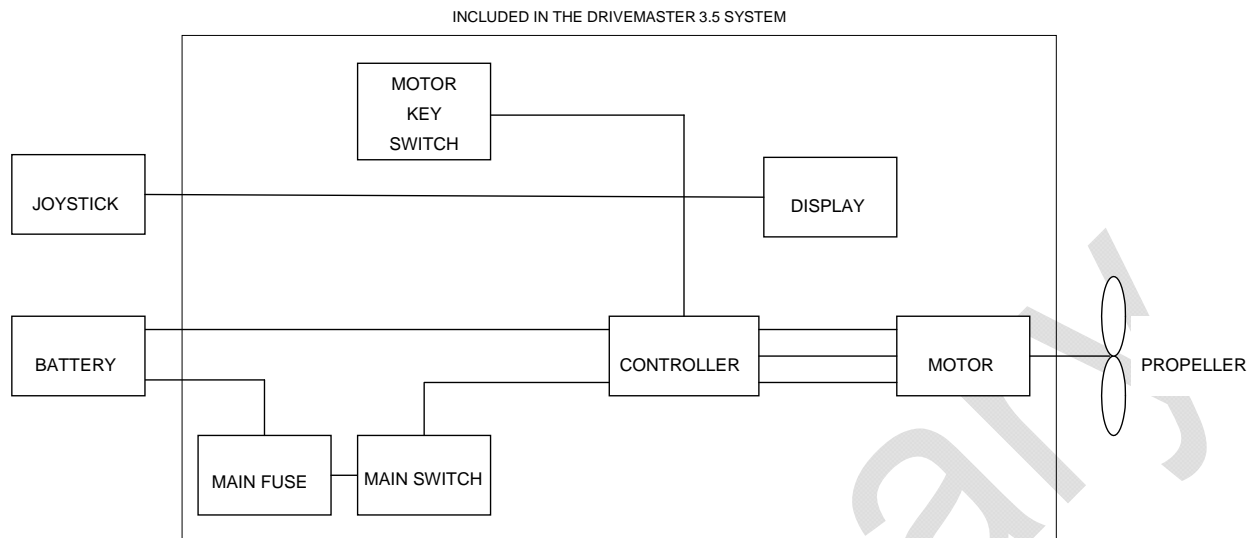


Figure 1: System block diagram

### 3.1 DRIVEMASTER ULTRA SYSTEM

The diagram of Figure 1 gives a simplified view of a DriveMaster Ultra system.

The main parts of the system are the battery and controller, supplying the motor with energy, and the motor with propeller, providing the thrust for the propulsion.

The system is operated by the joystick and the motor switch with a key. The joystick sends speed and direction information to the controller which transmits the right amount of power to the motor. The motor switch is used to turn the system on and off and select its operating mode.

Information about battery voltage, remaining power, thrust power and possible malfunctions is shown on the display. Furthermore, there is a fuse for protection and a main switch for powering on and off.

The motor controller is the key element in the system. It manages operation, protection and information.

### 3.2 COMPONENTS

A DriveMaster Ultra comes with the following components:

- Motor controller
- Asynchronous motor with premounted flange on shaft
- Display
- Motor switch (with key)
- Main switch
- Main fuse and main fuse holder
- Connection cable (display, joystick and contact key) and battery connectors

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

### 3.2.1 MOTOR CONTROLLER AND MOTOR

The DriveMaster Ultra *motor controller* serves to control the speed of the asynchronous (induction) *motor* that is specifically developed for low voltage operation.

The microprocessor control allows the motor to be completely and accurately controlled and monitored. The controller software allows various properties of the drive to be set.

Some of these properties are:

- Maximum speed
- Maximum modus / economy modus
- Maximum power
- Acceleration
- Deceleration
- Boost and boost time
- Joystick performance
- Battery management

These properties and many others have already been set by Mastervolt. They can be adjusted to specific wishes by a Mastervolt dealer.

### 3.2.2 DISPLAY, JOYSTICK AND MOTOR SWITCH

The control cable connects the motor controller with the operating instruments: the *display*, the *joystick* and the *motor switch*.

The joystick is not included in the system and needs to be ordered separately. Various versions are available (see chapter 9).

### 3.2.3 MAIN SWITCH AND FUSE

The *main switch* is mounted between the *fuse* and the motor controller in order to disconnect the batteries during emergencies and maintenance.



## 4 OPERATION

### 4.1 SWITCHING ON AND OFF

The motor is switched on by turning the key clockwise in the motor switch. The motor switch has three positions: "off", "maximum" and "economy".

Two power programs are available:

- Maximum: the full power of the motor is available;
- Economy: 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 "Maximum" will increase the speed of the motor and that of the boat instantly.

It is possible to remove the key in the "economy" (reduced power) position for safety reasons.

The system is switched off by turning the key counter-clockwise to the "off" position.

### 4.2 USE OF THE DISPLAY

After switching on the motor, the display lights up.

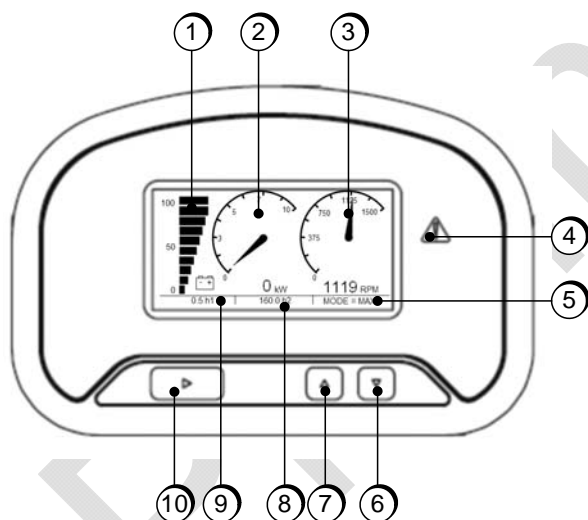


Figure 2: Display

#### Display buttons

6. "Up" menu navigation button
7. "Down" menu navigation button
10. "Select" menu button

The buttons are used for switching between two screens and navigation and control in the calibration and settings menu.

In normal operation two screens are available in the display. To toggle between the screens press the "Up" and "Down" buttons on the right [8 and 9].

*Screen 1* is recognized by the image of a *battery* in the lower left corner, *Screen 2* is recognized by the image of a *leaf* in the lower left corner.

#### Display fields

1. *Screen 1*: Battery condition indicator, showing battery State of Charge in percentage  
*Screen 2*: Eco-meter, showing relative economy of current operation in percentage
2. Motor power in kW
3. Speed motor / propeller
4. LED Attention triangle
5. "Economy" or "Maximum" mode
8. *Screen 1*: Calculated remaining time  
*Screen 2*: blank
9. Total number of operating hours

#### Alarm / error codes

The LED attention triangle (Figure 2 [7]) flashes several times when an error occurs, followed by a short rest period. The number of times the LED flashes and the colour of the LED is an indication of the malfunction.

Meaning of LED colours in case of an alarm/error:

- *Yellow*: low battery level;
- *Red*: alarm/error code system.

The alarm number is shown in the display.

The display will show a large text block in the upper section with the error code displayed. See chapter 7 for a description of the error codes.

#### Personal preferences and battery capacity

The display can be set to suit personal preferences. Both power and speed scale can be set, using the installed motor and program settings.

In the same menu also the battery capacity (C20) that is installed in the system can be set. This value is important for the battery status indication and remaining time calculation.

To change the settings:

1. Press the "Select" menu button [marked 10 in Figure 2] for three seconds and the preferences menu will appear.
2. Move the slider to the setting you want to change with the "Up" and "Down" buttons on the right [8 and 9]. With the help of these buttons you can step up and down through the list of options you can change, including the battery capacity.
3. Confirm your choice with the "Select" menu button [10].
4. Repeat steps 2 and 3 for the settings you want to change.

5. Go to “Exit” to leave the settings menu and confirm with the “Select” menu button [10].
6. Press the “Select” menu button [10] for three seconds to leave the menu. The settings have now been changed.

### 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 3 shows the joystick with default forward (clockwise) and backward (counter clockwise) operation.

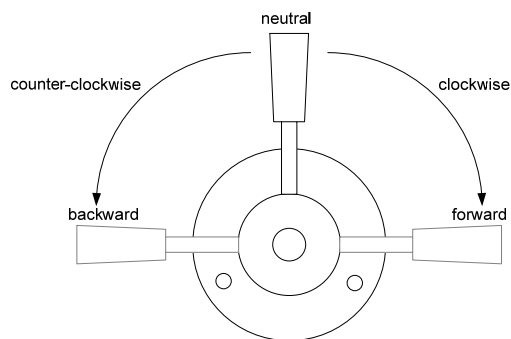


Figure 3: Joystick

Refer to the ordering information in chapter 9 for available types.

### 4.4 OTHER OPERATION FUNCTIONS

During normal operation the following functions exist and operate autonomously:

1. **Boost function:**  
To accommodate fast maneuvering, a DriveMaster

Ultra system is able to deliver an additional amount of power for a limited amount of time when changing direction by the throttle.

2. **Sleep function:**  
Whenever the throttle is in neutral position for over 60 minutes (standard setting), the DriveMaster Ultra will switch to Sleep mode limiting the amount of power use. To switch back to normal operation switch the system off and on by using the motor switch.

### 4.5 DEPARTURE

Before departure, always check the system for correct functioning.

Follow these steps:

3. Disconnect the shore connection.
4. Turn the main switch on.
5. Put the joystick in the neutral position.
6. Turn the motor switch on.
7. Check the battery condition.
8. Choose the power program (maximum or economy).
9. Check system forward and backward.

### 4.6 ARRIVAL

Follow these steps after arrival:

1. Put the joystick in the neutral position.
2. Check the battery condition.
3. Turn the motor switch off.
4. Turn the main switch off.
5. Connect the shore connection and make sure it works properly.
6. Reload the batteries after arrival.

## 5 INSTALLATION

During installation and commissioning of a DriveMaster Ultra system, the safety instructions of chapter 2 must be followed.



### CAUTION!

The complete set is fully tested and provided with the correct base settings in the factory, which means that the proper motor controller always needs to be combined with the proper motor.

Check the serial number of the motor controller and that of the motor; they must be identical.

### Notes

For a proper installation of the DriveMaster Ultra, take note of the following:

- Check the propeller shaft for straightness;
- Use a balanced propeller that is suitable for the system on the boat;
- Provide the balanced propeller if necessary with a so called "anti-singing edge";
- Pay attention to the position of the propeller in the shaft and the relative position of the rudder;

A number of optional items to make installation easier can be found in chapter 9.

