SEACRAFT
MADE TO EXPLORE

ELECTRONIC NAVIGATION CONSOLE

Quick User Guide

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CAUTION !

This manual is no substitute for a proper training in how to dive and navigate under water, with or without use of ENC3.

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1. Technical specifications

Model	ENC III	**Power source**	Built-in Li-ion 3,7 V battery
Type	ENC v.3	**Battery capacity**	5 Wh
Maximum depth	300 m	**Typical working time**	20-35 h
Tested depth	350 m	**Average charge time**	<2 h
Depth of start and stop of immersion time counting	Optional: 0.5, 1 or 1.6 m (compatible with the norm EN 13319)	**Working temperature**	+10 ... +45ºC
Accuracy of depth measurement	0.3 m in the whole depth range, temp. range: 0...30°C	**Storage temperature**	-20 ... +45ºC
Accuracy of compass	<5 degrees*	**Temperature when charging**	+10 ... +40ºC
Accuracy of ext. log	<2%*	**Mounting type**	Universal
Possibility of using above the water level	up to 5000 m	**Internal storage capacity**	50 routes
Weight / displacement	290 g / -90 g	**Length x height x width**	95 x 71 x 30,6 mm

* The accuracy of the measurement depends on the quality of the calibration and assume the absence of external interference.

Included sensors: 3D magnetometer, 3D gyroscope, 3D accelerometer, pressure sensor, temperature sensor.

Satellite positioning: GPS, Beidou, GLONASS

Data exchange: via Bluetooth 4.2 and/or via USB cable.

Power source: Li-Ion battery cell 5 Wh. Device can use any 5 V DC power source as charger. When charging, it can consume up to 1 A current.

2. Precautions

This manual is suitable for the navigation device with software version 1.7.10 and above. The software version number is shown under **MENU**, when the battery voltage is displayed (**OFF** option selected).

WARNING !

This device may have some bugs in the software, which we did not find yet.

You should never risk your life using this device as sole advisor.

Electronic devices are designed for support and cannot substitute knowledge and training.

Waste disposal information:

Li-ion

This device contains Li-Ion battery and other materials, which must be recycled properly, in accordance with the current environmental protection regulations

3. Mechanical construction

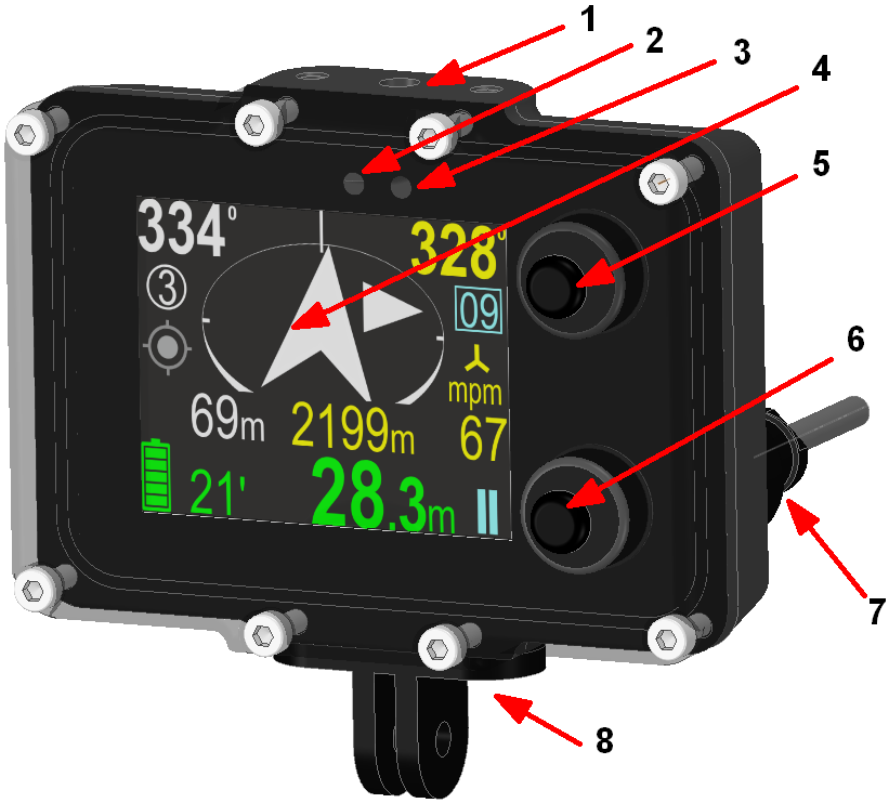


Fig. 1. Description of elements.

1. Universal mounting – top side
2. Ambient light sensor (do not cover)
3. Additional LED diode (red color)
4. Screen / display
5. Top button (NEXT)
6. Bottom button (SET, REC, HOLD)
7. External socket – for charging and speed
8. Universal mounting – bottom side

4. Control

Button functions (depending on actual screen content):

Top button (5) – NEXT screen / NEXT item / CANCEL change / BACK

Bottom button (6) – SET / change value / enter changing item / switch between REC and HOLD state

Note

On most screens, a small graphical hint is displayed in top and bottom right corner of the display.

This hint is connected with the actual button function. It may be one of the below:

- ▽ – Move cursor/selection down to next item
- ▷ – Go to next screen
- ◁ – Go to previous screen
- ⏎ – Select current item
- **X** – Cancel or delete
- **>>** – Switch to next available value
- **+** – Increment current value by 1

First steps - switching on and off:

Switching on the device – press both buttons at the same time.

The device will also switch on when immersed in water min. 0.3 m (1 ft) deep, when the AUTO-ON option is enabled (factory default).

Note

This is the standard method of switching on the ENC3 device, valid for any factory new device. User can change the switching on method by switchin the **One-key ON** option to **yes**. See **Other settings** chapter for details.

Switching off the device – You have to stop recording first. Then go to MENU (from main screen –press the top button 3 times, then press the bottom button once). When the **OFF** command is selected, press the lower button.

The device will switch off automatically when the diving depth is less than 0.5 m and recording is off (HOLD) if the AUTO-OFF option is enabled (factory default).

Buttons operation - ENC buttons operating principle may seem strange for beginners. These are custom designed piezoelectric modules integrated into thick polycarbonate front-panel. Rubber "buttons" have indicative function only (easier operation in thick gloves).

Designing a non-magnetic solution that guarantees operation in very wide range of extreme pressures- **up to 300 m depth**- is not easy task, with ensuring reliability and simplicity. Some "getting used to" their operation is recommended, as ENC3 operating may be different from any other computer-style device you have used previously.
When diving, water pressure around this device is changing slowly all the time. Buttons cannot be sensitive for SLOW pressing/depressing. If so - only RAPID pressing can activate buttons. Thus, to activate button, quick "tapping" action rather than "pressing" is favored.

Modes of operation:

Normal operation mode – Default mode after power on. The user sees the current dive parameters, may switch recording ON (REC) and OFF (HOLD), enter settings and view the contents of the device's internal memory.

Charging mode – After connecting the device to a power source, the charging screen appears. The buttons are inactive in this mode. This mode will be terminated, when the battery is fully charged or the power source is disconnected.

Service mode – When a software update was requested, the device switches to this mode. The screen is blank and the LED above the display is blinking. This mode ends automatically after less than 1 minute.

5. Main screen layout

After power on, the device display will show this content:

Screen elements:

1. Course to planned destination. If no destination is programmed, this field is blank.
2. Present memory slot number. If you start recording, the dive data will be saved in the device memory with this number.
3. Small directional marker (described below).
4. GPS status marker (described below).
5. Time/distance to destination. These values alternate every 3 seconds. This field may be blank, if the corresponding value cannot be calculated.
6. Battery icon
7. Current compass heading (including programmed declination and deviation).
8. Present marker number. For using markers, please see next chapter.
9. Destination direction arrow. The tip of the arrow is always pointing to the planned destination. If no destination is set, this arrow will point to the North (just as 'normal' compass.
10. Present speed value and units. **mpm** means that the speed is displayed in meters per minute, **kts** stands for 'knots'. The symbol ⅄ means, that the external speed sensor should be connected to get valid distance/speed readings.
11. Total distance travelled.
12. REC/HOLD marker.
13. Present depth.
14. Total Dive time.

Buttons role:

Top button – Switch to next screen

Bottom button – Switch recording between ON (RECORD state) and OFF (HOLD state). The icon in the right bottom corner shows the current recording state as described below.

HOLD	**RECORD**	REC/HOLD marker

NOTE - When the device is in RECORD state, the red dot symbol is animated.

Battery indicator

Icon	Charge on %	Time left	Icon	Charge in %	Time left
	85-100	20-25 h		28-45	5-10 h
	68-84	17-20 h		12-27	1-5 h
	46-67	10-17 h		1-11	<1 h

Caution: The value 'Time left' is approximate !Navigation arrow colors:

White – Normal operation with or without programmed destination

Green – Destination is set and distance to it is less than 10 meters

Orange – The diver is returning to the start point (distance >10 meters)

Notice

The arrow described above always points at the programmed target point. You can clear the target coordinates when navigating to specific point is not required (‘exploring’ mode). In this case, the arrow will change it’s shape to “compass like” – see below. Red colored end indicated North.

Main screen when no target was set

Main screen when the target was set

GPS indicator:

Icon	Meaning	More info
	GPS location fixed	Good GPS readings are available. The GPS location reading is valid and accurate.

	GPS location fixed	GPS readings are available, but the accuracy may vary due low signal strength/quality.
	No valid GPS location available	The GPS receiver cannot obtain the current location, but previous readings may be still available and valid.

Depth indicator colors:

Color	Meaning	More info
0.0	Vertical speed (up or down) is less than 9 m/min (29.5 ft/min)	No special actions required from diver.
9.5	Vertical speed (up or down) is equal or greater than 9 m/min (29.5 ft/min)	There is a noticeable depth change.
24.3	Vertical speed (up or down) is equal or greater than 19 m/min (62.3 ft/min)	The user should be aware, that ascending or descending at this speed may have negative health effects.

The vertical speed is calculated based on measurements taken in the last 3 seconds.

6. Additional information screen (next to main)

After pressing the top button on the main navigation screen, the display content changes like shown above.

On the left side of the screen, all present information are shown. On the right side there is a list with all available options. The currently selected item is marked by inverting the background and foreground color (highlighting).

In the picture above, first item (DESTIN) is selected, so left part of the display is filled with information connected to actual destination parameters:

1 - Course to the programmed destination 2 - Time left to destination (approx.), if can be calculated 3 - Distance left to destination 4 - Current record number in memory / maximum available records 5 - GPS information: available satellites count / horizontal precision 6 - Operation hint – when you press the lower button, you will be redirected to the screen with DESTINATION parameters	7 - Top button role – go to the next (lower) item 8 - Currently selected item 9 - Bottom button role – enter/choose the selected item

Note

If some of parameters cannot be evaluated, a **'---'** value will be shown instead.

RETURN function is unavailable (grayed) before you start swimming and went at least 20 meters from the start point.

Buttons role:

Top button – Select the NEXT item. After 3rd press, you will return to the main navigation screen.

Bottom button – ENTER to activate the selected item.

Note: If the destination parameters are cleared (not set), this screen looks like this:

If the RETURN item is selected, the screen looks like below:

1 - The course you need to follow in order to return to the start point 2 - The time required to return to the start point (approx.) 3 - The distance from current location to the start point 4 - Operation hint – when you press the lower button, the device will guide you back to the start point	5 - Top button role – go to next (lower) item 6 - Currently selected item 7 - Bottom button role – enter/activate the selected item

Buttons role:

Top button – Select the NEXT item (MENU).

Bottom button – Switch the device from navigating to DESTINATION to navigating back to the START POINT.

If the MENU item is selected, the screen looks like this:

1 - Internal date (DD.MM.YY)
2 - Internal time (hh:mm), in 24-hour system
3 - Water temperature
4 - Operation hint – when you press the lower button, other functions will be shown.
5 - Stopwatch

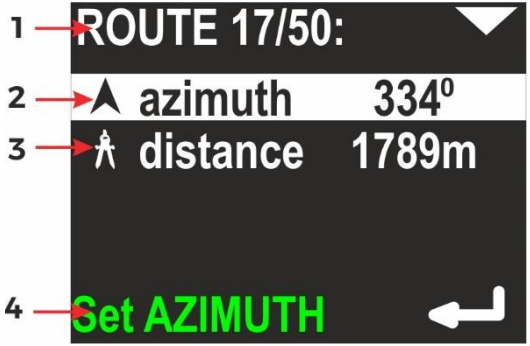
The description regarding the right display side is the same as on previous picture.

Note

If the STOPWATCH is running or was stopped with count > 0, the STOPWATCH value will also be shown in green color on this screen (see below).

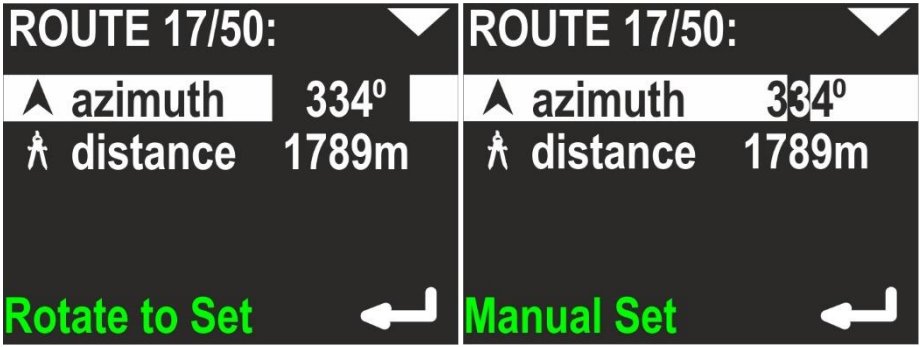
7. Destination parameters – setting and changing

When you activate the DESTIN(ation) option on the additional information screen (see fig. 1 on p. 6), the device will show the current destination parameters (if set) or it will suggest new ones, as shown in the following picture:



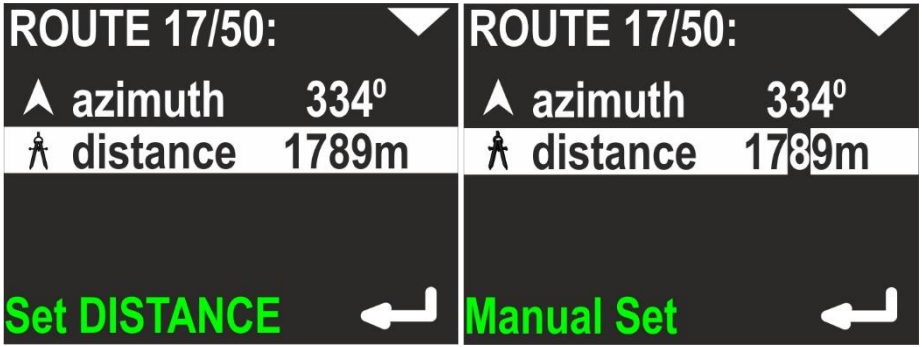
1 - Current route number in memory / total routes in memory
2 - Azimuth – planned course (including deviation)
3 - Distance – The distance to the planned destination
4 - Operation hint – When you press the lower button, AZIMUTH can be modified.

