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Electronic Navigation Console

ENC3Pro

User Manual

User guide ENC3Pro

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Caution!

This manual will not exchange correct training about diving and navigation underwater, with or without use of ENC3Pro

In case of any questions and remarks, please contact:

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We will be extremely grateful for any suggestions for improving this manual as well as for pointing out possible errors or shortcomings in its content. To do so, please contact us via e-mail: service@seacraft.eu.

Table of Contents

Purpose

The ENC3 electronic navigation console is used for topographic and vertical orientation during the dive.
The ENC3 electronic navigation console is intended for use only by people trained in this field and having appropriate permissions to work under water in accordance with the local law requirements. In the event of a discrepancy between the console usage rules set out in this manual and the ones used, developed or provided to the user during training by diving organizations, please contact the navigation console manufacturer (service@seacraft.eu) for clarification.

Transportation

It is recommended to transport the console in the packaging provided with the console or other, guaranteeing shock absorption during transport and protecting against potential fall

Spare parts consumption

The following replacements are recommended during console operation:
– sealing elements every 2 years;
– the battery after noticing a significant decrease in capacity;
– other elements after noticing significant wear as a result of usage.

ENC3Pro Technical parameters

Model	ENC3Pro	Power source	Built-in Li-ion 3,7 V battery
Type	ENC v.3	Battery capacity	5 Wh
Maximum depth	150 m	Typical working time	16-22 h **)
Tested depth	300 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	0 … +50^{o}C
Accuracy of depth measurement	0.3 m in the whole depth range, temp. range: 0…30°C	Storage temperature	-20 … +50^{o}C
Accuracy of compass	<5 degrees*	Temperature when charging	+10 … +40^{o}C
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 35 mm

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

** Total working time may change without notice, if the new firmware will be provided. The working time also depends slightly of the way of use and actual programmed options – for example : the display brightness. The given working time value is estimated with factory defaults.

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

Satellite positioning: GPS, Beidou, GLONASS, GALILEO (if available)

Data exchange: via Bluetooth 4.2 or USB 2.0 (recommended).

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.

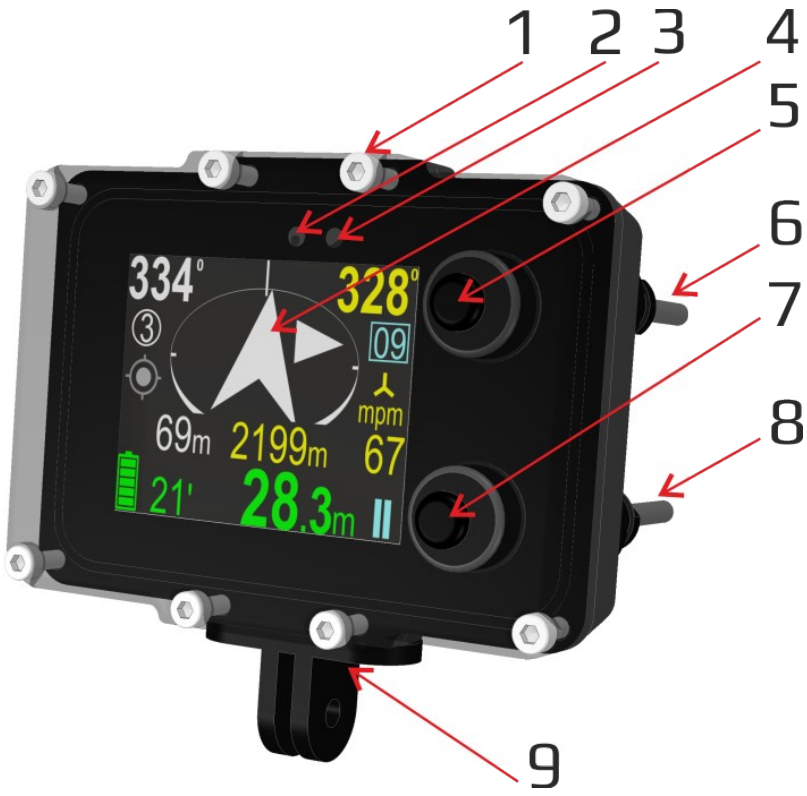
Precautions

This manual is appropriate for the ENC3 device with internal software marked with the number indicated in the "Document information" table on page 2 of this manual. To check the software version of the device, enter MENU, where the device OFF option is located. The battery charge status is displayed on the left side of the screen, and below the device's unique serial number and software version.

Caution!	
	The device may have errors and other imperfections in the firmware that have not yet been detected. You must not risk your life or health by relying solely on the instructions of this device. The device is not a measuring instrument and is not used for measurements. The device cannot be used as a substitute for a dive computer. The device is not a depth gauge or combined instrument for measuring depth and time. Electronic devices are designed and constructed as human support and cannot replace knowledge and training.

		The device contains a lithium-ion cell and other electronic components that must be utilized in the manner prescribed by relevant regulations.

Mechanical construction



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. Optional GPS buoy socket
7. Bottom button (SET, REC, HOLD)
8. External socket – for charging and speed sensor
9. Universal mounting – bottom side

Control

The role of the buttons (depends on the currently displayed screen):
Upper button (5) - NEXT (next screen, next item) / CANCEL (cancel operation) / BACK (return to previous screen)
Lower button (6) - SET / change value / edit item / switch between REC (record) and HOLD (no record)

NOTICE!
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 previous / next screen
- Select current item

X
- Cancel or delete

>>
- Switch to next available value

+
- Increment current value by 1

Basic operation - switching on and off:

To turn on the device - press both buttons at the same time.
The device will turn on automatically after immersion in water about ≥0.5 meters deep (if the AUTO-ON function is active).

If you press any button and the red led above the screen will lit and then starts blinking – the **One key ON** option is selected and the powering on scheme is different that described above. See the **One key ON** option description.

To turn off the device - first stop data recording (REC/HOLD). Then find the MENU function (on the main screen it requires pressing the upper button 2 or 3 times until the MENU option is highlighted, then press the lower button to select it). When the highlighted OFF command appears, press the lower button once more.
The device turns off automatically after 5 minutes when the following conditions are simultaneously met:
- the measured depth is less than 0.5 m, and
- the REC data recording function is disabled, and
- the AUTO-OFF option was activated in the settings (active by default).

Buttons operation

The buttons are made in a special piezoelectric technology, so they respond better to weaker but fast pressure (tapping) than to strong but slow pressure. The rubber covers visible on the front panel of the device only serve to facilitate finding the button in poor visibility conditions. The active part of the button is not visible and is located inside the front panel.

The use of such technology of making control buttons results from the need to use a solution that will not introduce magnetic disturbances and at the same time will be resistant to a wide range of temperatures and pressures. Operating the buttons may require the user to do several previous exercises to understand the differences in how these elements respond (compared to controls on other devices).

During immersion, the ambient pressure increases slowly, to values significantly exceeding the force that can be generated by human muscles. Therefore, the buttons do not respond to SLOW pressure changes, but even at great depths they are sensitive to FAST changes (similar to knocks), despite the fact that at the moment the water is pushing them with a constant force of much greater pressure than that coming from the operator's pressure.

When the ENC is off, pressing each button will cause the red light above the screen to blink shortly. It shows that button is OK and your ENC has some battery power left. It is the default (factory programmed) behavior.

If you press any button during the off state and the red light will lit for 1 second and then start blinking – it means that you have **One key ON** option enabled.

Working modes

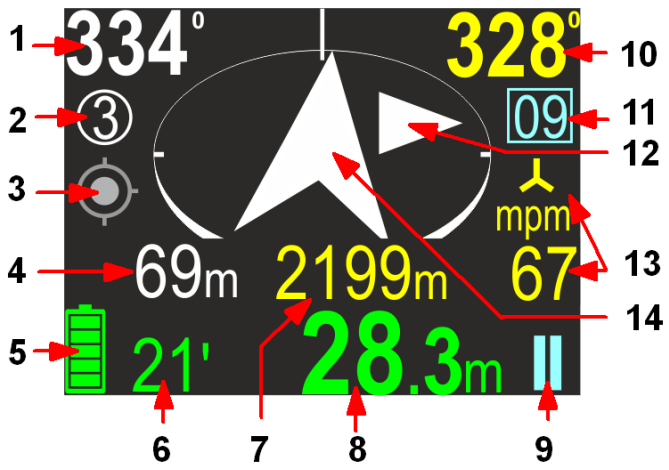
Normal operation mode – Default mode after power on. The user sees the current dive parameters, may switch recording ON (REC) and OFF (HOLD), enter settings and view the contents of the device’s internal memory.

Charging mode - When connected to a power source, a screen with the words "Charging ..." appears and most of the device's functions are blocked. Unnecessary systems (GPS) are turned off and the backlight of the screen is reduced to accelerate the energy storage of the device. Charging mode will end automatically when the battery is 100% charged, however the charging process can be interrupted without any problem in any time. If the collected charge is greater than 95%, device will show the “Fully charged” message instead of battery voltage and capacity.

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

Main navigation screen

Shortly after turning the device on, a main screen is displayed (as shown below) :



Screen content:

1. Course to be taken to get to the currently selected route point. If no route plan is set, this field will be blank.
2. Marker of the currently selected destination.
3. GPS work indicator (description below).
4. Alternately displayed time and distance to the programmed point. The displayed values change every 3 seconds.
5. Battery charge indicator.
6. Total time submerged (description below).
7. Total swim distance
8. Current depth.

9. REC / HOLD indicator.
10. Current compass bearing (includes all programmed corrections, including deviation and declination).
11. Number of the current marker (marker saved with the route in memory). Markers are described in the next chapter.
12. Auxiliary direction marker, a preciser (description below).
13. Current moving speed. The mpm tag indicates that the value is expressed in meters per minute (Meter Per Minute), kts stands for nautical miles per hour (Knots). The symbol indicates that the speed is measured by an external sensor (so-called log) that should be connected.

14. Arrow showing direction to destination. The arrowhead is always directed towards the currently calculated point to which we intend to reach. If no destination has been programmed, the arrow points north like a normal compass.

Buttons role (on the main screen):

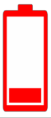
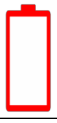
Top button – Switch to next screen

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 ON	REC/HOLD indicator

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 !

Times are given for the scenario when all device functions are active, settings are programmed to default values and data recording is enabled. Configuration of user parameters (settings) of the device may affect its maximum working time!

Navigation arrow colors:

White – Normal operation with 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)

Busole - Normal operation without programmed destination

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.
	GPS receiver failure	No connection with the GPS external receiver (failure)

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.

Additional information screen (next to main)

If the upper button is pressed while the main navigation screen (Screen 1) is being displayed, Screen 2 will appear, as shown in the figure below.

1 - Course to the currently selected mission point.
2 - Estimated time to reach the selected point (when it can be calculated).
3 - Distance to the selected mission point.
4 - Current memory number / total memory available.
5 - Number of current selected mission point / number of points of mission stages.

6 - A short hint about the currently selected control function,
7 - Hint for the upper button - go to the next function down,
8 - Currently selected function (in negative)
9 - Hint for the bottom button - activate the selected function.

Current information is displayed on the left side of the screen. The available control functions are displayed on the right. The selected function is highlighted by background lighting. The transition between successive functions is done by the upper button. The selected function is activated by pressing the lower button.

In the figure below, the first element (DIVE PLAN) is marked, so the left part of the display displays the scheduled dive parameters:

If any of the presented values cannot be calculated at the moment, the device displays in its place three horizontal lines '---'.

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.