### 5.1 GENERAL CONSIDERATIONS FOR A SILENT PROPELLER SHAFT SYSTEM

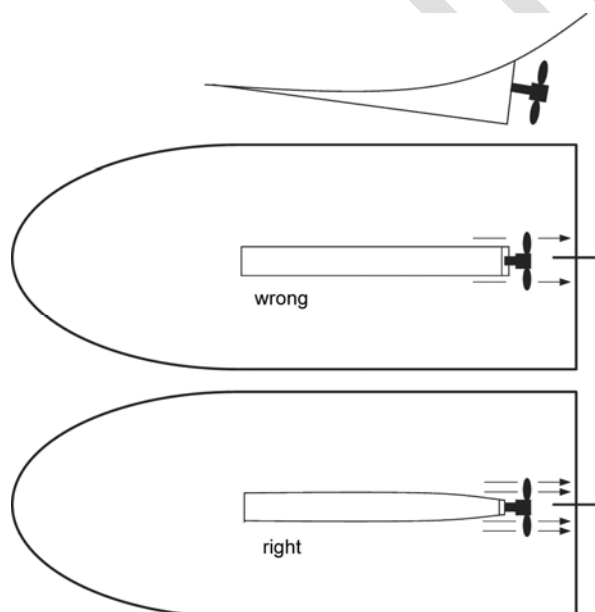


Figure 4: Propeller system

Before installing the propeller shaft system, the following three points must be considered to make the (electric) drive real quiet. The points are listed in order of importance.

- Inflow of the water from the propeller. For example, a propeller with a 2.4 kW drive moves about 280 liter water per second. The water inflow should be disrupted at a minimum and the water should flow horizontally through the propeller. If the boat has a keel from which the propeller protrudes, then the keel must be narrowed above and below the propeller shaft to get the inflow to the propeller as smooth as possible. See Figure 4. The view of the keel shows the difference between a straight keel and a keel that is narrowed.
- There must be enough space (at least 15% of the propeller diameter) between the propeller and the hull. The same applies when a heel is mounted that supports the rudder. When designing the heel, it is important that the inflow of water is not disrupted. A curved piece of flat steel can cause tremendous turbulence in the water causing noise and loss of efficiency.
- There must be sufficient space between the propeller and the rudder. It is an advantage that the rudder is drop shaped en is not made out of a flat plate. This drop shaped design is also called a NACA profile.

### 5.2 COMPONENTS

See the block diagram in chapter 3 and the wiring diagram in section 5.8.

### 5.3 MOTOR

A DriveMaster Ultra 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 and the entire propeller shaft system.

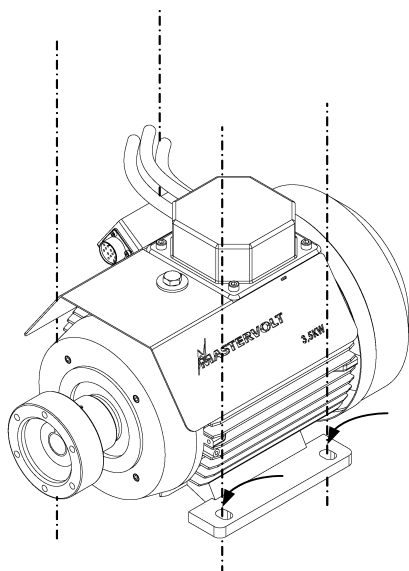


Figure 5: Mounting the motor

The motor must be mounted directly on an existing foundation or by using the optional support bracket. The motor must be fixed by using four bolts, as shown in Figure 5.



**CAUTION!**

In a propulsion system using a propeller, a thrust bearing must always be present to transmit the large forces generated by the motor to the hull.

The motor can be installed with or without a homokinetic coupling.

If no homokinetic coupling is used, the motor has to be **100% in-line**.

In combination with a homokinetic coupling, the motor must be placed **slightly out of line**. This is to guarantee the lubrication of the homokinetic joint.

During installation of the motor pay attention to the following:

- Check that all bolts are tightened after positioning the motor and propeller shaft system;
- Make sure that the motor is well protected and prepare for unforeseen circumstances like leakage. Suggestion: place a bilge pump;
- Clockwise rotating is forward.

See chapter 8 for the motor dimensions.

## 5.4 A-FLEX COUPLING



**ATTENTION!**

The homokinetic joint and thrust bearing are not part of the delivered system and must be ordered separately. They can be ordered separately at Mastervolt. See the ordering information in chapter 9.

### 5.4.1 HOMOKINETIC JOINT

The homokinetic joint is mounted between the thrust bearing and the motor flange. The homokinetic joint is properly fitted if, after mounting, the center axle can be moved a few millimeters to the front and back.

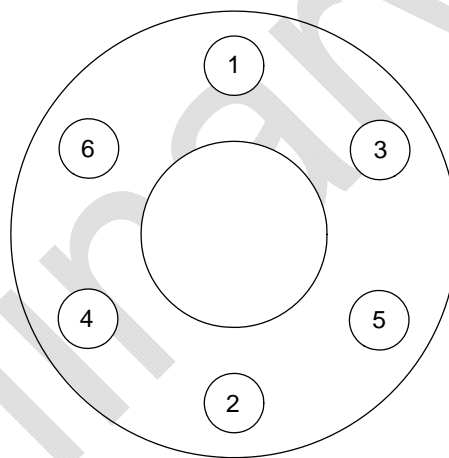


Figure 6: Tightening order of bolts

The bolts (2 x 6 M8) must be tightened crosswise, as shown in Figure 6. First tighten bolt [1], then bolt [2] and so on.

Use a torque wrench (M8 = 41 Nm).



**CAUTION!**

The homokinetic joint may never be 100% in-line. It must be a minimum of 1° out of line per homokinetic joint.

The maximum mounting angle depends on the rpm of the propeller shaft:

8° angle for each homokinetic joint => maximum 1200 rpm

6° angle for each homokinetic joint => maximum 1500 rpm

5° angle for each homokinetic joint => maximum 2000 rpm

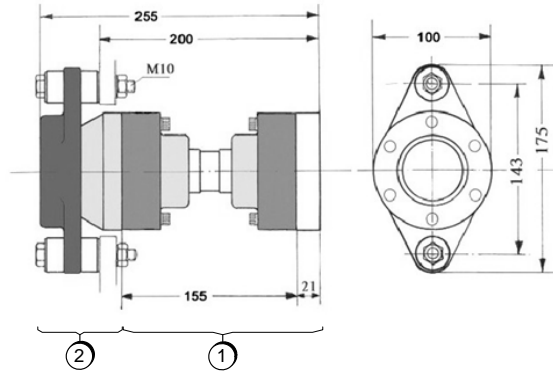


Figure 7: Homokinetic joint

Figure 7 shows the homokinetic joint [marked 1] and the thrust bearing [marked 2].



**WARNING!**

**Specifications:**

Maximum thrust	4,300 N
Maximum torque	485 Nm
Maximum shaft speed	5,000 rpm
Length homokinetic shaft	155 ± 25 mm
Propeller shaft diameter	25, 30 & 1", 1 1/4"

The given values are for sailing with less than 100 hours at full load. For commercial applications 60-80% of these values are to be considered maximum load.

## 5.4.2 THRUST BEARING

Due to the high torque of DriveMaster Ultra systems and the associated high thrust, the thrust force of the propeller shaft on the motor always needs to be absorbed by a thrust bearing.

The thrust bearing carries the thrust of the propeller directly to the ship's hull instead of the motor. This is done via absorbing plastic bushings. The mounting of the cylindrical propeller shaft in the thrust bearing is a solid bush.

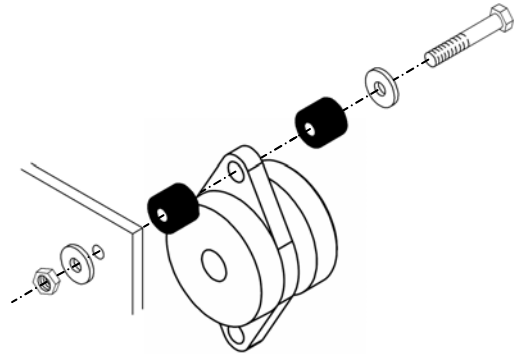


Figure 8: Thrust bearing

The thrust bearing should be mounted on a plate that is strong enough to transfer the thrust from the propeller to the hull. The thrust is calculated by means of the following formula:

$$F_{th} = 300 \times P$$

$$F_{th} = \text{thrust [N]}$$

$$P = \text{power [kW]}$$

$$10 \text{ N thrust equals } 1 \text{ kgf}$$

Example:

$$P = 10 \text{ kW}$$

$$F_{th} = 300 \times 10 = 3000 \text{ N}$$

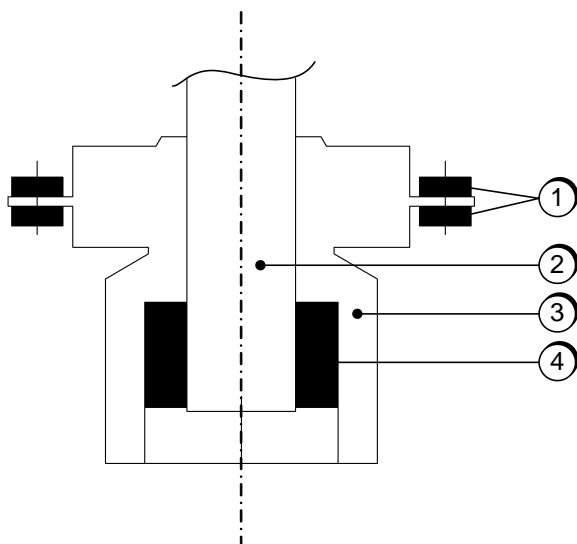
$$\text{this equals } 300 \text{ kgf}$$

The mounting plate must be positioned at an angle of 90° compared to the propeller shaft. The tolerance is < 2°.

Take note of the following when installing the thrust bearing:

- The rubber shock absorbers are to be installed on both sides of the thrust bearing;
- The bolts should be tightened so that the rubbers are slightly rounded. An exact torque is not available;
- Check the tension after approximately one month and tighten the bolts with one stroke.

The propeller shaft should slide into position in the thrust bearing easily (without friction).



- 1 - Plastic bushings
- 2 - Propeller shaft
- 3 - Thrust bearing
- 4 - Sleeve

Figure 9: Propeller shaft in the thrust bearing

Take the following steps:

1. Mount the thrust bearing by using the bushings [marked 1].
2. Lubricate the propeller shaft [2] and the exterior of the sleeve [4] with oil and grease.
3. Insert the propeller shaft [2] into the sleeve [4] until it sticks out approximately 5 to 10 mm.
4. Tighten the bolts of the clamping device inside the thrust bearing [3] crosswise and diagonally by hand until they are properly fastened.
5. Tighten the bolts crosswise and diagonally with a torque wrench with half a stroke each time: M6 = 17 Nm.