If you press the lower button (ENTER) when **azimuth** is selected, the display will change like this:



You may now rotate the device, in order to set the desired heading. Then simply press the lower button (ENTER), if the value is appropriate. You may also press the upper button now. This will allow you to set the desired **azimuth** manually digit by digit (use the lower button to change the value).

Next, set the distance – you may do it when the second line is highlighted:



Distance value is changed also digit by digit. Pressing the top button switches to the next position, the bottom button changes the value 0 > 1 > 2 > … > 9 > 0.

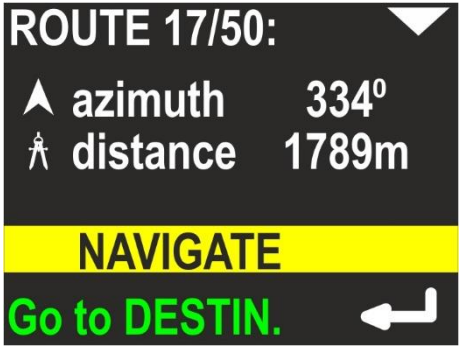
Note

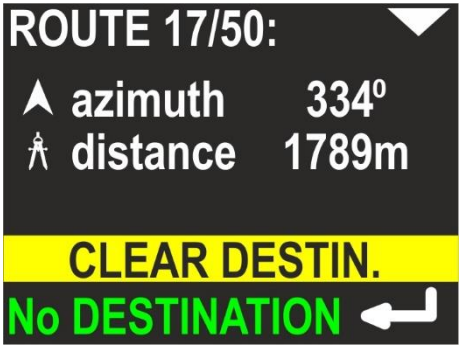
The minimal allowed distance is 10m (or 0.01 mile). The device will not allow to set a shorter distance.

When both parameters (azimuth and distance) are set, pressing the top button will bring up the command line.
You may choose from two commands, using the top button:

NAVIGATE – Apply values and switch to main screen (with destination)

CLEAR DESTIN(action) – Clear all values and switch to main screen (with no programmed destination)





Notes

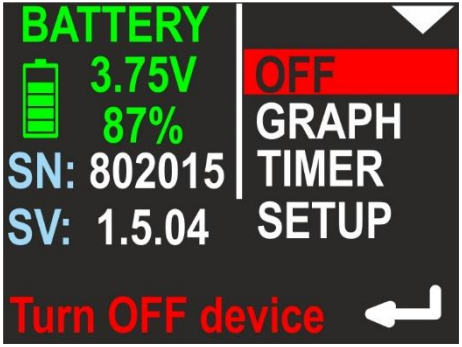
The DESTINATION, once set, is held in memory until cleared or changed (power off will not clear programmed values).

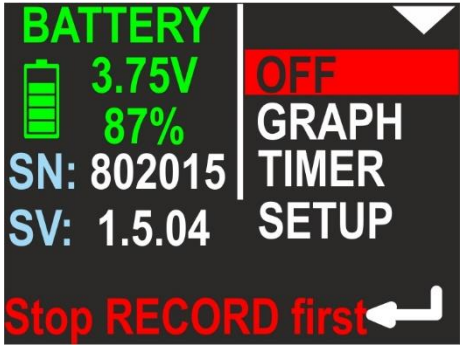
The DESTINATION is always set or changed relatively to the current position.

8. MENU screen

If you press the lower button (ENTER) when the MENU item is highlighted on the additional information screen (see fig. 1 on p. 6), you may choose between 4 commands:

OFF – Allows you to switch off the device. The left part of the screen shows information about the present battery charge. Below that you see the device serial number (SN) (unique device identifier) and the internal software version (SV), as illustrated below:

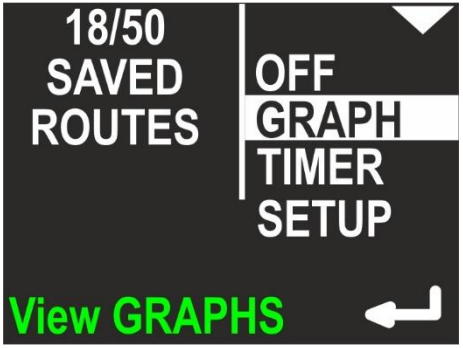




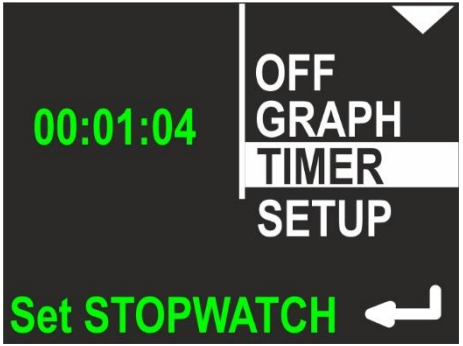
Note

You cannot switch off the device in the recording state (Hint: **Stop RECORD first** in bottom line – right picture). This prevents the user from accidentally switching-off the device.

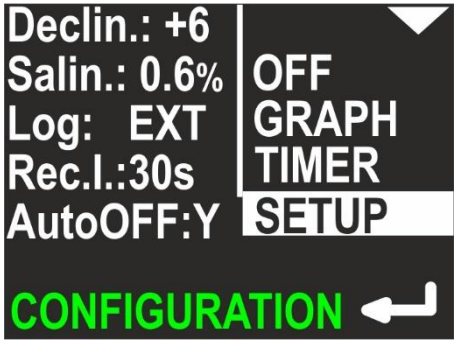
GRAPH – Allows you to show the position and depth graphs on the device screen. More info about graphs can be found in chapter 9 and 10. On the left side of the screen, the device shows 2 numbers: Current routes in memory / maximum routes in memory. More about memory organization can be found in chapters 9 and 10.



TIMER – Allows you to start, stop and clear the internal stopwatch. The stopwatch is described in chapter 11.

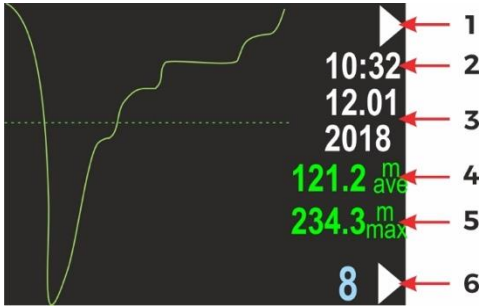


SETUP – This allows you to show and change all internal configuration parameters. More about this function can be found in chapter 12. On the left side on the screen, the most important settings are shown in short form (to avoid unnecessary activation of the configuration just to check it).



9. Depth profile graph

If you press the lower button (ENTER), when the GRAPH item on the MENU screen is highlighted, you will be redirected to the simple graph browser. The first available graph is called 'depth profile' and contains a representation of dive depth vs time, as shown below:



1 - Top button role (now – go to next graph: swim route graph)
2 - Time of first recorded data (hh:mm, 24-hour system)
3 - Date of first recorded data (DD.MM / YYYY)
4 - Average depth (if it can be evaluated)
5 - Maximum depth (if it can be evaluated)
6 - Route number in memory (blue) and lower button role (now – go to the next route number)

Note:

- The internal device memory stores all dive data identified by 'route number'. When the device is switched on, the least available (empty) route number is chosen for recording current data. If all available route numbers (1-50) are used, the oldest one will be overwritten.
- Data recording can be paused (HOLD state). The graph above does not show these breaks.
- You may tilt device to left or right to change the button roles on this screen. When tilted left, the lower button switches to the previous route number. When tilted right, the lower button will allow you to delete the current route.
- If the recording time is less than 1 minute, the record will be deleted when the device is switched off.

10. Swim route graph

This screen presents the changes in the diver location projected on a flat surface (like on a map). The route start point is always positioned in the screen center. The route end point will be shown as a green dot, but only on the present route. Near the right edge of the screen, you will find some information elements:

1 - Top button role (now – go to next screen: return to main menu)
2 - Time of first recorded data (hh:mm, 24-hour system)
3 - Date of first recorded data (DD.MM / YYYY)
4 - Total recording time, in minutes (above 2h, this value will be shown in hours), may be blank, if the value cannot be calculated (empty record)
5 - Total distance in meters (above 2000m in kilometers), may be blank, if the value cannot be calculated (empty record)
6 - Route number in memory (blue) and lower button role (now – go to the next route number)

Note

You may see small GPS symbol above the record time, if this route has also any valid GPS readings recorded.

You may tilt the device to the left or to the right, in order to change the button roles on this screen. When tilted left, the lower button brings you to previous route number. When tilted right, the lower button will allow you to delete the current route. When tilted left, the upper button brings you to the previous graph (depth profile). This can be done on both graph screens:

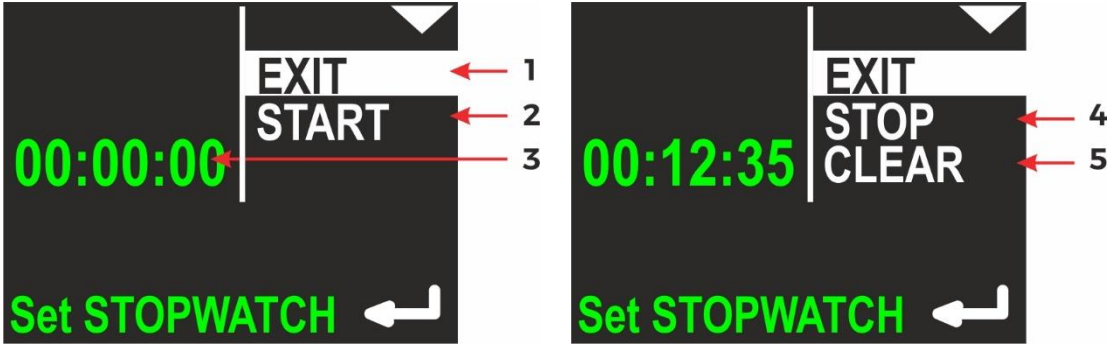
Buttons role	**Device tilted left**	**Device in normal position**	**Device tilted right**
Top	Previous screen	Next screen	Next screen
Bottom	Previous route (10→9→8...)	Next route (4→5→6...)	Delete current route

Note

Before current route deletion there is always warning screen "**Are you sure to delete current route**". You may cancel this operation by clicking "**NO**" (upper button).

11. TIMER / stopwatch

If you press the lower button (ENTER) when the TIMER item on the MENU screen is highlighted, you will be redirected to the TIMER/STOPWATCH control screen:

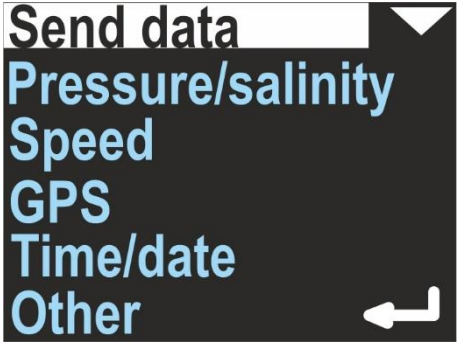


1 - EXIT – current selected command; if you press lower button (ENTER), you will return to main navigation screen
2 - Timer START – option to start TIMER/STOPWATCH for counting
3 - Current TIMER/STOPWATCH value (up to hh:mm:ss – hours: minutes: seconds)
4 - Timer STOP – option to stop TIMER/STOPWATCH
5 - Timer CLEAR – option to clear TIMER/STOPWATCH

If TIMER/STOPWATCH is running, there will be options to STOP and CLEAR its value. STOP will leave the TIMER/STOPWATCH value unchanged (you will be able to start it again and continue counting). CLEAR will set the TIMER/STOPWATCH value to 00:00:00, but the stopwatch will not be automatically stopped with this command.

12. Device configuration (SETUP)

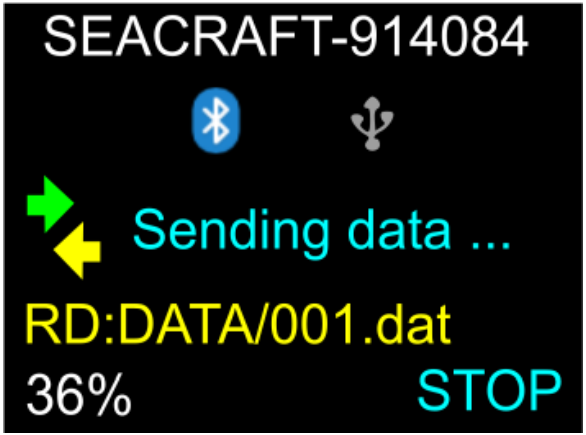
If you press the lower button (ENTER) when the SETUP item on the MENU screen is highlighted, you will be redirected to the SETUP menu. Device settings are organized in 2 screens. The selected function is highlighted. The top button (NEXT) will switch the selected function to the next one (below). The bottom button (ENTER) will activate the selected item.



13. Send data

Used to activate the internal Bluetooth transmitter and allow USB connection. Activate it before any data transmission from the navigation device to a PC or smartphone. When this function is activated, the device will not power off automatically (except when the battery is low).

In data transfer mode, device screen looks like this:



First line shows device name – the same name you will see in Bluetooth environment.

Below you can see the Bluetooth and the USB icon. When the ENC will start sending data, one of this icon will be shown in full color, depending of the communication medium. On the picture above we can see, that communication is made using the Bluetooth (GPS is grayed).

Green and yellow arrows will change to gray color, when transmission was broken.

Yellow text describes current operation (RD = reading, then file name).

In left bottom corner you will see progress indicator, in %.

You can always break communication by pressing lower ENC3 button (STOP).

CAUTION !

If you want to use USB cable for data transfer, you should first enter in the 'Send data' mode and then connect the cable to the device and to your PC.

If you first connect the USB cable to the PC, device will switch to charging mode and data transfer will not be possible.