DIVE PLAN – scheduled route

The function enables displaying details of a planned route and selecting one of its stages as the current destination (to which navigation will lead us).
The device allows you to plan a route consisting of a maximum of 30 stages.
The dive plan consists of the following elements:
- the starting point (S), with the defined geographical coordinates, which must be specified at the planning stage
- 1 ... 30 intermediate points (stages) marked with numbers; the last one is always marked with the letter M (aiM)

Intermediate points can be given in the form of GPS coordinates, MGRS coordinates, or in the form of distance-azimuth (always calculated from the previous point). Planning a route and sending the plan to the device is always done using a computer program. The ENC device can only display the details of the currently held plan and choose which stage is currently active.

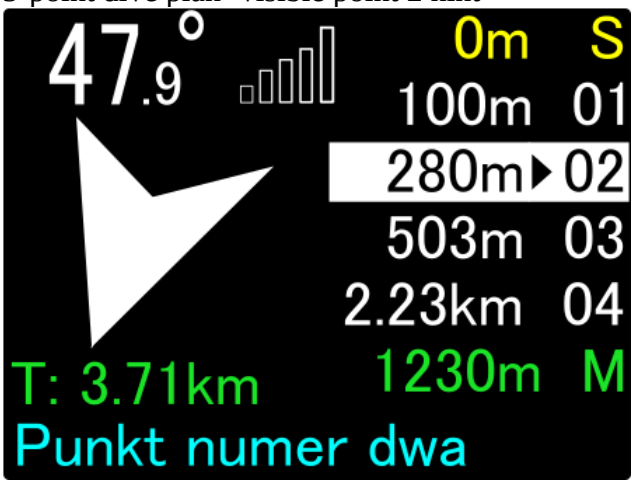
The dive plan screen in the ENC device only allows you to view the scheduled route, display current distances and azimuths for individual stages, and select the current stage (to which you want to go).

The Dive Plan screen always shows a view of the next 5 points of the current route. With the help of additional Prev and Next commands, displayed as needed, you can move to the previous or next group of 5 scheduled points.

If the Dive Plan contains 5 points or less, it will be displayed on a single screen.

If the highlighted stage point has a text description (hint) entered, it will be visible at the bottom of the screen (blue), alternating with the MGRS coordinates of that point. If no description is provided, only MGRS coordinates will be visible as shown in the illustration to the right.

5-point dive plan- visible point 2 hint

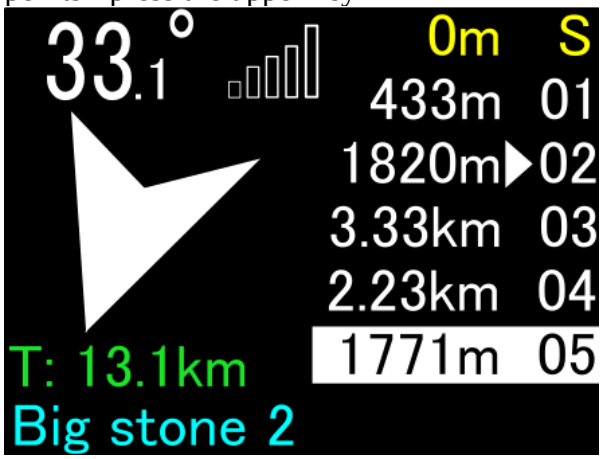


5-point dive plan- visible point 2 MGRS position

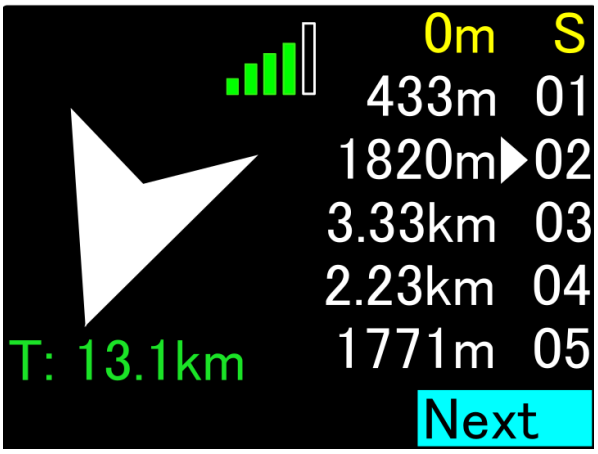
The bar indicator at the top of the screen shows the quality of the current GPS signal and can be green (Very good) or yellow (Fair). No GPS signal at the moment is indicated by empty bars.

When the Dive Plan contains more than 5 points, the screen allows you to move through groups of the next 5 points. On the first screen, the starting point S will be highlighted in yellow. When we reach point number 5 and press the upper key again, we will be able to display the next group:

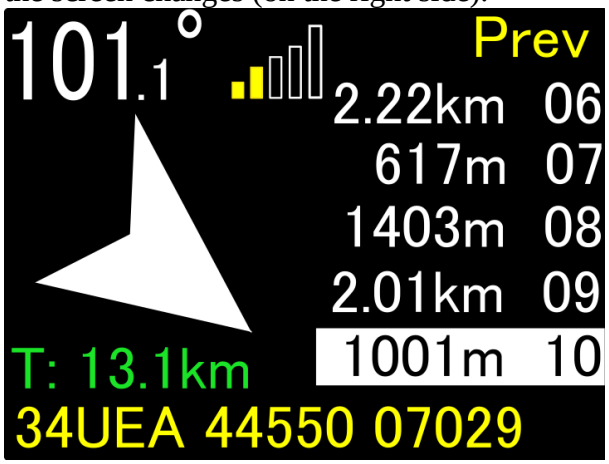
Selected point no. 5 from the schedule with 13 points - press the upper key ->



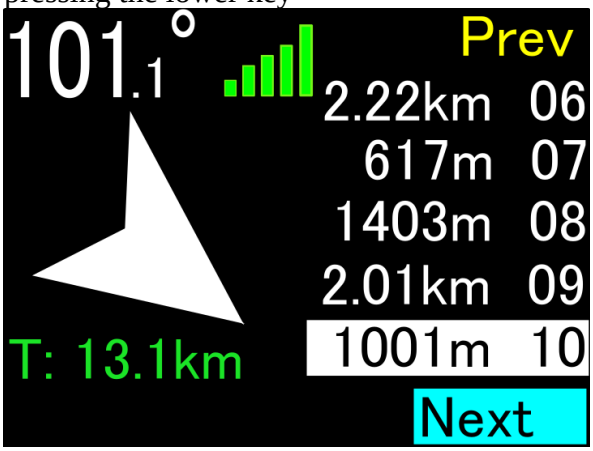
It is possible to move to the next 5 points, press the lower button ->



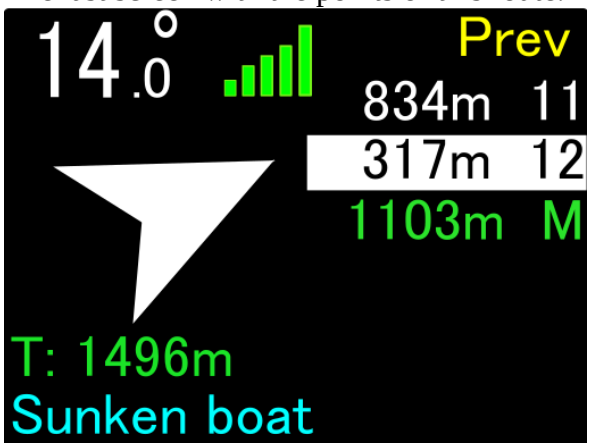
Selected point no. 10. In the bottom line you can now see its MGRS coordinates. After a while, the description will appear in blue (if the description is provided). Press the top button again and see how the screen changes (on the right side).



We go to the last points of the schedule by pressing the lower key



The last screen with the points of this route.



Moving around using the Prev. option works in the same way. Then we go back to the previous 5 points of the Dive Plan.

The triangular sign in front of the point number appears only at the point that is currently selected as the destination to which you want to go.

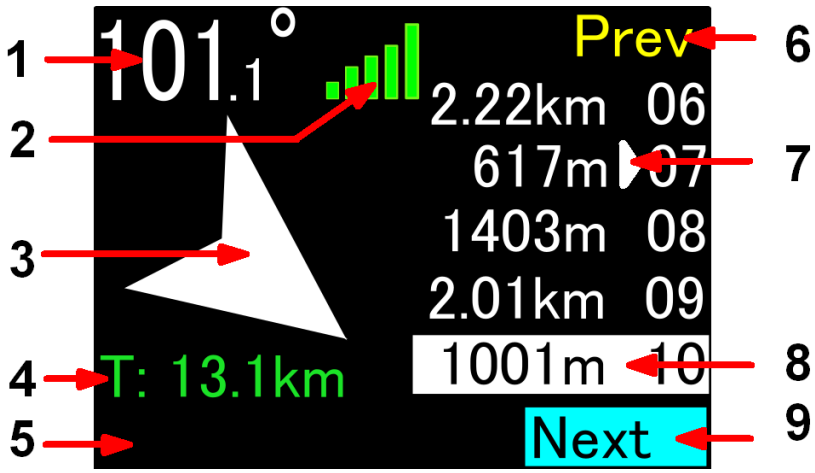
The ability to use more Dive Plan points and text descriptions for these points will only be fully utilized when Seacraft application released in 2022 (1.1.13) or later, running on your computer.

Switching between the selected points of the Dive Plan still takes place only at the explicit request of the user.

The text description of the points can be up to 16 characters long, including spaces. Descriptions that are too long will be truncated. No national specific characters are supported by now.

Full list of characters that can be included in the text description of the Dive Plan point:
ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789.>: + -%, ’!? &

The contents of the Dive Plan screen (Screen 3) are shown in the figure below:



Screen content details:

1. The course you should take to get to the currently selected stage.
2. GPS signal quality indicator (described above)

3. A compass arrow indicating the location of the currently selected stage. The arrowhead rotates to indicate the position of the selected stage.
4. Total distance (T - TOTAL) from the current point, through all subsequent intermediate points, up to the currently selected stage.
5. Current point description (hint) and selected point MGRS coordinates (switched with time).

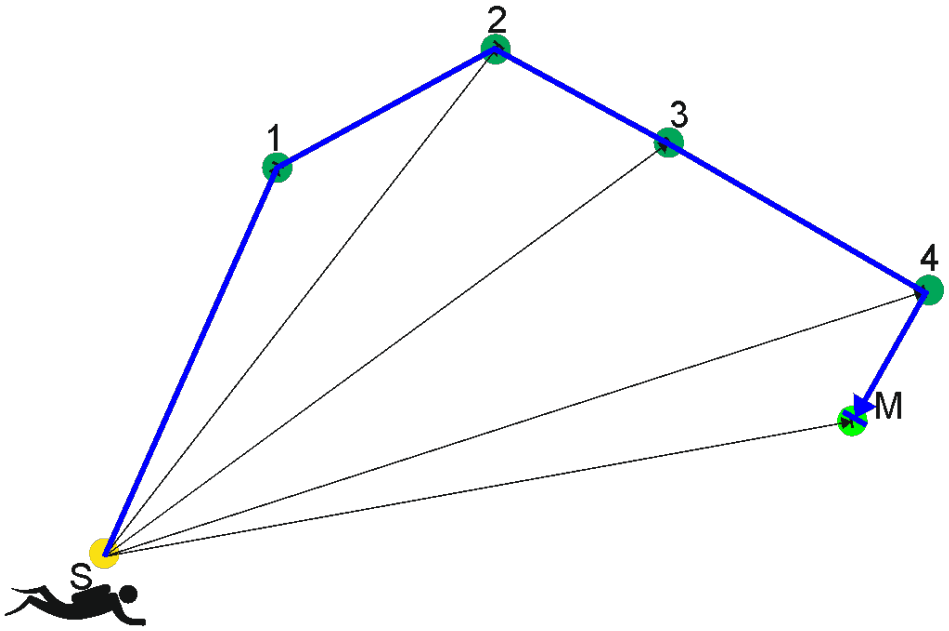
6. When selected, lower button press will lead us to the previous 5 points.
7. This little white arrow is marking currently selected Dive Plan Point (point which was selected before we entered into this screen)
8. White highlight allow us to choose the next Dive Plan Point (point we want to view and maybe select by pressing lower button)

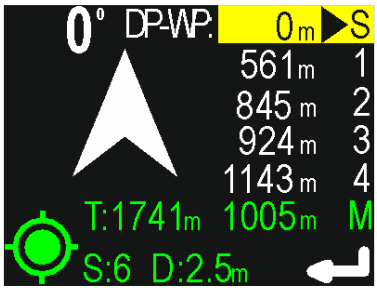
9. When selected, lower button press will lead us to the next 5 points (if next 5 points are not available, this field will not be shown).