The sleeve has two extra holes. This allows the sleeve to be removed. To do so, follow these steps:

1. Loosen all bolts.
2. Use two M6 bolts and screw them in the two pin holes.
3. Remove the bolts crosswise until the sleeve pops off the shaft.

The propeller shaft in the thrust bearing is not included in the delivery.

## 5.5 MOTOR CONTROLLER

Note the following when installing the motor controller:

- The motor controller must be mounted at a dry, well-protected and accessible location in the boat;
- Take note of the length of the motor cables since you can not shorten or extend these cables;
- Never install a controller near (or in the same location) as a so-called wet / open battery;
- The controller must be able to take in enough cool air, make sure there is adequate ventilation;
- Ensure that the intake opening cannot be blocked and do not cover up the outlet hole.

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

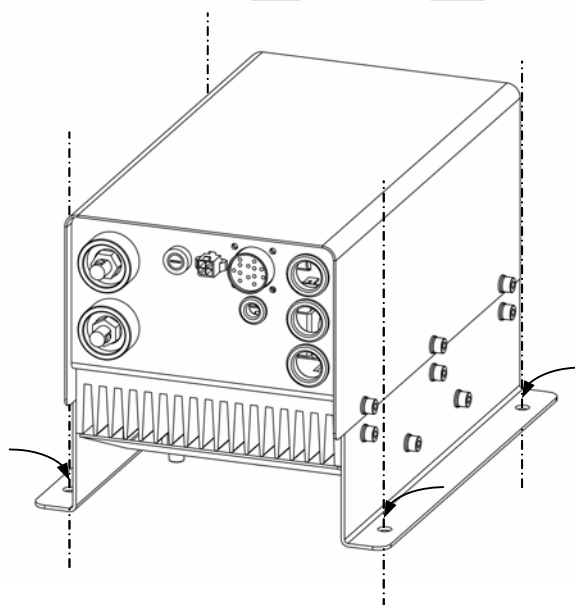


Figure 10: Motor controller mounting

The motor controller must be mounted by using four bolts, as shown in Figure 10.

See chapter 8 for the controller dimensions.

## 5.6 DISPLAY

The display is usually mounted on the control console of the boat. The location of the display is not critical, it is important that (rain) water does not remain on the display and can run off. Upright or slightly slanted installation is recommended. This does not apply to an indoor arrangement.

The display requires a rectangular 138 mm by 92 mm (width by height) panel cut-out.

See chapter 8 for the display dimensions.

## 5.7 JOYSTICK

The joystick is mounted, for instance, vertically on the control console.

Note the following:

- The joystick is splash proof only. Therefore the joystick should not continuously be in contact with water. Position the joystick carefully;
- The lever has to be able to rotate freely in both directions;
- Choose the location so that the risk of turning the lever in the unwanted direction is minimal.

## 5.8 WIRING

Each system has the following wiring:

- Main battery power connections;
- Control cables, including preassembled connectors;
- Preassembled motor cables, including clamp connection (U-V-W);
- Motor sensor cable, including preassembled connectors.

The power cables for connecting the batteries to the motor 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 chapter 3 and the wiring diagram in Figure 11.

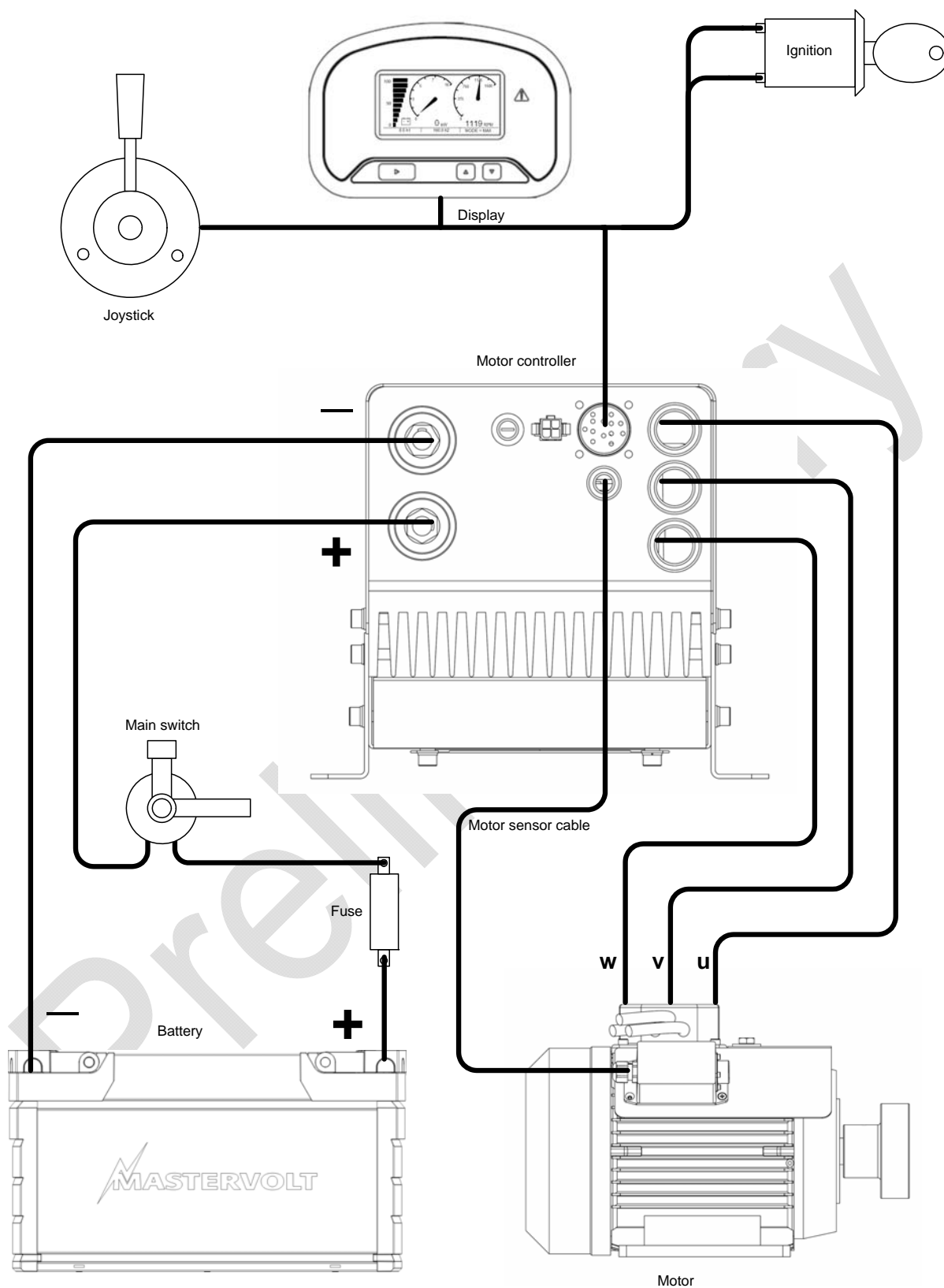


Figure 11: Wiring diagram (the shown motor controller belongs to the DriveMaster Ultra 3.5, but the same connections exist on the other systems)

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



## 5.8.1 MOTOR CONTROLLER CONNECTIONS

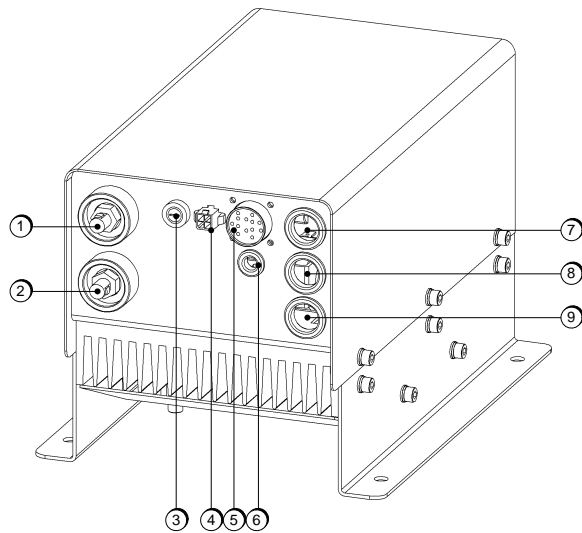


Figure 12: Motor controller (the shown motor controller belongs to the DriveMaster Ultra 3.5, but the same connections exist on the other systems)

Figure 12 gives an overview of the connections on the motor controller.

The connections include:

1. – Pole for battery
2. + Pole for battery (incl. main switch and fuse)
3. Fuse holder - Fuse = Fast 4 A
4. Connection for computer
5. 12 pin connector for display, joystick and ignition
6. Motor sensor cable
7. U wire hole from the motor
8. V wire hole from the motor
9. W wire hole from the motor

## 5.8.2 CONNECTION OF MOTOR CABLES

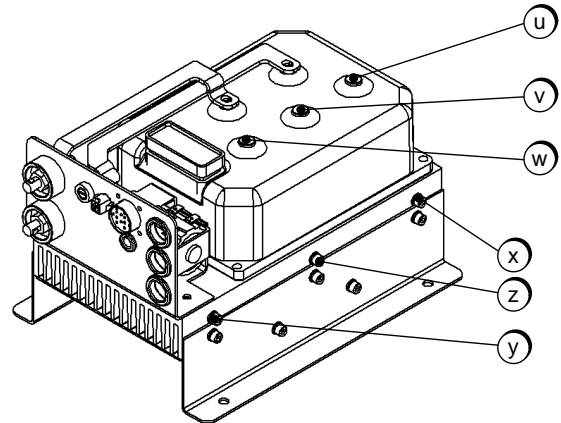


Figure 13: Connecting points for motor cables (the shown motor controller belongs to the DriveMaster Ultra 3.5, but the same connections exist on the other systems)



### CAUTION!

Motor cables must not be shortened or extended.

Connections must be preserved with acid-free Vaseline.

To connect the motor cables and motor sensor cable, follow these steps:

The motor cables are already fixed to the motor.

1. Remove the metal cover from the motor controller by removing the screws marked [x], [y] and [z] in Figure 13, on both sides of the controller.
2. Pull the three cables through the corresponding holes at the front of the controller. Make sure that the U, V and W cables are placed in the correct location.
3. Connect the three motor cables labeled [U, V, W] onto the correspondingly marked connections on the motor controller (see Figure 13). Install the cables using the supplied M8 bolts and tighten them with  $9.6 \pm 0.9$  Nm. Use a torque wrench.
4. Close the cover carefully and tighten the screws.

The motor sensor cable is already connected to the motor controller.

5. Connect the motor sensor cable from the motor controller to the motor with the preassembled cable with bayonet plug.
6. Turn the chrome ring clockwise until the bayonet ring is locked.