Note

If data transfer hangs, you can STOP transmission. ENC3 will reset (switch off and start from the beginning). You will have to enter the 'Send data' menu item again. You may also have to disconnect the USB cable, if you was using it for connection (see previous explanation).

IMPORTANT – when you updating ENC3 firmware and you have to break this operation, ALWAYS use STOP button on ENC3 device first (before closing program or PC/mobile device).

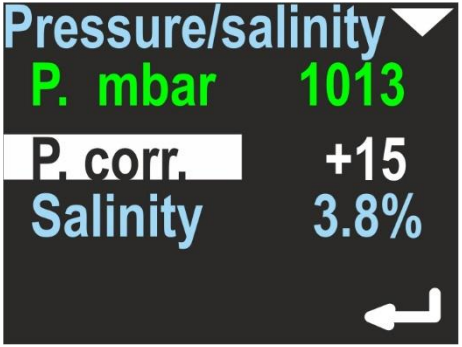
Note

When connecting your ENC3 console to the PC using USB cable, first time you will see message "New device found" and you will have to wait, until proper drivers are installed (internet connection may be required for this). After that you will able to use data transfer via USB cable.

If you will have any problems with device driver installation, please ask our support (support@seacraft.eu). We will help you to find the solution.

14. Pressure/salinity

Shows the current pressure in milibar (green color). 1 PSI ≈ 68,95 milibar. When no pressure is shown, the pressure sensor is defective.



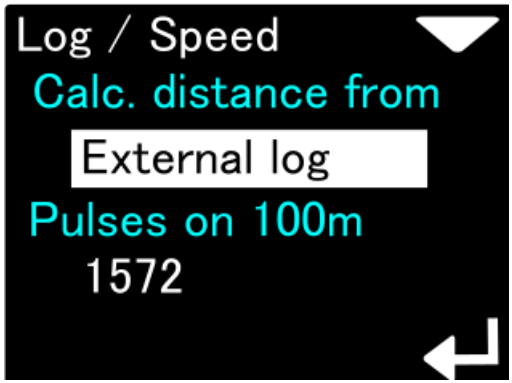
The lower line shows the pressure correction (white color) – this value will be added to the raw value of the measured pressure. It has no effect on depth calculations, but the value will be added to the pressure measurement shown above, so the user may calibrate this device as a precision barometer.

The last line allows to set the water salinity from 0.0% (fresh water) to 4.0%. This coefficient affects the pressure-to-depth transformation and should have an appropriate value.

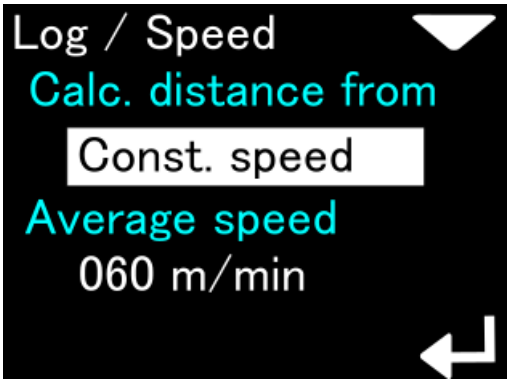
When the item is highlighted, pressing lower button will allow to edit its value.

15. Log/speed

This navigation console can work with an external sensor (speed sensor) or without it (inertial mode). This option can be used to switch between these two modes.



Lower button press changes this setting to →



Lower button press changes this back to ←

Field named 'Calc. Distance from ' can switch between two values:

- **'External log'** - distance and speed will be calculated based on signals from an external sensor (log). When selected, ⅄ will be placed next to the speed display on the main navigation screen
- **'Const. Speed '**- distance will be calculated based on the programmed average speed and elapsed time. Correct route counting in this mode requires precise operation of recording on and off (REC / HOLD).

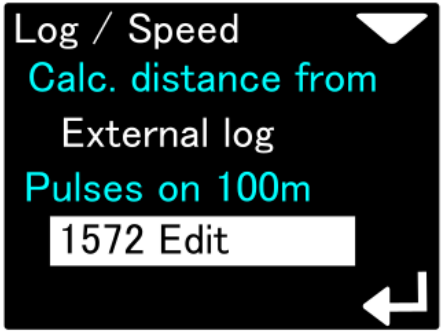
Lower button allows to switch between the modes, when the first line is higlighted. Upper button will higlight the second line, allowing to do more detailed settings.

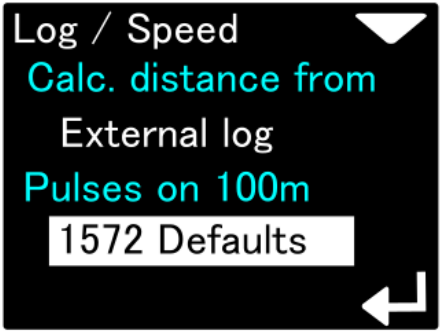
If the **'External log'** is chosen, and the lower line is higlighted, the upper button will allow to switch between:

- **'xxxx Calibrate'** -allows calibrating the external log calibration factor by swimming on choosen distance

- **'xxxx Edit'** – will allow to enter the calibration coefficient manually, digit by digit

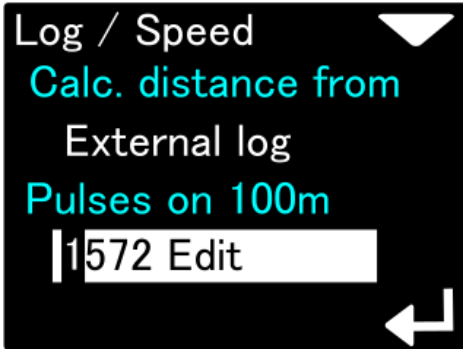
- **'xxxx Defaults'** – will set the calibration coefficient to the factory default value





Pressing the upper button will switch the screen as shown (from left to right).

Pressing the lower button will choose currently shown option.



Manual editing the log coefficient:

- lower button – increase digit 0, 1, 2, 3...9, 0...
- upper button – go to the next digit

ENC3 operation is different with and without external log sensor.

When the external sensor is not used (**Calc. distance from = Const. speed**), on the log settings screen you may set the average swimming speed. When the device is in HOLD state, the distance counter does not change. When the user switches the device to

RECORD state, the navigation console expects the user to swim with constant speed equal to the value set in this option (e. g. 50 m/min).

This type of operation requires from the user:

- Setting the average swim speed very precisely
- Swimming at constant speed
- Switching between HOLD and RECORD state as quick as possible

16. Log/speed calibration

When the external sensor is used and connected to the device (**Calc. distance from = External log**), the calibration option is used to get the best possible distance measurements. The sensor principle of operation is based on pulse counting. The sensor calibration factor equals the number of pulses which the speed sensor will produce while swimming a 100m distance.

A typical value is 1550 pulses on a 100 m distance. In most cases this value will be between 1400 and 1600 pulses on a 100 m distance.

Pulses value can be altered by type of DPV, mounting position, and influence of for example “propeller suction” effect. Devices are calibrated to be used with Seacraft scooters, which construction allows for optimal sensor placement, and minimizes interferences. While for general orientation underwater factory setting will be fine with most types of DPV’s, for more precise applications- as for example mapping- we recommend speed log calibration with whole set-up used.

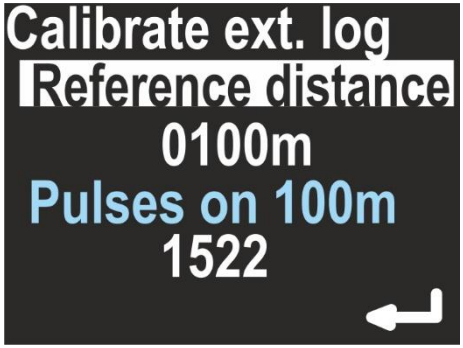
This calibration factor depends also on the exact sensor position on the DPV. To get best results, mark the sensor position on the DPV body and perform the calibration procedure as described below:

- Mark the START and STOP point on a straight, known distance (100-1900 meters)
- Go to **SETUP -> Log/Speed -> Calibrate log** (make sure **Active log** is set to **EXT**)
- Enter the known calibration distance in the field **log at: ...**
- Below, you will see the actual calibration factor **log 100 m: 1590**. Make sure, the arrow points to this line, and press the lower button.
- The screen will show the message **Press START and swim exactly .... m**
- Go to START, set the favorite speed on your DPV, press START (lower button) on the navigation console, and swim as straight as possible to the STOP point. The screen display will show the pulse counter, which should increase with time.
- When you reach the STOP point, press the lower button again. The new log calibration factor will be shown on the screen.

Caution: The calibration procedure will fail, if the pulse count recorded during the procedure is far too low. In this case, the previous value will be shown in the calibration factor field (**log 100 m: ....**)

The calibration procedure needs values in meters. No other units are available. 1 N.M. (Nautical Mile, U.S.) equals 852.0 meters. 100 feet equals 30.48 meters. 100 meters equals 328.08 feet.

All above procedure is shown on the screens below:



In order to calibrate the external log, first set the known and precisely determined test distance. This distance can be 10m..... 2000m. It can be changed by pressing the lower button when the 'Reference distance' text is highlighted on the above screen. For accurate calibration, select a distance of at least 100m. This value need to be determined with an accuracy of at least 1 meter.
The next field, 'Pulses on 100m' displays the current value of the log calibration factor, calculated for a distance of 100m. After highlighting the inscription 'Pulses on 100m' and pressing the lower button, the calibration process begins.

Position the device at the beginning of the marked test distance and press the lower (START) button. Then, swim the entire marked distance as straight as possible, avoiding unnecessary maneuvers, depth changes, and especially ascending above the water surface.

On the end of the calibration distance press STOP (lower button again). The counter visible on the screen will show the number of pulses registered by the log. If this quantity is too low, the calibration will be canceled (the previous value will be kept). Using the upper button (EXIT) during calibration will cancel the entire process at any time.

Important !

During the entire log calibration, user should swim straight at the same depth (if possible). Changing the depth and/or allowing to 'step back' will affect the calibration accuracy.

The best results is calibrate the log swimming along the reference in one direction and doing the same operation in opposite direction. After that, you should enter manually the average from collected log calibration coefficients. This procedure allows to eliminate the water current influence.

The log position along the scooter hull and/or the other equipment which changes the water flow can affect the calibration coefficient !

The log calibration is recommended only in case of specific applications, non standard equipment configurations, or partial log damages. In case of regular ENC usage, use the factory value.

It is possible to set the calibration factor also without a need to dive and measure a known distance underwater. In case that logged route indicates deviation of covered distance - and currents presence or wrong mounting/ log damage are not a reason of that, the correct calibration factor **"f"** can be calculates using following equation:

$$f = \frac{ab}{c}$$

where:

a = length of the section as measured with ENC3

b = current calibration factor (pulses / 100 m)

c = precise known length of the route section

For example: the section being measured has a length of exactly 127 m and ENC has indicated the route length of 124 m. The entered and used in the ENC calibration factor is 1590 pulses / 100 m.

$$f = \frac{124x1590}{127} = 1555$$

After entering the calibration function on the 100 m section, press START and to blow, or use for example a fan until the number 1555 appears and then press STOP. The correct calibration factor will be saved. The above operation is not complicated and takes very little time.

This function may be useful if various configurations of speed sensor are used, and you write down also various calibration factors- corresponding with given set.

Note

The log is a precise and delicate mechanical element and in the case of its significant contamination, after mechanical impacts or after changing the environment (fresh / sea water) it is recommended to check its early work and / or recalibration.

There are 2 types of log sensor: classic (type B) and compact (type C). In the future may be even more. If you have the classic log, a value between 1550 and 1600 in the calibration field should be good for you. With the

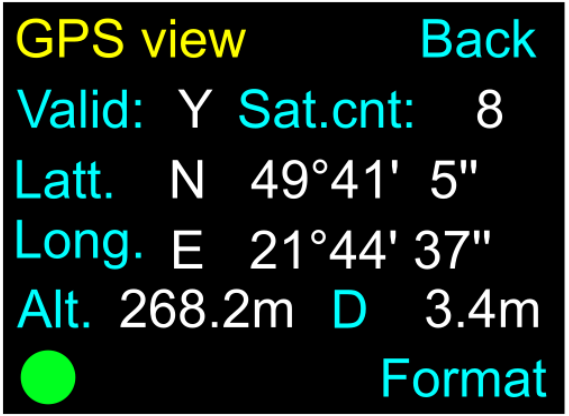
compact sensor, you should have good results when the calibration is between 1600 and 1650 pulses/100m.

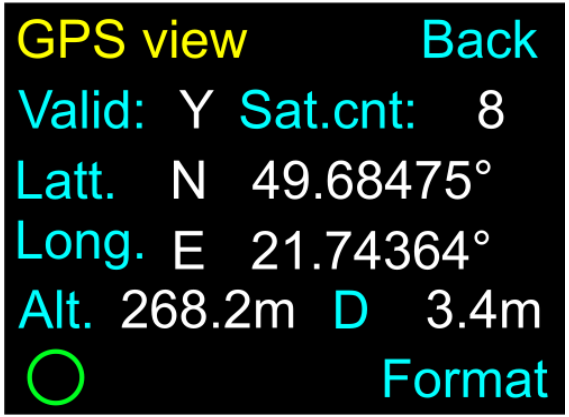
17. GPS

This menu option is for information purposes only. When selected, the navigation screen will show the GPS status information as described below:

- **Valid: Y/N** – Displays, if GPS information is available now
- **Sat.cnt: 0...15** – Number of satellites used to calculate the position (more = better)
- **Latt. N/S 0.00000º** - Latitude in degrees, can be **N**(orth) or **S**(outh)
- **Long. E/W 0.00000º** - Longitude in degrees, can be **E**(ast) or **W**(est)
- **Alt. 0.0** – Altitude above sea level
- **D 0.0** – Horizontal dillution of precision (the lower, the better)

Note: When **Valid** is set to **N**, other values can be 0 (if no valid GPS readings were obtained during the last 30 seconds) or the value might display the last valid readings. When **Valid** is set to **Y**, values equal the present reading.





GPS information is refreshed automatically after each successful update on this screen.

The GPS state is also reported as icon on the main screen.

Green circle in the left-bottom corner of the screen will change his shape each time new GPS reading is received from the internal sensor. If you cannot see the change, internal GPS sensor may be faulty.

By pressing the lower button you can change data format between DD MM SS (degrees minutes seconds) and DD.DDDDD (decimal format of degrees).

Altitude and horizontal precision can be shown in meters or in feets, depending of what unit you set for the depth indication.