Basic information about dive planning using ENC3Pro

The ENC3Pro navigation console was designed to support underwater navigation based on a sketch consisting of several points projected onto a two-dimensional plane. For the purposes of this manual, we will call this sketch the dive plan, and its points - the stages.
The basic features of the dive plan in terms of the device used:
– strictly defined initial point S (START) - it is mandatory to provide it; you need to specify its GPS coordinates or location on the map;
– 1-30 intermediate points (stages), the last of the points is always marked with the letter M;
– by definition, the Dive Plan is to dive in order to the individual stages, but the device does not force the operator to do this.

The sketch illustrating the flowchart is presented in the drawing:





When at the starting point, the operator can choose any stage to which he wants to move. The selection is made via the Dive Plan screen.
It is clear that the real course of the planned route will not be in the form of straight sections. The terrain and changing environmental conditions will force the operator to move in the direction that is currently possible (maybe even temporarily far from optimal). Thanks to internal calculations, the ENC3Pro device will indicate the correct, real azimuth and distance to the planned stage at any time. Using the average speed of the last 30 seconds, he will also try to estimate the time to reach the planned stage, but assuming that you can move directly in its direction, in a straight line. For more on mission planning, see the chapter describing PC software functions.
Choosing the RETURN function means that the start point (S) is set as the current destination.

Activation of the RETURN function is only possible if we are at least 10 meters from the starting point (S). After selecting this function, the screen shows the following information:

1. Course to be maintained to reach the starting point.
2. Estimated time to reach the above point.
3. The distance in a straight line from the current position to the above point.
4. Hint about the selected function.
5. Hint for upper button - go to next function down.
6. Currently selected function.
7. Hint for the bottom button - activate the selected function.

BUTTONS OPERATION
Upper button
Select the next function (MENU).

Bottom button
Start navigating to the starting point (S).

Two independent modes for navigating - comparison

To extend the capabilities and range of applications of the ENC3Pro console, the ability to select how the device navigates to your destination has been introduced. This increases the usability of the device at the cost of slightly complicating its operation. Below are the characteristics of each navigation mode and the main differences between them. In the previous version of the device software, only the scheduled mission mode was available.

Feature	**Scheduled dive plan**	**Azimuth-Distance mode**
Description in the device menu	DIVE PLAN	Azim./Dist.
The number of possible points to which we navigate	2 ... 31 START, 1 ... 29 intermediate points and the FINISH	2 START and FINISH
Support for position determination with GPS data	YES	NO (GPS data is logged but does not affect the calculation)
Programming of navigation settings from a computer	YES	NO
Programming the navigation settings manually from the device menu	NO	YES
Change the navigation settings at any time	Only for the selection of one of the programmed points in the Dive Plan	YES
Azimuth, distance and time information to	YES, to each of the saved	YES

the programmed destination	points in the Dive Plan	
Information about azimuth, distance and time needed to return	YES, always to the START point	YES, always to the point where track recording has been enabled
Record the current depth, position and speed	YES	YES
Possibility of pause (HOLD) and generation of markers	YES	YES
GPS data recording	YES	YES
The ability to switch between modes at any time during the dive	YES	YES
Independent operation and data of each mode	YES	YES
Return RETURN to the START point after switching to another mode	Always START (DIVE PLAN)	Always START (other mode)

Each of the listed modes is an independent mode. Changing the navigation data in one mode does not cause any changes to the data in the other mode and in special cases they can be used interchangeably or even alternately during the dive. However, this requires experience and a good familiarization with the work of individual modes.

Changing the navigation mode is possible only when data recording is not currently turned on (selected function / HOLD mode).

It is not recommended to change the navigation modes once the data recording has started, unless the operator of the machine knows exactly what he wants to achieve. Changing the navigation mode, e.g. in the middle of the route recorded by the device, may make later analysis of the record difficult.
The RETURN mode to the START point when changing modes is dependent on the particular mode.

How do I find out which navigation mode is currently active on my device?

The main screen of the ENC3Pro Navigation Console has the same layout and content for each of the available navigation modes. This layout has not changed and can be read using the information available in the previous manual. However, if we use the upper button of the ENC3Pro console (the button described as NEXT), we will switch to an additional information screen, where it will be possible to read what the current navigation mode is.

In the picture below you can see what the display of the device will look like when the Dive Plan mode is on, labeled DIVE PLAN:

The right half of the screen will always contain three items. The first is information about the currently active navigation mode. It can be DIVE PLAN or Az./Dist. , as shown in the table above. Pressing the lower button of the console (SET) when the white frame with the check mark is set on this element leads us to the screen that allows you to program target settings, which will be described later in this study.

The current mode position (here – DIVE PLAN) will be grayed out / unavailable when REC is enabled. To be able to view and change the navigation settings, switch the device to the HOLD mode.

The RETURN position may not be available if the return point cannot be calculated - e.g. because we are at or very close to the starting point.
If you select RETURN once, it cannot be selected a second time until you delete the target or program new target coordinates.

Blocking access to inaccurate operations at the moment is to protect the user against reckless and unsuccessful actions.

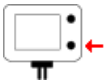
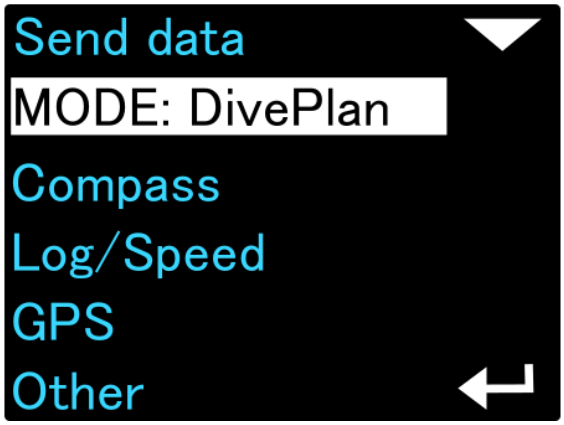
How to switch between navigation modes

To change the navigation mode, i.e. the way in which the ENC3Pro console determines the location of our target, make sure that the REC function has been turned off (recording is paused in HOLD mode) and go to the settings menu (MENU option on the screen shown in the previous figure).

As before, the SETUP menu consists of two screens that you move through sequentially using the top console button (NEXT).

Already on the first screen, the second position from the top allows you to change the navigation mode.

Just highlight it and press the lower button on the ENC3Pro console, and the selected mode will change as shown in the pictures below:

Azimuth-Distance Mode		DivePlan Mode
		

Changing the navigation mode is possible only when data recording is not currently turned on and the HOLD function / mode is selected. When (REC) is enabled, the option to change the navigation mode will be grayed out and not active.

Azimuth-distance mode (marked Az./Dist.)

After selecting this mode:

- the ENC3Pro console will calculate the current position using only the compass and log (if log is used)

- we can define the target point by specifying distance to it and azimuth (compass direction); the distance can be given in the range of 10m ... 99990m with a resolution of 10m; we give the azimuth with a resolution of 1 angular degree

- GPS data is indicated and recorded, but does not affect the position calculations, so it is particularly important in this mode to calibrate the compass and log correctly and use the HOLD function properly - you must use it immediately when you stop and switch the REC mode again as soon as you move.

After enabling this mode, the additional information screen will be as shown in the figure below:

When we select the option Az./Dist. , the device will go to the screen that allows you to program the parameters of our target (azimuth and distance):

1 - current or last good GPS position in the MGRS notation
2 - azimuth to the target
3 - distance to the target
4 - GPS coordinates of the destination point in the form of MGRS, calculated on the basis of the read coordinates (1) and the azimuth (2) and distance (3) provided by the operator
5 - a hint about the currently selected element

When the highlight (white frame) is set to position (2), you can use the lower (SET) button to switch to the course (azimuth) programming mode to the target. After pressing the lower button, the console allows you to select the target course by turning the device in the direction you want to drive:

It is enough to turn the device so that the indicated value meets our needs and then press the lower button again.

However, if we want to enter the course using the keys, press the upper key (NEXT) once and we will be able to enter the course value using the digit by digit method:

In this case, the value is changed with the lower button, and the upper button moves to the next position.

The first line of this screen shows the current GPS position in green (very good indication) or yellow (good enough indication). If the GPS receiver does not have a valid position, the text color is gray.

In line (4), the position of the target in the MGRS record is displayed, which will be updated when the user changes the entered azimuth or distance values, or when a new, better reading of the current GPS position appears.

The device always remembers the last good (i.e. accurate) GPS reading. If, from the moment of switching on, the ENC3Pro console does not have a single current GPS reading, then all calculations on the above-mentioned screen will be made with the use of this archived GPS point (it may even come from many days ago and indicate a distant location). The user should be aware of this limitation.

After accepting the azimuth and distance, the next pressing of the NEXT (upper) button will display the NAVIGATE command at the bottom of the screen - it means accepting (lower button) and

saving the entered values and going to the main screen. The set values are remembered even after the device is turned off or the navigation mode is changed.

Next pressing NEXT changes this inscription to CLEAR TARGET - selecting this option will delete all settings - ie azimuth and distance. The ENC3Pro Console, once its target settings are cleared, will no longer display the course to the target on the main screen in the upper left corner. It will also not show the distance or time to the target in the center line. However, all other functions will still work properly. After pressing REC, the console will record data and will allow you to return to the point where you started recording the START route (using the RETURN function).

The azimuth and distance parameter programming screens are shown in the following figures:

Set new target

Clear target

If we program the target parameters, e.g. azimuth 28 degrees and distance 600m as above, we can change them many times at any time.

If we program certain values and start recording (we are driving), then after re-entering this option we will see the azimuth and distance corrected so that they still point to the same point that we wanted at the beginning.

If the target parameters have been cleared (CLEAR TARGET), the course to the target (in the upper left corner in the picture above, marked with the number 1) will not be displayed. The distance to the destination (box 5) will then show the shortest distance to the starting point.

The MGRS indications on this screen are only calculated values and are presented to the user for comparison / orientation aid. They are not included in the position calculation and may be different each time we visit this screen - reflecting the current bearing and the result of the calculation.

The operator, by entering azimuth and distance, determines the position of the target always in relation to his CURRENT LOCATION.

Returning to the starting point (RETURN function) will always direct us to the point in which WE TURNED RECORDING FOR THE FIRST TIME (REC).

