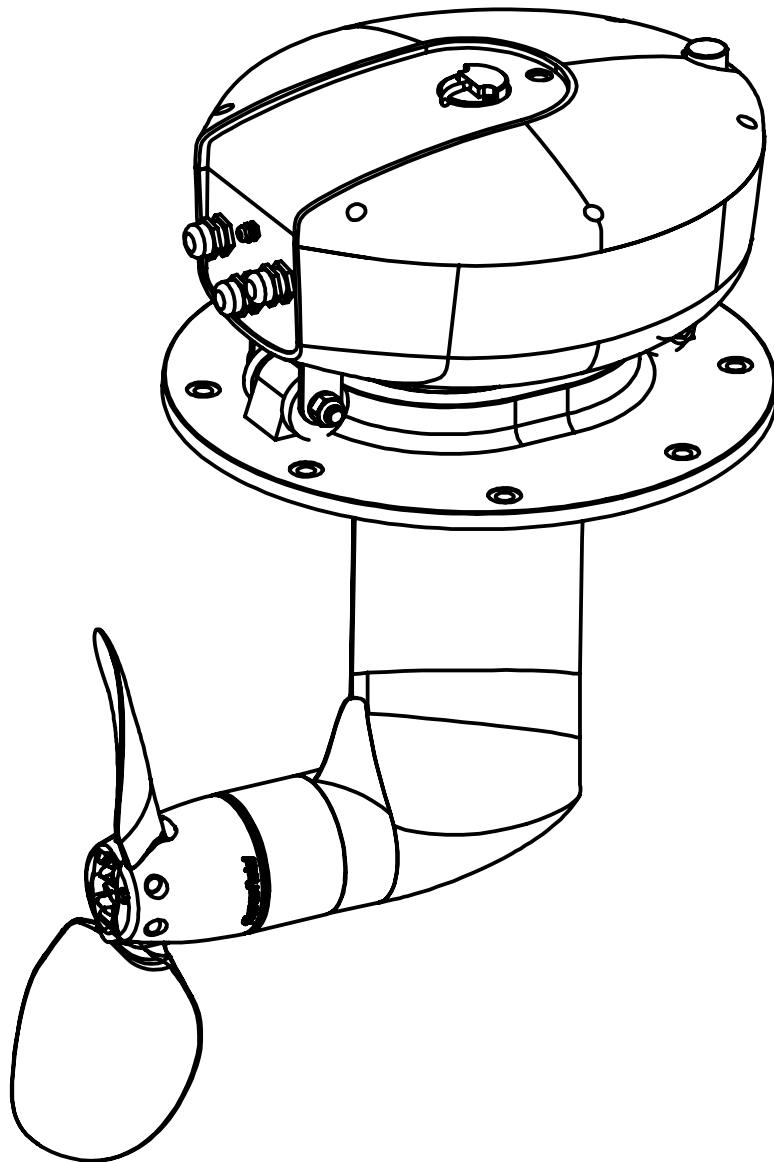


OCEANVOLT



Oceanvolt SD15 saildrive

Owners manual
English version 1.1



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1. Introduction

Dear customer,

Thank you for choosing Oceanvolt! Your new saildrive is designed to give you mile after mile of reliable, carefree and silent propulsion. We hope that you will enjoy the pleasant and effortless travel it provides.

We are constantly developing our products and would greatly appreciate your feedback. Please let us know if you have suggestions on how to improve our product:

www.oceanvolt.com

support@oceanvolt.com

Bon Voyage,

Timo Jaakkola, Managing Director

2. Conformity declaration

We, Oceanvolt Ltd, with sole responsibility, declare that Oceanvolt propulsion systems confirm with the following standards:

- ISO 10133 **Small Craft, Electrical Systems, DC installations**
- EN 55012 (2007) **Radiated disturbance emission test**
- EN 61000-6-2 (2005) **Immunity test (electro magnetic field and ESD)**

Helsinki 20.4.2014

Timo Jaakkola, Managing Director



3. Important safety information

This manual will tell you how to operate your Oceanvolt saildrive pleasantly and safely. Read the whole manual carefully before you take the system into use. Ignoring these instructions can cause property damage or personal injury.

The instructions are primarily applicable to single motor systems that use Valece XP-series lithium batteries (U24-12XP and U27-12XP). Your system may use a different set of batteries or be customized in other ways. Please refer to the boat owner's manual that came with your boat for information on how your system differs from standard installations. Information on twin motor systems can be found in the boat specific wiring diagram.

The boat owner's manual also includes information on where the main switch and fuse are, and contains descriptions of the electrical system and auxiliary devices such as generators and special battery sets. The manuals that come with your batteries, generators and other auxiliary devices will also contain important information that you must be familiar with before proceeding.

This manual does not teach you how to navigate, anchor, dock, or drive, and neither does any of the other manuals that came with your boat. We urge you to take a boating safety course and learn how to navigate and handle the boat properly.

This manual is based on Oceanvolt's experience and testing. It represents the latest information available at the time of printing, but no guarantee of its accuracy is made or implied, nor responsibility taken for its use. Oceanvolt reserves the right to make changes at any time, without notice, in the equipment, specifications, materials and prices of its products, or to discontinue any product, without obligation to make similar changes to products sold prior to the date of such changes.

Pay special attention to sections marked with the following sign:



DANGER: This symbol warns about risk of personal injury.



DANGER: This symbol warns about risk of damaging the system.



DANGER: This symbol warns about risk of electric shocks.



3.1 Using the system safely



Read this whole owner's manual and get familiar with the systems controls. Make sure that you know how to stop the motor quickly and how to turn off the main switch. Do not let anyone else operate the system unless they have read these instructions and you know that they are capable of using it safely. Always make sure that the throttle handle is turned to the "off" position before powering up the system with the main switch.

Switch power on and make sure that the batteries have a sufficient state of charge before casting off moorings from the pier or other attachment point.

Always make sure that there are no people in the water before starting the motor. Stop the motor immediately if someone enters the water near the boat.

Always check that there are no other boats or obstacles in the front or behind of the boat before starting the motor.

Always check that there are no ropes, anchor chains, floating thrash or other items in the water that could get tangled with the propeller before starting the motor.

Check that the rudder is straight, the anchor has been raised, and all ropes have been untied from their attachment points before you start the motor to make sure that the boat does not head off in an unexpected direction.

Never take the boat to shallow waters where there is less than three feet of water under the propeller. The motor and saildrive may break if the propeller cannot rotate freely. The mounting point of the saildrive may get damaged and start leaking if the saildrive or propeller hits the bottom.

Turn the throttle handle slowly and gently to keep the boat under control. Avoid quick turns, fast acceleration and stopping on short notice as other people in the boat could fall and get thrown overboard.

Never leave the system unattended when the motor is running. An accidental nudge or ill-advised push of the throttle handle may jerk the boat and cause injury and damage.

Keep the motor and its surroundings clean and dry. Do not cover the motor. Do not start the motor if there is anything resting on top of it. Make sure that there are no heavy items in the motor compartment, which are not secured. They may damage the motor, cables or the batteries when moving. If the motor stops while driving, turn the throttle handle to the "off" position, turn the main switch off, and wait ten seconds before turning power on again.

Always turn the main switch off after you have safely fastened the moorings. This makes sure nobody accidentally starts the motor. Switching power off also prevents the otherwise possible slow draining of the batteries, as the display and throttle handle consume some power even when in standby.

Always turn the main switch off before servicing any of the system's components or touching the batteries, cables, the fuse or the motor.



Changing the batteries, battery cables or other high current electrical wires must be done by a certified electrician. The batteries used to run the motor must be undamaged, and they must all be identical in manufacturer, model, make, chemistry, state of charge, and capacity. The cables must be at least 50 mm² in cross-sectional area and there must be a circuit-breaker and a fuse of a maximum of 350 A in the circuit.

When hauling the boat out of the water, make sure that the lines or ropes do not touch the saildrive. Never set the boat down so that the saildrive leans on the ground, the trailer or the supports. Do not turn the boat upside down.

Never run the motor while the boat is out of the water. This may overheat the motor or cause other damage. A running propeller is always dangerous and may cause injury. Keep the main switch turned off while the boat is out of the water.

Check the oil level regularly as instructed in this manual, and follow the servicing timetable.

The motor runs hot and may retain heat for some time after use. Let the motor cool down properly before touching or servicing it.

If there is a problem with the motor, stop it, check the display and write down any error codes, then turn the main switch off and follow the instructions later in this manual.

Please note that the display may only provides full functionality when using Valence XP-series batteries. With other batteries the display may not be able to provide information on the state of charge, malfunction etc.