The GPS receiver is automatically switched off, when the water depth is 1.5 m (4.9 ft) or more, in order to save battery. When the water depth is 0.5 m or less (1.6 ft), the GPS receiver is switched on automatically.

After power on, first GPS readings should be available after 20-60 seconds. The GPS antenna is located between the buttons, so you should not cover this point with any objects.

You may tilt the navigation console as far as possible (screen upwards) for a while, to achieve better/quicker GPS readings, but this is not necessary in most cases.

18. Time/date

This device provides an internal real time clock with calendar.

The time format is 24 hours, the Date format is DAY.MONTH.YEAR. YEAR has only 2 digits. The value 01 means the year 2001, 02 means 2002 and so on.

Caution:

– The device may drop date & time settings, if the battery was deeply discharged.

- The device clock accuracy is about 15 seconds per month. You may need to correct date & time settings from time to time.

- Date and time are used in record files. If date/time settings was lost, device will set date and time to 2019-05-01 12:00.

19. Other settings

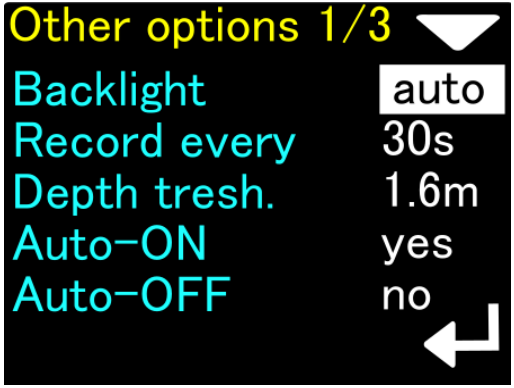
Miscellaneous other settings are available as a separate screen:

The additional settings screen (MENU → SETUP → Other) is divided into 3 parts.

The first part of the options shows the current settings: Backlight, Record every, Depth tresh. (...old), Auto-ON and Auto-OFF.

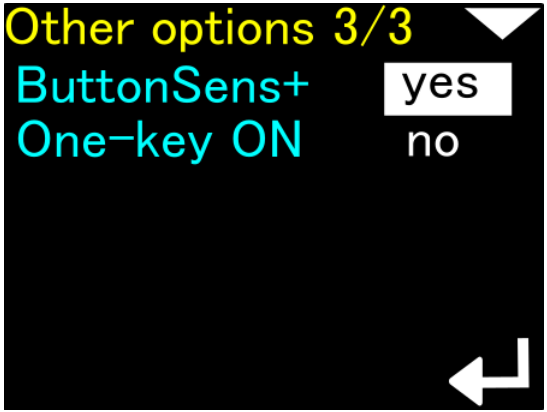
The upper button goes through all these options one after the other, and then the next screen is displayed.

The lower button allows - as on the previous screen - to cyclically change the highlighted value.



First part of settings screen

Second part of settings screen



Last part of settings screen

Backlight – [1, 2, 3, 4, 5, auto] – Changes the display backlight intensity. Value 1 means the constant lowest brightness (about 20%), value 5 means the constant maximum brightness (about 95%), value 'auto' means that the backlight will be auto adjusted using the ambient light sensor. Default is **auto**.

Record every [2 s, 5 s, 10 s, 30 s] – This is the maximum available time space between two records in memory. Note, that in some cases two records may be collected faster than this value, but never longer. Default is **30**....

Depth threshold [0.5 m, 1 m, 1.6 m] – The navigation console will count 'underwater time', when the depth is equal or greater than this value. Default is **1.6**....

Auto-ON [yes/no] – If yes, device will switch on automatically when immersed in water by at least 0.3 meters (1 ft.). Default is **YES**.

Auto-OFF [yes/no] – If yes, the device will automatically power-off, if the water depth is less than 0.5 meters, RECORDING is OFF (HOLD state), and the user did not press any button during the last 5 minutes. Default is **YES**.

'Auto-REC' option

Possible settings: enabled (**yes**) or disabled (**no**).

The option is enabled by default.

When Auto-REC is off, the ENC3 console functions as it did in the previous software version. User must manually start data recording (lower button on the main screen with compass) to save information.

When Auto-REC is enabled, the ENC3 console will automatically detect when data recording should begin

Automatic start of data recording will start if **all** of the following conditions are met **simultaneously**:

- the ENC3 console is submerged to a depth **at least equal** to **Depth tresh**. (available on the first screen of additional settings)

- Speed sensor detects water flow of **at least 8 m / min** for a minimum duration of 1.2 seconds. The flow must not be interrupted (no velocity decays)

- the **main console screen** is currently displayed (the one with the large arrow)

The Auto-REC option is responsible only for starting data recording automatically.

'Auto-HOLD' option

Possible settings: enabled (**yes**) or disabled (**no**).

The option is enabled by default.

When Auto-HOLD is off, the ENC3 console functions as before. Requires manual stopping of data recording by the user (lower button on the main screen with compass)

When Auto-HOLD is turned on, the ENC3 console will automatically stop writing data.

Automatic interruption of data recording will occur if **at least one** of the following conditions is met:

- the depth measured by the ENC3 console has decreased to **0.2 meters or less**

- speed measured by speed sensor has dropped **below 6 m / min** and remains so for at least 1.2 seconds (without momentary speed increases)

The Auto-HOLD function is responsible only for stopping the recording and works regardless of the current content of the device screen.

Caution

The Auto-REC and Auto-HOLD options have lower priority than the REC and HOLD commands issued by the user. Thus, any REC / HOLD command activated by pressing a button on the ENC3 console will lock Auto-REC and Auto-HOLD for only 15 seconds. During these 15 seconds, the REC or HOLD state will remain as manually set by the user. After 15 seconds, if the Auto-REC and Auto-HOLD functions are not turned off, the data recording status will be determined automatically again.

Warning

When recording (REC mode) is turned on - by user command or automatic mechanism - the device continuously calculates position and displacement based on information from the compass and log. When the recording is not started or when it is interrupted (HOLD mode), calculations are stopped (the position in space does not change). When at this point the user moves, the memory of the device will no longer correspond to the actual course of the dive. This can cause errors that are difficult to detect, including the inability to return to the starting point basing on ENC console readings.

Notice

The Auto-REC and Auto-HOLD options control recording only when the ENC console is enabled to use a speed sensor to measure the distance traveled (**MENU → SETUP → Log / Speed = External log**).

If the external log is turned off (**MENU → SETUP → Log / Speed = Const. Speed**), then the Auto-REC, Auto-HOLD and Auto + marker settings will be kept, but their description will be displayed in gray, and an attempt to change them will trigger the message " Option currently not available "

'Auto+marker' option

Possible settings: enabled (**yes**) or disabled (**no**).

The option is disabled by default.

The ENC3 console has a built-in mechanism for writing markers. A marker is an additional "highlight" associated with a point on a recorded route. By default, each time you stop recording manually (with the button on the console), the device saves the current marker number in the memory and increases its number by a value of 1 until it reaches 99.

If Auto + marker is turned off, markers will only be saved when you stop recording manually.

When the Auto + marker option is turned on, stopping the recording due to the Auto-HOLD option will cause saving and increasing the marker number. If Auto-HOLD is turned off, Auto + Marker does not work.

'Deep sleep' option

Possible settings: enabled (**yes**) or disabled (**no**).

The option is disabled by default.

The ENC3 console periodically measures barometric pressure, even when turned off. This is necessary for the precise calculation of the underwater depth. However, even brief partial wake-ups of the console causes the drain on internal battery power, so even a fully charged ENC3 console needs to be recharged after about 3-4 months of non-use.

When we enable the **Deep sleep** option, periodic measurements of atmospheric pressure will not be performed.

It should be remembered that in a few unfavorable cases, the accuracy of the depth calculations may deteriorate. The maximum error of the depth calculation may increase to even 0.8 m, while without saving energy, this error remains in the range of 0.2-0.4 m.

Thanks to the Deep sleep option, the energy consumption of the ENC3 console during shutdown decreases about 2.5 times, so a fully charged device will maintain the state of charge for up to about 9 months (estimated).

Warning

If you plan to stop diving for a long time, it is recommended that this option be turned on (yes).

If you are moving to a different geographic area and intending to dive there, it is recommended that **Deep sleep** be set to 'no'.

'Disable GPS' option

The ENC3 console has a built-in GPS receiver that works continuously on the surface (when the calculated depth is 0.1 meters or less). The operation of the GPS receiver increases the consumption of battery power while it is **on** (active).

There are cases where receiving a GPS signal is inherently impossible (e.g. inside caves), so keeping the receiver on is an unnecessary waste of energy.

If **Disable GPS** is set to **yes**, the GPS receiver will remain off all the time, regardless of the depth. This will allow the ENC console to work on the surface for approx. 20% longer.

Warning

Turning off the GPS receiver completely causes its icon to disappear from the main navigation screen.

Attempting to enter the detailed information on GPS status (**MENU** → **SETUP** → **GPS**) will display the message "Option currently not available"

'ButtonSens+' option

Possible settings: enabled (**yes**) or disabled (**no**).

The option is disabled by default.

This option allows to increase buttons sensitivity by about 30%. Amplification works only when device is powered on. If you enable this option, after power on you will need less force to operate buttons, but power-on sensitivity will remain unchanged.

Notice

Buttons sensitivity is lower in water with temperature <10°C (50°F), but the dependence is not linear, so the user must decide, if he needs increased sensitivity or not.

In very hot climate you may want to stay with normal (default) button sensitivity, to avoid unintended clicks caused by vibrations.

'One-key ON' option

Possible settings: enabled (**yes**) or disabled (**no**).

The option is disabled by default.

This option requires a longer explanation.

All earlier versions of the ENC3 had a default method of switching on by pressing both buttons simultaneously.

Such a mechanism was dictated by the need to avoid accidental (unintentional) activation of the device due to shock or vibration.

However, due to the specific way the buttons work, this method was able to cause difficulties for novice users.

Also, if you need to turn on the device underwater, the classic way can create difficulties.

Therefore, the possibility of choosing an alternative method to turn on the device has been introduced (**One-key ON**).

In CLASSIC power-on scheme (**One-key ON = no**):

- pressing single button will cause red light above the screen to blink once (confirms, that device has power and the button is OK)

- pressing both buttons at once will cause red light above the screen to lit for ~1 second, and immediately the screen will turn on to show Seacraft logo

In ONEKEY power-on scheme (**One-key ON = yes**):

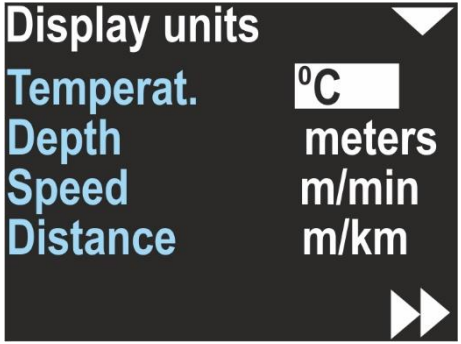
Pressing any button will cause red light above the screen to lit for about 0,5 second and then it will start blinking fast.

When the light is blinking, you need to press **ANY** button **AGAIN**, to confirm you really want to power on the device. Without this second button press, ENC will remain off.

Please remember the rules described above. They will help you to recognize, which power-on scheme is programmed in your device (when you will get unknown ENC in your hands).

20. Units

Allows you to choose the units of the values presented on the screen:



Temperat.(ure) – Can be °C (Celsius) or °F (Fahrenheit)

Depth – Can be meters or feet

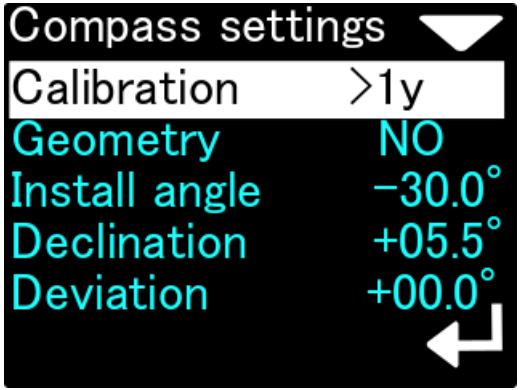
Speed – Can be m/min (meters per minute) or knots (nautical miles per hour)

Distance – Can be m/km (meters and above 2000 m kilometers) or US.NM (United States Nautical Mile; 1 US.NM = 1852m)

The selected unit is usually displayed near the values on all other screens.

21. Compass

The ENC2 compass settings screen, accessible by selecting **MENU** → **SETUP** → **Compass**, looks like the picture below:



Compass setting screen

White text highlighting indicates the currently selected item.

On the left side there is a text description of the function or parameter.

The right side shows information about the function or the parameter value.

Calibration - these are functions related to compass calibration. The information on the right is the time that has elapsed since the last calibration (in minutes, hours, days or '> 1y' if the time is greater than 1 year). The exact content of the compass calibration menu is shown in the next section of the manual.

Geometry - is a screen of precise compass readings corrections. The operation of this function has not changed compared to the previous version of the program.

Install angle - is the value of the ENC console installation angle relative to the scooter hull. Details on this setting will be described in the next section of this manual.

Declination - the compass declination value expressed in degrees. Alignment accuracy has been increased to tenths of a degree. A positive value of this coefficient means eastern (E) declination, and negative - western (W).

Deviation - compass deviation (constant error) expressed in degrees.

Declination and deviation difference:

Declination - The magnetic declination is a constant value, depending on your geographical region. It can be obtained from many sources for example https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml#declination

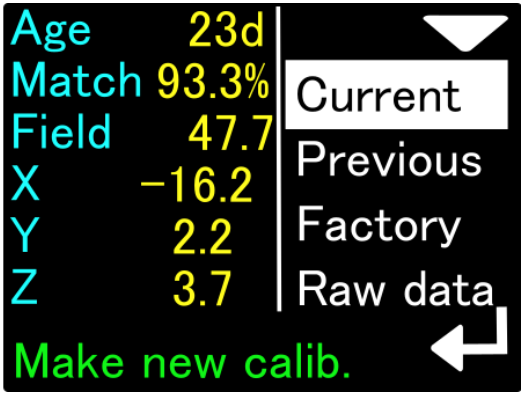
Deviation – A constant value that will be added to the heading shown on the display (and to all position calculations). The deviation is a constant value caused by magnetic elements near the navigation device, that cannot be removed. In most cases it will be set to 0.