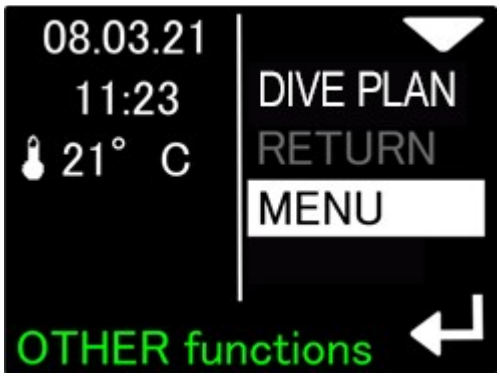
Display content optimization

Displaying all necessary information on small screen is not an easy job. Using small font is not good idea, because user may have troubles with reading it. That’s why this device has to change the displayed content with time, or use different content depending on context – for example : depending on what the user set or switch on.

Distances greater than 2000m may, if necessary, be displayed in kilometers. In such cases, the decimal place is marked with a dot.

Very long distances will be displayed as> 99km.

Below you can see an example, how the screen content may vary in time, to provide more information to the user.



So far, only the date, time and water temperature have been displayed on the screen that allows you to enter the MENU.

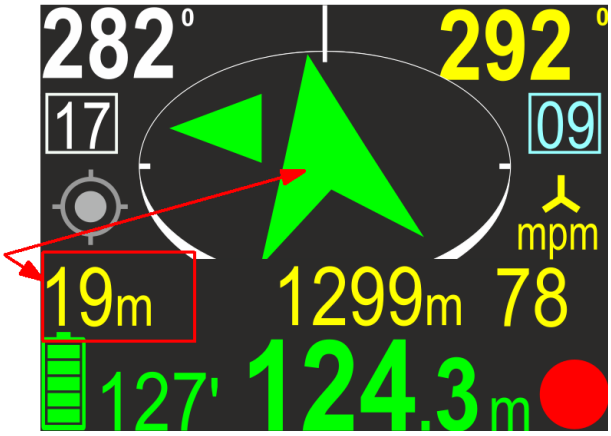
Currently, the current reading of GPS coordinates in the MGRS record is also displayed in the same place, alternating with the date / time and temperature (every 3 seconds change).

On the main display screen there are also some time-dependent elements and they can be shown in certain circumstances.

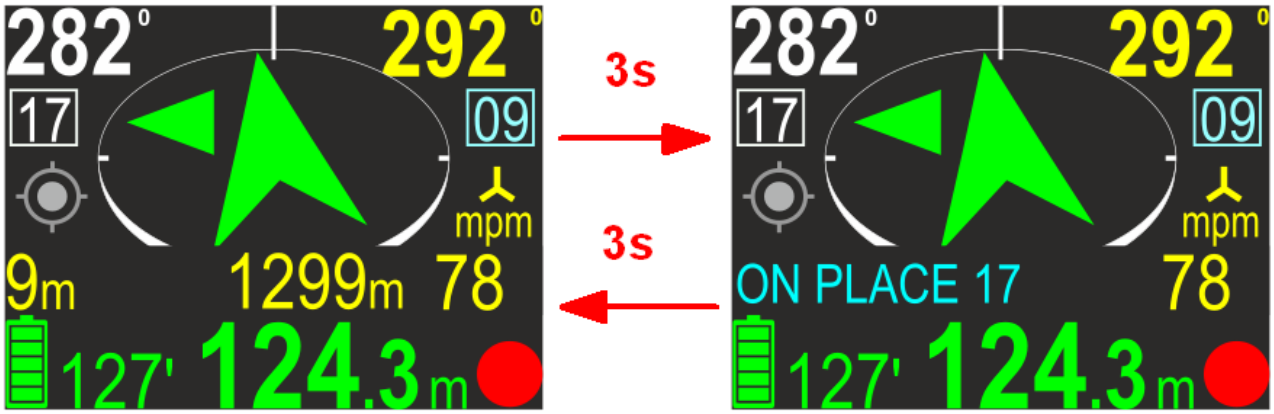
When the currently selected point is 20 meters or less - the compass arrow turns green

Main navigation screen during normal work

Main navigation screen if distance to the target is <20 m



When the currently selected point is 10 meters or less - a text description (hint) associated with that point appears just below the compass arrow. This description is shown in blue for 3 seconds, alternating with the distance values (in yellow) that would normally be there.



If the description of a given mission point has not been entered, the word ON PLACE xx will be displayed as a hint, where XX is the number of the current Mission Plan point that we have set.
In some versions, this text may be formatted as ON POINT xx (depends on firmware details)

When the currently selected point is 4 meters away or closer - the digital azimuth-to-point indication in the upper left corner of the main navigation screen is not visible. At a short distance from the target, this indication changes rapidly, which is due to elementary mathematical rules. So it is more of a disturbance than a help.

If you use the Azimuth-Distance mode, you may clear (delete) the destination point settings. In this case, the ENC will not show you the course (heading) to the destination and will not calculate the arrival time.
Main screen arrow will point to the North instead to the target location. The shape of the arrow will be also different, to highlight this case.

Main screen when no target is set.

Main window when target is defined.

Notice : red part of the busole-like arrow points North.

If the MENU function is selected, the screen looks as shown:

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.

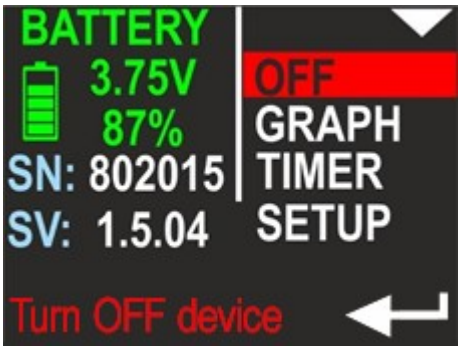
Caution!
If the STOPWATCH is running or was stopped with count > 0, the STOPWATCH value will also be shown in green color on this screen (field marked as 5)

MENU screen- functions choice

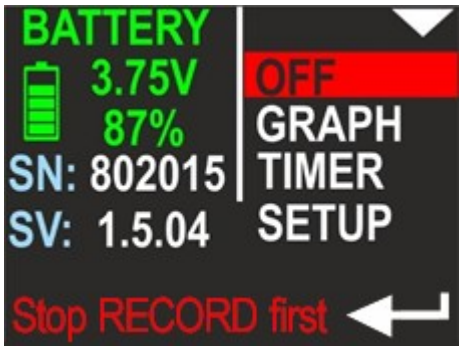
After activating the MENU function on the additional information screen (see page 21), the user can choose one of 4 commands:

OFF

Allows you to turn off the device. On the left side of the screen, the following are displayed: battery charge status (green), unique device serial number (SN) and firmware version (SV):



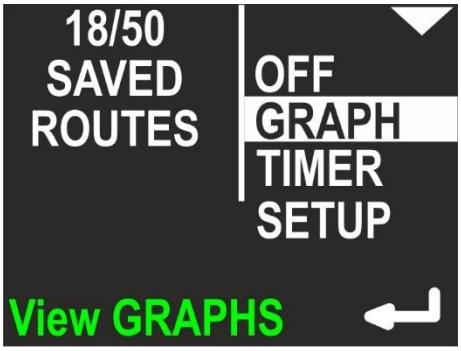
Power off is possible.



Power off is denied because REC(ording) is ON

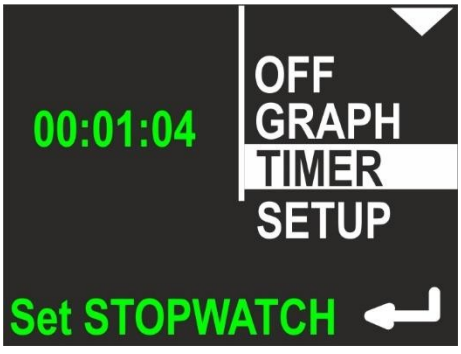
Caution!
The device cannot be turned off if data recording is active. This prevents accidental shutdowns and data loss. This situation is shown in the figure on the right - in the hint at the bottom we see the message Stop RECORD first.

GRAPH



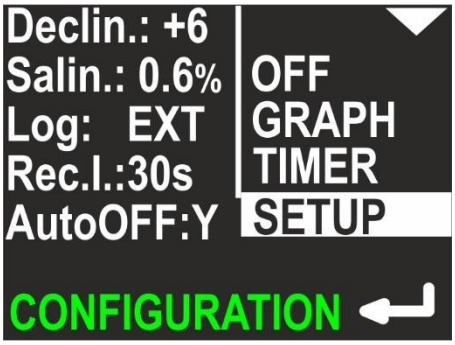
This function allows you to view the recorded data in the form of graphs on the screen of the device. A detailed description of the charts is provided in next chapters. After selecting this function, the left side of the screen shows the content of the memory - successively the number of already saved charts and the total memory capacity.

TIMER



This function allows you to start a simple stopwatch. The exact description is in the next part of tis manual.

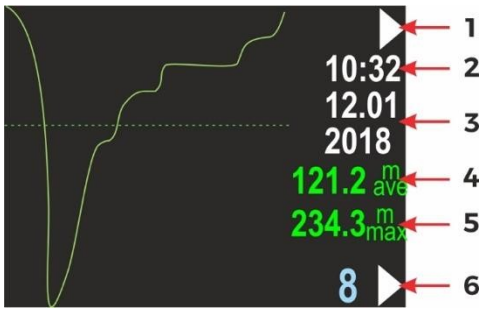
SETUP



This function takes you to the advanced settings of the device (details in the further part of this document). On the left a shortcut of the most important operating parameters that are currently set is displayed.

Depth profile record

After activating the GRAPH function from the device MENU, a screen will be displayed containing the so-called depth profile (shown below). This is a record of the recorded depth in relation to the dive time (depth values increase downwards, time values increase right).



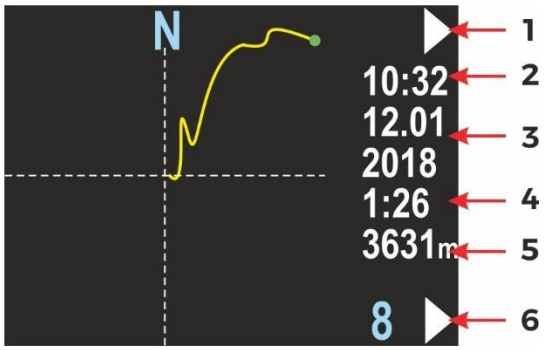
1. Top button role (now – go to next graph: swim route graph)
2. Time of first recorded data (hh:mm, 24-hour system)
3. Date of first recorded data (DD.MM / YYYY)
4. Average depth (if it can be evaluated)
5. Maximum depth (if it can be evaluated)
6. Route number in memory (blue) and lower button role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

Caution!

- The device's memory uses numbers to mark the next saved data. That is why each chart has a 'route number'. After switching on, the device accepts the lowest available number in the memory for storing current data. If the memory is full, the oldest record will be deleted to save new data.

- Data writing may be repeatedly suspended (HOLD). Due to the limited capabilities of the device, this graph does not show these gaps in any way.
- You can tilt the device left or right (at least 45 degrees) to change the function of the lower button. Details are described in the next chapter.
- When the device is turned off, it automatically deletes the recording, which lasted less than 1 minute (elimination of user mistakes).

Route recording in XY plot



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)

Caution!	
	In the upper right corner, above the time of recording, there may be a small green GPS marker if the route has GPS data saved (it was possible to register the satellite position at least once).

