SEACRAFT
MADE TO EXPLORE

DIVER PROPULSION VEHICLE (DPV)
USER MANUAL

GO!

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This manual is no substitute for a proper training in how to dive with an underwater scooter.

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Local Distribution

The local (translated) version of this manual is made available by the responsible distributor. Please check the Marine Tech website for your local distributor.

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Table of contents

7. TROUBLESHOOTING

1. INTRODUCTION

CONGRATULATIONS!

By purchasing the Seacraft underwater scooter (“Scooter”) you have chosen one of the best products available on the market today.

The Seacraft scooter (DPV - Diver Propulsion Vehicle) is an additional element of diving equipment used for faster movement and increased range diving. The Seacraft scooter is designed for use only by persons trained in this field and having the appropriate diving certification obtained as a result of the completion of diving courses organized by authorized certification bodies.

In the event of a discrepancy between the rules for use the scooter set out in this manual, and used, developed or communicated to you in the course of training by diving organizations, please contact the manufacturer of the Seacraft scooter (office@seacraft.eu) in order to explain it.

Before operating the Seacraft scooter, carefully read this manual and follow all instructions given. Manual and proof of purchase should be retained, easily accessible after purchase.

The manufacturer reserves the right to change the specifications of the device without prior notice.

The current version of the manual is available for download at www.seacraft.eu.

2. General Safety Rules

2.1. Warnings, labels and pictogramms on the scooter

For the safe and proper use of the Seacraft scooter every user is obliged to familiarize himself / herself with the warnings, labels and pictograms placed on the device.

Caution!

Every Seacraft scooter and the batteries are marked with a number of labels and warning signs and information. Their removal from the surface of the device is prohibited.

The scooter user is required to replace worn or damaged labels and pictograms with new, for which the manufacturer or distributor may be contacted.

The following is placed on the scooter:

Read the instruction before the use!

Information on use in the manual!

Use of the item is prohibited by children and adolescents under 18 years of age!

Store and operate out of the reach of children!

Important information! / Caution, danger!

Li-ion batteries must be disposed of in accordance with all local and national regulations. If the batteries are not properly disposed of, they could pose a risk to human health or the environment.

Modules below 100 Wh of total capacity certified for air transport. Complies with UN 38.3 standards (Seacraft modular batteries only).

After the service life, the device must not be placed along with other household waste.

Device must be disposed of in accordance with applicable regulations!

Caution during air transportation!

Observe the restrictions applicable to equipment in air transport!

Do not allow the scooter to overheat!

Caution, fast spinning, dangerous element!

Do not insert hands or any other items to the area of the device's propeller!

2.2. Using the scooter safely

Caution!

Rules for safe use of scooters are subject to compulsory diver training hence the user should first and foremost follow the rules provided during specialized training on how to use a scooter.

Below, only some elements related to the safety and use of the Seacraft scooter are presented.

- Please read the scooter's and the charger's manual as they contain important precautions, warnings and information.
  It is essential that it is carefully and fully read before using the scooter.
- The scooter may only be used by persons with appropriate training in this field. It is strongly forbidden to use the scooter without obtaining special qualifications for diving with a scooter.
- Using the scooter for purposes other than those specified in this manual or in violation of the rules set out in this manual may result in serious personal injury or even death.
- It is forbidden use the scooter to descend and to pull you to the surface of water.
- Be careful with the propeller. Keep away from the rotating propeller as it may injure you.
- For carrying the scooter, always use the handle. Do not carry or pull the scooter by the nozzle.
- Always check the level of batteries before entering the water.
- Remove all objects from the vicinity of the scooter's nozzle and propeller before every dive in order to prevent them from being drawn into scooter 's power unit.
- Using DPV charger in a manner inconsistent with manual instructions, in particular in conditions of high humidity or when the power cord is damaged may present a risk to the user's health or life. Do not touch any part of scooter's charger with wet hands.
- It is forbidden for children and adolescents under 18 years of age to use the scooter, or to leave the device unattended.
- Before transporting scooter, ensure it is packed in a way that prevents it from damage during shipping.

2.2.1 Safe diving with a scooter

2.2.1.1 Before beginning each dive, you need to do the following

- Charge the battery to full (▶ "6.4. Charging the battery" on page 6-7).
- Balance the scooter (▶"5.1.2 Trimming the scooter" on page 5-2).
- Make a decision regarding the point of return for your dive according to air consumption, water temperature etc.
- Check, if your regulator needs to be adjusted.
  With some regulators, you need to make sure, that the second stage does not give a free flow, when the main membrane is pressed by the raised water pressure caused by the scooter's speed. To avoid a free flow, the breathing resistance of most second stages can be adjusted. Make sure to adjust both second stages (if present).

2.2.1.2 During every dive, you need to do the following

- Control the battery charge level on a regular basis, taking into account the required battery level for the return dive.
- Use the scooter with optimal, medium speed, which allows for longer battery life.
- Control the level of air consumption on a regular basis. Too fast flow rate or incompetent use of the scooter may result in activating the regulator and thus the loss of breathing gas.
- Control the level of hypothermia. The fast pace movement of the diver with an scooter can lead to faster than normal cooling of the body by increasing the exchange of heat with the environment.
- The scooter is only to be used moving under water on a horizontal plane at a constant depth.
- Follow the safety rules relating to the determination of the time of return; i.e.:
  - Adjust your decision regarding the turning point (return), taking into account the air consumption and battery discharge of the scooter.
  - Regularly check and control the level of the battery discharge.
  - Follow the rules learnt during training concerning DPV usage organized by recognized training organizations.
  - Follow the below procedures in case of scooter failure.

2.2.1.3 How to react in case of scooter failure while diving

In the case of **automatic shutdown of the scooter** while diving **and / or lack of reaction to start attempts**, do the following:

- Immediately abort the dive and (maintaining appropriate procedures) ascend to the surface.

In the case of the **scooter blocking and / or the inability to switch it off with the main switch**, do the following:

- Perform the necessary decompression stops swimming with the scooter or
- Unhook the harness / cut off the harness and abandon the scooter or
- If the diver has a sufficient supply of air, in a controlled manner lean the front of the scooter on the bottom of the water tank or on other permanent items in the water and wait until the battery power of the device runs out or
- Abandon the scooter under water if its towing would be impossible or too burdensome.

2.2.1.4 After the end of a dive, follow this routine

Caution!

Intense diving with a scooter lasting longer than a normal dive can cause fatigue and hypothermia even with experienced divers.

So, be prepared to assist them.

- Assist the person using the scooter when leaving the water.
- Ensure that the person using the scooter has help while the scooter is being transferred, e.g. to the boat or to the shore. Failure to follow the aforementioned instructions may cause injury.

2.2.2 Potential Risks and Solutions during the use of a scooter

This Seacraft scooter offers you 3 different control modes. It is recommended, that you check the mode setting before each dive (▶ “5.2.3 Control mode” on page 5-13).

Also, train to get to know your scooter. Learn how to stop it fast and how to control it responsibly.

2.2.2.1 Your personal skills and your physical / mental state of the day

Even if you are an experienced diver, do not overly rely on your skills, when you are not familiar with this scooter. Consider the following:

- Take your time to get to know this scooter step by step, in order to avoid a so-called “task overload”, that could distract you from controlling your dive. Hence, it is recommended, that initially you use scooter without accessories and in lower gears.
- Do not exaggerate your first dives with the scooter with regard to maximum depth, diving time and water temperature.
- Plan for a higher air consumption than normal, because you might experience a completely new and exciting way to dive.
- Return to the shore or boat in planned intervals (observing the general rules of diving), in order to talk about your experiences and to change the scooter settings step by step.

2.2.2.2 Scooter awareness

If you have no or little experience with scooters, you should remind yourself every now and then during the dive, that you are connected to a powerful and somewhat bulky object.

Observe the rules for entering and leaving the water (▶ “5.2.4 Entering the water with the scooter” on page 5-15).

2.2.2.3 Uncontrolled descent / ascent

Do not use the scooter during descent and ascent. You might loose control of your descent or ascent speed, which can lead to severe injuries or decompression sickness. Therefore switch off the scooter during these phases of your dive or at least wait, until the scooter automatically returns to gear 0).

2.2.2.4 Deviating from the planned dive depth

Using the scooter during a dive, you should always keep in mind that the use of this device can greatly mitigate errors in determining correct buoyancy, which, when stopping the scooter may cause sudden, uncontrolled ascent or descent of the diver.
Accordingly, each time before using the scooter check the neutral buoyancy of the scooter. When being pulled by the scooter, regularly check your depth by means of your diving computer or with the scooter accessories.

The scooter is only to be used to move in the water on a horizontal plane at a constant depth.