Note

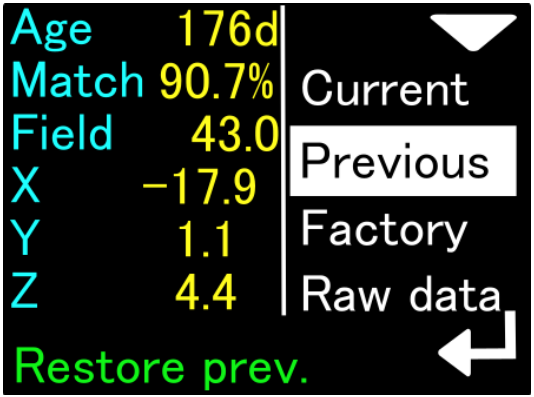
The compass heading on the device display (and the data recorded in memory) will use both **declination** and **deviation** coefficients. There is a common rule: **declination** is a matter of geographical location and **deviation** is caused by other equipment. That is why these two coefficients are separated.

22. Compass calibration

After selecting **MENU** – **SETUP** – **Compass** – **Calibration**, we will be moved to the next menu, containing information and commands for calibrating the compass. The screen is shown on the pictures below:



Compass calibration - current values



Compass calibration – previous calibration values

The compass calibration current values contain the following information:

Age - calibration age (time elapsed since the last calibration). NOTE - if the clock is or was incorrectly set during calibration, the indication may be incorrect.

Match - estimated quality of performed calibration. A value below 80% may indicate a device fault or external interference during calibration. The ideal calibration should be 90% of this parameter.

Field - the length of the magnetic field vector at the calibration site. The value is expressed in microtesla (uT). The correct value of the magnetic field strength can be found using, for example, this website:
https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml#igrfwmm

If the value given by the ENC in this field differs by more than 10% from the expected value of the field strength (given by the online calculator), we have reason to assume that the calibration has been disturbed or there are local magnetic anomalies at the calibration site.

X, Y, Z - exact values of the magnetometer calibration coefficients. You can use them for comparison purposes (for subsequent calibrations)

The values in the factory calibration screen have the same meaning but refer to the settings that the device received at the time of manufacture (can be used for comparison).

Warning

Factory calibration may or may not be effective for the user's current location.

In the lowest line of the screen, in green, hints for each highlighted function are displayed.

When **Current** is highlighted, pressing the new button starts the compass calibration process.

When the **Previous** field is highlighted, we can see the calibration settings that the console had previously. The device stores one previous compass calibration in its memory. Pressing the lower button when the Previous field is highlighted will cause the current compass calibration to take the values saved previously (e.g. from a month or a week ago)

When the **Factory** field is highlighted, we see the factory calibration properties. These are the parameters that the device had when the factory tests were carried out. Pressing the console's lower button while Factory is highlighted will restore the compass to factory calibration.

Warning

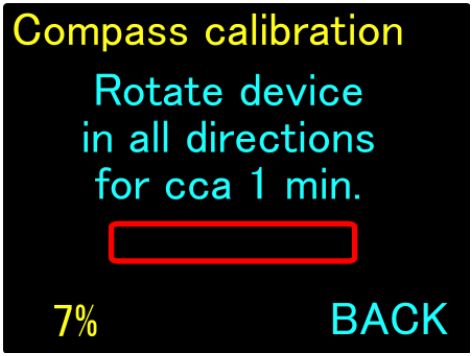
Restoring the factory calibration of the compass makes sense only in one case - if our device does not work properly and we cannot deal with it ourselves.

Factory calibration is correct for the place where the device was manufactured. In another part of the world, the readings of such a calibrated compass may differ significantly from the correct values.

If the compass still does not work after factory calibration has been restored - e.g. shows only one value or it only changes by a few degrees - it means a defect in the device that can only be diagnosed by factory service.

If a factory reset of the compass has made it unblocked, try a regular calibration to get the best readings.

The screen for restoring the calibration to the factory values



ENC2 window during calibration

While calibrating the compass, you should slowly- without rapid movements- turn it in all possible directions ("tilting the eighths while turning around"). The screen displayed during this operation has not changed from the previous version. The only addition is the digital "calibration progress percentage" indicator that appears at the bottom left of the screen.

However, the internal procedure for obtaining compass calibration data completely changes.

Previously, calibration was simply measured by its duration. It was up to the diligence of the user whether after the calibration was completed its result would be good or not.

In the current software version, an advanced algorithm analyzes the operations performed by the user while calibrating the device. The progress bar and digital indicator on the screen reflect the actual operation progress.

If the user does not rotate the device as it should, or rotates it only in one axis all the time, the progress bar and digital indicator will remain unchanged and may even roll back after 5 minutes of inactivity.

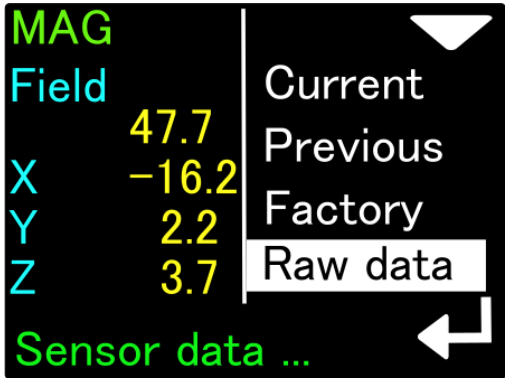
Calibration is successful when the progress bar turns green and the digital indicator is at least 70%. At this point, the text in the lower right corner of the screen will change to **APPLY**, and the user by pressing the lower navigation button will save the new calibration values to the device memory.

The top navigation button during the entire calibration process is used to abort the operation without saving the data.

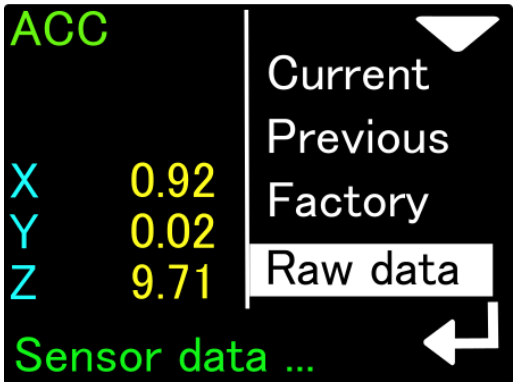
The maximum value shown in the digital progress indicator field is 120%. This means that 20% more data has been collected than is necessary to accurately calculate the compass calibration.

Preview of current values from sensors

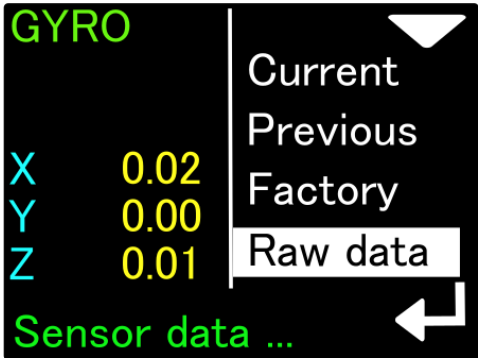
The last function available in the compass calibration menu is the function of displaying the current values measured by the sensors of the ENC console. We activate this function by highlighting Raw data on the compass calibration screen. By pressing the lower button of the console, we change the view of the previewed data, as shown in the figures below:



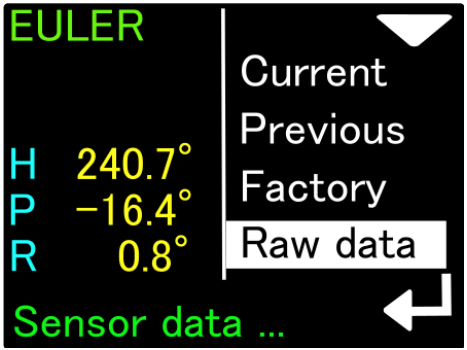
Magnetometer raw data



Accelerometer raw data



Gyroscope raw data



Euler angles

The data of the magnetometer (**Mag**) can be used, for example, when looking for a good place to mount the ENC console. If the total value of the magnetic field (**Field**) oscillates, for example, around the number 47.7uT (as in the picture above) and we bring our ENC console closer to the scooter, we can observe a change in the Field value. If this change is large (above 10%), then the place where we placed the ENC console is not suitable for mounting it, as it is under the influence of some disturbing magnetic interference.

Similarly, we can test equipment elements by bringing them closer to the ENC console. Changing the Field value will show us what objects generate or change the magnetic field and should be placed away from our ENC.

Accelerometer (**ACC**) data is needed to determine console tilt. The values on this screen are accelerations expressed in m / s2. If we place the console perfectly vertical, the value on one of the axes (X, Y or Z) should be close to 9.81 (this is the average acceleration due to gravity), and the other values should be close to 0. If the acceleration due to gravity cannot be observed, or when the vertically positioned device does not show zero on at least 2 axes, it may indicate its damage (e.g. due to a very strong impact). The compass may not be correct in this case.

The gyro data (**GYRO**) is used to determine the compass direction when there is a sharp change in speed or direction. When at rest, the measurements of this sensor should be very close to 0 (acceptable values 0..... 0.02). If it is not, the gyroscope may be damaged, which can negatively affect compass calculations.

The last screen (**EULER**) is the result of the direct operation of the ENC console's computational algorithms. The given angles are: H - Heading = compass heading without declination and deviation corrections), P - Pitch = ascent or descent grade, for ascent the values are positive, for descent - negative, R - Roll = side to side, a positive value means tilt to the right, negative - to the left.

If the Euler angle indications do not work as described, the device must be reset to factory settings and then carefully calibrated from the beginning. When that doesn't help, the ENC console should be returned for service.

23. ENC installation angle (Install angle)

The last new feature available in the compass calibration menu is the **Install angle** feature. This feature significantly increases the accuracy and repeatability of compass readings. **It is mandatory to set this value correctly, to have good compass precision.**

The electronic compass built into the ENC console will work properly only if the console is mechanically connected to the body of the underwater vehicle (scooter) in a permanent manner (unchanged throughout the entire dive). In addition, it is required that the angle formed by the screen of the device with the axis of the scooter is known and constant.

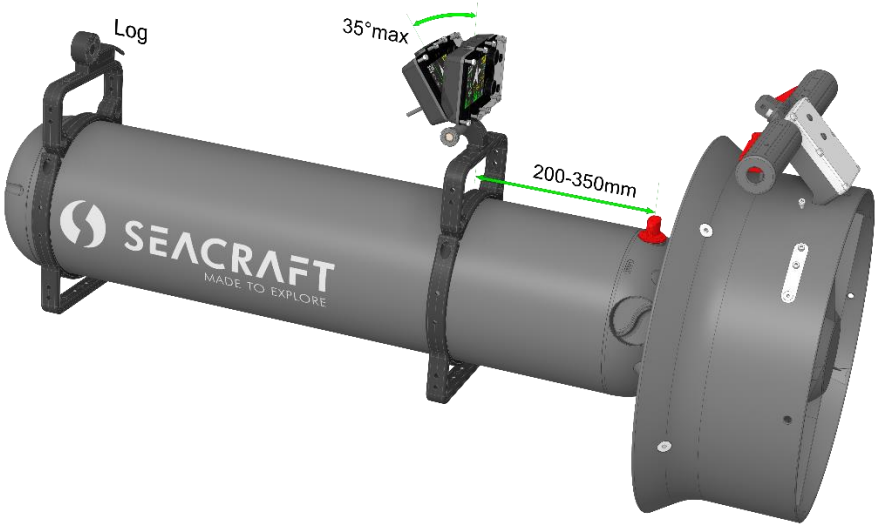
In the previous version of the ENC console software, we assumed that the user could attach the ENC console to the scooter in a certain way (fig. Below), and the installation angle would be within a small range of values (0.....- 35 degrees):

Analyzing some less typical cases, we concluded that for some divers, due to their specific habits or specific diving conditions - this simplified system is insufficient and may lead to errors in determining the direction of flow, which also tend to accumulate.

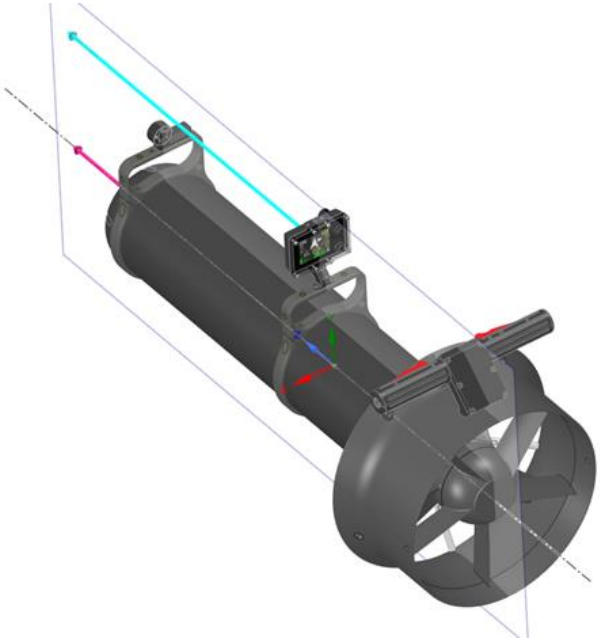
Therefore, in the current software version, the installation angle issue has its own configuration section and **it is required** that the user **correctly configure this parameter.**

What is an installation angle and why is it important.