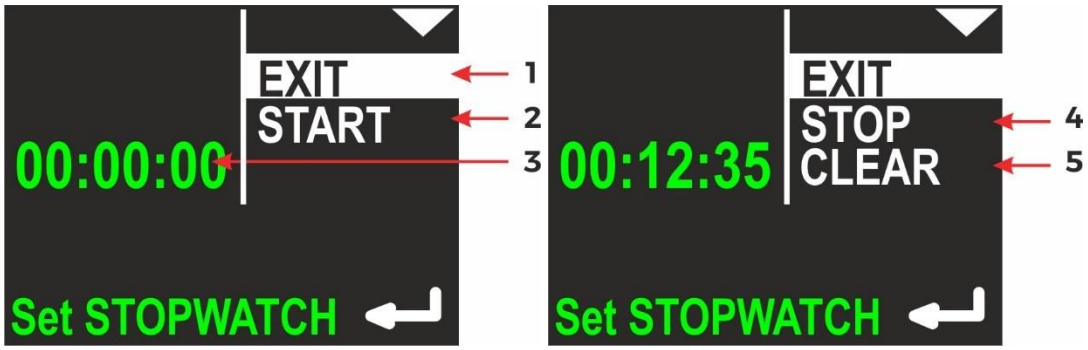
Due to the limited number of buttons available in the device, additional functions when viewing the graphs are available after tilting the device at least 45 degrees to the right or left, as shown in the table below.

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

Caution!	
	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).

TIMER / stopwatch – auxiliary time counter

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:

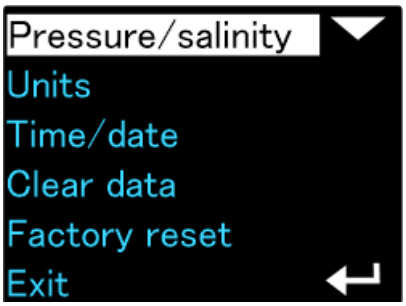


1. EXIT – current selected command; if you press lower button (ENTER), you will return to main navigation screen
2. Timer START – option to start TIMER/STOPWATCH for counting
3. Current TIMER/STOPWATCH value (up to hh:mm:ss – hours: minutes: seconds)
4. Timer STOP – option to stop TIMER/STOPWATCH
5.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

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.

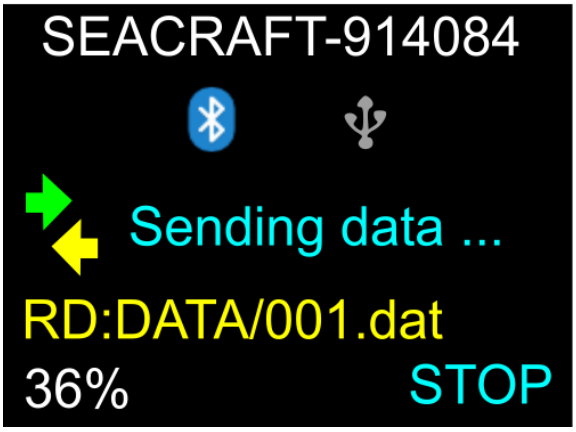
First part of the SETUP screen



Next part of the SETUP screen

Send data – data transmission

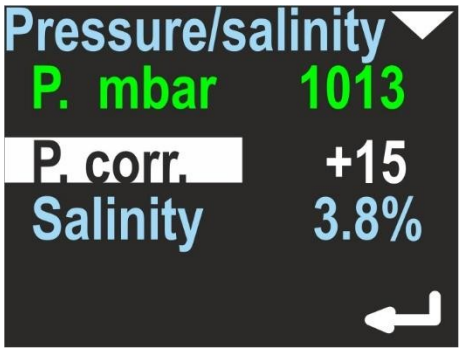
Activating this function activates the USB interface on the device. After activating this function, connect the ENC console to the computer using the supplied USB cable. The first time you connect, you may need to install drivers (provided by the software manufacturer). In data transmission mode, the device does not turn off automatically unless the internal battery is discharged.
The screen in data transmission mode contains the following elements:

	First line - device name and serial number. Bluetooth and USB icon – become active depending on how the device started transferring data Green and yellow arrows on the left - they light up when data transmission is active Yellow text in the middle of the screen - describes the current operation (here: reading the file 001.dat)

A progress indicator for the read operation appears at the bottom left of the display.
On the bottom right of the display is a description of the role of the bottom button in the ENC console - it can be used to interrupt the data transmission operation. The console in this case will be completely restarted.

Caution!	
	During the firmware update procedure, if you need to stop this operation, always use the STOP button on the device - before the update program closes.

Pressure/salinity – pressure and depth correction

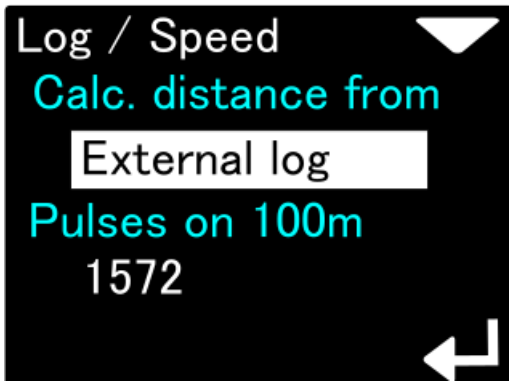


This option is used to control the work of the pressure sensor and to set the salinity necessary for correct (accurate) depth determination.

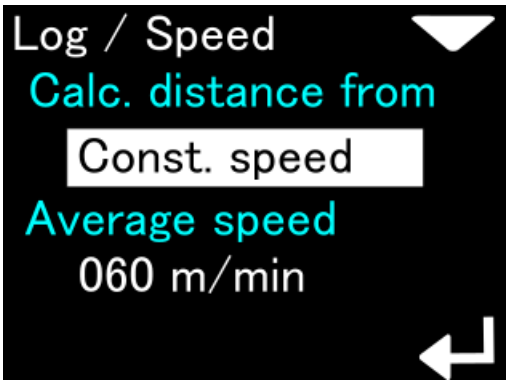
The first line, green, displays the external pressure currently measured by the built-in sensor, expressed in millibars. In the middle line there is an editable correction field - this is the value that will be added to the pressure sensor indication. In this way, you can use the ENC console as a precision barometer. This parameter has no effect on the depth display (it is not included in its calculation).
The last line (blue) contains the salinity factor expressed as a percentage. This setting affects the depth algorithm. This field should have a value of 0.0 for fresh water and an appropriate non-zero value for sea water (check the current value for a given water area yourself).
When a specific field is highlighted, its value can be changed cyclically (0-1- ... -9-0 ..) using the lower button.
To exit this setting, press the top button several times.

Log/speed – speed sensor settings (measurement of distance and speed)

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



Lower button press changes this setting to →



Lowe 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 highlighted. Upper button will higlight the second line, allowing to do more detailed settings.

If the ‘External log’ is chosen, and the lower line is highlighted, the upper button will allow to switch between :

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

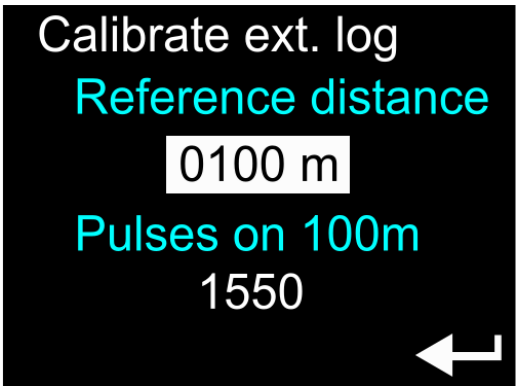
- ‘xxxx Edit’ – will allow to enter the calibration coefficient manually, digit by digit

- ‘xxxx Defaults’ – will set the calibration coefficient to the factory default value

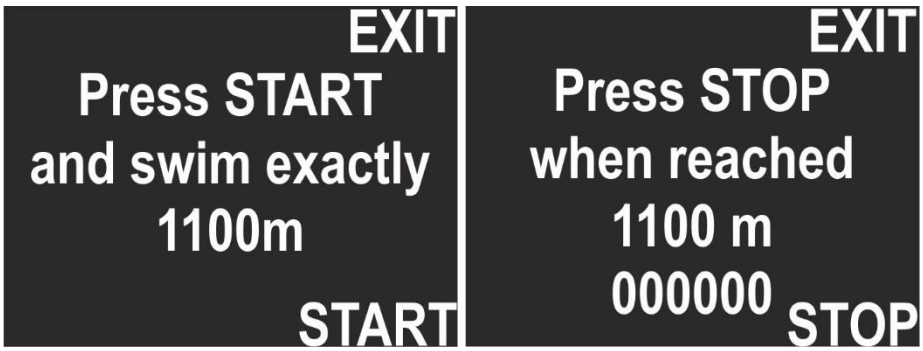
Pressing the upper button will switch the screen as shown (from left to right).
Pressing the lower button will choose currently shown option.

Manual editing the log coefficient :
- lower button – increase digit 0→ 1 → .. → 9 → 0 ...
- upper button – go to the next digit

Most accurate option is always to check the log operation ‘in the field’ – for example : swimming parallel to the known, marked distance (measured rope). This is called ‘Calibration’.



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, shown in the figure below:



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 !

Log/speed calibration – detailed information regarding external log calibration

The ENC navigation console can operate in two distance determination modes: working with and without an external logo. This chapter introduces the operation of the device in both cases.
When the external log (Calc. Distance from = Const. Speed) is not used, the average driving speed can be set using the Calibration option. In this case, when the device is in the HOLD state, the distance metering is stopped. When the user switches to the REC state, the device begins to assume that we are constantly driving at the programmed average speed (e.g. 50 m / min) until we switch to HOLD mode again.
This way of functioning requires that the user:
– set the average speed very accurately;
– is driving at a constant speed
– switched between REC and HOLD immediately after stopping / starting.

If an external log (Calc. Distance from = External log) is programmed and connected, you can get very accurate measurements of the actual distance using the Calibration option. The log converter works on the principle of counting pulses. The calibration factor stores information about how many pulses are per 100 meter distance.
A typical value is 1590 pulses per 100 m. In most cases this value will be between 1400 and 1600 pulses per 100m.

The value of this coefficient may depend on the position in which the log is mounted, the type of watercraft on which it is mounted, and other factors that change the properties of the flowing water stream (e.g. 'nozzle effect'). The factory calibration of the log is appropriate for its use on SEACRAFT scooters, mounted in the manner indicated below. In individual cases, significantly different from the one presented above, it is recommended to recalibrate the log with all accompanying equipment that will be used in real conditions.

The calibration factor may also depend on the position of the sensor relative to the start of the watercraft on which it is mounted. For best results, mark the best location yourself and calibrate as follows:

– mark START and STOP points on a straight section of exactly known length (100-1900 meters);
– go to SETUP → Log / Speed → Calibrate log (check if you have set Calc. Distance from : External log);
– enter in the Reference distance: value corresponding to the marked trial distance;
– the current Pulses on 100 m: 1590 calibration factor will be displayed below; use the upper button to highlight this text and press the lower button;
– Press START and swim exactly ... m appears on the screen.

– set yourself at the point marked START, set the typical speed on the underwater scooter, prepare all the necessary equipment and press START (bottom button) on the ENC console, then swim as straight as possible and without changing the depth to the point marked STOP the flowing counter visible on the ENC screen should regularly increase its value;
– as soon as you reach the point marked STOP, press the lower button on the ENC console again; the updated calibration factor value will be visible on the screen.

Caution!	
	The calibration procedure will not save results if the pulse counter becomes too low at the end of the procedure. In this case the current value of the calibration factor will be kept.