2.2.2.5 Improper speed

Never underestimate the power of your scooter, which directly translates to a horizontal speed much higher than you might be used to. Hence, always select the right gear for the given situation.

2.2.2.6 Propeller-related problems

Again, never underestimate the power of your scooter, which directly leads to a considerable water displacement. Therefore, adapt your personal trim and your relative position to the scooter accordingly (▶ “5.1.5 Installing the harnesses” on page 5-5).

Make yourself familiar with the important aspects regarding the propeller (▶ “2.2.3 Safety rules regarding the scooter’s propeller” on page 2-6).

2.2.2.7 Accessory- and equipment-related problems

Make sure, that all accessory parts used on the scooter and all parts of your diving equipment are properly fastened and do not create a problem while using the scooter.

2.2.2.8 A Seacraft specialty: Silent run

Your Seacraft Scooter will run considerably more quiet than other scooters on the market.

With this scooter, it is very likely that even an (also silent) rebreather diver will see you under water, before he/she hears you. So, do not rely on other divers being aware of your presence, because they hear the „typical” buzzing scooter sound long before they see you – they will not.

2.2.2.9 And yet one more Seacraft Specialty: Reverse gear

Unlike other scooter models on the market, this Seacraft Scooter allows you to move backwards under water, by being „pushed" by the scooter (if the scooter was set to "Expert" or "Recreational" mode (▶ "5.2.3 Control mode" on page 5-13).

Before you activate the motor in gear [R], prepare yourself for the effect of the reversed water flow through the drive unit:

- Look behind you and make sure, that there is enough space for manoeuvring.
- Make sure, that no part of your equipment is hanging down into the stator area.
- With one hand, hold the lower part of the scooter's noozle, to push it away from your body in 2-points. Simultaneously this will tension the harness lines, to prevent them from being "swallowed" into propeller. Tense the muscles in the arm with the hand holding the scooter. Remember, that the scooter will push you now, so you should put on a certain „resistance".

2.2.3 Safety rules regarding the scooter's propeller

Caution!

A rotating propeller is a dangerous element.

Despite the intrinsic security it may cause serious injury.

Never insert, place hands or any objects into the scooter nozzle or rotating propeller blades. It is recommended not to remove the stator.

2.2.3.1 Before using the scooter

- Ensure that none of the elements mentioned above can become entangled in the scooter propeller.

2.2.3.2 While using the scooter

- Regularly check whether loose items of equipment are located at a safe distance from the scooter propeller and there is no danger of entanglement of these elements in the scooter propeller mechanism.
- Take special care when maneuvering the scooter in an area with rich vegetation or low visibility waters, where there are obstacles such as: nets, cables, wrecks. It is recommended to turn off the scooter until you leave the area with the above characteristics in order to avoid the possibility of entanglement of those elements in the mechanism of the scooter propeller.

2.2.3.3 Entaglement of foreign objects in the propeller

In the case of entanglement of ropes or other unwanted items into the scooter propeller mechanism, users of the device should first of all try to solve the problem under the water by taking the following actions:

- Turn off the scooter.
- Untangle or (if possible) cut unwanted items tangled in the scooter propeller.
- The removal of unwanted items is greatly helped by removing the propeller under water (▶ “5.1.6 Removing the propeller” on page 5-8). Note, however, not to use cutting tools to remove the propeller, as this could damage the engine.
- Start the scooter again and choosing the shortest way back, take the return course.

If the foreign objects cannot be removed successfully, proceed as follows:

- Turn off the scooter.
- Independently tow the blocked scooter choosing the shortest way back.
- Ascend to the surface, whilst maintaining usual safety rules.

2.2.4 Ehtical and environmental aspects

Keep the following in mind, while using the scooter:

- Exercise caution in context of caring for the natural underwater environment.
- Pay attention to the appropriate position of the scooter and fins while swimming past delicate underwater formations, so that equipment and diving accessories do not damage elements of flora or fauna.
- Avoid direct contact between the scooter and the bottom/sea bed; making contact with the bottom may result in deterioration of visibility under water, damage to flora or fauna, as well as blocking the scooter propeller (e.g. silt or sand getting into the mechanism as a result of the scooter contact with sea bed).

Worn or broken elements of the scooter must be disposed of in accordance with the applicable laws. Used batteries which are a component of the scooter must be returned to the manufacturer or supplier of the equipment or given to a collection point for used accumulators and batteries or electronic scrap.

2.3. MAINTENANCE, STORAGE, TRANSPORT AND PREPARATION

2.3.1 Maintenance

The scooter user is obliged to apply principles of maintenance to the equipment owned. Proper maintenance of the scooter is essential to avoid dangerous situations caused by the poor technical condition of the device. The scooter owner is obliged to apply the following principles of maintenance to the device:

- Before using the scooter the user should make himself/herself familiar with its structure, method of operation and rules of use described in this manual.
- Before using the scooter and after use, every time, the user must perform a thorough inspection of the state of the entire scooter housing, elements of which may be subject to leaks (especially the seals).
- During use of the scooter the user should adhere to the principles of proper charging of the battery according to the rules defined in this manual (▶ “6.4. Charging the battery” on page 6-7).
- After using the scooter thoroughly rinse it in clean, fresh water. During this operation special attention should be paid to the drive system - any foreign bodies like sand, salt or other should be removed from all of its components (▶ “5.1.7 Maintaining the propeller and the static engine part” on page 5-9).

2.3.2 Storage

This scooter is equipped with a smart battery control system that will pro-actively check the battery and minimize/eliminate problems.

If the battery has been fully charged before, the scooter can be stored several months without pulling the safety disconnector.

Nevertheless, the manufacturer cannot foresee all possible situations during storage. For additional safety during storage, it is recommended to always disconnect the battery cable before longer storage periods.

- For the entire period of use the scooter should be stored in a cool, dry and dark place, out of the children’s reach.
- Before long storage and after prolonged periods unused it is recommended to carry out a detailed check of the scooter and perform maintenance works (▶ “6.6. Storing the battery segments” on page 6-11).

Further information on storing the unit can be found here:

https://support.seacraft.eu/knowledge-base/faq-scooters/

2.3.3 Air and ground transport

- In preparation to transport the box containing the scooter, every time, ensure the scooter is secured against free movement in the hold.
- To maintain full working order, the scooter should be transported using dedicated accessories offered by the manufacturer of the scooter i.e. the base, suitcases, bags and/ or boxes.
- In cases of sending the scooter package by mail or courier service (especially by air freight), it is essential to read the rules and restrictions on the transport of lithium-ion batteries.
- In preparation to transport the consignment containing the scooter be careful in the protection of the nozzle or other parts of the scooter against its deformation (e.g. by crushing the above-mentioned elements of the scooter by other goods or heating over 60 º C).

2.3.4 Transport by sea (diving boat)

Caution!

The following procedure relates to transporting the scooter from shore to dive site.

If you need to ship the scooter by sea, the same rules as for air and ground transport apply.

Before transporting the scooter, follow this routine:

- Ensure, that the scooter is ready for use.
- Ensure that the device is turned off and properly secured.
- Ensure that the device is adequately protected against direct sunlight.
- Ensure that the scooter is secured against free movement on vessel's board.
- If there is possibility that the scooter may get wet during transportation, make sure that the scooter is correctly assembled and watertight.

2.3.5 Preparing the scooter for use

Safe use of the scooter depends on its proper preparation and use in accordance with the principles described in this manual. During the period of scooter usage, only original items of scooter equipment and dedicated accessories supplied by the manufacturer should be used. In the event of any faults in the proper functioning of the scooter or where there is doubt as to its proper operation, the user should immediately stop using the scooter.

Caution!

It is forbidden to:

- Independently modify and / or repair the scooter by the user or any other unauthorized persons
- Throw or hit a scooter as well as to use an excessive force when assembling and disassembling the device
- Use elements which are non-original and non-dedicated to a particular model such a charger, screw, battery, etc.
- Leave the scooter which is ready to work under water unattended or within reach of children or persons untrained to use it.

3. SPECIFICATIONS

3.1. TECHNICAL DATA

Model	GO!
Working time at optimal speed	>220 min (45 m/min)*
Maximum distance	>10 km*
Dimensions in milimeters	280 mm (w) x 520 mm (l) x 330 mm (h)
Housing diameter	160 mm
Weight with battery and fresh water ballast	9,7 kg
Battery (Li-ion) capacity	582 Wh in 6 segments (97 Wh each)
Nominal battery voltage	32,4 V
Maximum battery voltage (after charging)	37,8 V
Minimum battery voltage (after discharging)	26 V
Charger operating voltage	100-230 V / 50 Hz / 120 W
Maximum static thrust	> 260 N
Maximum speed	> 1,35 m/s
Maximum depth	130 m
Tested depth (std. version)	200 m
Correct displacement (with ballast)	Neutral
Level/Trim (with adjusted ballast)	Neutral
Scooter operating temperature**	-5/+45 ºC
Scooter storage temperature	-25/+50 ºC
Temperature whilst charging	+10/+40 ºC

* Applicable in terms of a diver in a twinset 2 x 12 l, in a dry suit, in fresh water. Range tested for 45 m/min speed.
** At temperatures below 0 ºC, due to the properties of lithium cells, the battery capacity and hence the scooter's performance can be significantly reduced. It is a reversible process - after raising the temperature of the battery to temperature level above 0 ºC the capacity of the battery returns to the nominal value.