### 5.8.3 CONNECTION OF SIGNAL CABLES

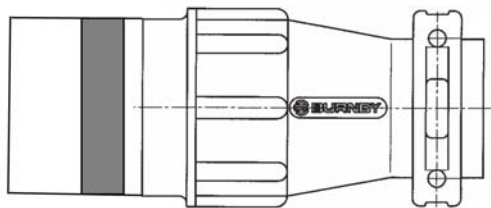


Figure 14: Signal cable connector

Follow these steps to connect the display, joystick and motor switch to the motor controller:

1. Determine the position of the display, joystick and motor switch.
2. Bring the supplied signal cable to this position.
3. Connect the display, joystick and motor switch with the preassembled plugs.
4. Connect the 12-pin plug at the other end of the cable with the 12-pin connector that is located at the front of the motor controller.
5. Lock the plug by turning the chrome ring a quarter of a stroke.



#### 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.

### 5.8.4 CONNECTION OF POWER CABLES



#### WARNING!

Make sure that when connecting the battery and the motor controller, the fuse has been removed and the main switch is turned off.

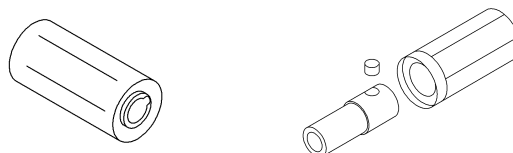


Figure 15: Quick connect couplings for power cable

Notice the following when connecting the cables:

- The positive terminal is clearly marked with a red mark on the motor controller;
- The main switch must be mounted at an accessible location between the fuse and the motor 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 – pole of the controller.

#### Specifications for connecting the power cables.

Motor controller	> 35 mm <sup>2</sup>
Fuse	T 225 Ampere
Power	3.5 kW
Voltage	48 Volts

Two quick-connect couplings are included for connection to the motor controller (see Figure 16).

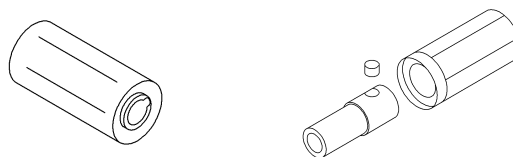


Figure 16: Quick connect couplings for the motor controller

Follow these steps to connect the quick-connect couplings:

1. Install the couplings with care at the ends of the cables.
2. Place the couplings on the controller.
3. Turn the couplings one stroke counter-clockwise. The cable is now secured and cannot get loose as a result of vibration.

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

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

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

## 5.9 CALIBRATION

The main calibration is done in the factory.

Every time the system is turned on, it will perform a self-diagnosis first.

Follow these steps:

1. Put the Joystick in the neutral position.
2. Turn on the system with the motor switch.

The display lights up and the main relay in the motor controller will close if everything is connected correctly.

3. Move the joystick forward and backward to check the system and the rotation of the propeller.
4. Check the system for unwanted noise and vibration.



### CAUTION!

Steps 3 and 4 must be done carefully so that the bearings of the shaft will not be damaged in case the propeller shaft is not properly lubricated.

## 5.10 COMMISSIONING

The factory settings of the DriveMaster Ultra are optimal for most installations. For some applications however, it is desirable to change these settings. Therefore, several adjustments can be made.

If your DriveMaster Ultra is not new, you have to take into account that previous users may have changed the settings. Let a certified installer set the DriveMaster Ultra to your preferences in case of doubt.

To change the controller software, a computer or laptop or the Curtis 1311 Handheld Programmer can be used. This 1311 Handheld Programmer simplifies adjustments, programming, testing and diagnosing. It provides a fast and easy interface to the motor controller. The connector for the computer or Handheld Programmer can be found on the front of the motor controller, marked [4] in Figure 12.

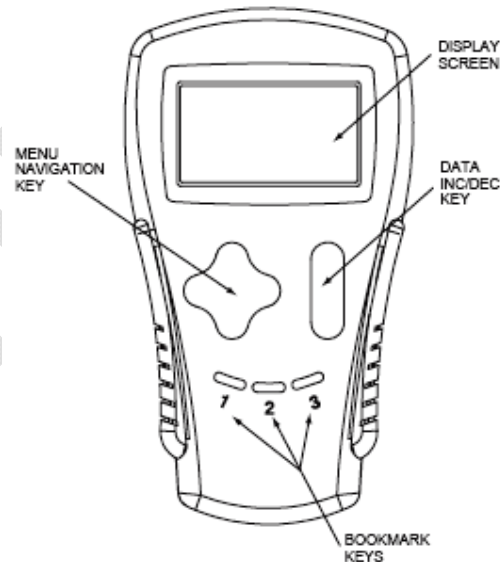


Figure 17: 1311 Handheld programmer

Please refer to the Curtis 1311 Handheld manual for further operating instructions.

## 6 MAINTENANCE

### 6.1 PREVENTIVE MAINTENANCE

Check your whole system regularly on the following points:

- Check the bilge and motor 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.

Keep the system always connected (even in winter storage) to the shore connection. 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 DriveMaster Ultra basically does not need maintenance. However, you should be alert for moisture and salt, which can permanently damage your system.

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

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

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

## 7 TROUBLE SHOOTING

In case of a failure, the DriveMaster Ultra 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](http://www.mastervolt.com).

Make sure you have the article and serial number close at hand.

At the right side of the display is a LED alarm triangle (see Figure 2). This triangle displays the following colours in case of an alarm:

- Yellow: low battery level;
  - Red: alarm/error code system.
- The number of the alarm is shown in the display, see Figure 18.

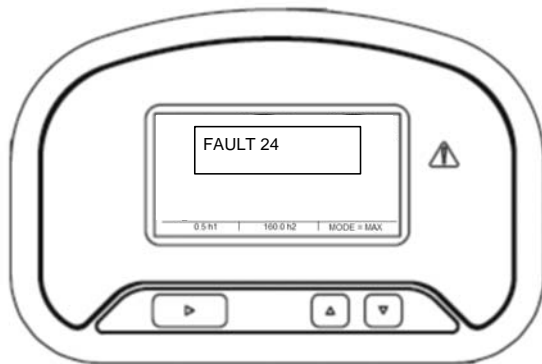


Figure 18: Display showing error code

The following table shows the most common errors.

Code	Error	Solution
16	Controller overheated > 95°	Let motor controller cool down and check the cooling of the housing.
22	Controller too hot > 85°	Power to motor is automatically reduced until the temperature has dropped to a safe value.
23	Low voltage warning + yellow LED signal	Battery voltage too low. Power is automatically reduced. Charge batteries as soon as possible!
24	Battery voltage too high. Motor controller cannot operate regeneratively	Standard security to prevent overloading the battery. When the battery can take up current again, the regeneration will automatically start.
28	Motor temperature too high > 135°	Power is automatically reduced by the motor controller until the temperature has dropped to a safe value.
47	Joystick is not in neutral during switch on of the system	Put joystick in neutral.

Errors are reset with the motor switch, by turning it off and on again.

## 8 TECHNICAL DATA

### 8.1 TECHNICAL SPECIFICATIONS

Model	DriveMaster Ultra				
	3.5	5	7.5	10	20
Article number	140300350	140300500	140300750	140301000	140302000
<b>Battery</b>					
Nominal battery voltage	48 V				96 V
Battery voltage	25.2 – 60.0 V				50.4 – 120 V
Minimal battery capacity	200 Ah	300 Ah	450 Ah	600 Ah	600 Ah
<b>AC</b>					
Number of phases	3				
Nominal phase current	85 A	150 A	150 A	225 A	225 A
Maximum phase current	250 A	350 A	350 A	450 A	450 A
PWM operating frequency	10 kHz				
Maximum encoder frequency	15 kHz				
Output frequency	0-300 Hz				
<b>Control adjustment</b>					
Motor type	Asynchronous				
Maximum motor power	< 3.5 kW (S1)	< 5 kW (S1)	< 7.5 kW (S2-120 min)	< 10 kW (S1)	<20 kW (S2-120 min)
Sensor	SKF – sensor bearing				
Encoder pulses per rotation	64				
Read motor parameters	Automatic via Auto fine tuning				
Standby mode	Blocked by software				
<b>Communication</b>					
CAN open, Nodes 2.0	Standard				
ID type	11 – bit				
Baud rate	< 500 Kbps				
<b>Safety</b>					
Undervoltage	19 V				38 V
Overvoltage	63 V				126 V
Current	Maximum allowed value is programmable				
Motor power	Maximum allowed value is programmable				
Motor speed	1400 rpm	1400 rpm	1400 rpm	1400 rpm	1400 rpm
Related torque	24 Nm	34 Nm	51 Nm	68 Nm	136 Nm
Thermal safety	Shuts down the controller when overheated				
Coupling limitation	Adjustable via software				
<b>Environment</b>					
Temperature	-40 - 50 °C				
Protection class motor controller electronics	IP 65				
Display upper side	IP 65				
<b>Weight</b>					
Motor	37.2 kg	65 kg	69 kg	118 kg	176 kg
Shaft flange	0.7 kg	0.7 kg	0.7 kg	0.8 kg	0.8 kg
Motor cable (U V W) standard length 2.5 m	1.8 kg	2.2 kg	2.2 kg	2.2 kg	2.2 kg
Motor controller	9.7 kg	13 kg	13 kg	20.6 kg	20.6 kg
Display	0.4 kg	0.4 kg	0.4 kg	0.4 kg	0.4 kg
Wiring assembly (motor controller – display)	0.7 kg	0.7 kg	0.7 kg	0.7 kg	0.7 kg
<b>Total weight system</b>	50.5 kg	81.9 kg	85.9 kg	142.7 kg	200.7 kg