It is possible to program the calibration factor without having to be immersed in water and swimming on the marked track. In the event that we have a route of a known length known to us in the memory, and the record indicates a deviation from this value and at the same time we excluded the influence of other factors interfering with the measurement (improper installation, physical damage to the log sensor), the correct value of the log calibration coefficient can be calculated based on formula:

f= a*b*c

where:

a = route length recorded in the device's memory

b = previous calibration factor (pulses / 100m)

c = known actual route length

Example: The recorded route has a known actual length of 127m. The ENC3Pro console registered it as 124m, working at a default ratio of 1590 pulses / 100m. After substituting for the formula:

f = 124 * 1590 / 127 =1555

Then activate the log calibration procedure as described above. Enter 100m as the reference distance. Using an ordinary fan or, as a last resort, blowing in the speed sensor should lead to the situation that the meter reading will be 1555 pulses. Then press STOP and the new, corrected calibration value will be saved.

This functionality can be useful if we use the ENC3Pro console in extremely different hardware configurations. It is worth making a note of the appropriate calibration factors for individual configurations.

Caution!	
	Speed sensor is a delicate device, sensitive to mechanical pollution and impacts. It is recommended to rinse it under a stream of running, clean water if it has been used in sea water or in heavily polluted water. When using the log in extremely different environments, it may need to be recalibrated.

	All the ‘Calibration’ process use meters as the distance unit (knots will be too much, and feet – to little to achieve good results without additional complications of the whole procedure). Choosing the reference distance for the calibration you may use this quick reference: 100m = 109.36133 yd = 328.084 ft = 0.054 N.MI (nautical mile) 361 ft = 110.0328m (~110m with <0,03% of error) 164 yd = 149.9616m (~150m) 0.2 N.MI. = 370.4 m (~370m)

GPS – checking GPS receiver

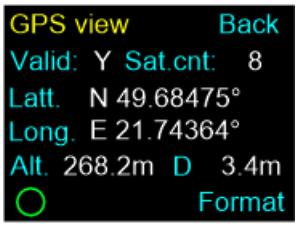
This menu option is for information purposes only. When selected, the navigation screen will show the GPS status information as described below:

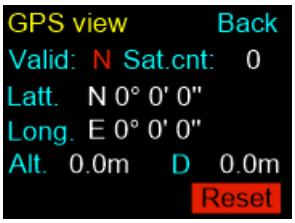
- Valid: Y/N – Displays, if GPS information is available now
- Sat.cnt: 0…15 – Number of satellites used to calculate the position (more = better)
- Latt. N/S 0.00000° - Latitude in degrees, can be N(orth) or S(outh)
- Long. E/W 0.00000° - Longitude in degrees, can be E(ast) or W(est)
- Alt. 0.0 – Altitude,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

Caution!
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.

Using the lower button (Format) can switch between all available formats.

Just after power on (in 30 seconds from it) lower button will allow you to reset the GPS receiver internal calculation. Use this option if the GPS receiver is not working as expected.

	GPS screen in D-M-S format
	GPS screen in decimal degrees format

	GPS screen in MGRS format
	First 30 seconds from the power on – you can reset the GPS receiver with the lower button.

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

Green circle at the bottom will blink in each second if the connected GPS receiver is working properly.

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

The GPS receiver is automatically switched off, when the water depth is 11 m (36 ft) or more, in order to save battery. When the water depth is 10 m or less (33 ft), the GPS receiver is switched on automatically.

After power on, first GPS readings should be available after 20-60 seconds. If the GPS antenna is not connected or if it is broken, the GPS mark on the main screen will have red color.

Time/date – internal realtime clock

This device provides an internal real time clock with calendar.

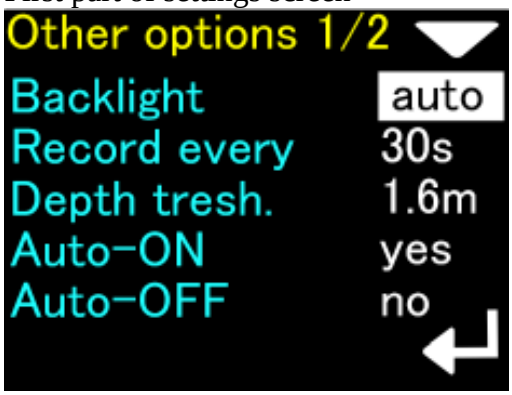
The time format is 24 hours, the Date format is DAY.MONTH.YEAR. YEAR has only 2 digits on the display. The value 01 means the year 2001, 02 means 2002 and so on.

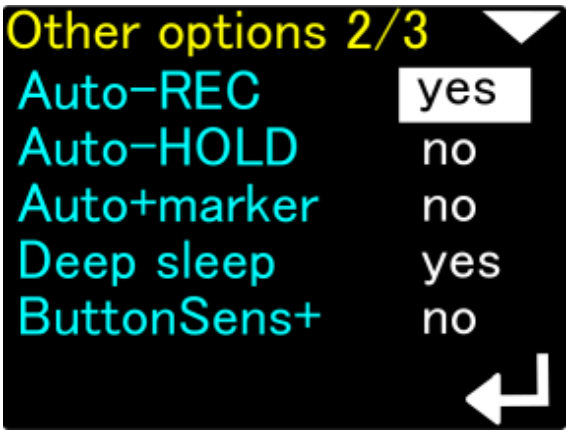
Caution!	
	• The device may drop date & time settings, if the battery was deeply discharged. • The device clock accuracy is about 15 seconds per month. You may need to correct date & time settings from time to time. • Date and time are used in record files. If date/time settings was lost, device will set date and time to the date, when the firmware was compiled (for example – 1-Aug-2021) and the time to 12:00.

Other settings – other parameters

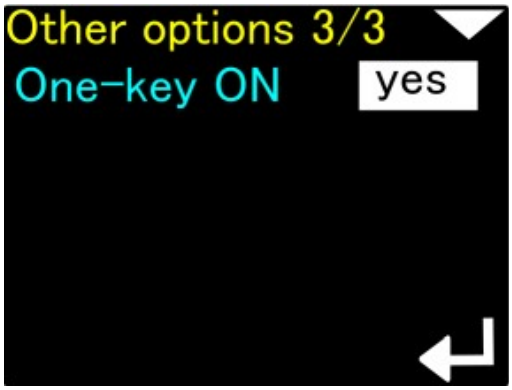
Miscellaneous other settings are available as a separate item. It is divided into two screens:

First part of settings screen





Second part of settings screen



Last part of the settings screen

The first part contains those options :

Backlight - [1, 2, 3, 4, 5, auto] - changes the intensity of the device's screen backlight. The value 1 corresponds to the constant lowest level of backlight (around 10%), the value 5 means maximum backlight (around 95%). The auto setting means that the device will measure the level of ambient lighting and periodically adjust the brightness of the display (less backlight in the dark).

Record every [2 s, 5 s, 10 s, 30 s] - This is the maximum time interval between two data records in the device's memory. It should be noted that if the data in the memory changes quickly, the space between successive entries can be even smaller than the value programmed here. It will never be bigger.

Depth threshold [0.5 m, 1 m, 1.6 m] - The ENC3Pro console counts the 'immersion time', increasing it by 1 every second when the measured depth is greater than or equal to the value set here. This time is displayed on the main screen (expressed in minutes) and is reset to zero when the device is turned off. The value of 1.6m is consistent with the depth recommended in the European standard EN 13319.

Auto-ON [yes / no] - If set to (yes), the ENC3Pro console will turn on automatically when immersed in water 0.3 m or more deep. This option does not allow turning off the device that remains submerged (it will restart automatically).

Auto-OFF [yes / no] - If set (yes), the console will turn off automatically after 5 minutes of inactivity (on the surface when recording is not enabled and we do not touch the keys).

Hint	
	The upper button goes through all these options one after the other, and then the next screen is displayed. The lower button allows – on all screens - to cyclically change the highlighted value.

Auto-REC option

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

The option is enabled by default.

When Auto-REC is off, the ENC will remain in HOLD state until the lower button is pressed on the main screen. User must manually start data recording to start saving data.

When Auto-REC is enabled, the ENC3Pro 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 ENC 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 ENC console will not stop recording on its own. Requires manual stopping of data recording by the user (lower button on the main screen with compass)

When Auto-HOLD is turned on, the ENC 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 ENC 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.

Precautions	
	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 ENC 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.
	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.
	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 ENC console has a built-in mechanism for writing markers, also called the markpoints. A markpoint 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, markpoints 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 in the same way, as if user will do it by his own hand. If Auto-HOLD is turned off, Auto + Marker does not work.

ButtonSens+

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

The option is disabled by default.

If enabled, this option allows to increase button sensitivity by 30-50% (value depending on the device instance). You will need smaller force to make the buttons work.

Enable this option if you have troubles with operating your ENC – for example, if you have thick gloves or if you dive in very cold water, you may consider to enable this option.

Hint	
	If this option is enabled, ENC buttons may be more sensitive to shock and vibration. Disable this option if you will see accidental screen switching during normal ENC operation. ButtonSens+ won't make the power-on easier. This option increases button's sensitivity only during normal ENC operation (when the power is on)

One key ON

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

The option is disabled by default.

If enabled, this option changes the way of powering on the ENC.

Instead of pressing both buttons at the same moment, to switch on your ENC you will have to do as follows :

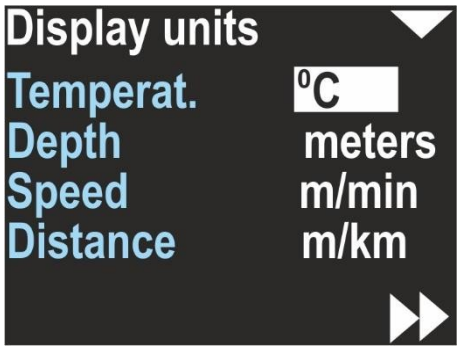
- press any button → red light above the screen will be on, and after a moment it will start blinking

- when red light is blinking, press any button again → ENC will power on

Hint	
	You may need to enable this option, if you have troubles with pressing both buttons simultaneously or if you want to switching on the ENC with one hand only. The new switching on method described above may seems a bit queer, but it was chosen carefully to make the whole operation easier in some cases and to minimize the risk of unwanted powering on (and battery draining).

Units – display 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)

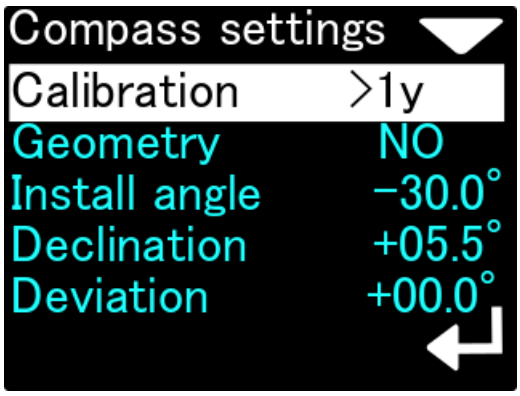
Distance – Can be m/km (meters and above 2000 m kilometers) or US.NM (United States Nautical Mile; 1 US.NM = 1852m)

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

Compass – compass settings

Electronic compass in this device is the most important element, when GPS signal is not available. Thus, compass settings are very extensive and understanding their role is very important.

When you enter inside the compass settings, first you will see this 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 – This option is used for basic magnetometer calibration. You should use this function, when the compass direction shown on this device is improper. This is usually needed when the magnetic properties of the environment have changed.