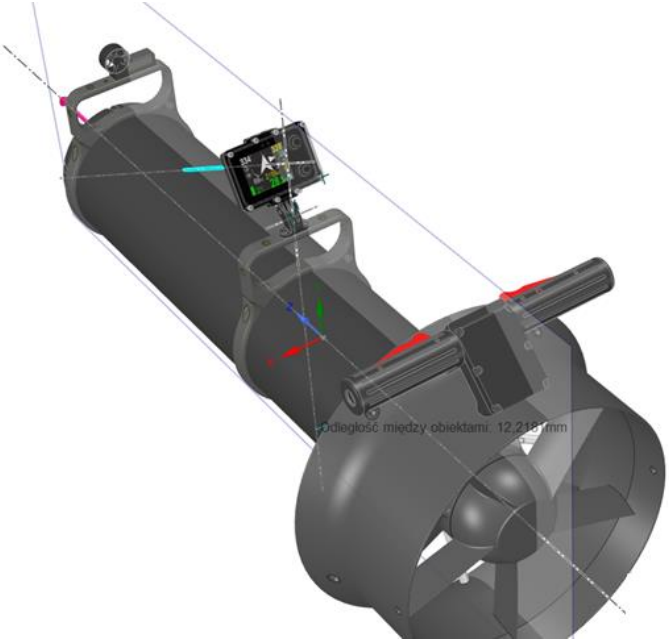
Ideally, the ENC console could be installed exactly perpendicular to the scooter hull. Such a case means that **Install angle = 0** (Fig. below)



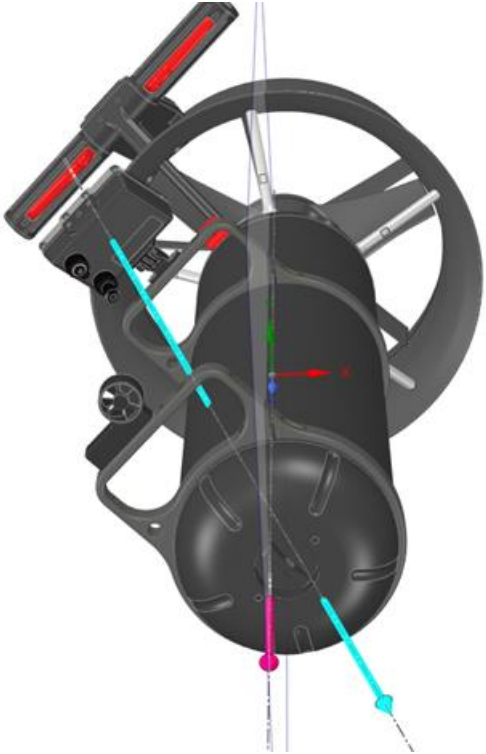
However, such a case is extremely rarely possible in practice. Due to the convenience of use, it is easier to read the ENC2 console's



indications when its screen is slightly tilted "forward". This means that **Install angle** is negative. Additionally, the value of this angle may vary depending on user requirements. If we tilt the console a bit, then when our scooter is set differently than straight, the compass direction measured by the ENC console does not coincide with the direction of the scooter movement.

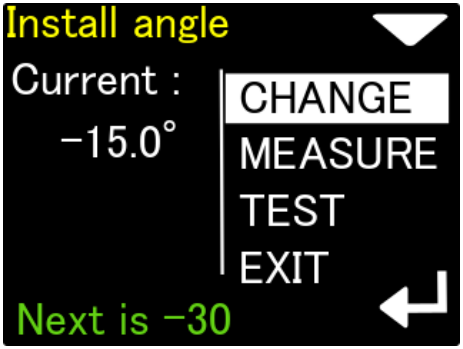


No DPV tilt- correct readings



DPV is tilted- changed readings

The error will occur in case the ENC2 console does not compensate its indications.
In the previous version of the console software, this compensation was only possible in a narrow range of installation angle and tilt angle. The ENC2 console selected the correct values automatically and the user could not influence them.
The new software version allows the user to fully control all the necessary parameters. To set this parameter, go to **MENU → SETUP → Compass → Install angle**. The ENC console display will show the following::

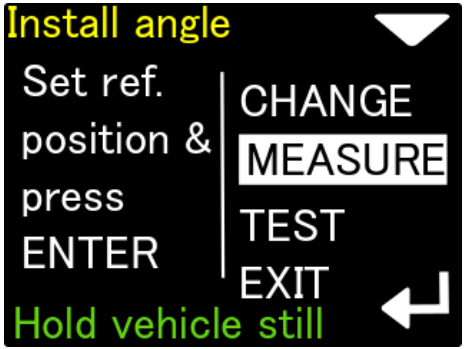


The current value of **Install angle** is shown

The lower button allows you to cyclically change the installation angle: 0.....- 15.....- 30.....- 45.....- 60..... 0..... -15.....

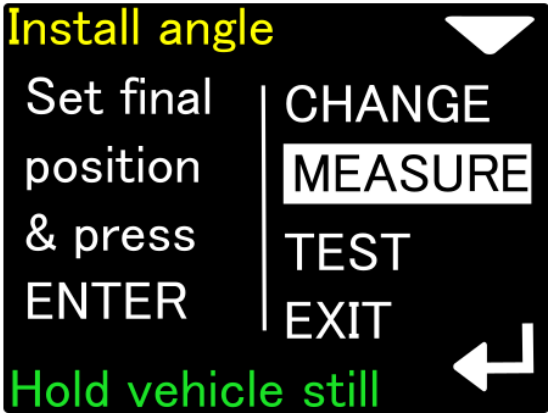
The green text at the bottom tells you what the next value will be

The upper button allows you to go to the next option - angle measurement (MEASURE)



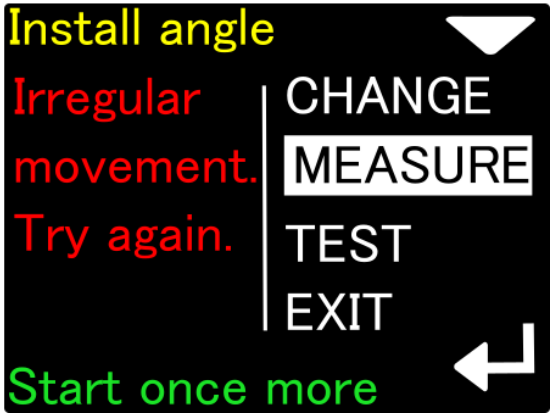
Measurement of **non-standard Install angle** value - first stage. Attach the ENC2 console perfectly perpendicular to the scooter hull and press the lower button once. This is how we measure the reference position (that is where the angle is 0).

The scooter should be kept as still as possible during the entire measurement. However, it does not have to be set in any particular way.



Second stage of **Install angle** measurement.

Tilt the ENC console to the position that is most comfortable for the user. Then press the lower key again.



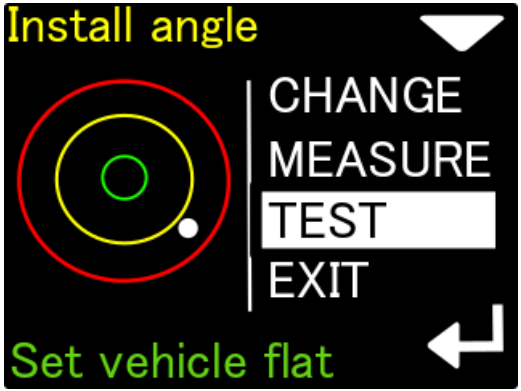
If during the **Install angle** measurement our scooter moves, the measurement will be rejected. The measurement can be started from the beginning with the lower button.

The installation angle measurement procedure allows you to set any angle that is convenient from the user's point of view.

The second option is to choose **the Install angle** from the available values (0, -15, -30, -45, -60), and then test if the selected value corresponds to our case.

To do this:

- attach the ENC2 console to the scooter body in the most convenient way for the user
- set one of the available Install angle, e.g. -30 degrees
- place the body of the scooter as horizontal as possible, e.g. parallel to the water surface
- go to the TEST option and check that the white dot is inside the green circle:



If so, our Install angle has been set correctly.

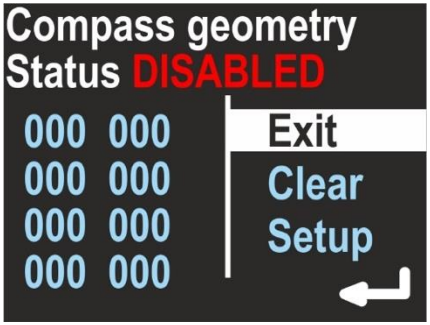
By tilting the scooter to the right or left, we will see that the white dot is moving in the opposite direction.

If the white dot is low, the Install angle selected by us is too small (e.g. we set -15 and it should be -30 degrees)

The reverse is true if the white dot is too high.

Very precise compass calibration (the Geometry option)

This option allows a precision calibration. When activated, it will show you 8 coefficients. In an ideal case, when no distortions are present, this coefficients should be: 0, 45, 90, 135, 180, 225, 270 and 315. This option allows to achieve best compass accuracy (~1°). Without it, the compass accuracy can be 3-5° depending on the calibration quality (described above).



Use the top button to change the option:

Exit – Return with no changes

Clear – Switch off the precision calibration and clear all its coefficients

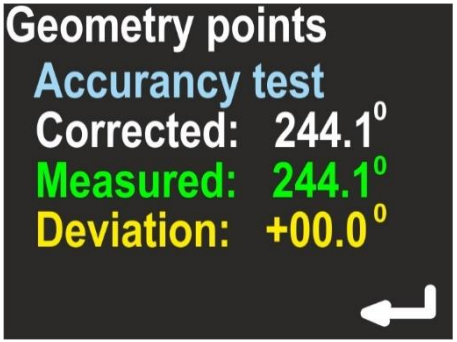
Setup – Make a new precision calibration

To make a new precision calibration, you should use the SET option. You will be asked to set the device in true **geographical** direction of 0, 45, 90, 135, 180, 225, 270 and 315 degrees. The device should be positioned vertically, like being attached to the DPV. The Display shows:

Current – Raw heading from magnetometer, without correction.

Stored – Stored value for this step.

The lower button will store the **Current** value as **Stored**, each time you press it. The upper button will guide you to the next step. On the last screen you can check, if this calibration improved the heading display. This screen is named 'Accuracy test' and will show you:



Corrected – Heading value with applied correction

Measured – Raw heading value from magnetometer

Deviation – Calculated correction; Corrected = (Measured + Deviation) mod 360.

If the corrected values are better than the measured values, press the lower button (ENTER) to store the results. If you press the upper button, no changes will be stored.

Caution: Beware of placing another compass near this device when performing this calibration, because it might affect the measurement and affects the calibration procedure.

Declination - Set magnetic declination, a constant value that will be added to the heading shown on the display (and to all position calculations). If the value is marked as E (East), the correction will be positive. When marked as W (West), the correction will be negative. The magnetic declination is a constant value, depending on your geographical region. It can be obtained from many sources.

24. Clear data

Clears all records from the internal memory. The user will be asked, if he really wants to perform this operation.

It is recommended to power off and on the device after using this feature.

25. Factory reset

After using this option, all settings will be restored to factory values, and all other data will be lost.

You may want to use this option if:

- Diving records are invalid / incomplete or lost
- The device is not working correctly and you cannot find good settings

26. Exit

Exits the settings mode. The device returns to the main navigation screen.

27. Auxiliary software for Android® - installing

Go to Google Play store (https://play.google.com/store), and search for SEACRAFT CONSOLE application....

Our application will be marked with this icon: .... You should download and install it on your device.

Minimum requirements for your mobile device:

Operating system	Google Android 5.0 or newer
Bluetooth link	Version 4.0 or above (4.2 recommended)
Internet connection	Required when displaying maps

Note: you may also need to switch on a 'Localization service' when using this application, if you have any troubles with displaying maps.

You will have to pair ENC3 console with your device only before first use.

Pairing procedure:

- switch on ENC3 console

- go to **MENU → SETUP → Send data**

- switch on Bluetooth receiver in your mobile device

- go to Bluetooth settings in your mobile device and scan for nearby devices; look for device named **SEACRAFT-XXXXXX** (i.e. SEACRAFT-904101), this name will be also shown on ENC3 screen

- click SEACRAFT-XXXXXX name and wait for pairing, no PIN is needed

Note: if you want to get data from another ENC3, you will have to manually unpair your present device first.

28. Auxiliary software for Windows® - installing

You can find a download link in our Download section: www.seacraft.eu/download

Valid link will be also sent upon e-mail request to support@seacraft.eu

Minimum requirements for your computer:

Operating system	Microsoft Windows 10
Bluetooth link	Version 4.0 or above (4.2 recommended); not necessary when using USB cable
Internet connection	Required when displaying maps

Note

Bluetooth hardware should be present and switched on before running this application, if you plan to use wireless transmission with your ENC3.

When using USB cable, first go to **MENU → SETUP → Send data**, next connect the cable to PC.

29. Using auxiliary software

ENC3 auxiliary software looks and works almost identically on Windows and on Android. In this manual we will describe Windows version of this software. This software is common for ENC2 and ENC3 devices.

When you start ENC3 auxiliary software, you will see main program window as shown below:

In example above, you can see software version number **1.1.13.0**. You should always include this information when requesting help or reporting errors.

Please always try to get a most recent software version, and keep the program updated.

Some functions are in development stage and will not be described below until finished (marked as 'in development').

Four buttons below lead to main program functions. All menu items are shown in table below as "menu tree":

Main window

Stored Routes		View and edit dive data / records
Import Routes		Download data into program
	From File	Download data from other person (i.e sent via email)
	From Bluetooth Device	Download data from ENC3 via Bluetooth
	From Serial Device	Download data from ENC3 via USB cable
Configuration		
	Units	Choose units for showing downloaded data
	Upgrade via Bluetooth	Upgrade internal ENC3 firmware using Bluetooth connection
	Upgrade via Serial	Upgrade internal ENC3 firmware using USB connection
	Manual	*(in development)*
	Clear data	Clear all downloaded data
	Advanced	Other settings (see below)
	Unlock PRO	Unlock some additional functions (see below)

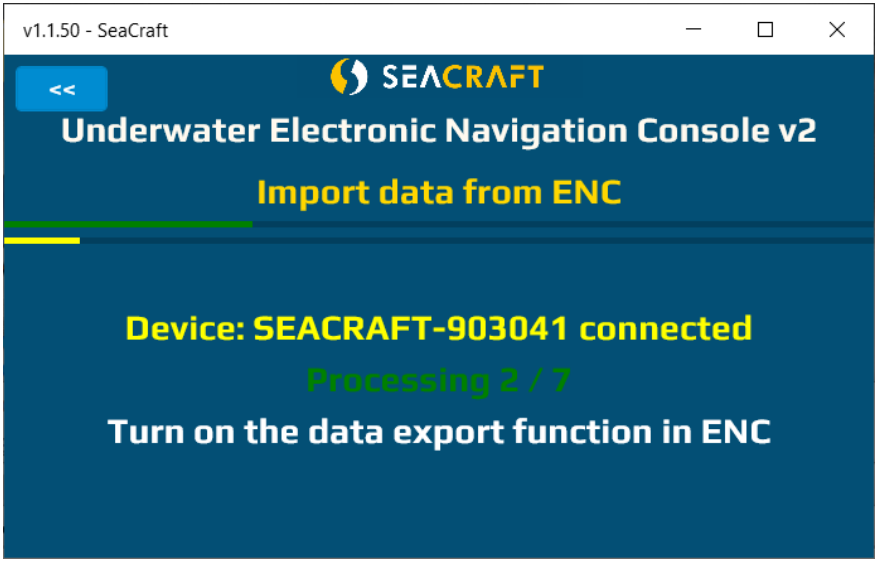
You can navigate back in this program using button marked as "**<<**".

IMPORTING DATA FROM ENC3 TO PC/MOBILE DEVICE

To download data from ENC3, click **Import Routes** and then **From Device** button.