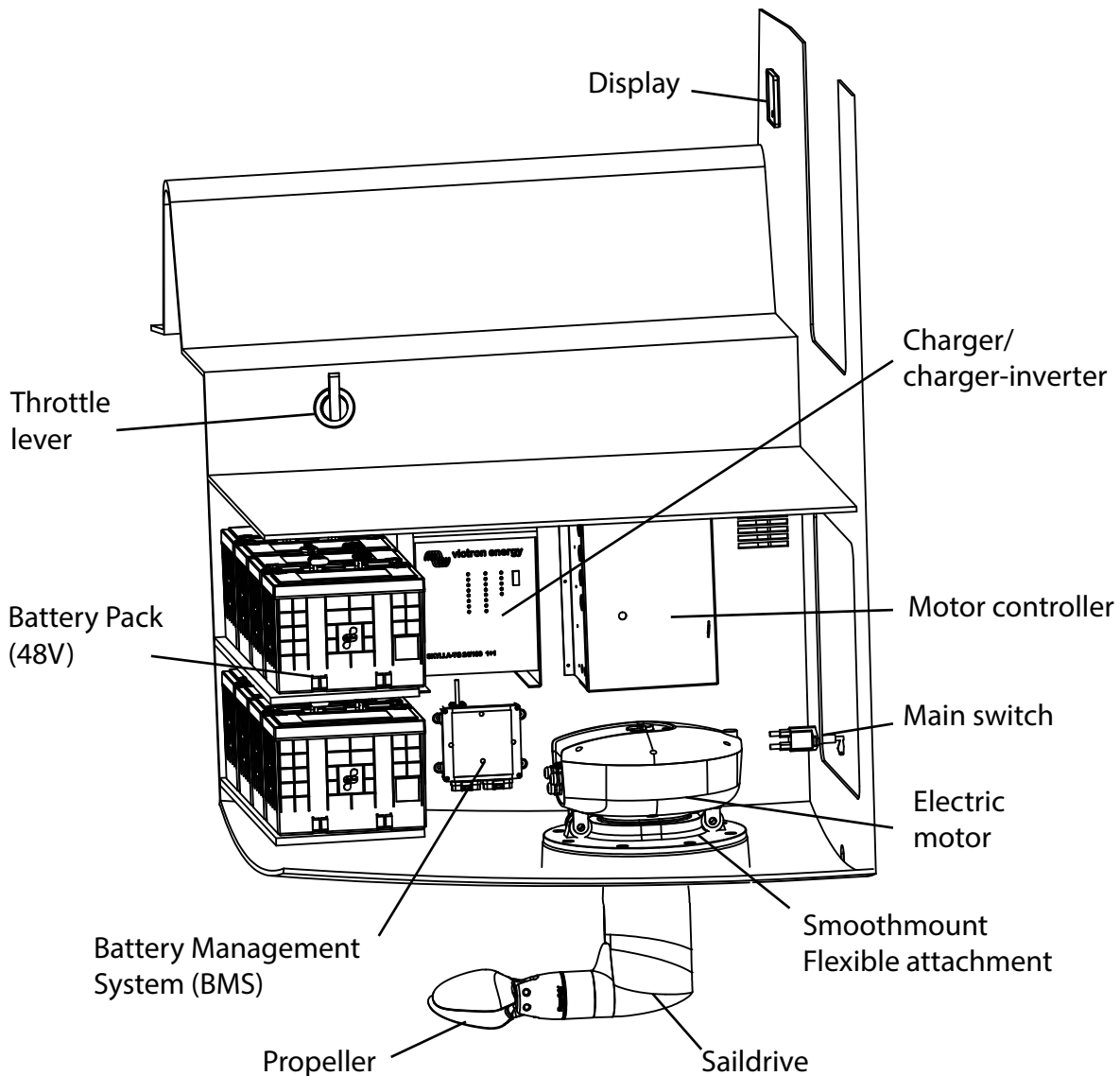
4. Discovering Oceanvolt SD15

Oceanvolt is an electric propulsion system for pleasure boats. It is a saildrive designed to be the only or primary motor in sailboats and motorboats. The saildrive is installed through the hull so that the electric motor is inside and the propeller is below the boat. The system is ready to go: testing and running in are completed before delivery.

In addition to providing propulsion, Oceanvolt saildrive can also generate electricity while sailing. This feature is called regeneration and it is one way to recharge the batteries. Sailing boats should be equipped with Flex-o-fold-folding propellers as these ensure proper regeneration. Motorboats normally use fixed blade propellers.

Other ways to recharge include shore power, solar cells, wind power and diesel generators, depending on the equipment installed in your boat. Further, the Oceanvolt system can be installed as part of a hybrid system. In full electric system all the energy is stored in batteries, whereas in hybrid systems there is an additional source of electricity, for example a diesel generator or a fuel cell.

The Oceanvolt system normally consists of the following components:

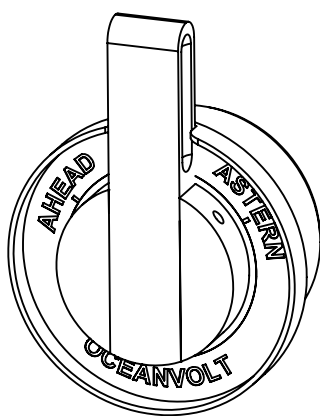




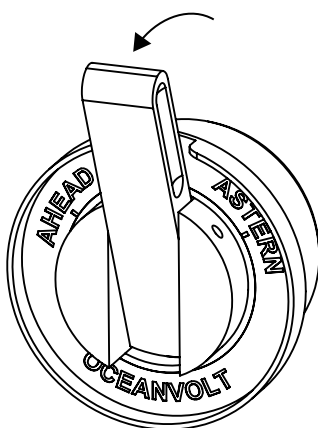
There is always a main switch and a fuse attached to the power cable between the controller and the batteries (look Appendix A). They are usually installed inside the boat or in a splash proof box in the cockpit. Please refer to the boat owner’s manual to locate all the components in your system.

4.1 Throttle handle

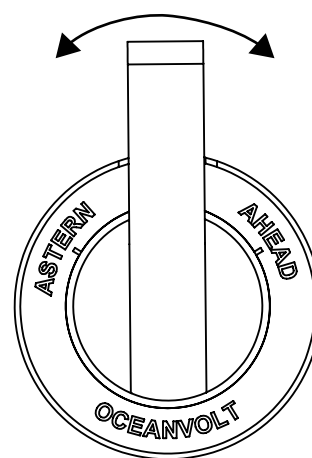
In the off position, the throttle handle points up and is pushed in the gap in the rim. To go to standby mode, pull the top of the throttle handle out of the gap so that it clicks. Turn the throttle handle gently to go to drive mode. Control the power by turning the handle to the direction marked “ahead” to go forward or “astern” to go backward. To return to standby, turn the handle back to the middle, and then push it into the gap to turn the system off.



Turned OFF



Stand by



Move handle
to drive forward/backwards



The throttle lever should always be in the OFF position when turning on the main switch. If the throttle lever is engaged in “AHEAD” or “ASTERN” position when switching on the system it will not respond before the lever has been turned to neutral position (STANDBY).

4.2 Display

Turn power on with the main switch to see system status, battery charge and other information on the display.

The display automatically discovers the system mode and shows relevant information accordingly. The most important piece of information on the display is the state of charge and the available operating time. The battery icon indicating the state of charge will change colors according to the table below.

Color	State of Charge
Green	100 - 16 %
Red	15 - 0 %



Symbols on left side:
Means to charge batteries.

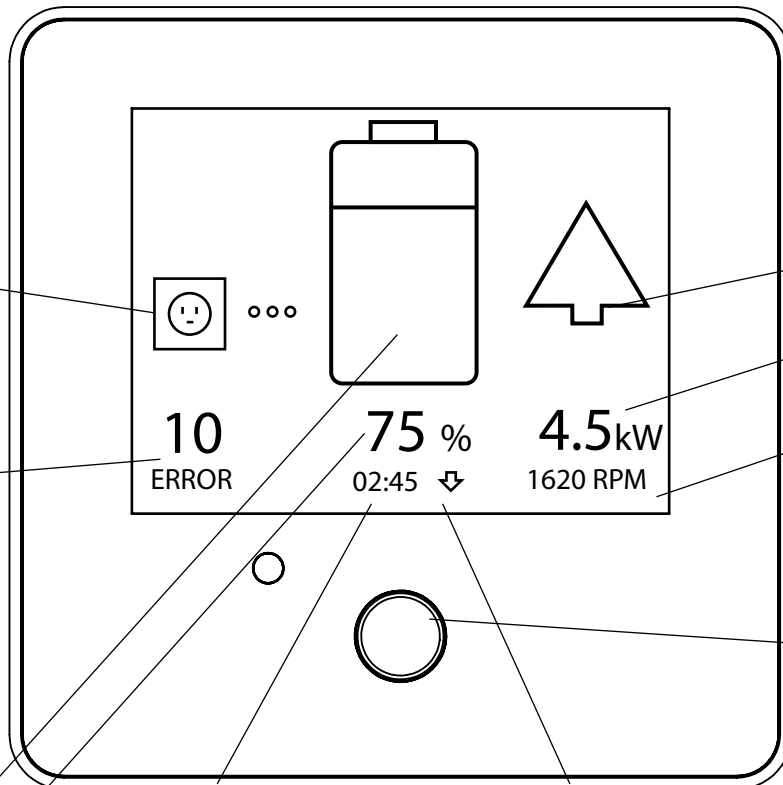
Plug indicates shorepower.