3.1.1 Important remarks

The manufacturer points out, that the laboratory data relating to the technical specifications of the Seacraft scooter may differ from the data obtained in real operating conditions in the field.

Note!

Potential discrepancies in terms of certain scooter operating parameters may be the result of differences in the equipment and the level of training of the scooter user, charge status and consumption of the scooter battery, velocity profile of the flow, local conditions (e.g. water temperature and speed of ocean currents), the temperature at charging, type of charger, the technical condition of the device, the degree of regularity of servicing the equipment, the degree of scooter's wear, and many other factors.

4. SCOOTER COMPONENTS

4.1. BASIC SCOOTER COMPONENTS

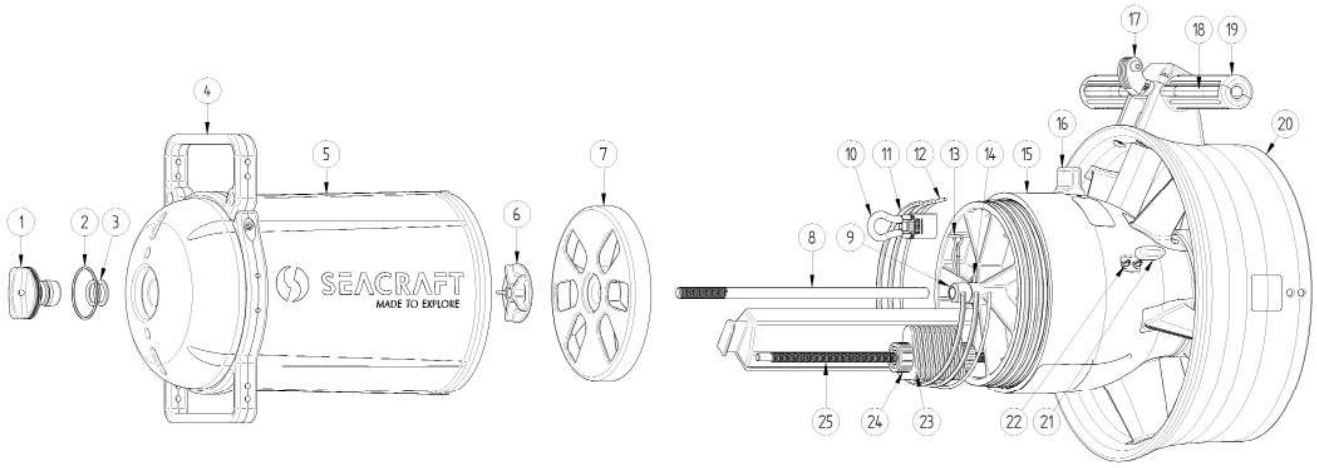


Fig. 1. Summary of basic scooter components

1 – Cap nut

The cap nut fixes the housing lid [5] to the center rod [8], thus making the scooter watertight, if properly tightened. The cap nut is sealed by 2 o-rings [2 / 3].

2 / 3 – Cap nut o-rings

These o-rings seal the cap nut against the housing lid. They need to be exchanged during regular service.

4 – Multipurpose transport bracket

This special transport bracket supports the scooter when placed on a flat surface, it allows for simple carrying of the scooter, and it provides several attachement points for accessories.

5 – Housing lid

The housing lid covers the internal scooter part. It is fied to the center rod [8] of the drive unit [15] by means of the cap nut [1]. The housing lid is sealed against the drive unit by 3 o-rings [11 / 12].

6 – Battery segment fixation nut

This nut holds the battery segment fixation ring [7] on the center rod [8] and thus the battery segments in place. Make sure to always install this nut hand-tight, to avoid any movement of the battery segments.

7 – Battery segment fixation ring

This ring is held in place by the battery segment fixation nut [6]. If the openings in this ring are properly placed over the installed battery segments, and if the battery segment fixation nut is tightened, the battery segments cannot move inside the scooter and will thus provide the energy stored inside without any interruption.

8 – Center rod

This rod serves as the “backbone” of the scooter, providing a mechanical link between cap nut, housing lid, battery segments and drive unit. The center rod may be removed by the user in order to facilitate travelling.

9 - Guiding opening for center rod

The center rod is inserted into this opening in order to provide stability.

10 – Battery disconnector

This disconnector is placed in a free slot on the upper side of the battery segment contacts. By means of this disconnector, the user may interrupt the connection betwen the battery segments and the engine / control system. This is highly recommended e.g. for shipping the scooter, in order to comply to the transportation rules for LI-ion batteries. Please note, that the dsconnector must be in place in order to charge the battery segments.

11 – Lid o-rings

The 2 lid o-rings touch the inner part of the housing lid [5] and make it watertight.
These o-rings have to be exchanged during regular service.

12 – Drive unit o-ring

This o-ring touches the lower edge of the housing lid [5] and serves as additional seal.
This o-ring has to be exchanged during regular service.

13 – Securing pin

This pin serves to hold the center rod [8] in the guiding opening [9].

14 – Moveable fixation element

This element is part of the intrinsic scooter safety concept.

15 – Drive unit

The drive unit holds all propulsion-related components of the scooter, meaning the control system and the engine.

16 – Main switch

The scooter is equipped with a non-contact sensor responsible for turning the device on and off. Operating the scooter in SWITCHED OFF mode is characterized by very low power consumption, so it is not necessary to unclip the battery from the scooter after each use, and thus it is not necessary to disassemble the scooter every time it has been used.

It may be turned in any direction in order to swith the scooter on (switch positioned in direction of travel) or off (switch positioned perpendicular to the direction of travel).

17 – Sports camera mount

This standard holder allows for attaching a sports camera or the Seacraft Electronic Navigation Console to the scooter.

18 – Control trigger

The scooter provides 2 control triggers, which need to be pressed (depending on the selected drive mode) independently or at the same time.

19 – Steering handle

The scooter provides 2 steering handles with integrated control triggers [19].
These handles allow for steering the scooter into the desired direction.

20 – Nozzle

The nozzle directs the water flow to the propeller and away from it. It also holds the pre-swirl stator, which eliminates all torque forces created by the rotating propeller, and offers 4 harness attachment points.

21 – Charging contacts cap

This cap protects the charging contacts from contamination, if the scooter is not in use.

22 – Charging contacts

This scooter may be charged without opening it. Simply wipe these specially coated, corrosion-proof contacts clean / dry, and connect the supplied charger as stated in the manual. The charging contacts are secured by diodes, so there will be no electrical current flow through these contacts, when the charger is not connected.

23 – Trim weights

The trim system of this scooter allows for continously adjusting the trim, by moving the trim weighs back and forth by means of two setting screws [24]. Like this, you may adapt the scooter to changing water salinity and / or accessories, so it will stay level underwater.

24 – Trim weight screws

By means of these 2 screws, the user may move the installed trim weights [23] continuously back and forth on the trim weight rod [25].

25 – Trim weight rod

The trim weights [23] are placed in a free slot on the lower side of the battery segment contacts. Like this, the trimming system also serves as a “keel” for the scooter, keeping the steering handles pointing upwards underwater.

4.2. Display

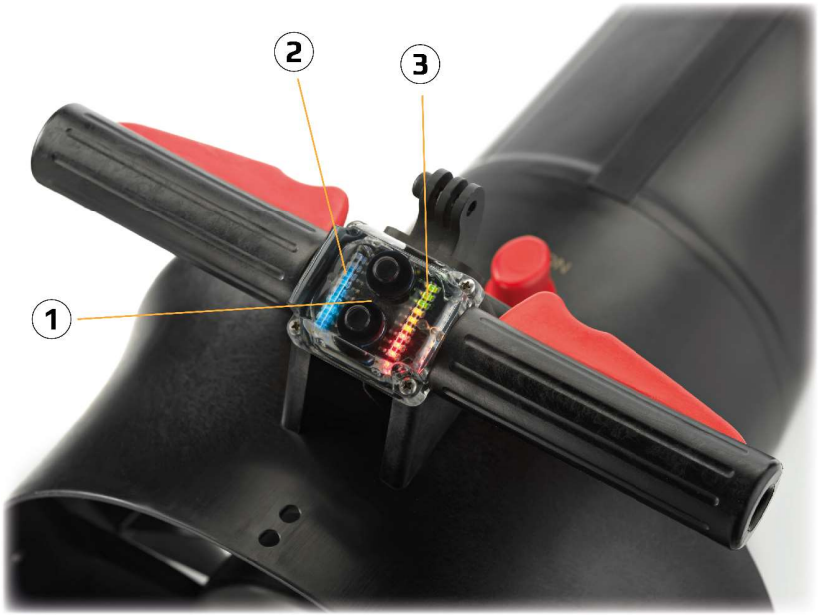


Fig. 2. Scooter display

1 – Control buttons

With these piezoelectric buttons, the user may select the desired gear while the engine is stopped or running.