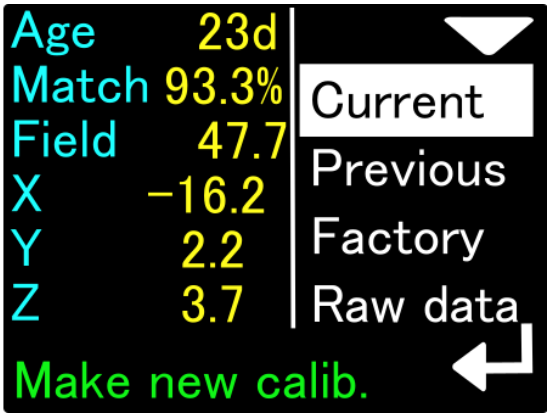
In every location, magnetic background, declination and other magnetometer-influencing factors are different. Thus, the compass should be calibrated every time, when the location is changed,

especially when there are big distances traveled (traveling to another continent, or to a distant country).

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.

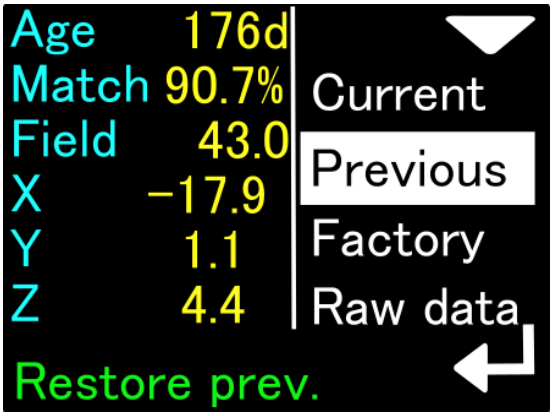
If you press the lower button, when the Calibration is highlighted, next screen will be shown :

Current calibration values



Press the lower button to start new calibration process

Previous calibration values



Press the lower button to get back to the previous calibration. In the same manner you can quickly restore the factory calibration.

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).

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)

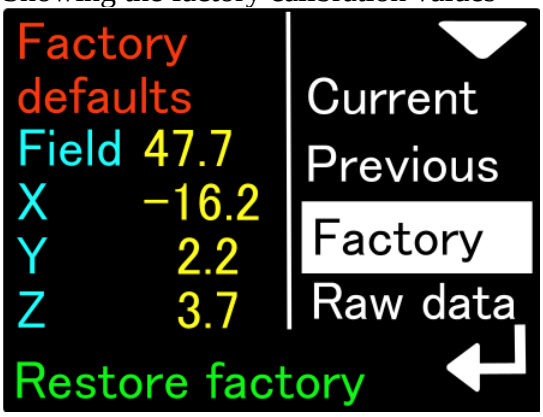
When the Factory field is highlighted, we see the factory calibration properties. These are the parameters that the device had when the factory tests were carried out. Pressing the console's lower button while Factory is highlighted will restore the compass to factory calibration.

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

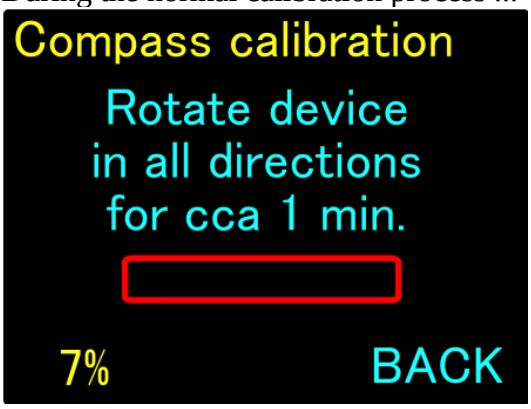
Factory calibration may or may not be effective for the user's current location. You should only use this option when you are not able to make compass working properly in any other way.
Factory calibration is correct for the place where the device was manufactured. In another part of the world, the readings 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.

Showing the factory calibration values



During the normal calibration process ...



Compass calibration

While calibrating the compass, you should slowly- without rapid movements- turn it in all possible directions ("tilting the eighths while turning around"). A green progress bar will be shown on the screen. The lower button will be marked as BACK until the progress is less than 70% (minimum value to achieve good results). Pressing this button stops this operation, and no calibration data will be changed. When the progress indicator will reach the 70% value, the lower button will be marked as SET, and pressing it will cause to apply the new collected calibration values to the compass sensor.

The digital "calibration progress percentage" indicator is shown at the bottom left of the screen.

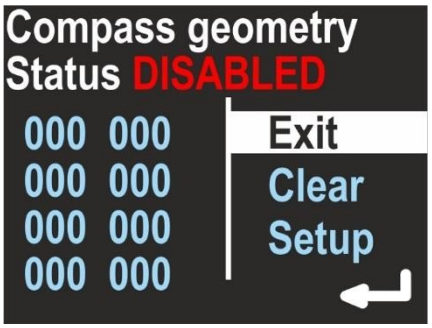
The progress bar and digital indicator on the screen reflect the actual operation progress.

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.

Notice	
	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.
	The new calibration can be worse than the existing. If you are not happy with the results, calibrate the compass again or restore the factory settings. After the basic calibration, you should set declination and deviation to 0 (zero), clear the precision calibration (see below), and set it again.

Using this device without the GPS signal available, demands to have as good compass readings as possible. This require doing the compass calibration in the regular periods of time.

Geometry – 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

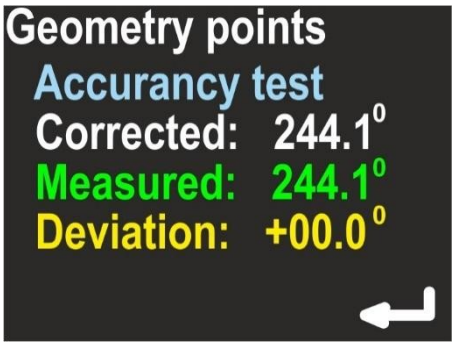
You should use this option only when experienced with this device.
We recommend to leave this option disabled in case of any troubles with compass operation.
After each new calibration, this settings will need to be checked and/or corrected (if enabled).
Proper usage of this option may require additional tools to determine required directions.

To make a new precision calibration, you should use the SET option. You will be asked to set the device in magnetic 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.

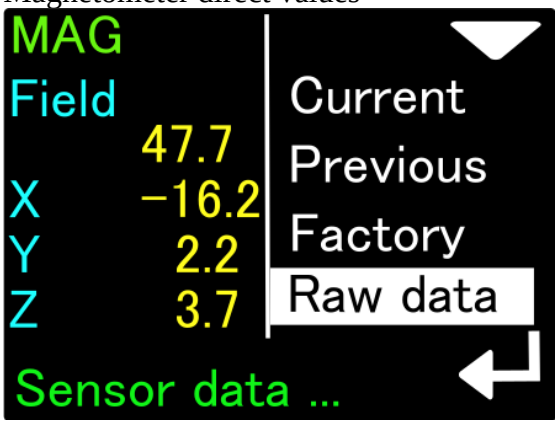
If the corrected values are better than the measured values, press the lower button (ENTER) to store the results. If you press the upper button, no changes will be stored.

Caution!
During the entire procedure, avoid placing near the calibrated device other elements that interfere with the magnetic field - large metal parts, cells, and even another magnetic compass. Failure to comply with this recommendation may significantly affect the effects of this procedure. It should be highlighted that mounting the device on a scooter and near other equipment (e.g. cameras, lighting or even the wrong mounting screw made of ordinary steel) can significantly affect the accuracy of compass measurement!

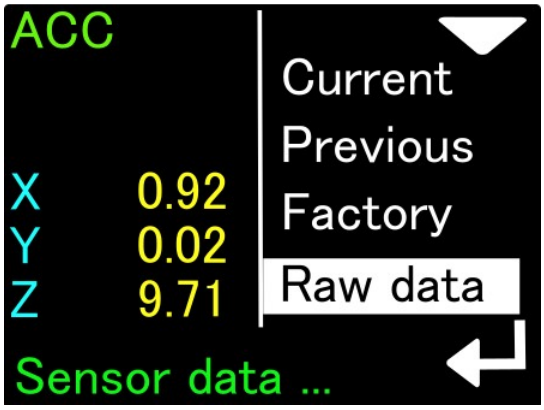
Compass sensor checking (diagnosis)

The user can preview all sensors data in case of troubles with compass indications (it may require guidance from our technical support). The Raw data item allows it :

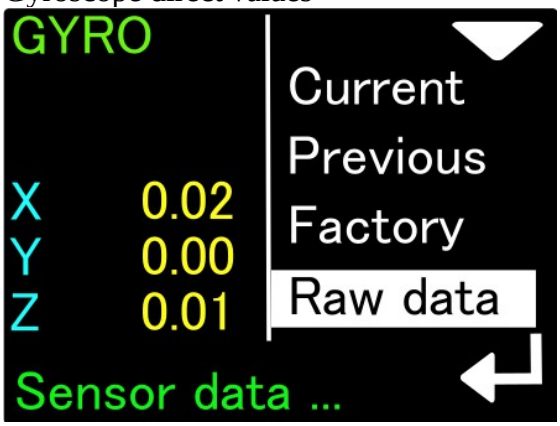
Magnetometer direct values



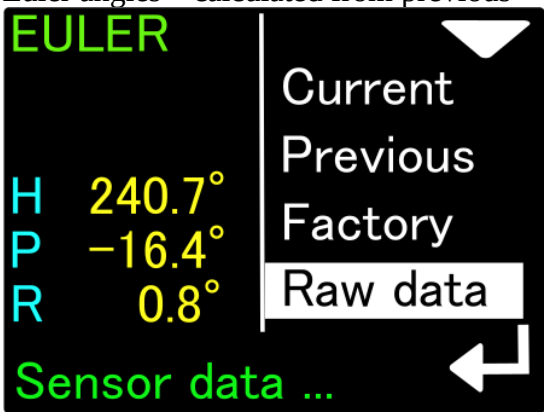
Accelerometer direct values



Gyroscope direct values



Euler angles – calculated from previous



Pressing the lower button of the console will change the view of the previewed data, as shown in the figures above.

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.

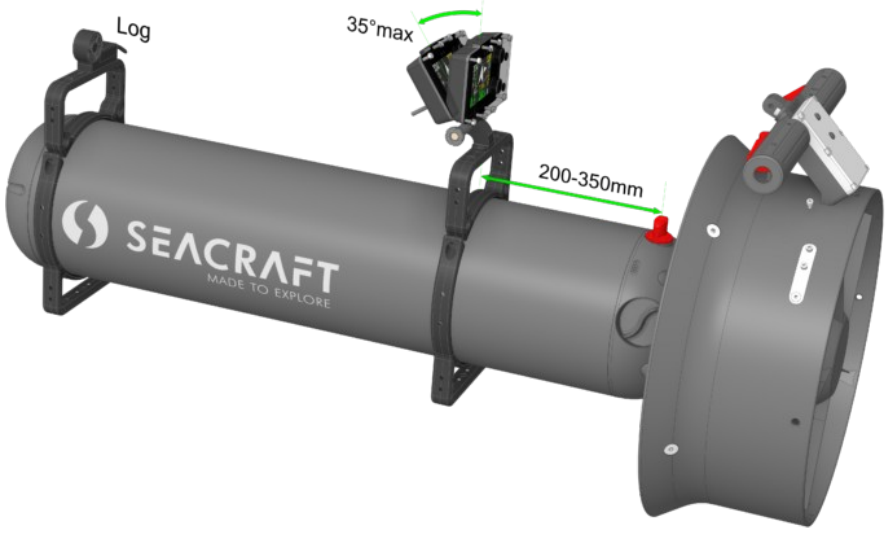
The last screen (EULER) is the result of the direct operation of the ENC console's computational algorithms. The given angles are: H - Heading = compass heading without declination and deviation corrections), P - Pitch = ascent or descent grade, for ascent the values are positive, for descent - negative,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

Compass Install Angle setting

The electronic compass built into the ENC3Pro 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 consoles, we assumed that the user could attach the 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):

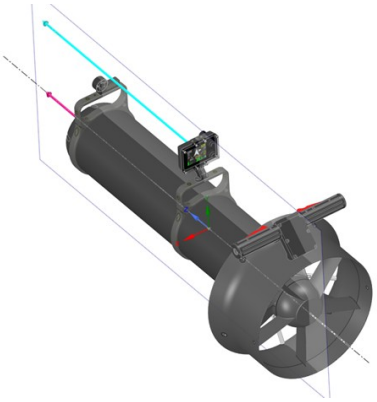


Analyzing some less typical cases, we concluded that for some divers, due to their specific habits or specific diving conditions - this simplified system is insufficient and may lead to errors in determining the direction of flow, which also tend to accumulate.