Errorcode

Battery charge level indicator.

Symbol color coded.

Battery capacity left in percent.



Symbols on right side:
Power indicators.

Arrow direction of power and it grows with increased power.

Power in use (kW).

Motor revolutions per minute.

Push button:

For acknowledge messages or alarms.

Time to go/recharge indicator hh:min.

Arrow up -> batteries charging.
Arrow down -> batteries discharging.



The display may not provide full functionality and information when used together with other than Valence XP-series batteries. With other batteries the battery icon may remain grey, which means charge level information is not available. The power and rpm indicators are available with all kinds of batteries as well as messages from the motor controller.

4.3 Lubrication and cooling

Oceanvolt saildrive is topped up with gear lubrication oil to protect the mechanics. The oil is filled thru the oli cap on top of the motor. The saildrive acts as a cooling device for the electric motor. The drive is immersed in water and will transfer the heat of the motor to the sea water.



Warning! Check the oil level weekly or after every 20 hours of operation. For proper protection of the mechanics it is important to only use transmission oil approved by Oceanvolt (Shell Spirax GSX 75W80 or similar quality oil).

4.4 Flexible attachment with the Smooth Mount

Oceanvolt saildrive attaches to the hull with special flexible rubber mounting. The Smooth Mount attachment reduces vibrations from the propulsion system. Because of the flexible attachment the saildrive may slightly tilt during driving (approximately ± 1-2 degrees).



4.5 Controller Area Network (CAN-databus)

Motor controller, batteries, throttle handle and the display are connected via Controller Area Network (CAN). The CAN bus reduces the number of wires and connectors, thus simplifying the installation and improving system reliability.



Warning! Do not connect any other CAN networks (for example NMEA2000) to the CAN bus used by Oceanvolt, unless these are a part of the propulsion system as that could cause interference with motor control and cause a hazard.

4.6 Batteries and chargers

The propulsion system is normally equipped with a 48 V battery pack and charger that can be used when the boat has access to shore power. The system may use different kinds of batteries consisting of lithium or lead acid battery units for instance. It is important that the batteries, the Battery Management System (BMS) and charger all are setup correctly to work safely together. Batteries, BMS:es and chargers supplied by Oceanvolt Ltd are preset to work properly together.

This manual gives general information concerning Valence XP-series lithium batteries (U24-12XP and U27-12XP) and Victron Skylla and Multiplus chargers. Please refer to their product manuals for more in-depth information.



Never replace a broken charger without making sure that it has been setup correctly. Using wrong settings may cause hazardous situations or serious damage to the system or boat.



It is important that all batteries used in the battery pack are all identical in terms of manufacturer, model, make, chemistry, state of charge, age and capacity.

Valence XP-series batteries

The Valence U24-12XP and U27-12XP lithium iron magnesium phosphate (LiFeMgPO₄) battery modules have a nominal voltage of 12 V. A battery pack for the propulsion system consists of a minimum of 4 pieces of serially connected batteries to achieve a nominal voltage of 48 V. A larger battery pack can consist of 8, 12, 16 etc batteries connected in series and parallel.

The battery pack is always equipped with a Battery Management System (BMS) that ensures and controls safe discharging and charging of the batteries. If an unsafe situation occurs the BMS will automatically close the charging or discharging of the pack by opening the contactor (electronic on/off switch) connected to the system.

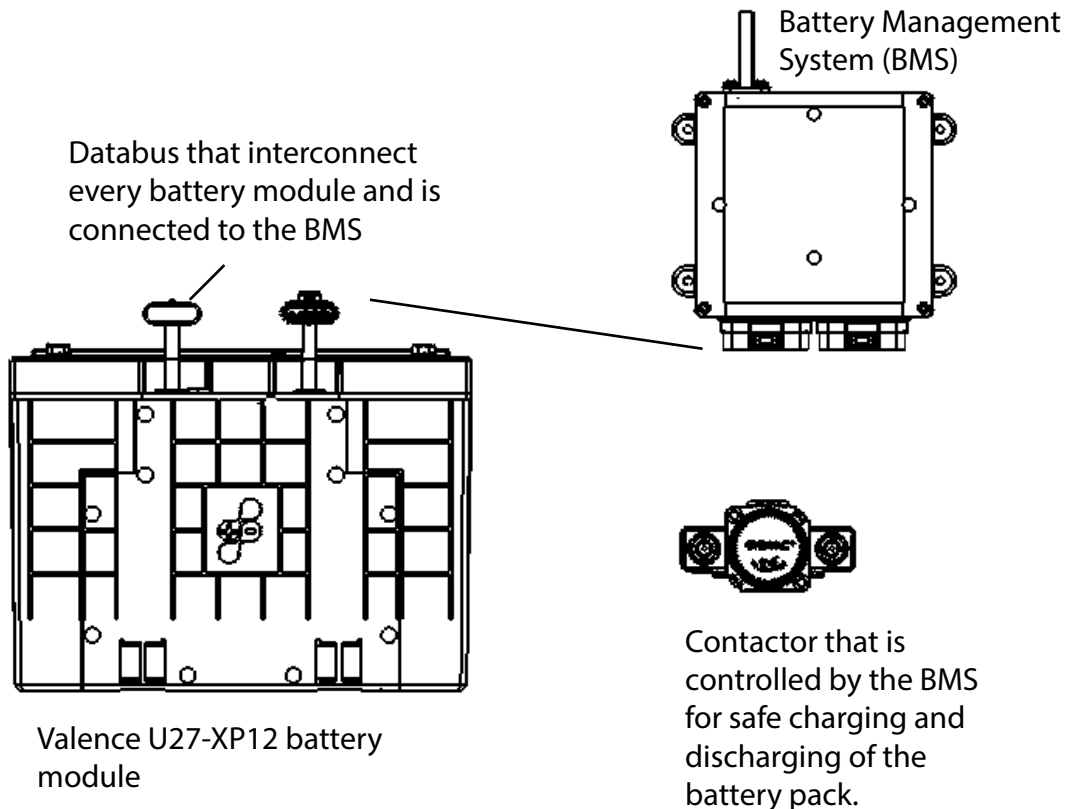
For the BMS to work it has to be connected to a 12 V supply that is separate from the propulsion battery pack (the house battery for instance). The 12 V supply must always be switched on when charging the batteries or using the propulsion system. The on-off switch of the supply may be placed on the electric board at the navstation for instance. Please refer to the Boat Owners manual to locate the switch.



All the batteries in the pack are inter-connected with data cables to supply information to the BMS and further to the display of the propulsion system over the CAN-bus.

The batteries and BMS are equipped with several safety features. On top of every battery module there is an inbuilt LED-light that indicates the proper function of the battery. A blinking green light indicates that the battery is intact whereas a red light indicates that the battery is not working properly and should not be used.

The battery pack is a significant investment that needs proper care during both use and storage. To ensure a long battery life we urge you to study the user guides of the batteries.



Victron chargers

The battery pack is normally equipped with a charger that can be connected to shore power. The charger has to be properly setup to match the charging requirements of the battery type as batteries of different chemistries require different charge voltages.

Oceanvolt supplies Victron Skylla chargers and Victron Multiplus/Quattro charger-inverters that are preset to charge Valence XP-series battery packs safely. To ensure that the charger is preset there should be a sticker on the charger that states "Oceanvolt 58.4 V".

The time to charge a near empty battery pack depends on the size of the pack and power of the charger. Typically the charger is sized to be able to fully charge the pack in about 3-8 hours. The display will indicate the remaining charge time.



Warning! Never bypass the contactor of the BMS when connecting the charger to the battery pack, as this may cause over charging the batteries. The contactor is meant to ensure safety.