## 8.2 DIMENSIONS

### 8.2.1 DISPLAY

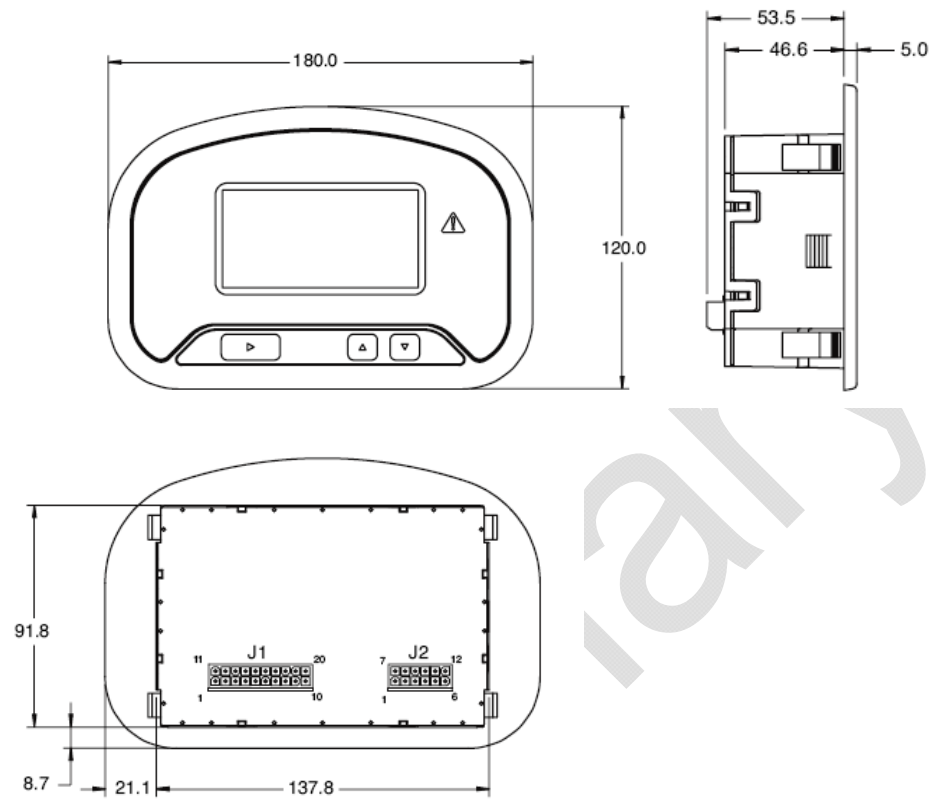


Figure 19: Dimensions of display in mm

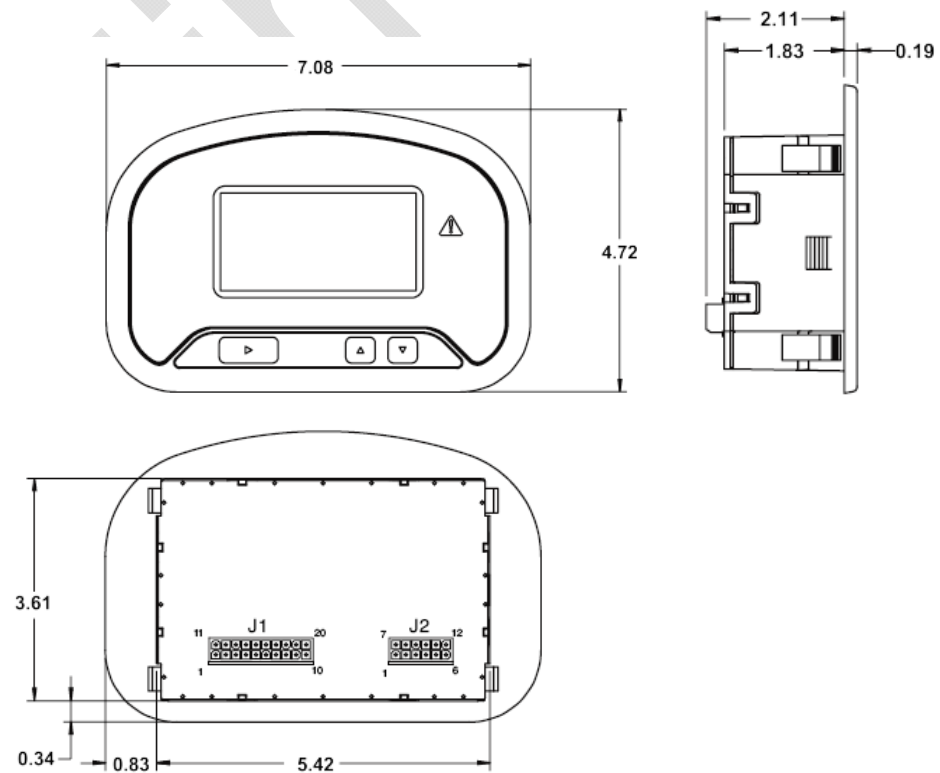


Figure 20: Dimensions of display in inches

8.2.2 MOTOR CONTROLLER

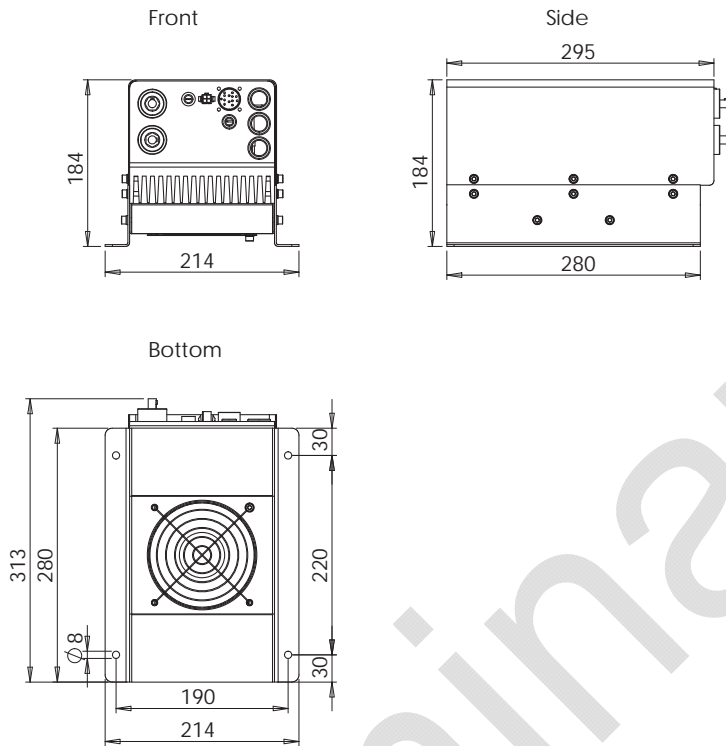


Figure 21: Dimensions of DriveMaster Ultra 3.5 motor controller in mm

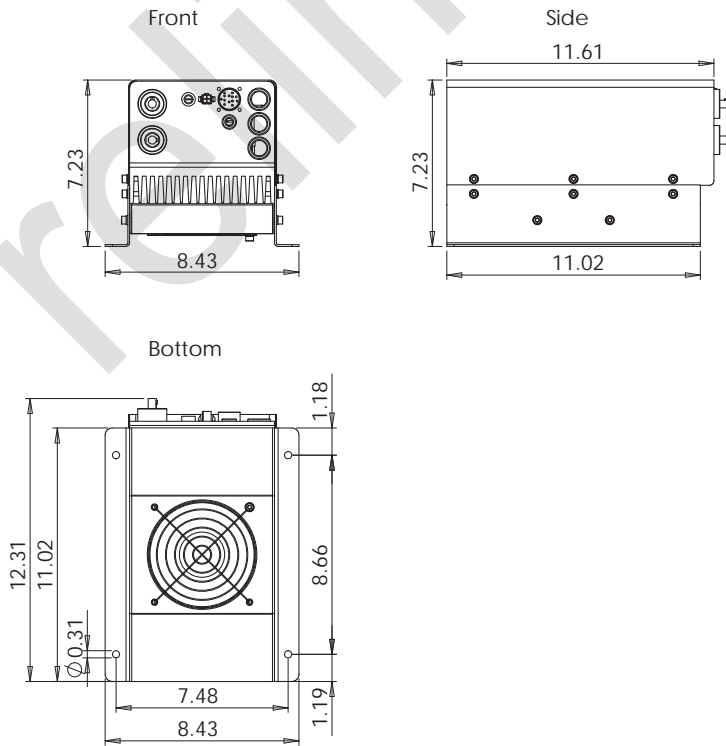


Figure 22: Dimensions of DriveMaster Ultra 3.5 motor controller in inches



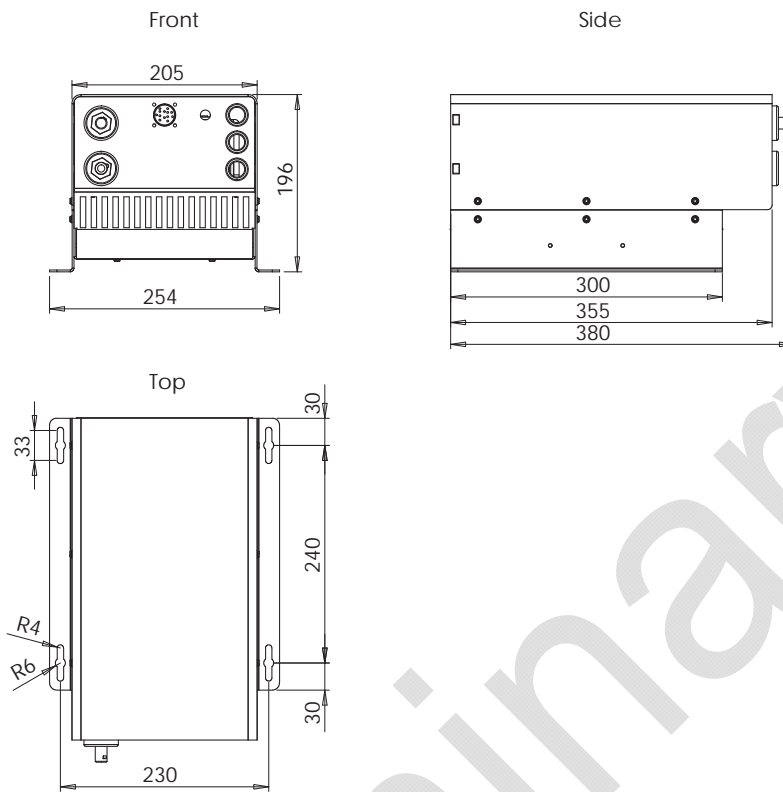


Figure 23: Dimensions of DriveMaster Ultra 5 and 7.5 motor controller in mm

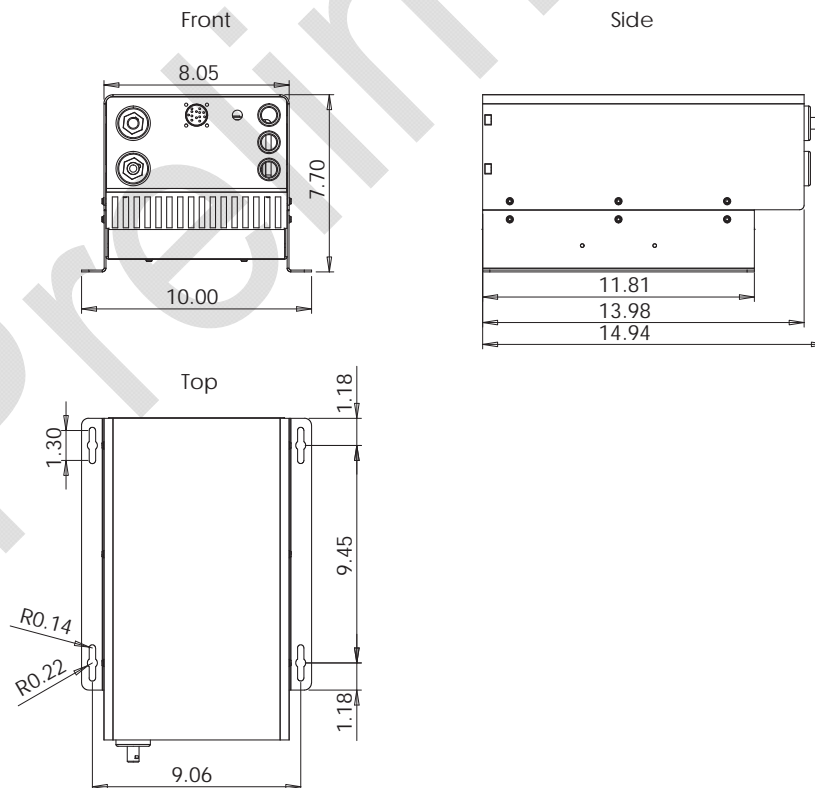


Figure 24: Dimensions of DriveMaster Ultra 5 and 7.5 motor controller in inches

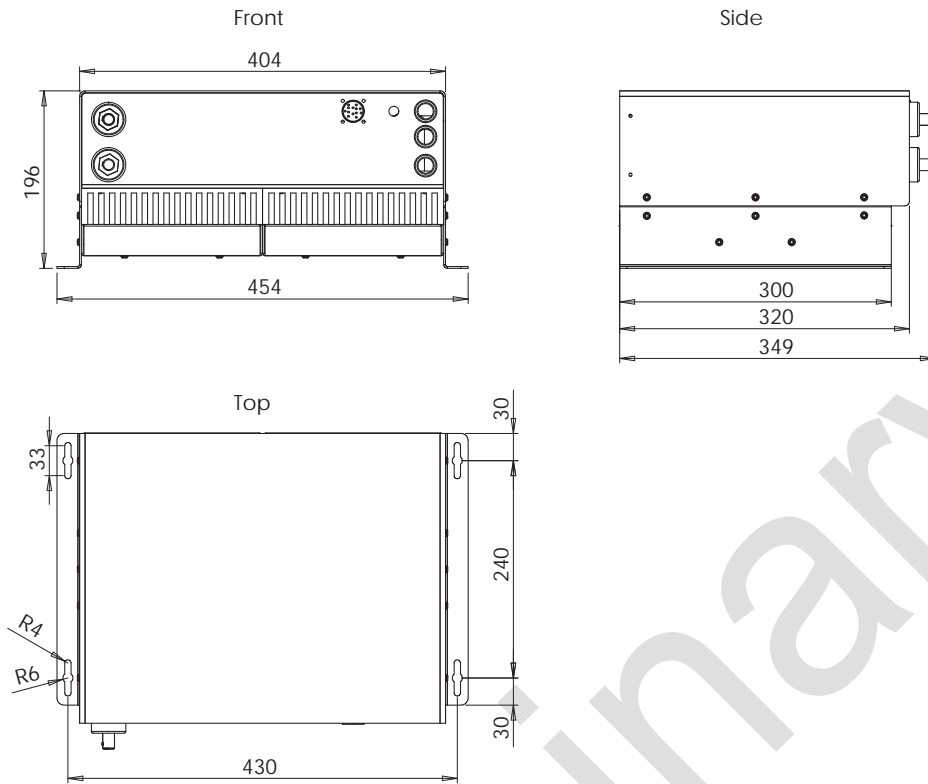


Figure 25: Dimensions of DriveMaster Ultra 10 and 20 motor controller in mm

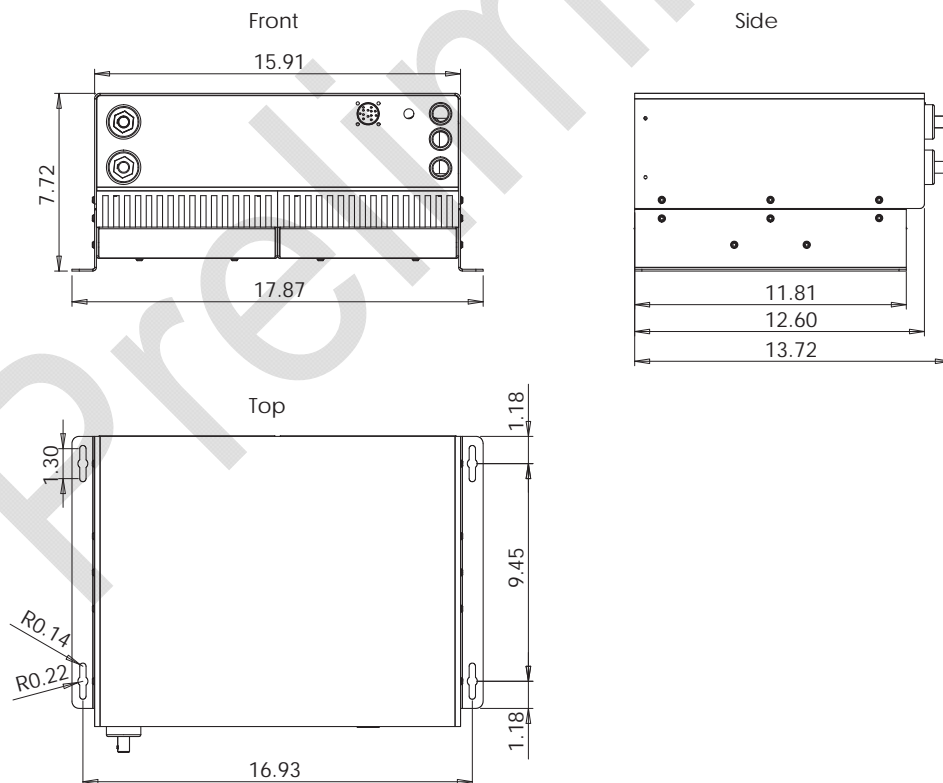


Figure 26: Dimensions of DriveMaster Ultra 10 and 20 motor controller in inches

### 8.2.3 ASYNCHRONOUS MOTOR

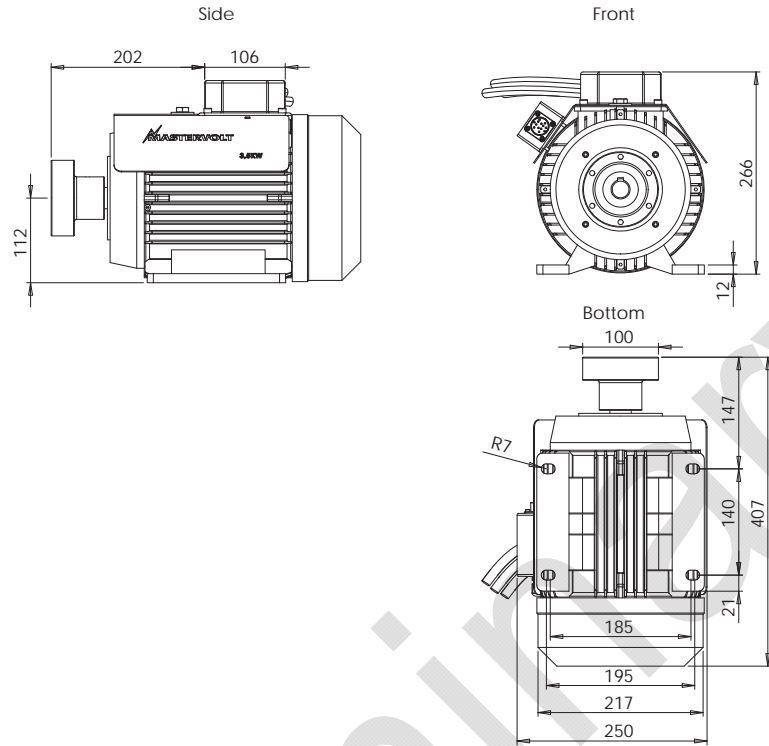