2 – Left LED strip (gears)

These LEDs show the currently selected gear.
Blue LEDs show the forward gears (1-8), a red LED shows, that the reverse gear is selected.
If no LED is lit, the engine will not start, when the user presses a control trigger.

3 – Right LED strip (charging level / mode)

These LEDs show the current charging level of the installed battery segments (approx. 11 % per LED) or (during setting the drive mode) the currently selected mode:
Sports mode (yellow), Expert mode (red) or Freediving mode (green).

4.3. DRIVE UNIT

Fig. 3. Components of the drive unit

1 – Harness attachement points in the nozzle

The nozzle provides 4 harness attachement points (left / right, top / bottom).
The provides scooter harness is attached here, so the diver will be pulled by the scooter via the harness carabiner attached to the crotch belt.

2 – Fixed engine part with bushings

This scooter provides a patented magnetic drive, where the engine is outside the scooter, working “in the water”. Like this, all mechanical links to an internal electrical motor are eliminated. The fixed part (“stator”) is mounted inside the nozzle. It provides a guide bushing, so the engine rotor with propeller [4] can rotate freely around it (powered by the magnetic field of the stator).

3 – Pre-swirl stator

This scooter may be driven “with 2 fingers only”, because all torque effects created by the rotating propeller are eliminated (independently of the selected gear). To reach this goal, the pre-swirl stator transforms the water flow into thrust.

4 – Rotor with propeller

This engine part rotates on the created magnetic field around the fixed engine part [2], while the little ball on the tip of the axle is the only point of contact between the rotating part and the rest of the scooter. For this reason, this scooter is very energy-efficient.

4.4. Electronics

4.4.1 Motor controller

The brushless motor (BLAC, BrushLess Alternating Current) controller's task is to produce a three-phase voltage which is used to power the motor. The motor controller communicates with the display and control module in order to obtain information about the chosen gear and transmits information on operating parameters of the scooter display module e.g. the state of the battery, propeller speed, the electricity consumed by the scooter, battery voltage, etc.

4.4.2 Control electronics

The control electronics is an interface, relaying the user's actions to the scooter.

4.4.3 Battery with control system

The scooter is powered by a battery made up of rechargeable lithium-ion segments.

The scooter battery voltage is always in a safe range for the user. The battery is equipped with a BSM system (Battery Management System), which compensates the voltage across all the cells and a PCM system (Protection Circuit Module) that protects the battery against overload, overcharging and excessive discharge.

5. USAGE INSTRUCTIONS

5.1. PREPARATION FOR USE

The scooter is composed of two main elements (fig. 1):

- The cylindrical part, in which battery and ballast are located.
- The drive unit comprising a body with a motor and an propeller and nozzle with the steering handle.

5.1.1 OPENING THE SCOOTER

The GO! was developed in a way, that it only has to be opened to change the trim or to remove / install battery segments. During normal operation, it may stay shut.

If you need to open the scooter, proceed as follows:

- Place the scooter on a flat, stable and clean surface.
- Loosen and remove the cap nut.
  Please note, that for loosening the cap nut - while it should have been tightened by hand only - you might need the Seacraft service key. The reason is, that drying grease and sediments over time may cause the cap nut to be more tight than right after closing the scooter.

Fig. 4. Cap Nut

Fig. 5. Seacraft service key

- Hold down the drive unit by pressing down the nozzle edge with one hand or leg (not the steering handles). With the other hand, pull up the housing cover by the transport handle, while at the same time “wiggling” it in all directions.

Note!

Especially with new o-rings, the housing cover might sit tight on the drive unit. In this case ask a second person to assist you.

5.1.2 TRIMMING THE SCOOTER

The GO! provides a unique continuous trimming system, that allows for a very precise trim.

In combination with the scooter's battery segments, the trimming system also serves as a „keel", making sure that the scooter's steering handles underwater will always point upwards.

The GO! scope of delivery encompasses some additional trim weights, so the scooter may also be trimmed for salt water.

Fig. 6. Additional GO! trim weights

Trimming the GO! is quite easy:

- Open the scooter (▶ "5.1.1 Opening the scooter" on page 5-1).

Fig. 7. Trimming system in opened scooter

- Loosen and remove the battery segment fixation nut.
- Remove the battery segment fixation ring.
- Define the required amount of trim weights depending on the water salinity and your scooter configuration.

Note!

Seacraft offers an online trim calculator to assist you trimming your scooter:

https://support.seacraft.eu/trim-calculator/

- Place the required number of trim weights on the trim weight rod.
- Move the trim weights back or forth by adjusting the front and rear setting screws. Like this, you will make the scooter's nose point more downwards/upwards. Depending on the salinity of the water, you will use the GO! in and on the accessory installed on the scooter, try to make the scooter swim level. If needed, add or remove one or more trim weights.

Note!

Choose the weight position carefully, since even small deviations can cause an improper trim.

Keep in mind that balancing with internal ballast may require several attempts to select mass and positioning of the ballast.

Make sure, the trim weights are fixed by the 2 setting screws, so they cannot move on the trim weight rod.

- Place the battery segment fixation ring properly onto the battery segments.
- Tighten the battery segment fixation lock (hand-tight).
- Close the scooter (▶ "5.1.3 Closing the scooter" on page 5-4).

5.1.3 Closing the scooter

- Check/clean the 3 o-rings on the drive unit, and slightly lubricate them with silicone grease provided by the manufacturer.
- Check/clean the sealing area inside the housing lid and on its lower edge.
  Slightly lubricate these areas with silicone grease provided by the manufacturer.

Fig. 8. Seacraft silicone grease and engine grease (green)

- Hold the housing lid over the scooter and align both components.
  The top of the transport bracket must be parallel to the steering handles.
  Slowly lower the housing lid down to the driving unit.
  Check the alignment one more time, then use reasonable force to press the housing lid onto the drive unit.
  Make sure, that the housing lid correctly slides over the 3 o-rings on the drive unit, and that the housing lid is flush with the drive unit.
- Check/clean the 3 o-rings on the cap nut, and slightly lubricate them with silicone grease provided by the manufacturer.
- Insert the cap nut into the opening on top of the housing lid, and slightly press it down, until you feel the cap nut touching the center rod inside the scooter.
- Pressing it slightly downwards (in order to avoid damaging the first threading winding), tighten the cap nut firmly by hand until the point of resistance.
  Do NOT use any tools to tighten the cap nut. This may lead to damages to the scooter.

5.1.4 Battery handling

For information about installing, removing, charging and transporting the battery segments, please refer to ▶ “6.4. Charging the battery” on page 6-7.

5.1.5 INSTALLING THE HARNESSES

5.1.5.1 Assembling and installing the scooter harness

The scooter harness, consists of 1,8 m solid line, a bolt snap carabiner and 2 tensioners. It is supposed to link the diver via his/her crotch belt d-ring with the scooter's nozzle. Like this, there will be no fatigue because the diver does not have to endure any pulling forces on his hands and arms.

Fig. 9. Seacraft scooter harness

Since the harness is delivered in parts, assemble it as shown in the above image.

Proceed as follows, to assemble the harness:

- Pass the line through the boltsnap's eye.

Note!

Some divers prefer a "fixed" bolt snap, where the line is forming a loop to hold the bold snap. Other divers prefer a moveable bolt snap. Decide yourself, how you would like to mount your harness.

- Now, pass the line through the upper opening of a tensioner, behind the back of the fastener and through its lower opening.
- To fix this line end, guide the line through the left-right or up-down fastening holes on the edge of the scooter's nozzle.

Caution!

Pass the harness only through one of the DPV noozle holes. Passing the line through both, may lead to breaking of the nozzle. See pictures below to check correct orientation.

Fig. 10. Scooter nozzle with fastening holes

Fig. 11. Correct placement of the harness in the noozle hole

- To close the harness loop, pass the line end through second lower opening in the tensioner, and make a knot.
- Repeat these steps with the other line end, and be sure to pass it through the opposite fastening hole located on the edge of the nozzle.
- Now, use the tensioners to adjust the length of the scooter harness.
  The harness should be adjusted before diving according to the user's preferences.
  The manufacturer's original tensioner's shape allows easy adjustment of the harness length even by a diver wearing thick gloves.