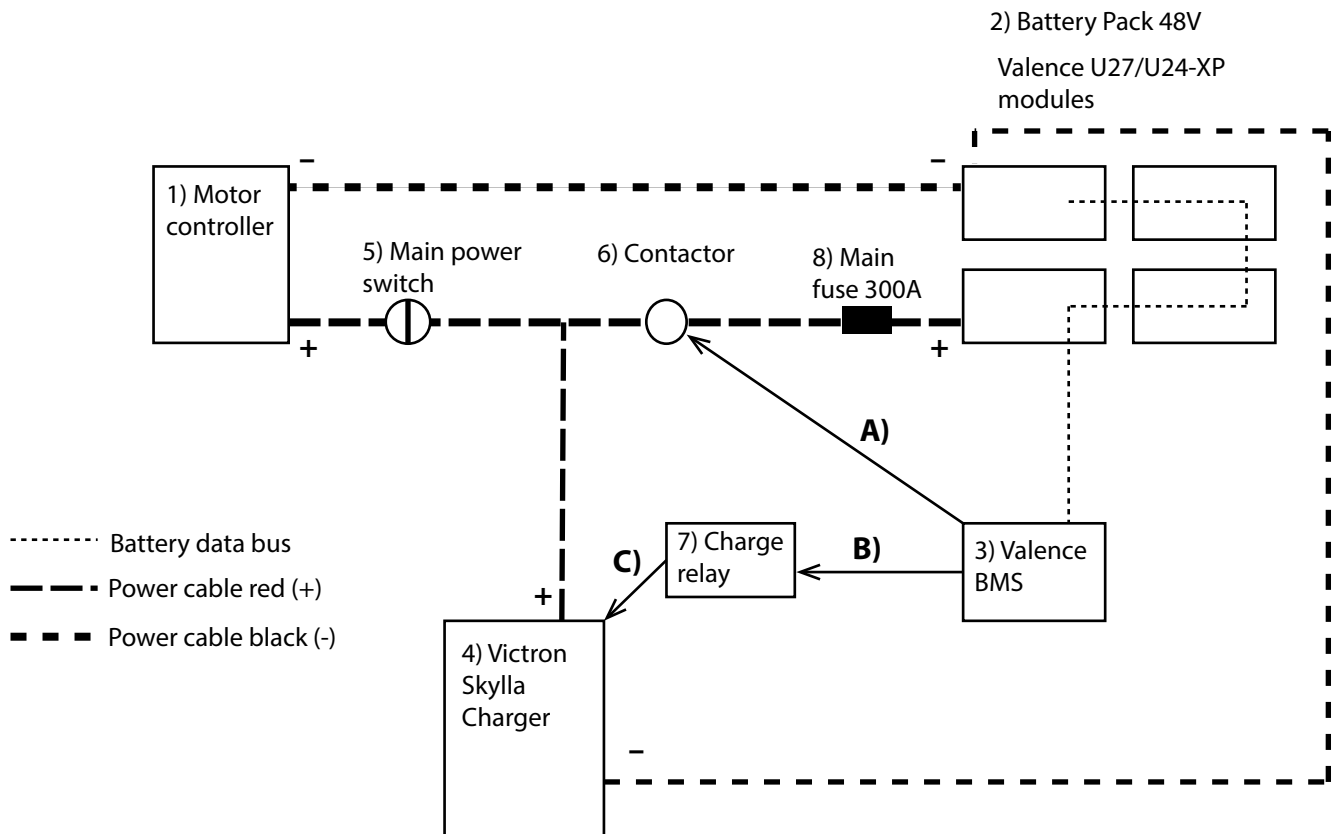
4.7 Charging for the first time

To get the full capacity from the battery pack it should be properly charged and balanced before starting to use the propulsion system. If the propulsion system and battery pack have been installed on a boat yard please ensure that this has been done.

When charging the battery pack the first time it may take a significantly longer time to reach 99-100 % charge level than it will in normal use. This can happen if one or more battery modules have a significantly lower level of charge than the other modules (the battery pack is imbalanced).

Reaching a 90-95 % level of charge may be achieved in normal time for an imbalanced battery pack, but topping up the batteries to 99-100 % level of charge may require several hours of additional charging. It is important to charge the battery pack fully before using the system for the first time to get the full capacity. It is also important to fully charge the battery pack a couple of times during the season (year) to keep the battery pack well balanced. Balancing the battery pack should always be done using the main charger.

4.8 How charging /discharging is controlled by the BMS



A) The BMS (3) controls the contactor (6). The contactor is closed (power on) when the BMS is turned on and it is safe to charge and discharge the battery pack. The battery receives information from the battery modules over the data bus. Should the BMS receive information that the one battery module is out of order and unsafe to use it will open the contactor (switch the power off). In such case it will not be possible to use the motor or charge the batteries.

B) The BMS (3) controls the charge relay (7) to control when it is safe to charge the battery pack.

C) The charger (4) receives information from the relay (7) on when it is safe to charge.

NOTE! The diagram is only schematic and its purpose is to explain the logics of the BMS as it controls the charging and discharging of the battery pack. For installation please refer to the complete installation diagram!



5. Driving and recharging

This chapter contains important information about driving with Oceanvolt saildrive, recharging the batteries, and using the regeneration feature.



The capacity of the battery set has a substantial effect on the range that the boat can cover when running on electric power. The battery capacity is given in the boat owner's manual.



The display unit will give an estimate on remaining operating time, but you should always play it safe and make sure you have sufficient power to drive the boat to harbor.

5.1 Before unfastening the moorings

1. Unplug the shore power cable.
2. Check the oil level of the system (weekly or every 20h of motoring).
3. Turn on the 12 V power supply of the BMS if it has been closed during mooring.
4. Turn the main power switch on.
5. Check the battery state of charge shown on the display unit.

5.2 Starting up

1. Make sure that there are no swimmers, boats or other obstacles in front of or behind the boat. Unfasten the moorings.
2. Pull the top of the throttle handle out of the gap so that it clicks to standby position.
3. Gently turn the throttle handle to “ahead” (forward) or “astern” (backward).

5.3 Turning the motor off

1. To stop the motor, turn the throttle handle so that it points up. Push the handle into the gap in the rim to turn power off.
2. You may keep the main switch on while sailing to let you easily continue motoring or start regeneration of power. If you do not plan to use the motor, turn the main switch off, as this will save the batteries. The system always takes some power when the main switch is on.

5.4 Regenerating power while sailing

The Oceanvolt system can generate electricity to recharge the batteries while sailing, with folding propellers. Regenerating will typically slow the boat down by 0.1 to 1 knots depending on propeller size, wind speed and boat dynamics.

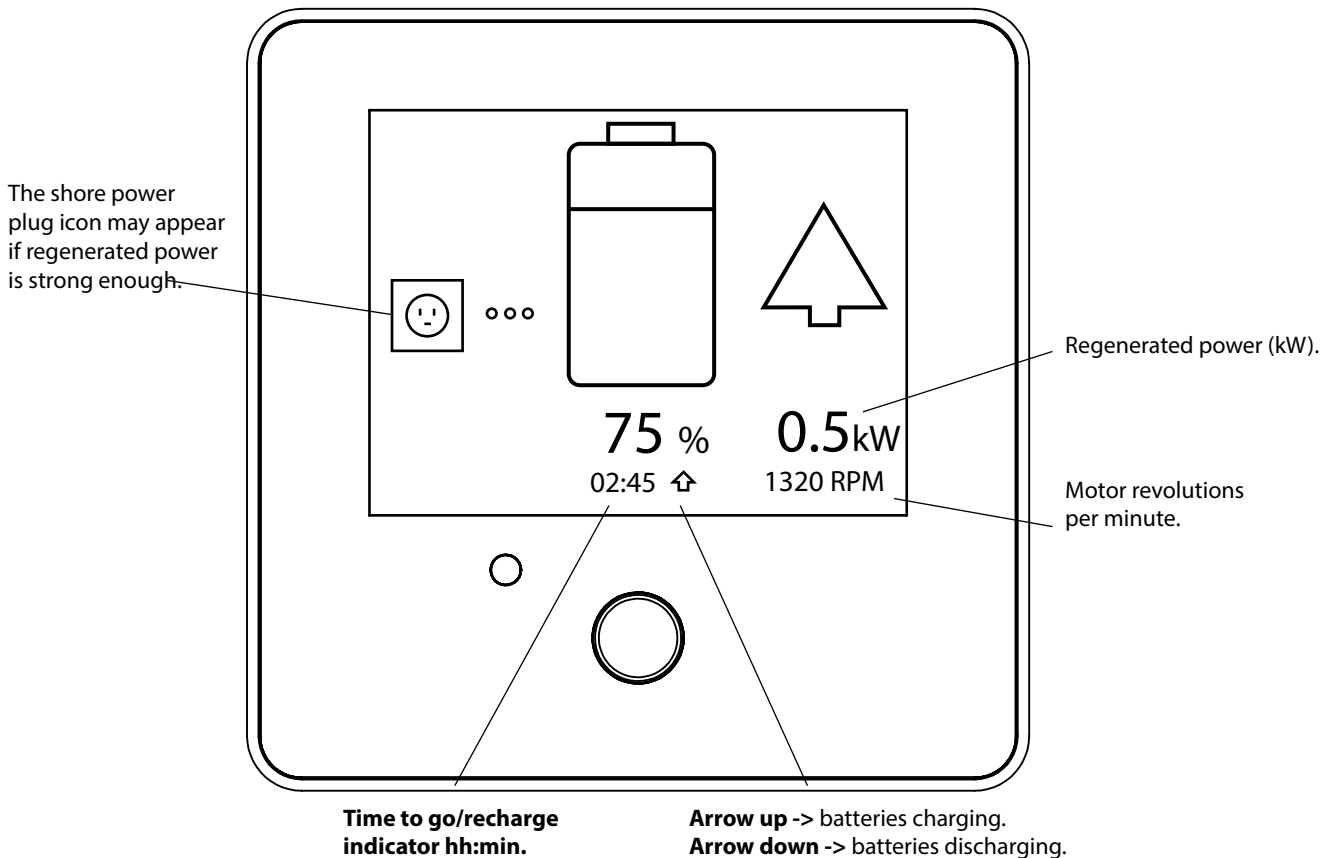
Regeneration should only be used when the charge level of the batteries is 95 % or less. Regeneration is typically feasible at speeds of five-six knots or above. Recharging can be done manually using the throttle lever by following the sequence described on the next page:



1. Check that you are sailing at a sufficient speed.
2. Make sure that propulsion system is turned on from the main switch.
3. Engage the throttle lever in forward to 1500 rpm or more to ensure that the blades will open. The throttle shall be engaged in "FORWARD" during regeneration.
4. Move the throttle lever to find a suitable rpm for regeneration and check the power readings on the display. When the power reading is positive and the small arrow is pointing upwards it indicates that the system is charging the batteries. When the regenerated power is strong the socket icon on the display will appear.
5. The optimum rpm for regeneration depends on the propeller pitch and boat speed. If the sailing speed increases significantly a higher rpm may be more efficient for regeneration. If the motor rpm is all too low the blades of the propeller may fold in. Increase to rpm to re-engage regeneration.
6. Follow the charge level readings on the display from time to time and stop regenerating when the charge level has reached 95 %. Regeneration can be stopped by turning the throttle lever to neutral position (STANDBY or OFF).



Regeneration should only be used when the charge level of the batteries is 95 % or less for all kinds batteries. The battery pack should also be properly balanced prior to regeneration. The BMS of the Valence batteries will protect the batteries from overcharge, but it may cause a close down of the battery pack if the charge level gets too high when topping up the batteries.





The power produced by regeneration depends on sailing speed and the propeller size. This table lists typical regeneration power levels:

Sailing speed	Regeneration power Folding propeller
6 knots	75 W
7 knots	200 W
8 knots	350 W
10 knots	500 W

5.5 Mooring

1. To stop the motor, turn the throttle handle so that it points up. Push the handle into the gap in the rim to turn power off.
2. Make sure that the boat is securely fastened to the pier or other attachment point.
3. Turn the main switch off.



Always turn the main switch off when the boat is securely moored. This will prevent the accidental starting of the motor. It will also prevent the slow discharge of the batteries when the boat remains moored for an extended time.

5.6 Recharging with shore power

Shore power is the most convenient way to recharge the batteries while at harbor. The Valence battery pack is normally equipped with a Victron Energy charger (Skylia) or charger-inverter (Multi-Plus). The BMS will automatically shut down the charging when the batteries are fully charged.

1. Make sure that the 12 V power supply of the BMS is turned on. It is not possible to charge the batteries unless the BMS is active.
2. Make sure that the battery charger is plugged into its socket.
3. Connect the shore power cable to a terminal on the pier or shore. Make sure that the terminal socket is equipped with a residual current circuit-breaker (ground fault circuit interrupter).
4. The chargers are normally equipped with led-indicators which tells the status of it. It may provide information on whether the charger is connected to shore power and if it is charging. Please refer to the operation manual of the charger.
5. The chargers will normally indicate when the batteries have been fully recharged. The level of charge can be checked on the display of the propulsion system if the main switch of the propulsion system is turned on.



6. Follow the instructions of shore power usage provided by the harbor or yacht club. If the main power switch is turned on there will appear a socket icon on the display that indicates that the batteries are charging. There will also be an estimate on how long time charging will take until the batteries are fully charged.

Please refer to the manual of the batteries, battery charger or Boat Owners manuals for more information.



The BMS will protect the batteries from overcharge. Never bypass the BMS by connecting the charger directly to the plus and minus pole of the battery pack.

NOTE! The battery pack should be fully charged at least a couple of times during the season (year) with shore power to ensure that the battery pack remains well balanced (all battery modules reach the same state of charge). To ensure it is properly done leave the charger on for a couple of extra hours after the charge level indicator has reached 100 %.

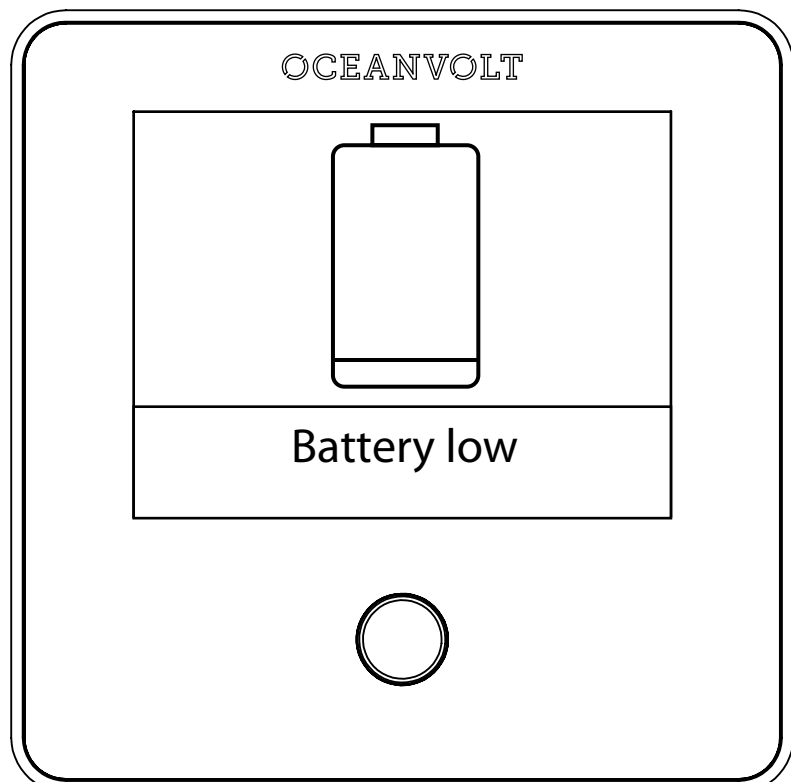
5.7 Messages on the display

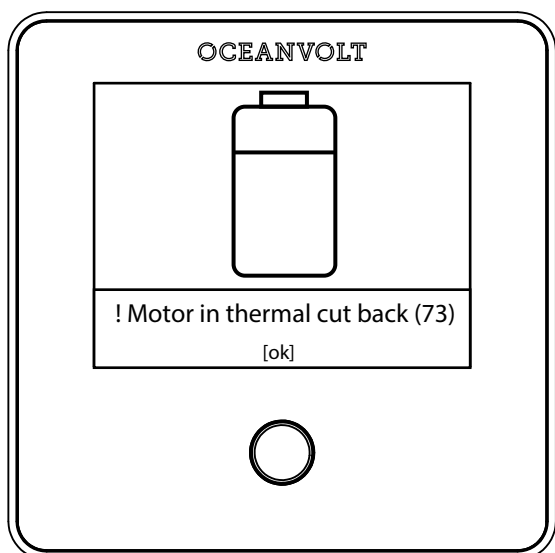
In the event of a fault or an error, the display will show a warning message. You can acknowledge the message by pressing the button. Warnings of serious faults will however remain on the display until the problem has been fixed.

The Oceanvolt SD15 –system has several inbuilt safety features that aim to protect the system. Should the motor or controller overheat the system will automatically reduce the maximum power output.