Figure 27: Dimensions of DriveMaster Ultra 3.5 motor in mm

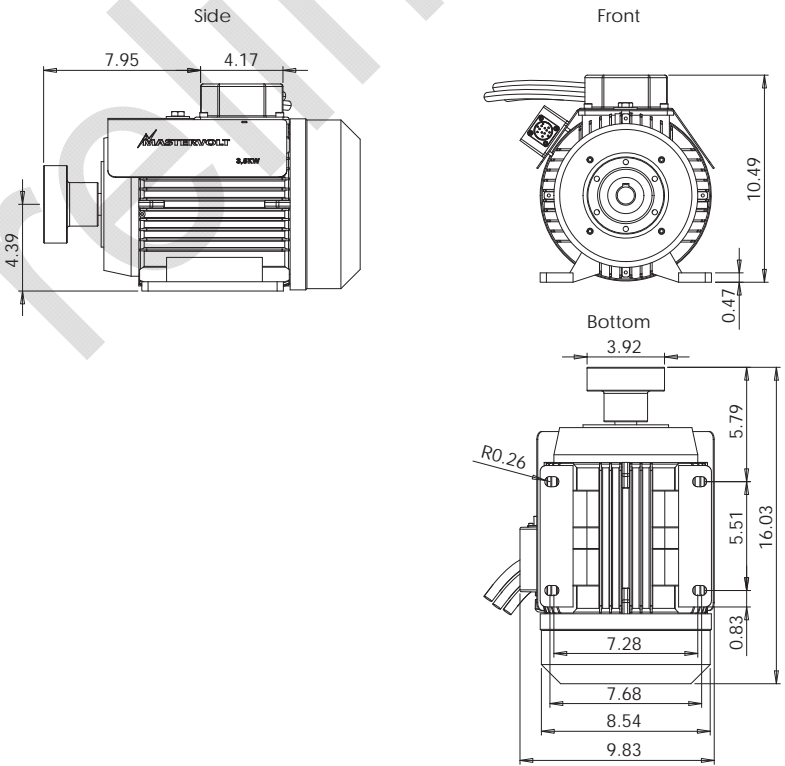


Figure 28: Dimensions of DriveMaster Ultra 3.5 motor in inches

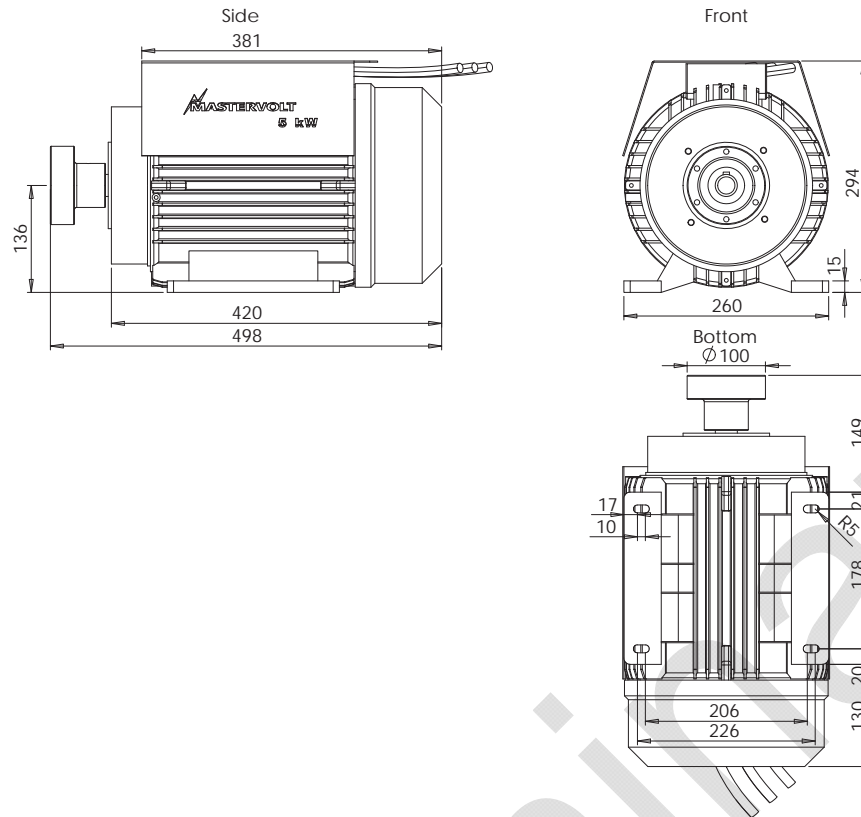


Figure 29: Dimensions of DriveMaster Ultra 5 motor in mm

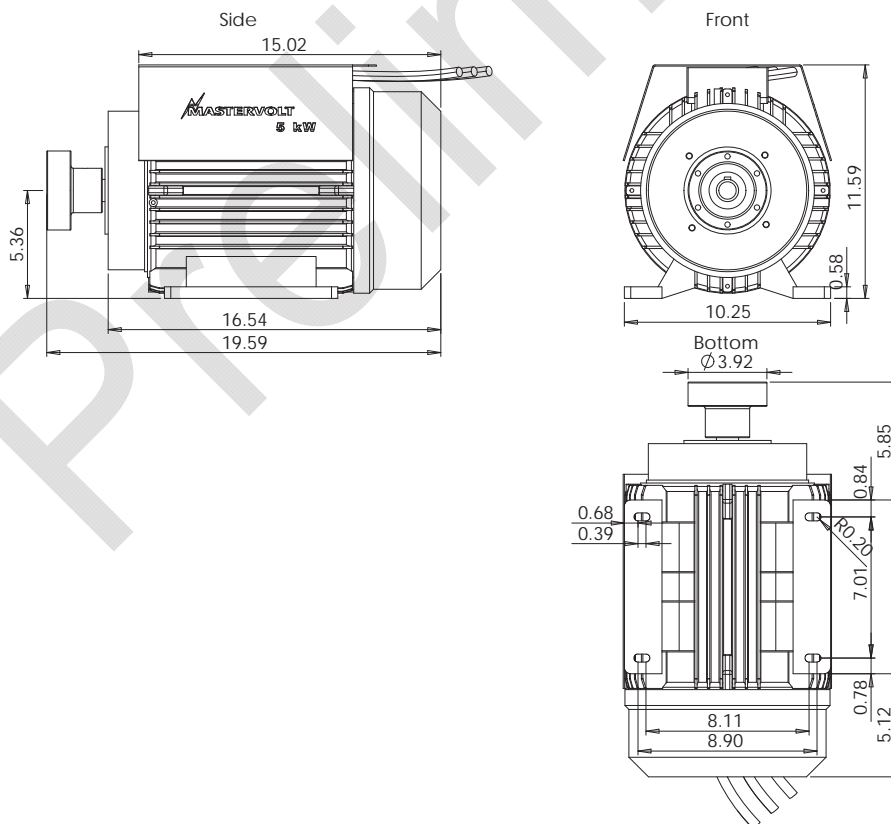


Figure 30: Dimensions of DriveMaster Ultra 5 motor in inches

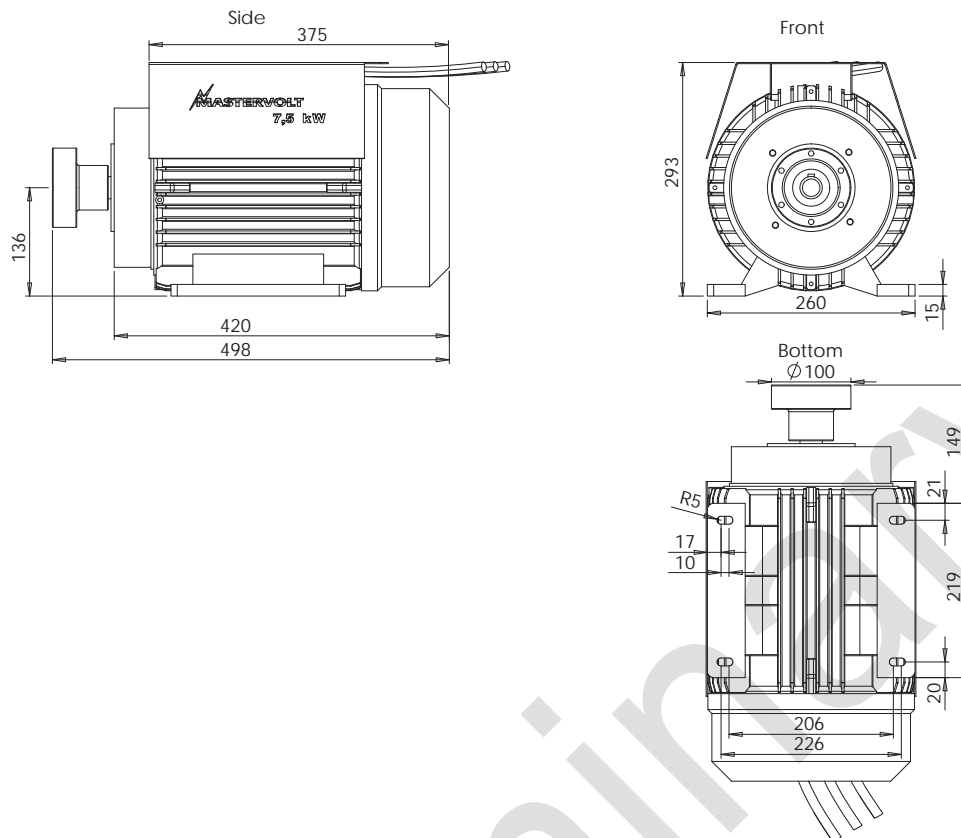


Figure 31: Dimensions of DriveMaster Ultra 7.5 motor in mm

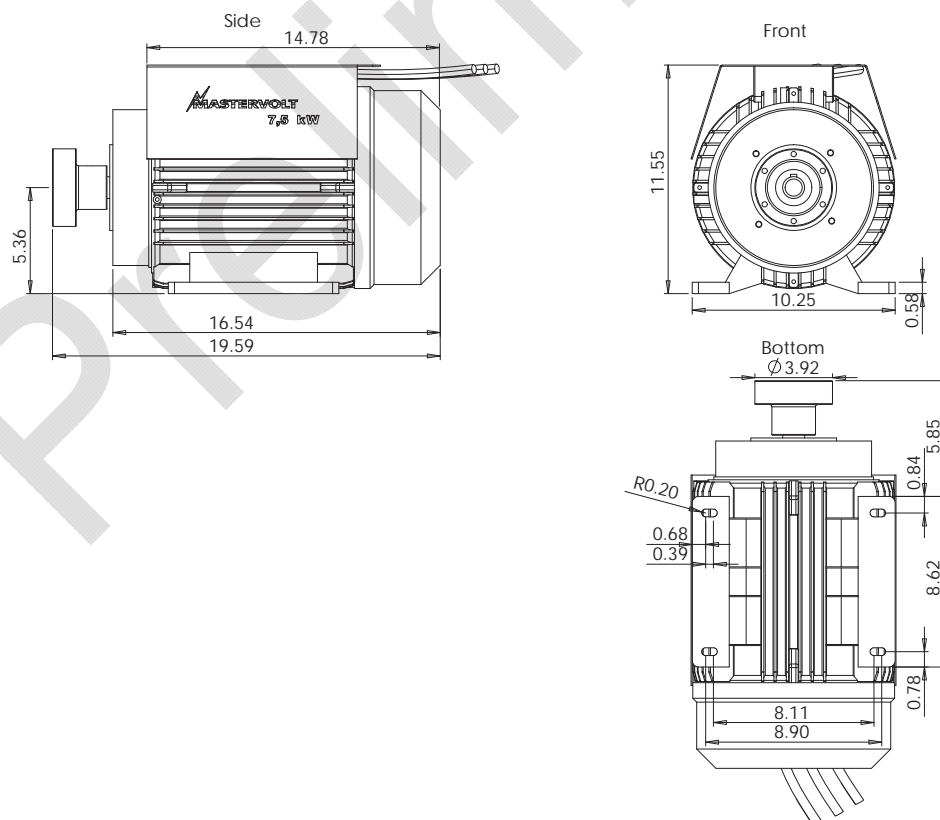


Figure 32: Dimensions of DriveMaster Ultra 7.5 motor in inches

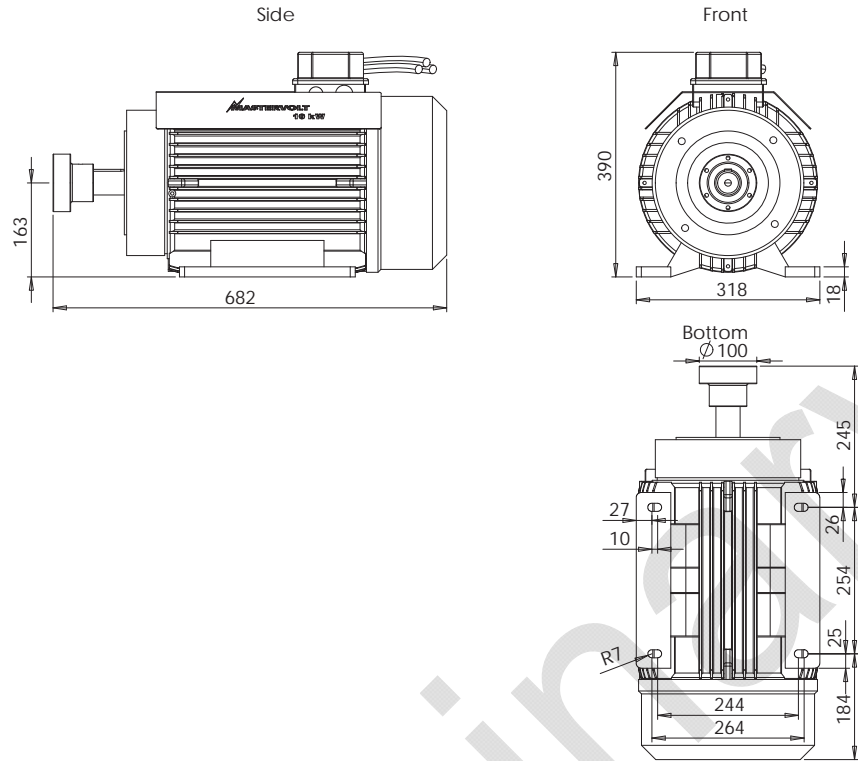


Figure 33: Dimensions of DriveMaster Ultra 10 motor in mm

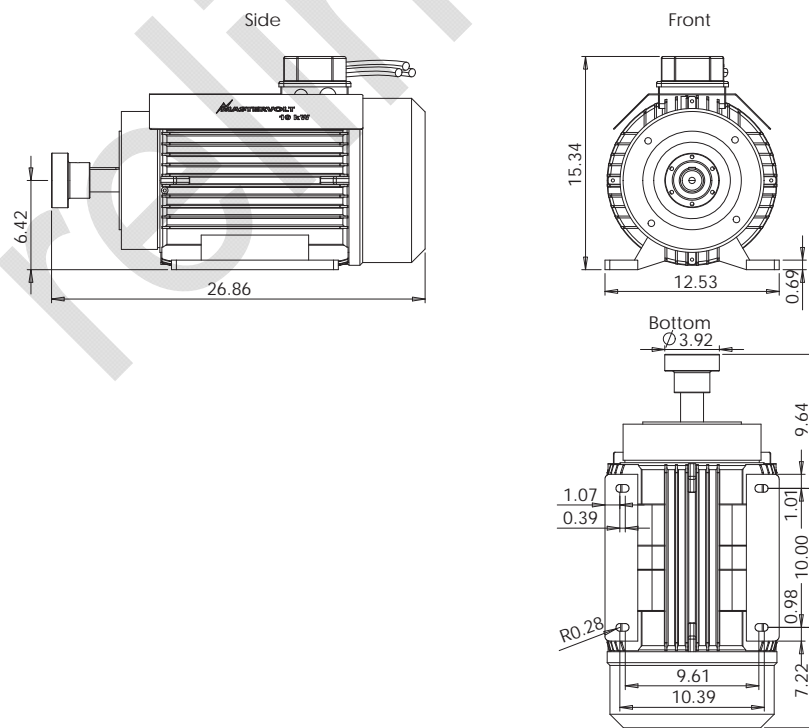


Figure 34: Dimensions of DriveMaster Ultra 10 motor in inches

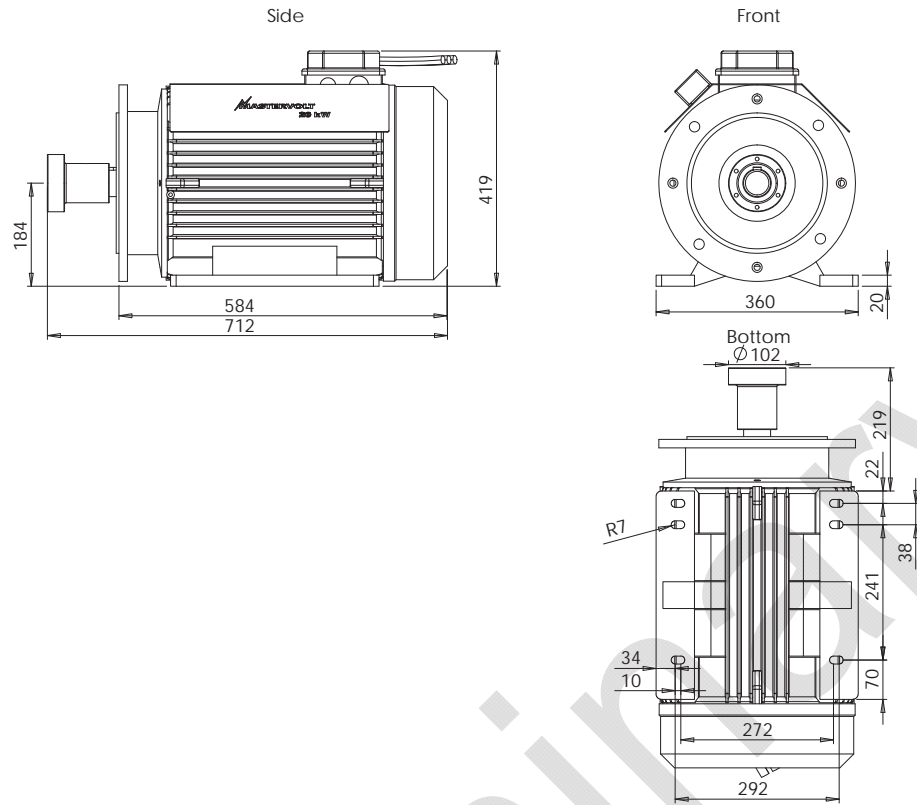


Figure 35: Dimensions of DriveMaster Ultra 20 motor in mm

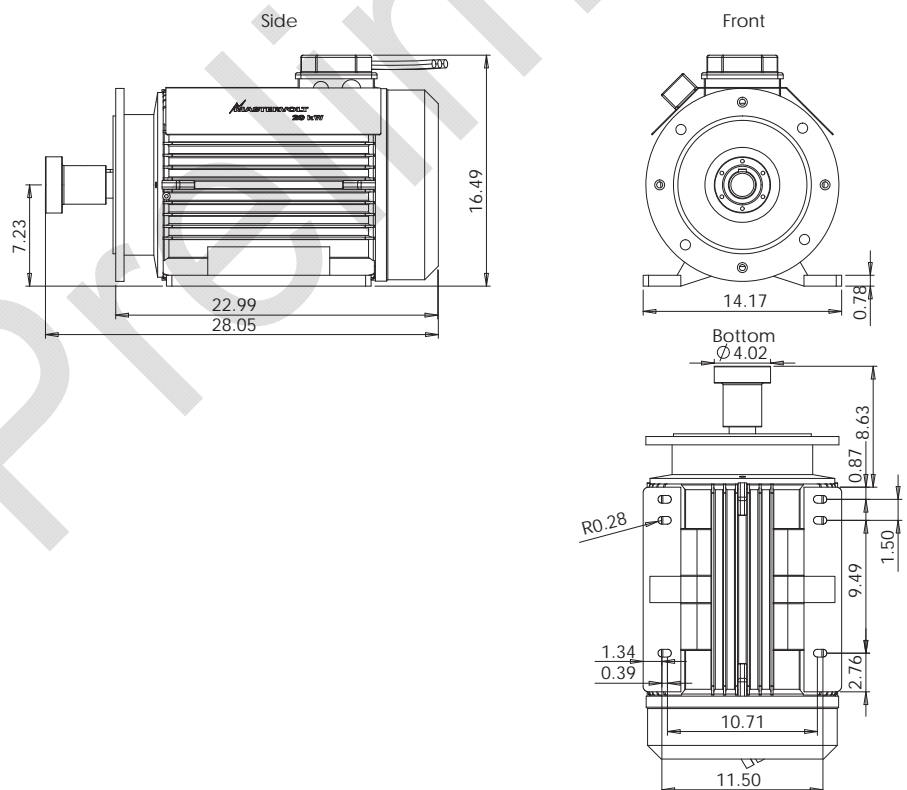


Figure 36: Dimensions of DriveMaster Ultra 20 motor in inches

## 9 ORDERING INFORMATION

Part number	Description
142000260	<b>3D motor mounting set</b>