On Android, you have to pair ENC3 with your mobile device before this operation (or make sure it was paired before). On Windows pairing is done automatically.

When downloading data from ENC3, program screen will look like below:



Green horizontal bar shows total progress of operation.

Yellow horizontal bar shows progress downloading current item.

Yellow text **Device: SEACRAFT-903041 connected** shows ENC3 name and status.

Green text **Processing 2/7** informs, that 2nd item of total 7 is now processed. When all items are downloaded, this field will show **TRANSFER COMPLETED**.

Then you can switch off ENC3 and start browsing your downloaded data. Click

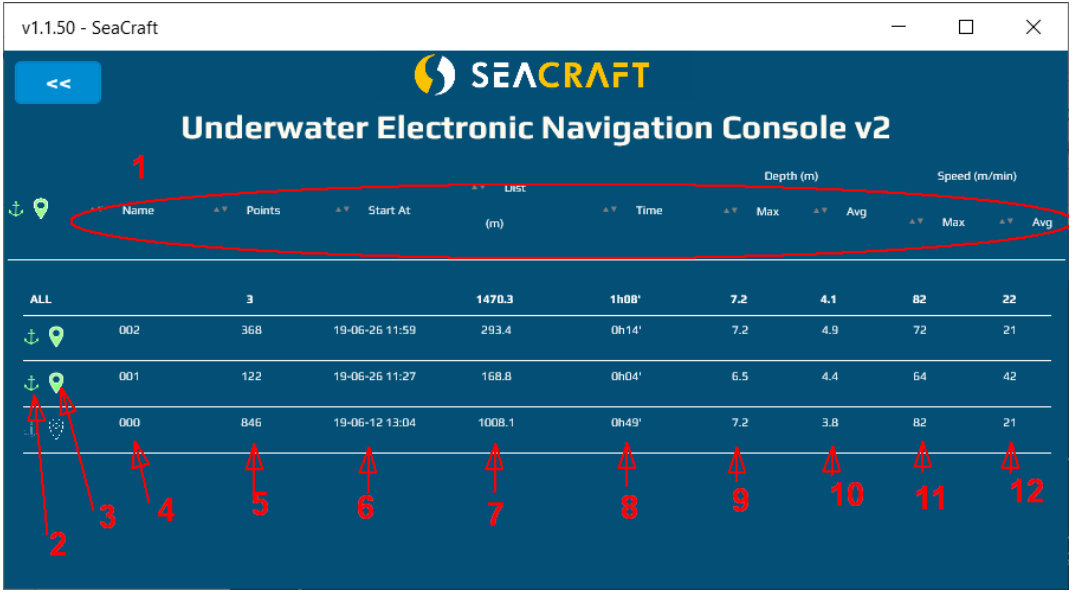
button to go back to main screen.

Note

ENC3 device can hold up to 50 different routes inside. GPS data and swim data are recorded as separate files. So if you have 10 records inside your ENC, download screen can show you 10-20 items (10 items – no GPS data was recorded, 20 items – all 10 routes has GPS data)

VIEW / EDIT IMPORTED DATA

All imported data are available by clicking **Stored Routes** button on main screen.



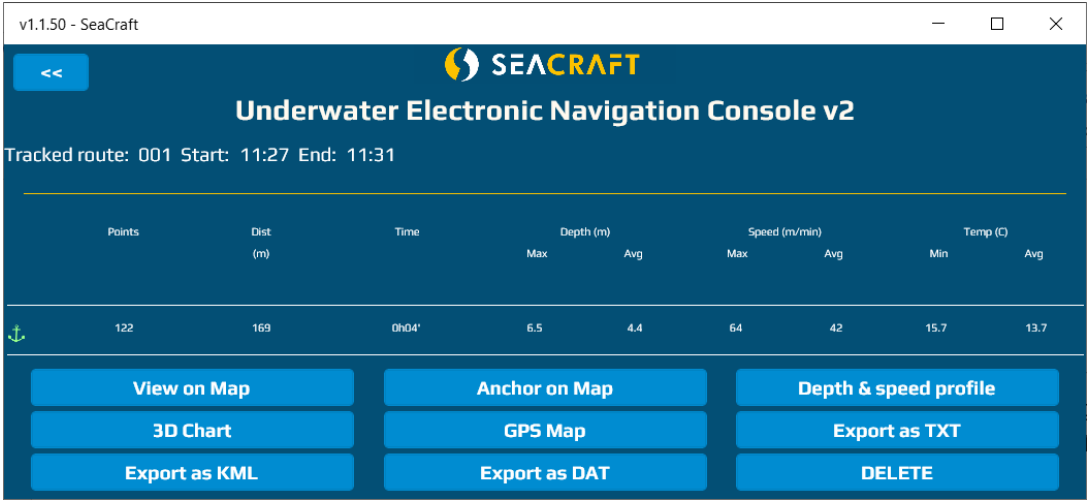
1- Headers section. By clicking on each header you can sort data in table ascending or descending
2- Green anchor symbol means that this route was anchored (see further for more information)
3- Green marker symbol means that route has GPS data also
4- Route number. Notice that route no. 1 in ENC device is downloaded as item 000, route no. 2 – as 001, etc.
5- Total number of records in each route (1 record = 1 stored set of data: depth, speed, location, ...)
6- Route start time (time of the first record). Format is **YY-MM-DD hh:mm**....
7- Total travelled distance
8- Route time (time between first and last record in this route)
9- Maximum recorded depth
10- Average recorded depth
11- Maximum recorded speed
12- Average recorded speed

Note

This application always downloading only missing information from ENC3. If not all data was downloaded at first try, you can always repeat downloading procedure and missing items will be filled.

Sometimes not all data are downloaded at first time. ENC3 is much slower with serving the data, if compared to your PC which is grabbing it. If you find, that some of your records from ENC3 are missing in the PC program, just repeat the downloading process to complete it.

When you click on selected route, screen will show you detailed information about it:



Buttons role:

DELETE – delete current (only one) route from this PC or mobile device.

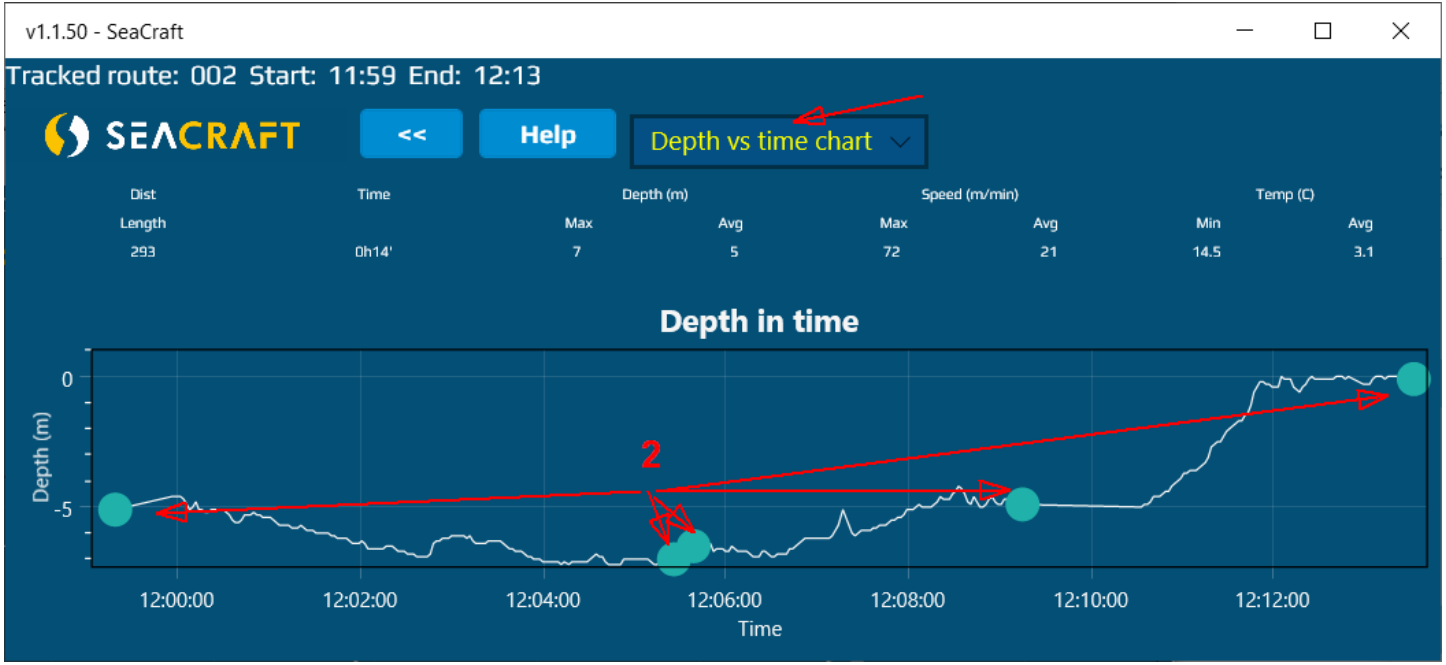
Export as DAT – swim data (without GPS records) will be stored in native ENC3 format (for helpdesk or support purposes)

Export as TXT – swim data (without GPS records) will be stored as text CSV file (you can import it to any spreadsheet program for further calculations)

GPS map – shows all GPS records (only) on map – as points connected with lines

3D Chart – shows swim records as 3-dimensional graph

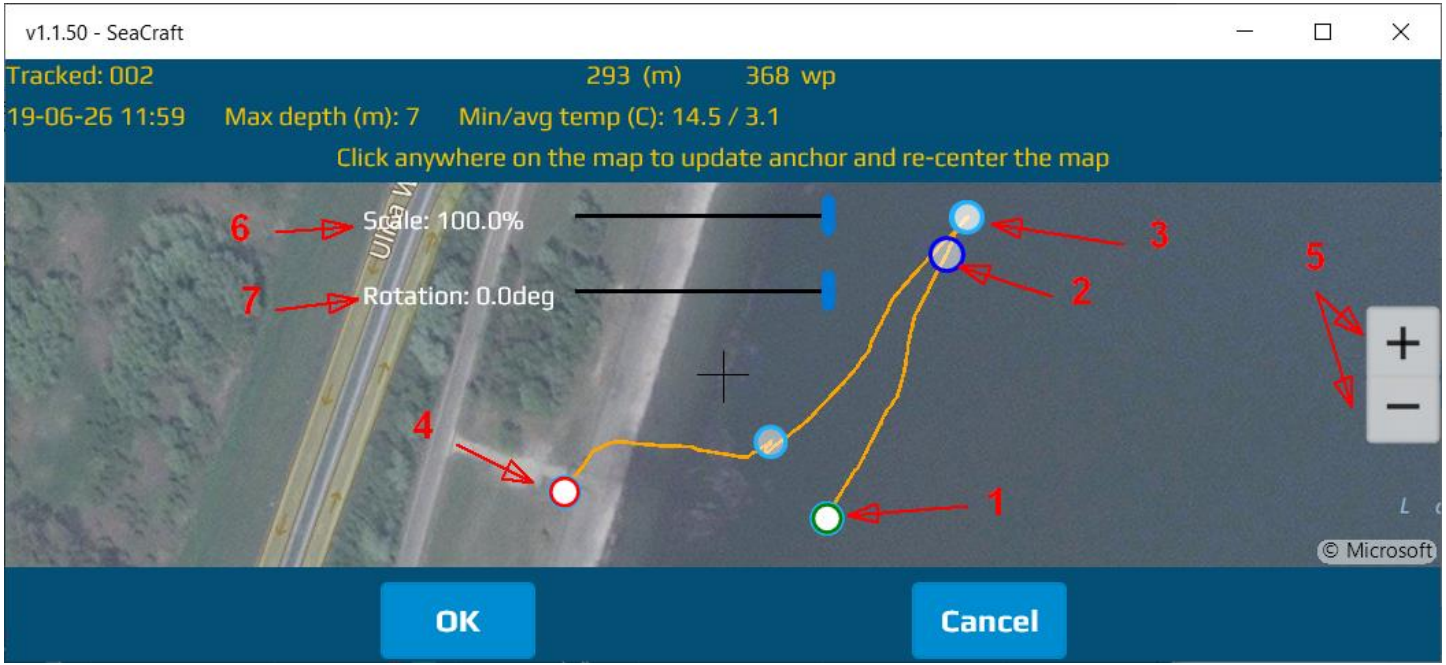
Depth & speed profile – shows in graphical form depth and speed data as shown below:



1 – with this field you can switch between 3 graphs: **depth vs time, depth vs distance** and **speed vs time**

2 – this blue point shows each marker (point where you switched between REC and HOLD state while using ENC3)

Anchor on map – ENC3 device records route as set of relative positions. If you want to show this route on any map, you have to manually set the "first point location" – by clicking it on the map. It should be this point, where you press REC first time. If you press this button, you will see the empty map. It's recommended to click in any point of the map first. This will be the first (but invalid) anchor position. Then you may move the map by clicking and holding it. Use Zoom-in and Zoom-out controls to get appropriate scale for your operations.



1- Route starting point (green circle)
2- Route max depth point (dark-blue circle)
3- Marker point (light-blue circle)
4- Route end point (red circle)
5- Zoom In/Out controls

6- Scale fit slider
7- Rotation slider

Note

You may want to use **Scale** slider if you had log sensor uncalibrated. In that case, distance recorded by ENC3 will differ from real value and this control can fix this problem.

You may want to use **Rotation** slider if ENC3 had constant, uncompensated compass deviation, or declination was not correctly set. In that case, ENC3 show (and recorded) a compass, or magnetic courses. For map plotting we need to use real headings (compass heading, corrected by deviation and declination), otherwise shown tracks will be invalid.

This features will take effect in map display and KML file export. Raw exported data (DAT, TXT format) are always 100% unchanged regarding to ENC3 records.

View on Map – allows to show current route on map. It looks almost the same as when anchoring route, but without Scale and Route controls.

CONFIGURATION OF AUXILIARY SOFTWARE

Units

This option allows to change display units, but in this application only. ENC3 has his own display units settings and it is independent.

Upgrade

Allows ENC3 firmware update (see further – chapter 28)

Manual

(in development)

Clear Data

This option allows to delete all data imported from ENC3 from this application database. This option does not affect internal ENC3 memory, only downloaded records.

Advanced

Please do not change this options from its default values, unless asked by our technical support.