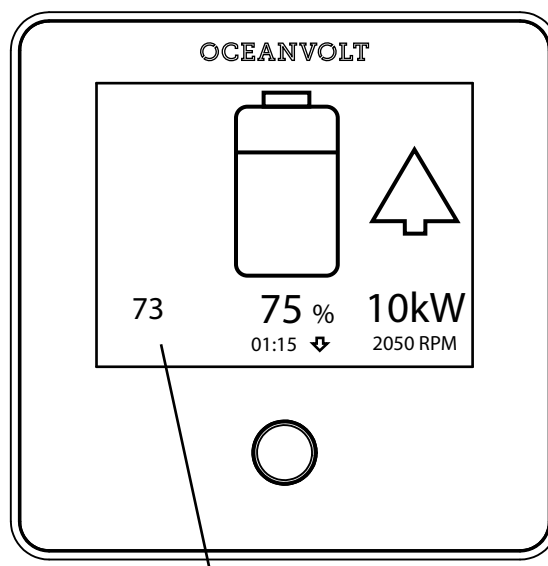
Battery state of charge low:

When battery charge level goes below 15 %, a warning message is displayed. Push button to acknowledge message and the display will turn to general view. The battery icon will stay red as long as the battery level is less than 15 %.





1) Push button to acknowledge message.



2) Error code "73" will appear until motor has cooled down enough.

Example: Motor in thermal cut back (73):

The motor is overheated and will not provide full power until cooled down enough. Avoid using the motor if you can. The system will limit the maximum power output in order to prevent damage to the system components. This may make it more difficult to maneuver the boat. The warning will stay on the display until the system has cooled off sufficiently.

General about display messages

The display provides both informative messages as well as fault error messages and codes. For some errors the display will provide further information when pushing the button the first time. A second push will bring the display back to general view.

Write down the error code and look it up in the troubleshooting section (section 8 of this manual) for more information.



6. Maintenance and care

We appreciate that you want to take the necessary measures to protect the value of your Oceanvolt saildrive, and have outlined a program for periodic maintenance and safety inspections. It is important that you follow these recommendations.



Always turn the main switch off before commencing any maintenance or inspections. Pay attention to warning labels and prohibitory signs. None of the enclosures of the components such as the motor may be opened. If you suspect a problem in a component, have it serviced by a qualified electrician on-site, or detach the component and ship it for servicing to the manufacturer or an authorized service center. The boat's electrical system may only be serviced and modified by a qualified marine electronics technician. Before detaching a component be in touch with your local dealer or Oceanvolt Ltd.

Operation / component	Every trip	Weekly	Monthly	Every 6 months	Annually	Every 5 years
Battery state of charge	X					
Oil level check		X				
Saildrive inspection / cleaning				X		
Display and throttle handle cleaning			X			
Anode inspection / replacement				X		
Oil change					X	
Saildrive painting with anti-fouling					X	
Saildrive attachment bolt inspection					X	
Battery balancing				X		
Cable connector inspection					X	
Inspect / replace flexible mounting						X



6.1 Batteries

Proper treatment and storage of batteries will help give them a long life span. Please refer to the battery manufacturer's instructions on how to maintain and store the batteries.



Lithium and lead-acid batteries will be seriously damaged if discharged completely. Always recharge the batteries to full capacity and turn main switch off when leaving the boat unattended for an extended period.

Check the state of charge each time before using the motor. This can be done by checking the display if using Valence batteries. If your system uses another type of batteries, please consult the boat owner's manual for more information. Charging of lithium batteries must always be controlled by the BMS.

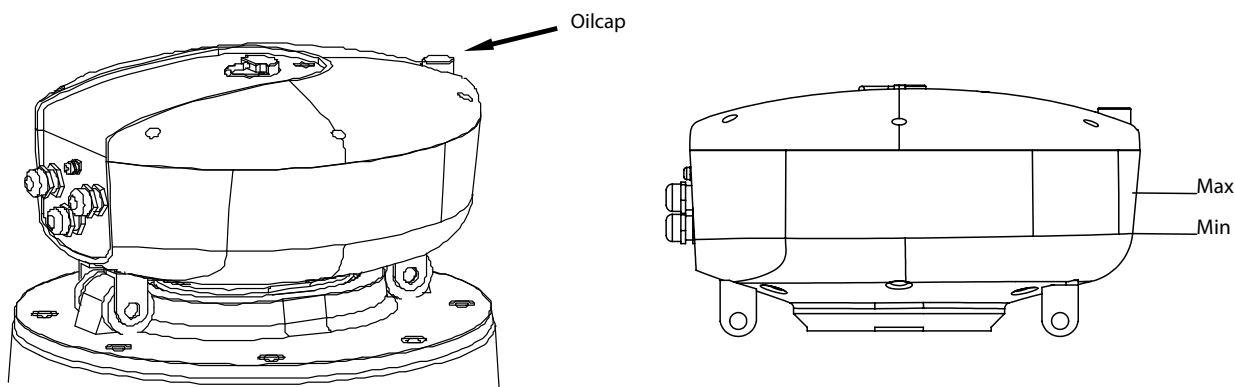
NOTE!

If the boat is left unattended for an extended period of time make sure that the power supply of the BMS is ensured if left turned on. The BMS of the Valence battery pack uses a separate 12 V supply (house battery for instance), which will drain slowly when the BMS is active. The 12 V supply battery needs to be big enough and/or be charged by shore power, solar power or some other means to compensate for the slow power drain.

6.2 Oil level check and oil change

Oil level can be checked by opening the oil cap on top of the motor. The right oil level is indicated in the picture below. If the level is lower, add more oil and close the plug carefully. It is very important to only use oil approved by Oceanvolt (Shell Spirax GSX 75W80 or similar quality oil).

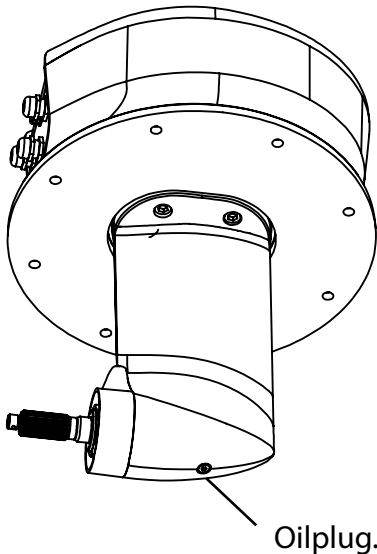
The transmission oil must be drained and replaced with fresh oil annually. This can be done when the boat is out of the water thru the oil drain plug in the bottom of the drive (recommended). Optimally, oil change should take place at the end of the boating season.





Oil drain thru the oil plug

- 1) To change the oil, haul the boat up and place a small bucket under the saildrive. Open the plug at the bottom of the saildrive to drain the oil. When all of it has come out, carefully close the plug and dispose of the used oil properly.
- 2) Then open the plug on top of the motor and fill the oil channels with slightly less than a quarter of a gallon (approximately 0.7-0.8 liters) of fresh oil, at a slow pace. Check the oil level an hour later and add more if the oil level is not high enough.



- 1) Open the oiltap with allen key (hex wernch) size 5.
 - 2) Drain oil to bucket.
 - 3) Replace the sealing and put back the oil plug and tighten gently (2 Nm).
- NOTE! Tightening the oilplug too hard may damage the thread.



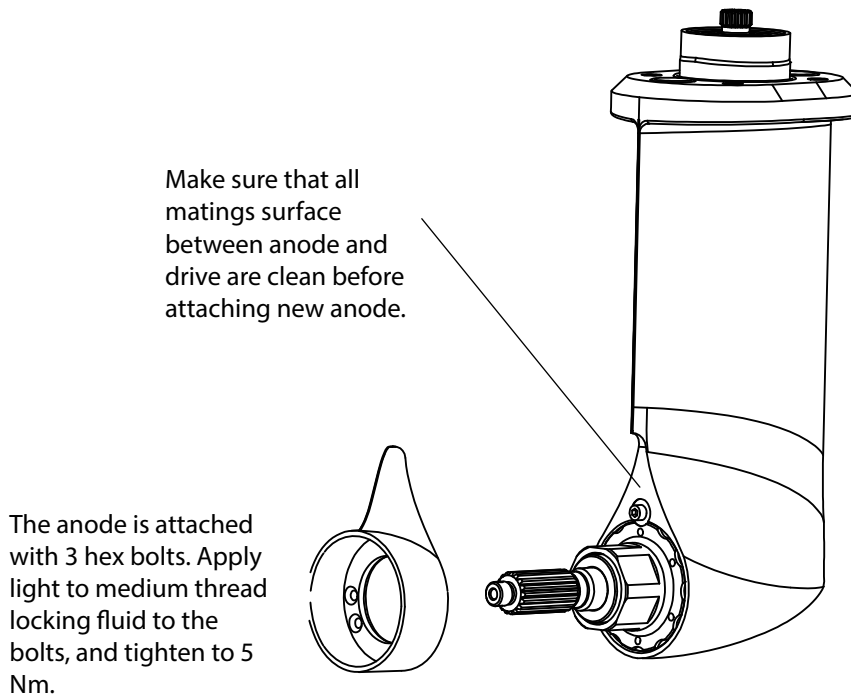
It is important to check the oil level right before the motor is first used after an oil change, and at the start of the boating season.