Note!

You may check the correct harness position as follows:

On the water surface, attach the scooter to your diving gear and lay behind the scooter as if you were starting it.

Slightly bend your arm(s) holding the control handle
(in an angle of approx. 30 °).

If you can now see the scooter's display without any problems, the harness is set correctly and may be optimized later.

Make sure, that the scooter will be level and straight in the water. If this is not the case, adjust the upper / lower or the left / right part of the harness accordingly.

While transporting the scooter, it is recommended to clip the bolt snap to the scooter.

5.1.5.2 Assembling and installing the nose harness

Seacraft offers a second optional harness to be attached to the scooter's nose.
This harness facilitates towing and securing the scooter, when it is not needed under water.

Fig. 12. Seacraft nose harness

Proceed as follows, to fix this harness to the scooter's nose:

- Locate the fastening openings in the scooter's nose.
  For more stability while towing, it is recommended to pass one harness line end through the upper openimg, and the other harness line end through the lower opening.

Fig. 13. Fastening openings in the scooter's nose

Let the harness line ends be long enough to allow for removing the cap nut, and tighten each harness line end with a stable knot to the scooter.

5.1.6 REMOVING THE PROPELLER

In certain cases (e.g. an entangled line or for maintanence), the user will need to remove the propeller from the scooter, if the problem cannot be solved by activating the reverse gear. Since the scooter's propeller is held on the engine by magnetic forces, there are no tools needed to remove it - even underwater.

Caution!

Make sure, that the scooter has been switched off, before you try to remove the propeller! Any uninteded activation of the engine may lead to severe injuries!

Never try to pull out the propeller by holding it on the propeller blades, and keep away from sharp edges!

Proceed as follows to remove the propeller:

- Firmly grab the propeller with both hands hand, so that your fingers are positioned between the propeller blades.

Fig. 14. Propeller

- Let another person hold the scooter at the steering handles, while you pull off the propeller. Be aware, that there will be a sudden "jolt", when you have overcome the magnetic forces holding the propeller in place.

5.1.7 MAINTAINING THE PROPELLER AND THE STATIC ENGINE PART

The scooter's engine needs very little maintenance.
Proceed as follows to make sure, it will always function properly:

- Regularly (e.g. before each dive) check the inside of the moving engine part for contamination and damages.
- Especially after diving in silty environments or in salt water, rinse the inside of the moving engine part with clean sweetwater, and wipe dry the surfaces with a soft and clean cloth.
- Make sure, the little openings on the back of the propeller ring are not clogged.
- If there is no or very little engine grease visible, slightly lubricate the little ball on the propeller axle and the axle itself with the provided Seacraft engine grease.

Fig. 15. Seacraft silicone grease and engine grease (green)

Fig. 16. Propeller axle

- Regularly (e.g. before each dive) check the fixed engine part for contamination and damages.
- Especially after diving in silty environments or in salt water, remove the propeller, rinse all parts with clear fresh water, and let them dry disassembled.

5.1.8 Installing the propeller

Since the scooter's propeller is held on the engine by magnetic forces, there are no tools needed to install it - even underwater.

Caution!

Make sure, that the scooter has been switched off, before you try to install the propeller! Any uninteded activation of the engine may lead to severe injuries!

Never try to hold the propeller by the propeller blades!
This may lead to damages to the propeller or to injuries due to sharp edges!

Proceed as follows to install the propeller:

- Firmly grab the propeller with one hand, so that your fingers are positioned between the propeller blades.
- With your other hand, push against the middle of the scooter's steering handle, and let the propeller slide onto the fixed engine part. Be aware, that there will be a sudden "jolt", when the magnetic forces pull the propeller into place.

  Should you not be able to place the propeller with one hand, ask another person to assist you by holding the scooter for you. In this case, grab the propeller firmly with both hands, so that your fingers are positioned between the propeller blades.

5.2. Operating the scooter

This section contains useful operation on the following topics:

- Preparing the scooter for use
- Control elements
- Setting the control mode
- Entering the water with the scooter
- Using the scooter under water
- Leaving the water with the scooter

Before the first dive using the scooter it is essential to read the instructions carefully and learn about the scooter operation - turning on and off, control of gear changes, modus change and error codes displayed.

Before entering the water with the scooter, make sure it is working properly and that the battery is charged.

5.2.1 PREPARING THE SCOOTER FOR USE

Before you actually use the scooter, make sure you have completed the following steps:

- The scooter's battery has been charged to a safe level for the planned dive (▶ "6.4. Charging the battery" on page 6-7).
- The scooter has been closed properly (▶ "5.1.3 Closing the scooter" on page 5-4).
- The scooter harness(es) has / have been installed and set (▶ "5.1.5 Installing the harnesses" on page 5-5).
- The scooter has been checked and is ready for diving.

5.2.2 CONTROL ELEMENTS

You need to be familiar with the following 3 control elements to operate the scooter:

5.2.2.1 Main switch

The main switch is located on the upperside of the housing lid, directly in front of the steering handles. To switch on the scooter, turn the main switch in any direction until it is perpendicular to the direction of travel:

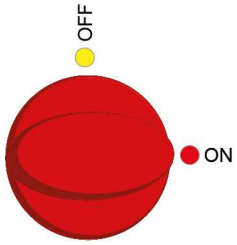


Fig. 17. Main switch in position ON

To switch off the scooter, turn the main switch in any direction until it is in the direction of travel:

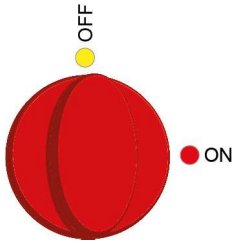


Fig. 18. Main switch in position OFF

5.2.2.2 Control triggers

The control triggers are integrated in the steering handles.
There is a left and a right control trigger:

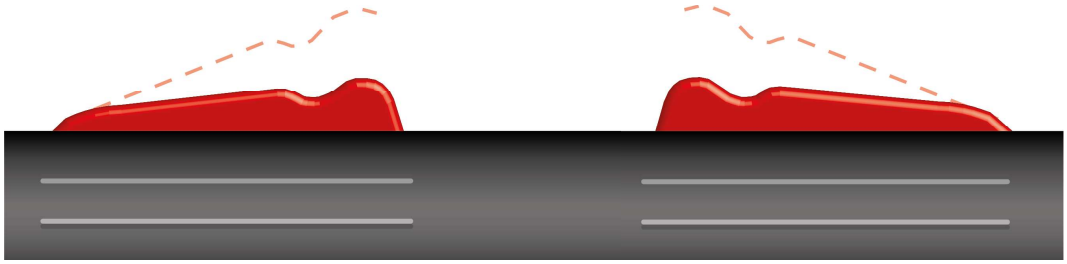


Fig. 19. Control triggers

Depending on the selected control mode, you will need to press only one or both control triggers to activate the scooter engine or (during mode setting) to return to driving mode.

Driving the scooter with one hand in Expert and Freediving mode, you may also perform a "double click" with the unused control trigger to do the following:

- When in gear 1-7, accelerate to full speed
- When in gear 1-2 in Freediving mode, accelerate to full speed
- When at full speed, decelerate to the last used gear
- After the gear was automatically reset to 0, accelerate to the last used gear

5.2.2.3 Display with control buttons

The scooter's display is located on the steering handles and looks like this:

Fig. 20. Scooter display (gear 4, battery charged to approx. 88 %)

- The LEDs on the right side of the display show the current battery charging level or (during mode setting) the currently selected control mode.
- The LEDs on the left side of the display show the currently selected gear (reverse, 0, or 1-9) or an error code (blinking red LED in the bottom left).
- Press the upper and lower piezoelectric control button in the middle of the display, to select a gear or (during mode setting) to select the control mode.

5.2.3 CONTROL MODE

The GO! is a versatile companion for recreational, technical and free divers alike, because Seacraft has integrated 3 different control modes, that offer targeted functionality for these groups of divers.

Proceed as follows to set the control mode:

- Turn the main switch, until it is perpendicular to the direction of travel - the Display LEDs will be off.
- Hold both control triggers pressed, and switch on the scooter (turn the main switch in any direction, until it is in the direction of travel - the display LEDs will shortly “flash”, and the charging level will be displayed).
- When the red, yellow or green LEDs on the right side of the display light up, release the control triggers.
- Press the upper or lower display button, to select the desired control mode (Recreational [Yellow], Expert [Red] or Freediving [Green]).

Please note, that the GO! offers some special features, which may be activated or deactivated depending on the selected control mode:

- Time Lock feature (▶ 5.2.5.3 on page 5-18)
- Double click (▶ 5.2.5.4 on page 5-18)
- Bypass (▶ 5.2.5.6 on page 5-18)

In the following table, the 3 different control modes are explained.