Unlock PRO

This software can be used also with other version of ENC3 console, specialized for less common tasks. For this 'special' versions of ENC3 some additional settings are required and you may unlock it using this option. Ask our support for unlocking code, if you have this 'special' versions of ENC3 console. Users of regular ENC3 device will have no reasons to access this options.

30. ENC3 firmware update

To use this feature, you will have to get new firmware file. This file can be send to you from our support team via e-mail, after receiving your device serial number. You will have to copy received file to the device (PC or mobile device) when this auxiliary software is installed.

Before starting update process:

- Make sure ENC3 is charged at least to 50%
- Make sure your PC or mobile device is charged enough to work for 15 minutes or more
- Go away from any strong electromagnetic field sources, which can disturb wireless connection (microwaves, electric motors, etc.)
- switch on ENC3 device and go to the **MENU→SETUP→Send data** (inside ENC3), then connect the data cable between your ENC3 and your PC (if you're planning to use USB for the data transfer)
- Start auxiliary software and select **Configuration → Upgrade via Bluetooth** or **Configuration → Upgrade via Bluetooth** depending of you preferred communication medium
- Select ROM file which you received from us. **DO NOT try** to use any other file in this option.
- Make sure no other application on your PC or mobile device will disturb update process

If you make all this steps correctly, you will see screen like below:

and for a while ...

After all data was sent to the ENC3, display of your console will be switched off, and red LED diode above it will blink for 10 seconds. After that, your ENC3 should switch on automatically.

TROUBLESHOOTING FIRMWARE UPDATE

Symptom	Procedure
Update process hangs and progress bar doesn't increment for more than 1 minute	- Press **STOP** on ENC3 device to break data transmission - Close PC / mobile application and start all update procedure again from the beginning
Firmware was not updated (software version shown in ENC3 didn't changed)	Update file was corrupted during transmission and rejected by ENC3. Repeat update procedure from the beginning.
Compass not working properly	Compass sensor was overcharged during update process. To fix it: - Switch off ENC3, wait 10 seconds and connect to charger for 10 seconds, or - Leave ENC3 switched on until battery is totally discharged, and then recharge ENC3

The update process can take 2-3 minutes when using software installed on Windows 10 PC (5-6 minutes when using Android devices).

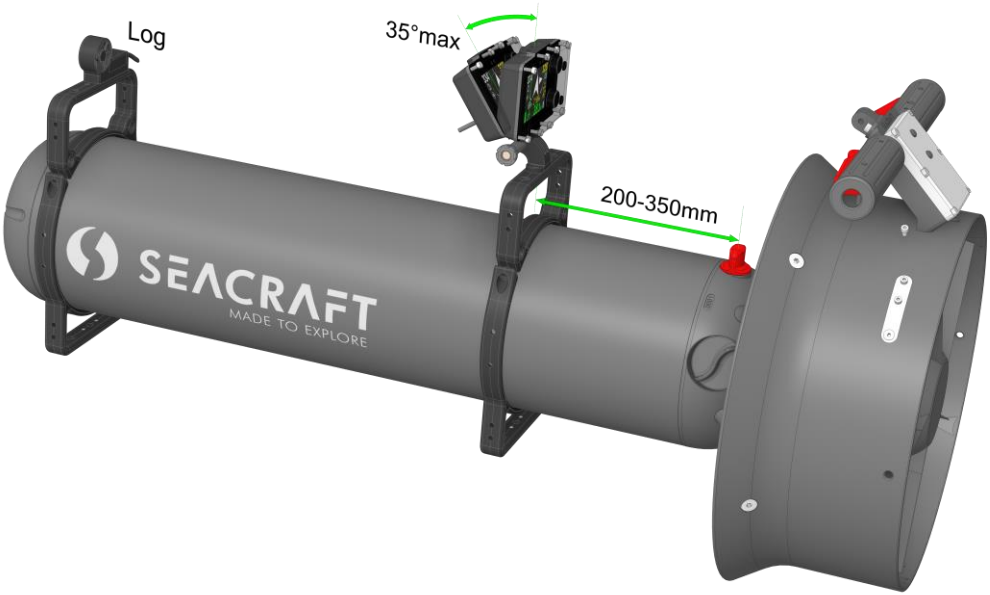
IMPORTANT !

If you will have to break the update process, first use the lower button in your ENC to break transmission (this is 100% safe, always).

After update, ENC will reboot. Check software version. If software version did not changed, you will have to repeat the update process (it happens sometimes, but second try is always successful).

31. Guidelines for attaching the ENC to DPVs

When using the navigation console with any DPV, you should carefully choose the mounting point for the device. An unfavorable placement may cause magnetic interferences from your vehicle elements (battery, engine) to the ENC compass sensor.
For a SEACRAFT® underwater vehicle, the recommended placement for the navigation device and its speed sensor is shown below:



LIMITATIONS:

- ENC device should be placed at least 0,2 m (7,9”) from any element containing ferromagnetic material (engine, battery), permanent magnets (engine, vehicle handles, speed sensor) or electrical wires connecting the battery with the motor. If this rule is violated, compass indications may be incorrect.
- It is recommended to use Seacraft Transport Bracket as a mounting platform. It allows for lower screen tilt, still keeping it in optical axis of diver, and moves it away from DPV hull and elements inside (as cables, battery) which may influence to the compass readings. This is important especially for Ghost models, which battery is located more in the center of the unit.
- Compass indications may be less stable when ENC tilt (**Install Angle**) exceeds 35° (from vertical position). If you include your vehicle lean, you should not exceed 35° inclination of ENC device vs vehicle body.
- Speed sensor should be placed away from any elements that can disrupt the flow of water. Front of vehicle is almost always the best choice. Have in mind propeller “sucking” effect, and avoid placing it in the water intake area.

If you need to place ENC device on some other kind of underwater vehicle, you have to find best mounting points on your own, using picture above as guidance.

In order to maintain the correct compass accuracy, it is recommended to always calibrate the compass before diving. Indicated by the compass the direction is calculated from the device measured by the magnetic components of the Earth measured by the magnetometers. These components change depending on the location, local geological conditions (eg the presence of ferromagnetic minerals) and are subject to periodic changes. Large ferromagnetic elements, eg shipwreck, reinforced concrete port quay or steel elements buried in the bottom, also very strongly affect the work of the compass.
A poorly calibrated compass or its disturbed operation can cause significant errors. In the case of a route with a length of 1 km, 5 degrees of compass error will result in an error in the calculation of the target of almost 88 m.

One should also remember about the differences between the magnetic direction indicated by the magnetic compass and the geographical direction that can be read from the maps. The difference between these courses is called magnetic declination and depends on the location. The device allows you to set the magnetic declination and offset this difference.
In order to optimally use the device, it is recommended to familiarize with the theory and principles of navigation in detail.

The log sensor is a precise electromechanical device and must be protected against mechanical impacts and contamination. After the dive, it is recommended to gently rinse with fresh water to cleanse any remaining vegetation or mineral impurities. If it is necessary to make measurements with full precision, it is recommended to calibrate the log every time.

Advanced mounting information

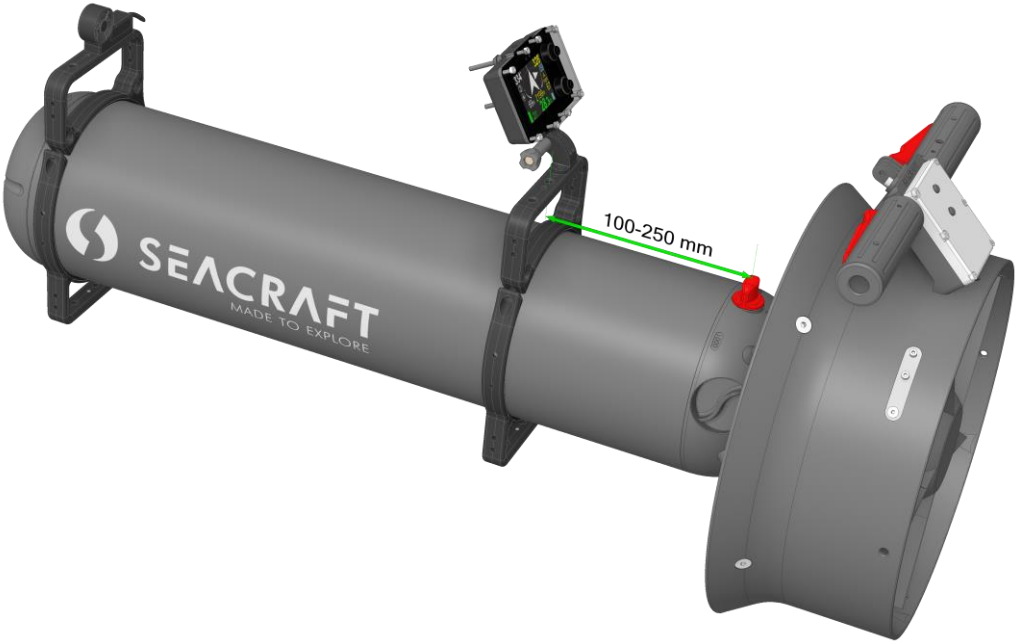
In case you would like to used ENC for very detailed work, for example survey, there is an additional fine adjustment that can be accounted for.

The ENC IMU (inertial measurement unit) is located in its upper left corner. This position is chosen to avoid all possible internal interference. Extended testing has proven that ensuring that IMU position is in the same line, as DPV rotation axis is providing a bit better data – especially regarding the applications where we are fighting for even 0.5% of accuracy.

In order to do this, ENC mounting can be moved to the right, as indicated in the picture below. There is a dedicated accessory that allows to do it on any Seacraft transport bracket expected to be released at the end of 2022.

Typical ENC mounting

ENC off-set to the right



ENC off-set to the right, assembled on the Future model

Installation for other brand underwater vehicles.
If the ENC3M console is to be used on other than Seacraft underwater equipment, please contact the manufacturer to determine how and where it should be installed, and the installation procedure.

To maintain good accuracy of the compass, it is recommended to calibrate it carefully before diving in a new area. The direction of the compass is calculated by measuring the three components of the Earth's magnetic field. The properties of the magnetic earth field depend on the geographical location, local terrain properties (e.g. soil iron level) and in addition are subject to constant, slow changes

over time. Be aware that large steel structure components (shipwrecks, reinforced concrete, etc.) can have a significant impact on the compass.
An incorrectly calibrated compass can cause significant errors in position determination. For example, at a distance of 1 km, 5 degrees of compass error results in moving 88 meters from the planned target.

It is important to remember the difference between the location of the Earth's magnetic pole (which, in simplified form, indicates the compass) and the actual geographical pole (by which the maps are oriented). This difference is called magnetic declination and changes with longitude and latitude, and over time. The ENC console allows the introduction of magnetic declination in the form of a permanent correction, the value of which should be checked based on current data and location.
In order to properly use the ENC console, it is recommended to familiarize yourself with the theory of navigation basics.

The log sensor is a precise and sensitive electromechanical element. It should be protected against harmful factors: mechanical impacts and pollution. It is recommended to flush the log under a weak stream of fresh water after each dive. This guarantees a long service life of the device. The properties of the log may change slightly over time, especially when it was used in adverse conditions. It is recommended to periodically check the correctness of its indications or carry out calibration.

Notice

Best compass calibration results are achieved when calibrating the device underwater, attached to the vehicle. This method may require former additional trainins.

32. Troubleshooting

Symptom	Cause	Solution
Device cannot be switched on. Display is blank and no other reactions is observed.	Excessive battery discharge.	Start charging battery for at least 30 minutes before attempt to switch on the device. After few minutes, the red led the will start blinking.
	Broken device (flooded, charged from improper source), does not react when charging	Factory service needed.
Device is switching on and off continuously.	One of the internal sensors may be damaged or battery is broken.	Connect the charger for 1 minute. If this will not help, allow the device to discharge its battery and to switch off. Wait 1 hour, and try to charge it again. If this will not help, return the device for service.
When switched on, the device shows “Battery is low!” message and switches off.	The battery is discharged too much.	Charge the device.
The charging process never ends. Battery charge level never reach 90%.	Broken battery.	Return the device for service.
	Damaged charging cable or dirt/rust on its connector.	Clean the charger connector. Make sure it is not cut or damaged.
	Charging source too weak.	Try another charger. You may use the USB port of a laptop/PC.
The depth indication is 0 and never changes. Depth shown is invalid. The device is not switching on automatically when immersed in water.	Defective pressure sensor.	Go to Settings / Pressure/salin. If the pressure is near 0, the sensor is defective and factory service is needed.
	Pressure sensor gap filled with dirt or mud.	Wash the device using a mild stream of warm fresh water, until the problem is gone.

External sensor is connected, but no speed is shown.	Sensor connector misfit, broken or rusted.	Disconnect the sensor plug, wash and/or clean the connector, connect it again.
	The device is switched do INERTIAL operation.	Go to Settings / Log/Speed, and make sure EXT is set to 'Active Log'.
Compass is showing improper heading.	Calibration required.	Perform the calibration as described in chapter 13.1 and 13.2
	Strong external magnetic field near the device.	Try to remove the magnetic and ferromagnetic elements from the vicinity of the navigation device. Move the navigation device to another location.
	Defective sensor	Return the device for service.
	Compass sensor was overcharged.	Power off the device. Wait 10 seconds. Connect charger for 10 seconds. Check again compass behavior.

Note

Recommended intervals to re-check the required accuracy of the product - 36 months from the date of purchase and the next every 24 months.

33. Before each dive...

Make sure that battery is charged enough. Power on device and check all important settings.

In order to connect the log to the device, check the state of the plug and socket, clean any impurities, check the o-rings, apply a delicate layer of silicone grease and gently but firmly tighten.

Before diving you have to check, if output socket (in the back) is well tightened. Also you have to make sure, that none of the sealing o-rings is broken or missing.

Proper way to fit the connector:

1. Push the plug into the socket as far as it can move
2. Turn the nut clockwise until you feel the resistance

EEA DECLARATION OF CONFORMITY

Product model/product:
Electronic Navigation Console with all unique identification numbers.

Name and address of the manufacturer or his authorised representative:

Marine Tech SA
Żwirki i Wigury 17 str.
38-400 Krosno, Poland

Subject of declaration: Electronic Navigation Console with all unique identification numbers.

The abovementioned subject of the following declaration is in conformity with the relevant EU harmonisation legislation:

EN 13319:2002

Additional information:

- Any unauthorized modification will invalidate this declaration;
- This declaration is not a guarantee of performance characteristics.

Signed for and on behalf of: Marine Tech SA

Krosno, 10.01.2019
.....
(place and date)

.....
(name, signature)

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