6.3 Anode replacement

The anode, made of pure zinc, protects the saildrive from corrosion. It must be changed when about half of the material has been consumed. You can order a replacement anode from Oceanvolt or an authorized service center.

To replace the anode you first have to detach the propeller. Refer to the documentation that came along with your propeller on how to do this.



The anode is attached with three M6 hexagon bolts. Clean the surface of the saildrive under the anode carefully to make sure that there is a good galvanic connection from the saildrive to the anode. Apply thread-locking fluid to bolts before attaching the new anode.

NOTE!

The thread locking fluid must be low to medium strength (normally purple or blue) to enable opening the bolts again for the next change of anode.



Never apply any kind of paint or anti-fouling to the anode.



6.4 Applying antifouling paint

Depending on the boating area the drive may benefit from being to be painted with anti-fouling to keep the drive clean during the boating season. It is important that the drive surface is clean to ensure sufficient motor cooling.

Firstly make sure that the paint surface on the drive is intact and there are no dents or scratches. If there are scratches all the way thru to the aluminum surface these need to be fixed using 2-component epoxy primer suitable for aluminum (Hempel Light Primer for instance).

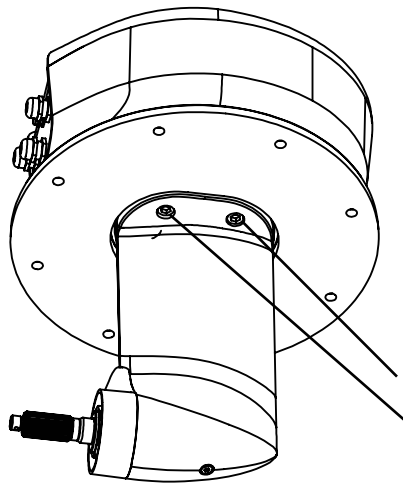
Only use anti-fouling paint that is suitable for drives made of aluminum alloy. Remove the anode during painting or protect it from getting painted. Then apply anti-fouling paint according to instructions from the paint supplier.



Never use copper based paint on the drive as this can cause severe corrosion problems! If such paint is applied to the boat bottom leave a 50 millimeters gap between the painted area and the drive.

6.5 Checking the saildrive attachment bolts

Check that the attachment bolts of the saildrive are firmly secured. The correct tightness of the bolts is 65 Nm.



The drive is attached with 4 M12 hex bolts. Ensure that the tightness is 65Nm on each bolt.



7. Limited warranty

Oceanvolt Ltd. guarantees the Oceanvolt motor and saildrive to be free of material and manufacturing defects during the warranty period. Oceanvolt will indemnify the final purchaser for the expenses to repair a material or manufacturing fault. This indemnification does not cover any incidental costs or financial losses (for example, costs for towing, transportation, communication, food, accommodation, loss of earnings or time). See complete warranty terms.

The warranty expires five years after the date on which the product was first delivered to its first owner. All warranty claims revert to the original date of delivery. Systems that are used commercially or by public authorities, even temporarily, are not included in this warranty. The right to make a claim under the warranty runs out two months after the discovery of a fault. Normal wear and tear and routine servicing are excluded from the warranty. For example, the anode, fuse and oil are not covered.

Oceanvolt shall have the sole right to decide whether faulty parts are repaired or replaced.

Oceanvolt Ltd. is entitled to refuse a warranty claim if:

- 1) the warranty claim was not correctly submitted (failure to present a completely filled-in warranty certificate and proof of purchase)
- 2) the owner fails to contact Oceanvolt before sending the system for servicing
- 3) the product was or has been handled, used or installed improperly
- 4) the safety, operating and care instructions given in the owner's manual were not observed
- 5) the product was in any way altered or modified or parts and accessories were added that are not expressly permitted or recommended by Oceanvolt
- 6) previous services or repairs were not carried out by an Oceanvolt authorized service center, or non-original parts were used

The customer must be in contact with Oceanvolt Ltd. by phone or email before detaching a faulty component and sending it to repair. The component must be properly protected during transport. Hazardous components such as lithium batteries may only be shipped if relevant regulations are observed and followed.

To check a warranty claim and to process a warranty, we require a completed warranty certificate. This must be filled with contact details, product details, its serial number, purchase date, boat type, and a brief description of the problem.



8. Troubleshooting

The Oceanvolt SD -system, the Valence XP-series batteries and battery chargers provided by Oceanvolt Ltd have a lot of inbuilt automatic electronic protection. The Valence BMS will for instance will close down automatically before the charge level is too low to harm batteries and protects the batteries from overcharge.

The display will assist you by supplying error codes. Please note that some of the error codes presented are only available when using Valence XP-series batteries. A selection of the error codes is presented in the table on the following page.

Additional to error messages the light ring of the throttle lever may support during the troubleshooting process. A steady light indicates that everything is in order, while a blinking light indicates that the throttle lever is not properly connected. The LED indicators of the battery modules, the charger and the motor controller may also give valuable information that supports trouble shooting.

8.1 First actions

In case of an error or fault the first action is to:

- 1) Put throttle lever in off-position.
- 2) Note and write down any error codes shown on the display.
- 3) Turn off the main switch.
- 4) Refer to the error code table later in this section and follow the instructions there.
- 5) Turn on the main switch and check if the problem remains.
- 6) If the problem remains, contact Oceanvolt or an authorized service center at your earliest convenience.

If the system does not turn on from main switch:

- 1) The charge level may be too low or the BMS is turned off. Turn on the 12 V power supply of the BMS. Charge the 12 V supply battery and the battery pack if the charge level is low.
- 2) Check that main fuse is intact.
- 3) Check that the power cable connections are intact.
- 4) Check that the data cables are intact.



Always turn off the main switch when inspecting or repairing the system. Avoid using jewellery or clothing materials made of metals when inspecting areas close to the batteries or controller.



8.2 Error codes on display

This table lists a selection of codes shown on the display in the event of an error. The error code will remain on the screen until the problem is fixed.

In general error codes numbered between 25 and 42 are concerned with the Valence battery pack. Codes numbered 43 or higher are related to the motor controller. If the error code can not be found in the table please write it down and contact your local dealer or Oceanvolt support.

Code	Description	Recommended actions
25. Battery module lost	The BMS fails to find all battery modules in the battery pack.	Check that data cables of batteries and BMS are properly connected.
26. - 27. Battery over temperature	The battery modules or BMS are too warm.	Improve ventilation/cooling of the battery compartment. Avoid heavy charging or discharging of the batteries until cooled down.
28. Battery critically discharged	Battery voltage or state of charge is low.	Charge batteries.
29. Battery over voltage	Voltage of one (or more) battery cells are high.	Stop charging batteries.
30. Battery over temperature	The battery modules or BMS are too warm and will close down.	Improve ventilation/cooling of the battery compartment.
31. Battery temp sensor failure	Information only.	Recycle power of BMS. Contact technical support if message appears frequently.
32. Battery voltage sensor failure	Information only.	Recycle power of BMS. Contact technical support if message appears frequently.
33. Battery current sensor failure	Information only.	Recycle power of BMS. Contact technical support if message appears frequently.
34. Battery SOC mismatch	Information only. Indicates that the state of charge of one battery module differs 30% or more from the others.	First actions: Recycle power on BMS. Second action (if message reappears, and the pack will not be fully charged in normal time): Charge battery pack with shore power for proper balancing for an extended period of time up to 48 hours).
35. Battery critically discharged		Charge batteries.
36. - 37. Battery over voltage	Information only. One or more battery cells are highly charged.	Stop charging the battery pack. Stop regenerating with propeller.
38. Battery critically discharged		Charge batteries.
39. Battery VMU timeout		
40. Battery precharge failure		
41. Battery sanity error	The BMS has received invalid information on the databus.	Check connections of data cables on battery pack. Check for external sources of disturbance, power cables, electronic equipments etc.
42. Battery OVP unavailable		
49. No motor speed signal		Check motor sensor connector
56. -59.	Contactors in motor controller do not work properly.	Write down errorcode and contact technical support
61. - 68.		Charge battery. If it does not help write down code and contact technical support.
69. Motor in low voltage cutback	Battery voltage is low and motor power reduced.	Charge batteries
70 Motor in high voltage cutback	Battery voltage is high and motor power reduced.	