142000261	<b>DriveMaster Ultra 3.5</b>
142000262	<b>DriveMaster Ultra 5 and 7.5</b>
142000263	<b>DriveMaster Ultra 10</b>
	<b>DriveMaster Ultra 20</b>

The DriveMaster can be mounted in the boat with a support bracket that is adjustable in height, width and angle. The support bracket has a total weight of 11.3 kg for the 3.5, 13.8 kg for the 5 and 7.5, 15.8 kg for the 10 and 18 kg for the 20.

The support bracket is delivered with 4 motor adjust feet and vibration absorbers.

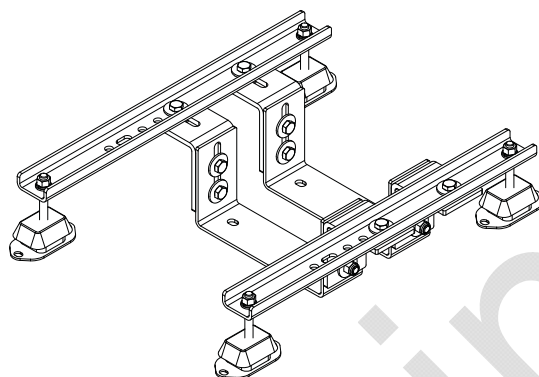


Figure 37: Support bracket

142000440	<b>A-flex thrust bearing + homokinetic coupling ø25mm</b>
142000441	<b>A-flex thrust bearing + homokinetic coupling ø30mm</b>

Characteristics of an A-flex coupling:

- Production of sound and vibration has decreased by 90%;
- Simplification of motor / propeller shaft systems;
- Lining procedure is easy by self-targeting clamping hub in the thrust bearing;
- Can absorb lining differences of up to 2 x 8°.

A complete set consists of: homokinetic drive shaft, thrust bearing with sleeve, optional adapter, bolts, nuts and washers. See the ordering details.

### Thrust bearing

The thrust bearing carries the high torque of DriveMaster Ultra systems and the associated high thrust force of the propeller shaft on the motor directly to the ship's hull instead of the motor. The thrust bearing aids in realizing a smooth and low noise propulsion system and absorbs all axial forces that need to be dealt with. Low friction ensures a long life propulsion system and the ability to operate a more powerful engine and propeller.

### Homokinetic joint

The homokinetic joint is mounted between the thrust bearing and the motor flange. Its purpose is to ensure installation of motor and propeller shaft without centering problems. After mounting, the homokinetic joint provides a few millimeters of movement to the front and the back of the center axle.

### ATTENTION!

Specify the propeller shaft diameter when ordering.

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
142000355	Extension cable set 6 metres



Preliminary