Display	Mode
	Recreational mode (yellow LEDs are lit) • The scooter must be controlled with both hands • 8 forward gears + reverse gear eavailable After switching the scooter on, gear 0 is selected.
	Expert mode (red LEDs are lit) • The scooter may be controlled with left or right hand • 8 forward gears + reverse gear available After switching the scooter on, gear 4 is selected. • After approx. 10 seconds of inactivity, the scooter is automatically set to gear 0 (Time Lock). • With a „double click“ on the free control trigger, the user may accelerate to full speed and then again decelerate to the previously used gear („Catch-up“ feature) • If the scooter is in gear 0, with a „double click“ on the left or right control trigger, the user may accelerate to the previously used gear (if the scooter has not been switched off in the meantime). • In the event of a display malfunction, the scooter engine is started automatically in gear 4 (Emergency Bypass), so the scooter will bring you home, even if the display cannot be used.
	Freediving mode (green LEDs are lit) • The scooter may be controlled with left or right hand • 3 forward gears available After switching the scooter on, gear 8 is selected. • By pressing the upper and lower button, the user may select between slow, medium and full speed. • With a „double click“ on the free control trigger, the user may accelerate to full speed for an emergency ascend. • In the event of a display malfunction, the scooter engine is started automatically in gear 4 (Emergency Bypass), so the scooter will bring you home, even if the display cannot be used.

- After having selected the desired control mode, briefly press one of the control triggers, to switch the scooter into diving mode.
- If you are checking the scooter before a dive, now test the scooter by selecting a gear by means of the control buttons, and pressing one or both control triggers. Otherwise, switch off the scooter.

Caution!

When testing the scooter, keep all body parts and objects away from the scooter's propeller. and make sure that the propeller may rotate freely!

5.2.4 ENTERING THE WATER WITH THE SCOOTER

The method of entering the water with the scooter should be adapted to the individual skills and abilities of each diver, using one of the following safe procedures (according to situation):

- The scooter is placed in the water, the diver enters the water.
- The diver enters the water, the scooter is given to the diver by a third party.

Caution!

To avoid damages and injuries, do NOT jump into the water with the scooter!

Even though the GO! is a rather lightweight unit, never underestimate the effects of a bulky object connected to a diver jumping in the water.

When you are in the water with the scooter, secure it by clipping the scooter harness bolt snap to your crotch belt d-ring.

5.2.5 Using the scooter underwater

5.2.5.1 General

Your Seacraft scooter will allow you to move much faster than a diver without a scooter, and it will give you considerably more range. Apart from that, a Seacraft scooter runs very silent.

Please keep in mind these factors when planning your dive and while diving.

Caution!

Remember that other divers and animals might not hear you approaching, so keep sufficient distance between you and other divers and the wildlife.

Match your speed to the environmental conditions (visibility, temperature, currents etc.)

Be prepared to stop the scooter at any time, in order to avoid collisions or dangerous situations.

Never use the scooter for descending / ascending, except while freediving.

Start your dive, and descend to the planned depth, then switch on the scooter.

You may switch on / off the scooter or enter the mode setting at any time during your dive.

5.2.5.2 Selecting a gear

After switching on the scooter under water, the display should look like this:

Fig. 21. Scooter switched on, gear 4 selected

If you now hold both control triggers (Recreational mode) or one control trigger (Expert mode) pressed, the scooter's engine will be activated, and the propeller starts to turn.

As soon as you release the trigger(s), the propeller will stop.

While driving, you may at any time change the gear by pressing the upper or lower control button with a thumb. You may also change the gear, while the propeller is stopped. When you press the control trigger(s), the scooter will start in this new gear.

5.2.5.3 Automatic reset to gear 0 (Time Lock feature)

For safety reasons, the GO! will reset the currently selected gear automaticly to 0 after 10 seconds of inactivity. This is to avoid any unsafe situations due to unintentional activation of the engine.

If the scooter is in Expert or Freediving mode, simply perform a double click on one control trigger, to resume driving with the last selected gear.

If the scooter in Recreational mode, there is no automatic gear reset.

5.2.5.4 Double click

If the scooter is in Expert or Freediving mode, you may perform a double click on the unsued control trigger, to do the following:

- When in gear 1-7, accelerate to full speed
- When at full speed, decelerate to the last used gear
- When in gear 0, accelerate to the last used gear (even reverse gear)

5.2.5.5 Reverse gear

If the scooter is in Expert or Recreational mode, you have a reverse gear at your disposal. This gear might be useful to stand still in a current coming from behind, or to withdraw from an obstacle in your way.

When in gear 0, press the lower control button to activate the reverse gear:

Fig. 22. Reverse gear selected

Caution!

When the reverse gear is selected, before pressing a control trigger, make sure to keep the scooter harness away from the propeller and be prepared to “push” against the scooter, because it will move towards you.

5.2.5.6 Bypass

When the scooter is switched on, it performs a self-test to check the communication between the engine control and the display. In case of a communication interruption, the scooter’s engine is automatically activated in gear 4, in order to bring the diver safely home, even when the control buttons or triggers do not function properly.

The bypass feature is available in Expert and Freediving mode.

5.2.5.7 Capacity dependent power reduction

Depending on the battery capacity left, the GO! will deactivate certain gears, in order to make sure that you will safely return to the starting point of your dive (driving more slowly will increase the scooter's range).

As an example: If the battery capacity drops below 33 %, you will not be able to in gears above 5.

Fig. 23. Dropped battery capacity

Here are some examples for charging level display:

Display	Battery charging level
	Battery is 99 % charged
	Battery is 11 % charged

5.2.5.8 Leaving the water with the scooter

Proceed as follows after completing a dive:

- Turn off the scooter using the main switch.
- Secure the scooter by attaching it to the boat ladder or the pier etc. or hand it over to a person helping you. Keep away from the scooter above you (e.g. at a boat).
- Leave the water, drop your diving gear, then, pick up the scooter.
- Maintain the scooter as described in this manual.

Caution!

Do not underestimate the fatigue after the dive, sudden movements by the boat or waves. Never leave the water with the scooter in your hand while wearing your diving equipment, as this may lead to severe injuries due to falling over, going overboard etc.

6. BATTERY HANDLING

Caution!

Rules for safe use of scooter batteries are subject to compulsory diver training hence the user should first and foremost follow the rules provided during specialized training on how to use a scooter.

Below, only some elements related to the safety and use of the Seacraft batteries are presented:

- Please read the manual as it contains important precautions, warnings and information. It is essential that it is carefully and fully read before using the battery.
- The battery may only be used by persons with appropriate training in this field. It is strongly forbidden to use the battery without obtaining special qualifications for diving with a scooter.
- Using the battery for purposes other than those specified in this manual or in violation of the rules set out in this manual may result in serious personal injury or even death.
- When using a Seacraft battery different than the original battery built in the scooter, it is necessary to read the enclosed leaflet and instructions for use of the said battery.
- Never use or carry a battery showing signs of mechanical damage.
- Always check the level of the battery before entering the water.
- Use a battery charger in a manner inconsistent with the instructions in the user manual, in particular in conditions of high humidity or when the power cord is damaged may present a risk to the user's health of life. Do not touch any part of scooter 's charger with wet hands.
- It is forbidden for children and adolescents under 18 years of age to use the battery, or to leave the device unattended.
- Before transporting the battery, ensure it is packed in a way that prevents it from damage during shipping. Remember to use the provided blind plugs, to secure the segment's electrical connectors. For transporting the battery segments, it is recommended to use the optional Seacraft transport bag.

Note!

It should be remembered that Li-Ion batteries at temperatures below 0 ºC show a decrease in capacity, which must be taken into account when planning a dive in such conditions.

At temperatures below -20 ºC, a significant decrease in the battery capacity may prevent the scooter from working properly. After heating the battery to an above-zero temperature, the battery capacity returns to its nominal value.

6.1. Battery segment specifications

Fig. 23. Seacraft battery segment

Segment features

- 1 - Sealed segment body with notes and usage information
- 2 - Segment connection to plug into the battery housing
- 3 - Segment handle for pushing in/pulling out the segment

Segment specifications

Type	Li-Ion
Capacity	97 Wh
Max. voltage	37,5 V
Length	250 mm
Weight	0,54 kg

6.2. REMOVING THE BATTERY SEGMENTS

Note!

In case you own more than the 6 segments needed for the scooter, please make sure, that you keep together the segments belonging to one scooter.

This is important for keeping your scooter operational with its full battery capacity (▶ “6.5. What to observe with the modular battery” on page 6-8).

Proceed as follows to install the battery segments:

- Open the scooter (▶ “5.1.1 Opening the scooter” on page 5-1).