Code	Description	Recommended actions
71. Device too cold	Motor controller too cold	Allow motor controller to warm up.
72. Device too hot	Motor controller too hot	Allow motor controller to cool down.
73. Motor in thermal cutback	Motor too warm, output power reduced	
74. Motor too cold	Suggests the motor temperature is below -30C.	Check that motor sensor connector is intact.
77. RPDO Time out warning	Motor controller has not received all necessary information at startup.	1) Check that the throttle lever connector is intact. 2) Check other connections on the CAN-bus.
78. - 79.	Motor sensor not working properly.	1) Check motor sensor connector. 2) Contact technical support.
91. Overload Fault	The system is overload.	Check that the propeller is free to turn.
102. - 104.	System is entering a mode of reduced power due to high/low temperature/ voltage.	1) Power off the system or use with only low power if cut back is related to high temperature. 2) Charge batteries if level of charge is low.
105. RPDO Timeout	Motor controller has not received all necessary information at startup.	1) Check that the throttle lever connector is intact. 2) Check other connections on the CAN-bus.
167. Heatsink overtemp	The heatsink is too hot.	1) Let the heatsink cool down. 2) Arrange better ventilation in the motor controller compartment if problem reoccurs.
168.-172.	Motor controller unable to control the motor.	1) Check motor sensor connector. 2) Check motor phase cable connector. 3) Contact technical support.



9. Contact information

Head office:

Oceanvolt Ltd
Vanha Talvitie 1
00580 Helsinki
FINLAND

Email: support@oceanvolt.com

Phone: +358 40 717 6336, open 9am to 5 pm (timezone: GMT +2)

Local distributors:

Australia:	Outback Marine	www.outbackmarine.com.au
Belgium:	Variodrive	www.vario-drive.be
Denmark:	Johs Thornam	www.thornam.com
France:	Eco Power Solutions	www.eco.power-solutions.fr
Hong Kong:	Marine XO	www.marinexo.com
Italy:	MAS srl	www.mas-yachts.com
Netherlands:	ASA Boot Electro B.V ASA Energy Systems B.V	www.asabootelectro.nl www.asaenergysystems.nl
Poland:	Marineworks	www.marineworks.eu
South Africa:	PowerSol	www.powersol.co.za
Sweden:	Odelco AB	www.odelco.se
Switzerland:	Infanger Propeller AG	www.infanger-propeller.ch
Turkey:	Marinel	www.marinel.com.tr
UK:	Energy Solutions UK	www.energy-solutions.co.uk
USA, Canada & Caribbean:	Annapolis Hybrid Marine	www.annapolishybridmarine.com



10. Technical data

	Oceanvolt SD15
Power S1 (continous)	12 kW
Power S2 (30 min)	15 kW
Battery voltage	48 VDC
Operatig voltage	34 VAC
Current (S1/S2)	235/290 A
Rpm	2200
Reduction ratio	1.93:1
Lubrication oil	Fully synthetic transmission oil 75W-80 Class: GL4/GL4+
Propeller diameter	max. 16" (3-blade) max. 17" (2-blade)
Propeller type	Left handed (standard)

OCEANVOLT

Specifications



Power (S1, Cont.) 12kW

Power (S2, 30 min) 15 kW



Voltage 34 VAC



Torque (S1/S2) 51.6/64.5 Nm



Current (S1/S2) 235/290A



Motor RPM 2200

Reduction 1.93:1

Transmission oil 75W80 GL4

Safety Instructions

- Please read the complete operating manual before use.
- Do not touch, motor can be hot after use.
- Always switch off the power from the main switch when not using the motor.
- Always turn off power when servicing the system.

S/N: **OV-XXX-YYY**

Oceanvolt Ltd, Finland

SD15

Model OVSD15, Type 1

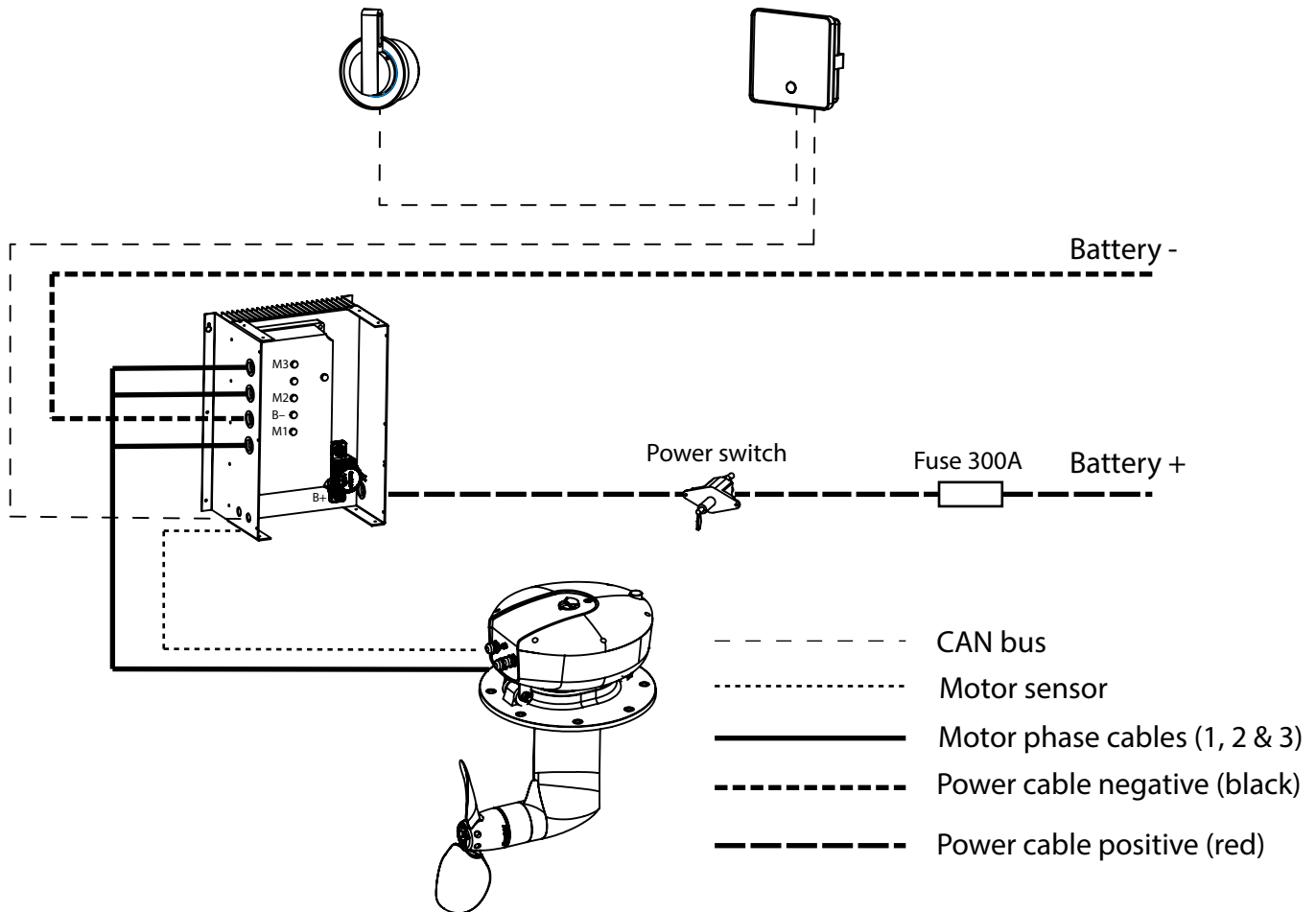
The main serial number of the Oceanvolt SD15 propusion system can be found on top of the motor.



Appendix A

Wiring diagram for Oceanvolt SD15 system (schematic)

Observe that depending on the battery pack there may be variations how the CAN-cables should be connected.



Cable type/number	Length (m/inches)
*CAN (1)	0.6/23.62
*CAN (2)	3.0/118.11
**Motor sensor	1.0/39.37
**Phase cables	1.0/39.37
***Power cable black 50mm ²	3.0/118.11
***Power cable red 50mm ²	3.0/118.11

* Optional cable lengths 0.3, 0.6, 0.9, 3.0, 5.0 and 10.0 m

** Fixed length

*** A power cable kit including cable shoes is provided. Should there be need for longer cables the cable thickness may need to be increased.