Fig. 24. Opened scooter with installed battery segments

- Loosen and remove the locking nut of the battery segment holding ring, and keep it in a clean area.
- Remove the battery segment holding ring, and keep it in a clean area.
- One after the other, remove the battery segments, and protect their connectors with one of the supplied protection caps.

Fig. 25. Opened scooter with removed battery segments

- Place the battery segments in the provided Seacraft transport bag.

Fig. 26. Seacraft transport bag for battery segments

- Install the battery holding ring again onto the scooter's center rod, and secure it with the locking nut.
- Close the scooter (▶ "5.1.3 Closing the scooter" on page 5-4).

Caution!

Especially in regions with high relative humidity, it is recommended to store the scooter properly closed. This will also make sure, that no insects or foreign matter can enter the inside of the scooter.

6.3. INSTALLING THE BATTERY SEGMENTS

Note!

In case you own more than the 6 segments needed for the scooter, please make sure, that you keep together the segments belonging to one scooter. This is important for keeping your scooter operational with its full battery capacity (▶ “6.5. What to observe with the modular battery” on page 6-8).

Proceed as follows to install the battery segments:

- Open the scooter (▶ “5.1.1 Opening the scooter” on page 5-1).
- Loosen and remove the locking nut of the battery segment holding ring, and keep it in a clean area.
- Remove the battery segment holding ring, and keep it in a clean area.
- Remove the safety disconnector.
  If you do not remove the safety disconnector before installing the battery segments, your scooter might only be switched on after connecting the charger to it.
- One after the other, remove the protection caps from the battery segments, and vertically lower down the battery segment to one of the free connection ports on the scooter’s corpus.

Fig. 27. Opened scooter with partly installed battery segments

- Install the safety disconnector.
  Without the safety disconnector, the scooter cannot be switched on.
- Install the battery holding ring again onto the scooter's center rod and over the segment handles, and secure it with the locking nut.
- Connect the safety disconnector, in order to link the battery segments with the scooter's control system and with the engine.
- Close the scooter (▶ "5.1.3 Closing the scooter" on page 5-4).

Caution!

Especially in regions with high relative humidity, it is recommended to store the scooter properly closed. This will also make sure, that no insects or foreign matter can enter the inside of the scooter.

6.4. CHARGING THE BATTERY

Note!

Always make sure that you charge all 6 battery segments belonging to the scooter at the same time. A battery segment will be „deactivated“, if it differs by more than 0,5 V from the remaining battery segments. Like this, you will use 1/6 of your scooter‘s battery capacity (▶ “6.5. What to observe with the modular battery” on page 6-8).

To prepare the charger, please read the separate charger manual carefully.
Then, proceed as follows:

- Connect the charger to a working electrical outlet.
- Make sure, that the 2 charging pins on the scooter‘s body are dry and clean, in order to avoid damaging the scooter or the charger, when connecting the charging cable.

Fig. 28. Charging pins

- Connect the charger to the scooter‘s charging pins (the polarity does not matter).

Fig. 29. Connected charger

- The charging procedure begins, if the charger‘s cooling fan is activated.
- The charging progress is displayed by the colored LEDs on the right scooter display side.
- If the scooter‘s battery is sufficiently charged for your purposes, pull off the charger plug from the scooter‘s charging pins.

6.5. What to observe with the modular battery

With a standard scooter battery, all of the cells are normally inextricably connected to each other. Thus, charging and using such a battery means, that all cells are charged and discharged evenly and at the same time.

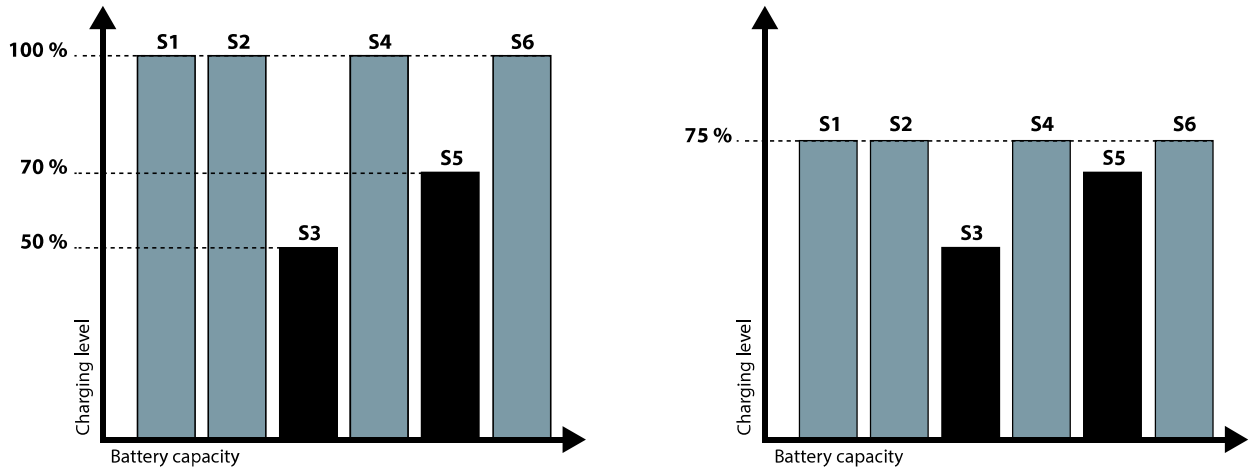
Now, one feature of the Seacraft modular battery is the possibility to dismantle it, in order to transport the extracted segments as hand luggage (if the chosen carrier permits this). But this feature reanders the user responsible for making sure, that all segments of a modular battery are charged and discharged evenly and at the same time.

While you may rest assured, that combining battery segments with different charging levels poses absolutely no risk or danger, this approach will confront you with the fact, that you will loose battery capacity temporarily. Therefore, when using a modular Seacraft battery, always remember the following:

6.5.1 Combining battery segments

If you combine battery segments form different sources (e.g. from different modular batteries or by adding new segments to an existing modular battery), it is recommended to assume, that these segments have a different charging level than the segments already in place.

Why is this important? Well, if the charging level of the battery segments differs by more than 0,5 V, the less-charged segments will be “blocked” and thus rendered inactive. This is a feature to protect the whole battery as a unit. An example:



You are using 4 segments, charged to 100 % and 2 segments charged to 50 % and 70 %. Your scooter will now have 4/6 of its nominal power, since 2 segments are “blocked”. When the 4 segments reach 70 % charging level, 5 segments will work together again. When the 5 segments reach 50 % charging level, the modular battery will provide 6/6 of its nominal power again.

BUT: When you discharge the 4 segments only to e.g. 75 % and then charge the whole battery, the 2 blocked segments will stay blocked!

Caution!

If only 1-2 segments are operating (because the remaining segments are “blocked”), the maximum current limitation of a single segment may be easily exceeded!

In such situation, this segment will get permanently disabled, and it is not unlikely that scooter will shut down or rapidly change the displayed charging level.

The only way to remove this overcurrent protection, is to proceed as described in 6.5.3.

6.5.2 CHECKING THE CHARGING LEVEL OF BATTERY SEGMENTS

As stated above, you need to be sure that the battery segments you combine in the battery hull provide a uniform charging level. To check the charging level, you may of course use a volt meter or (as a simple, but less precise approach while you are traveling) by the following method:

- Insert one battery segment at a time into the battery hull, and connect the modular battery to your Seacraft scooter.
- Switch on the scooter, and the battery indicator will show you the charging level of the inserted segment. If required, note the charging level.
- Switch off the scooter, disconnect the modular battery from the scooter, and remove the battery segment. Put the segment aside, and If required, place the note with the measured charging level with it.
- Repeat this procedure for the remaining battery segments.

6.5.3 PREPARING THE COMBINED BATTERY SEGMENTS FOR USE

In order to make sure, that all combined battery segments provide the same charging level, there is one procedure which will always work:

- Charge the scooter’s battery segments completely (to 100 %).
- Remove the scooter’s safety disconnector.
- Remove the charged battery segments, and install the remaining battery segments.
- Plug in the scooter’s safety disconnector.
- Charge the these battery segments completely (to 100 %).
- Remove the scooter’s safety disconnector.
- If required, fill up missing battery segments, with the previously charged battery segments.
- Plug in the scooter’s safety disconnector.
- Let the scooter remain unused for 24 h, so the battery segment voltages may equilibrate. Then, close the scooter (▶ “5.1.3 Closing the scooter” on page 5-4).

Caution!

When assembling the scooter, always make sure not to mix segments from different modular batteries!

If you own several modular batteries, we recommend you to mark the segments belonging together e. g. with a coloured sticker.

Why is this so important?
As pointed out in section 6.5, you will not get the nominal power output from your modular battery, if you combine segments with different charging levels. Both capacity, and the capability to provide maximum power will be affected if some segments are “blocked” due to a non-uniform charging level.

If the battery electronics recognizes segments, that are less charged than the others, these segments will be blocked. Such blocking can only be removed, by fully discharging and re-charging the all battery segments at the same time (6.5.3).

The battery “lifetime” in a Seacraft scooter is estimated at approx. 300-400 cycles and a period of 3-4 years. After that period, the battery will continue to work, however its capacity may be reduced due to natural battery capacity decrease. To check precisely the condition of your battery, contact your closest service point.

Usage patterns of the scooter and battery charging affect its durability.
Adherence to the manufacturer’s guidelines guarantee an extended battery life and the safete scooter use.

Among other things, the battery charging time depends on the following factors:

- Charger model
- Remaining charge
- Battery state
- Ambient temperature

Please see the Seacraft support website for more detailed information about the battery lifetime:

https://support.seacraft.eu/index.php/knowledge-base/faq-scooters/

Note!

Charging the Li-Ion battery segments may be carried out regardless of the state of the charge level.

For safety reasons, regardless of the battery charge level, it is recommended to charge them before each use.

Storing a battery segment, which is discharged to 0 % for prolonged time, will lead to irreversible damage.

6.5.4 TRANSPORTING BATTERY SEGMENTS

If you plan to transport the battery segments separately from the scooter, remove the battery segments (▶ "6.2. Removing the battery segments" on page 6-3).

It is recommended to use the optional Seacraft transport bag to keep all segments of one battery together.

If you are planning to fly with the battery segments, prepare for this, and print recommended documents from https://support.seacraft.eu/knowledge-base/flying/.

In any case, make sure that the segments are protected against mechanical damage, direct sunlight and other detrimental influences.

Note!

This modular Seacraft battery complies with the UN 38.3 standards.
The single segments are as such IATA-approved (International Air Transport Association, www.iata.org) to be transported in hand-luggage aboard a commercial passenger plane.

But: IATA recommendations are not binding rules for the airlines. Hence, check with your airline, that they allow you to transport the battery segments in your hand-luggage, before you book a flight!

6.6. STORING THE BATTERY SEGMENTS

The battery segments should be stored in a cool, dry place; the optimum storage temperature of the battery is approx. 10 °C. Storage of the battery at temperatures above 30 °C significantly reduces the battery's lifetime.

It is forbidden to store the battery segments in places exposed to direct sunlight, in heated, closed and unventilated spacer (e.g. vehicles) and near heating appliances.

In case you can foresee, that the battery segments will not be used for 6 months or longer:

- Charge them to approx. 50 %; this is the optimum charge level, which means the life of the battery decreases slowly.
- Dismantle the scooter by removing the housing cover (▶ "5.1.1 Opening the scooter" on page 5-1) and removing the safety disconnector. Disconnecting the battery does not create problems with the scooter's electronics.
- In case the device is stored at high temperatures, under which the accelerated self-discharge is taking place, the user should check the battery level once a month, and in the case of discharge below 40 % recharge the battery segments to approx. 50 % of capacity.
- It is recommended that the first use of the battery segments (after more than six months of inactivity) to perform a full cycle of charging - discharging - charging. This will allow the calibration of the measurement system and to determine the battery condition and charge level.

If the battery segments reach a voltage lower than the critical value, please contact the manufacturer or the scooter distributor to verify whether it is possible to restore their functionality.

Note!

Please note, that this way to damage the battery segments is rather theoretical, because to do so, you would have to discharge the battery segments by using the scooter until it shuts down automatically.

Afterwards, you would have to store the scooter for several weeks without charging the battery segments. Only then, the battery would reach the critical limit.

The decrease in battery capacity over time is a natural feature of all batteries, including Li-Ion batteries. The user should keep in mind that over time battery capacity is getting lower, which means that the maximum swimming time with the scooter on a charged battery is reduced. When planning a diving trip with a scooter the user should take into account the wear and tear of the battery segments.

Note!

It is recommended to have the scooter serviced every 12 months by an authorized service center, in order to evaluate the remaining battery capacity.

Caution!

It is forbidden to use the scooter with a defective battery as well as with battery which is discharged or overheated (e.g. as a result of exposing the scooter to sunlight).

6.7. TRANSPORT RESTRICTIONS

Transferring and carrying Li-Ion batteries of large dimensions using a mass transport is subject to regional and national legal regulations. As a rule restrictions in transport of these items are applicable only in the case of air transport. In the case of transport by land the aforementioned restrictions are not valid. Therefore, **each time before sending packages containing the Seacraft scooter with battery segments installed, refer to local regulations for restrictions on the carriage** of certain items or contact your carrier, distributor or the manufacturer of the scooter for detailed information on restrictions on transport of Li-Ion cells and batteries.

Note!

For safety reasons, it is recommended to transport the battery charged up to approx. 20 %.

During transportation, the battery segments must be protected against mechanical damage, particularly crushing. Damages of this type pose a fire risk.

Never use or carry a battery segment showing signs of mechanical damage.

6.8. DISPOSING OF THE BATTERY SEGMENTS

The battery segments are products, which after use become waste, hazardous to people, animals and the environment. It is prohibited to place used battery segments in containers for domestic waste.

The used battery segment is recyclable and should be disposed of in properly labeled containers, dedicated to specialized points of receiving the used electronics, returned to the manufacturer or scooter supplier.

7. TROUBLESHOOTING

7.1. BATTERY-RELATED PROBLEMS

PROBLEM	POSSIBLE CAUSE	SOLUTION
My modular battery is depleted very quickly.	You might have combined segments with different charging levels in one battery. Now, at least one battery segment might be locked.	Make sure, all battery segments have been inserted correctly into the battery hull. Fully discharge and re-charge the complete battery.
My scooter behaves strangely: I can use it in lower gears, but it turns off when I select a higher gear.	You are not getting the full battery power, because at least one battery segment has a lower charging level than the others (blocked segment).	Make sure, all battery segments have been inserted correctly into the battery hull. Fully discharge and re-charge the complete battery.
I fully discharged and charged my modular battery, but the capacity displayed on my scooter control module does not seem to match.	If you are using your scooter in very cold environments, it is a physical property of Li-Ion batteries, that their capacity will be reduced. This process is reversible: As soon as the battery has warmed up (e.g. due to changing ambient temperature), its capacity will be restored.	
The battery will not charge.	The battery is not connected to the charger.	Check the safety disconnector inside the scooter.
	The battery voltage is too low.	Measure the voltage at the battery terminals. If it is lower than specified as minimum for the type of battery, contact the service.
	The battery is damaged.	Contact the service.

7.2. Hardware-related problems

PROBLEM	POSSIBLE CAUSE	SOLUTION
The scooter will not start	Safety disconnector not installed.	Check the safety disconnector.
The motor does not run or runs unevenly	The motor is dirty or blocked.	Turn off the scooter, remove the propeller, remove impurities or cause of blockage in accordance with the instructions contained in the manual.
Water inside the scooter housing	Damaged seals.	Remove the old seals, clean the seal surroundings and contact areas of the sealed parts, replace with new seals, grease with lubricant recommended by the manufacturer.
	Deformation of the housing elements.	Replace the deformed housing element.
	Condensation caused by fluctuations in temperature and humidity.	Take the scooter to a dry place. Disassemble the scooter and dry individual components. Do not use the scooter at low temperatures if it was previously assembled in warm and humid conditions. If this is not possible, disassemble scooter earlier so the moisture can evaporate.
Problems with control elements	Dirty or blocked control elements.	Rinse the control elements (buttons on the steering handle) thoroughly, wash and wipe with a dry cloth.
The scooter sinks or rises towards the surface	Incorrect weight and / or poor placement of the ballast.	Improve the selection of the weight and the distribution of the ballast. If you have problems balancing and trimming, it is recommended to use an external ballast.
Underwater, the handles of my scooter do not point upwards.	The placement of the battery segments plus the sum of trim weights does not lead to creating a “keel” for the scooter.	

7.3. ERROR CODES

In case of internal malfunctions, the scooter will display an error code by means of the red LED in the bottom left corner of the display:

Fig. 30. Error code displayed

The codes are displayed in morse code style by means of long blinking intervals (approx. 1200 ms) and short blinking intervals (approx. 200 ms).

Caution!

If an error code is displayed, contact your Seacraft reseller, the local distributor, or create a service ticket on

https://support.seacraft.eu

The following error codes may be displayed (— = long interval, . = short interval):

Blinking code	Meaning
. . —	Overvoltage
. — .	Undervoltage
. — —	Max. temperature exceeded
— . .	Startup UP error
— . —	Speed feedback error
— — .	Overcurrent
— — —	Undefined malfunction