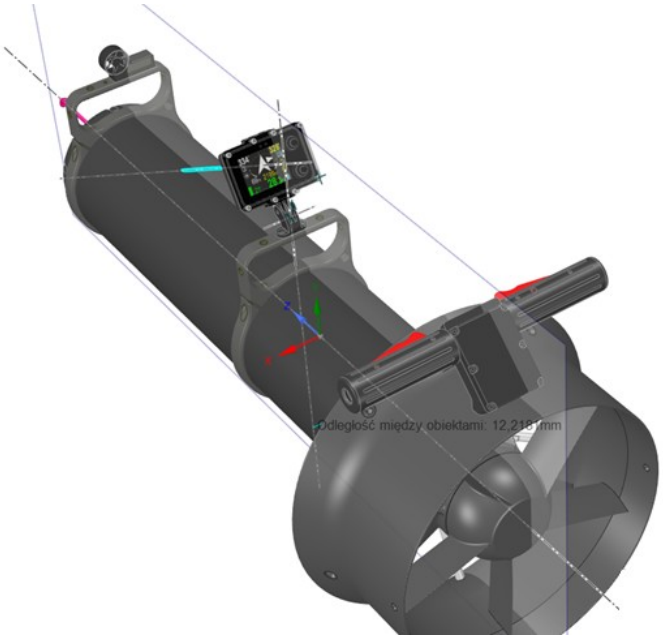
Therefore, in the current software version, the installation angle issue has its own configuration section and it is required that the user correctly configure this parameter.

What is an installation angle and why is it important

Ideally, the ENC3Pro console could be installed exactly perpendicular to the scooter hull. Such a case means that Install angle = 0 (Fig. below)

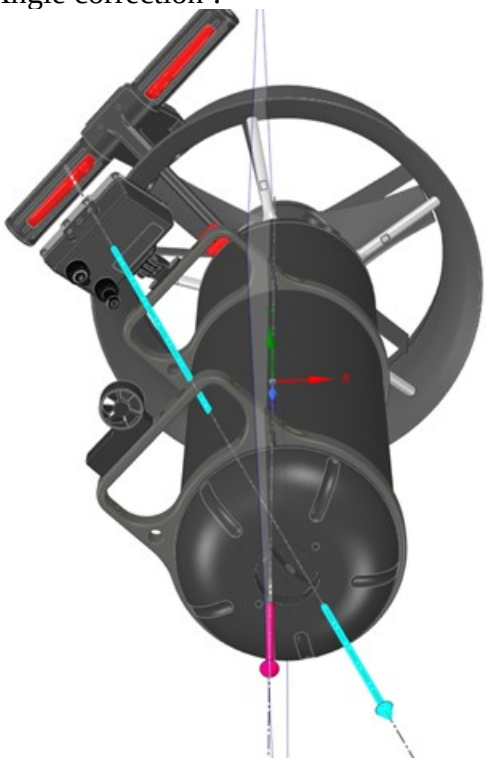


However, such a case is extremely rarely possible in practice. Due to the convenience of use, it is easier to read the ENC console's indications when its screen is slightly tilted "forward". This means that Install angle is negative. Additionally, the value of this angle may vary depending on user requirements. 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.



Vehicle not tilted – readings are still correct, regardless of the Install Angle settings

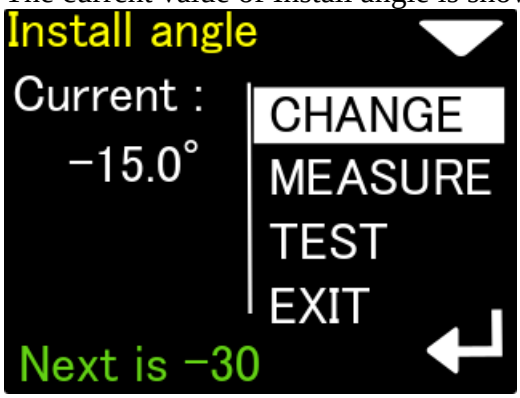
Vehicle is tilted to the right side – now readings will be improper without Install Angle correction !



To compensate tilt influence, the ENC has to know the angle between the vehicle hull and ENC itself. Below you can see how to set it properly.

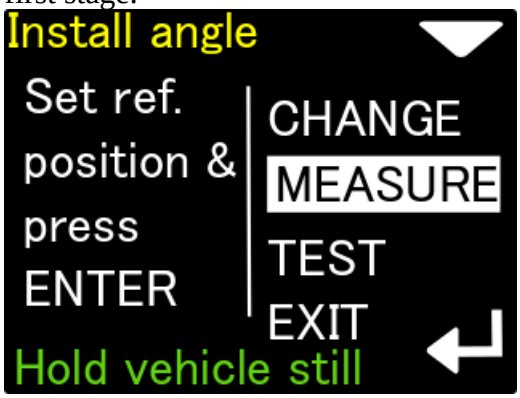
To set this parameter, go to MENU → SETUP → Compass → Install angle. The ENC console display will show the following:

The current value of Install angle is shown



The lower button allows you to cyclically change the installation angle: - 20 / - 30 / - 40 and again -20 ...
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)

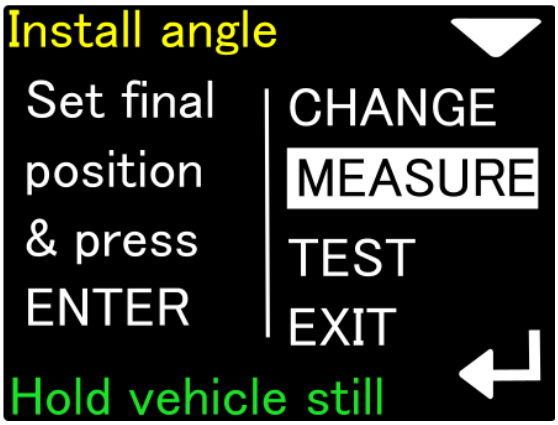
Measurement of non-standard Install angle value - first stage.



Attach the ENC 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.

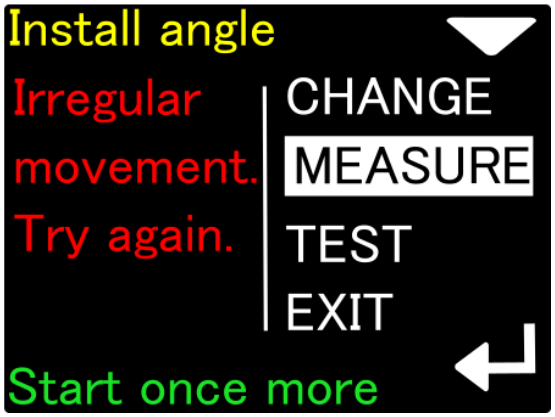
Second stage of Install angle measurement.

If during the Install angle measurement our scooter



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

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 (-20, -30, -40), and then test if the selected value corresponds to our case.

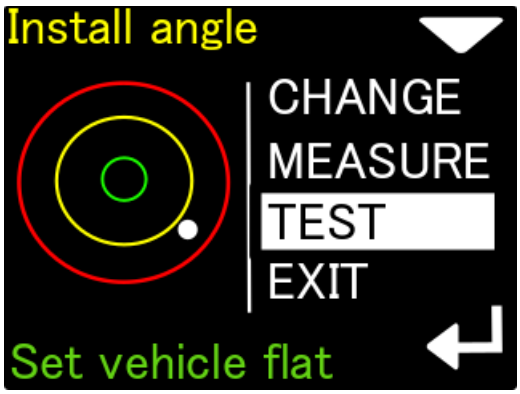
To do te test:

- attach the ENC 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 -20 and it should be -30 degrees).

Compass declination and deviation

On the Compass settings screen

Declination - Allows you to set the magnetic declination appropriate to your location. The declination is related to the displacement of the magnetic pole relative to the geographical pole and its value changes both in time and depending on the location. The declination value will be added to the compass readings on the screen and will be included in the position calculation. The declination called E (eastern) has a positive sign, while marked western (W) has a negative sign. The declination value appropriate for a given location can be determined from many official sources, e.g. on the Internet. The declination should always be set last, after performing all necessary calibrations (normal and - optionally - precise).

Notice
 If you plan to set the Declination value, highlight it first, then press the lower button. You will be able to set the +/- sign first (by pressing lower button), then use upper button to change focus on the first digit. Change value of the selected digit by pressing lower button 0→ 1→ 2→ ..→ 9→ 0→ .. . When you leave this field (using upper button again) the value will be stored in memory.

Deviation – Set magnetic 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.

Caution!
 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.

Clear data – clearing the memory

The option is used to delete all data records from the internal memory. The user will be asked to confirm this operation. After using this option, it is recommended to turn the device off and on again. This option does not delete the settings.

Factory reset – settings 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

Exit – exiting the settings

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

TIPS FOR INSTALLING THE ENC3Pro CONSOLE TO THE UNDERWATER VEHICLES

In order to guarantee proper operation, the ENC3Pro console must be stably mounted on a scooter or other underwater vehicle in accordance with the provided instructions for a given type of device.

The ENC3Pro console can be mounted to FUTURE/GHOST/TAC underwater scooters as follows:

Mount directly on the Seacraft scooter.

The console should be mounted at a distance of 120-300mm from the nozzle edge on the transport or dedicated handle, vertically, with a maximum deviation from the vertical of approx. 35 degrees. The log should be mounted vertically. The console and log should be assembled for transport purposes.

Caution!
When the console is attached to a vehicle in this way, the proper value of the Compass settings / Install Angle parameter is very important.

Installation for other underwater vehicles.

If the ENC3Pro console is to be used on other underwater equipment, please contact the manufacturer to determine how and where it should be installed, and the installation procedure.

Caution about restrictions!
• The ENC console should be at least 0.2 meters away from any potential sources of magnetic field (motor housings, high-power batteries, permanent magnets, current transfer wires over 0.5A, magnetic steel parts, etc.). Failure to comply with this rule may lead to erroneous console compass readings. • - The compass readings may have a significantly reduced accuracy if its deviation from the vertical (after mounting) or tilting the scooter exceeds 35 °. • - The speed sensor (log) should be placed in such a way that other equipment elements do not disturb the water stream that flows through the log measuring element. Failure to comply with this condition may introduce excessive distance / speed measurement errors or even prevent the sensor from working.

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 training.

Auxiliary glossary of phrases and terms used in the descriptions and menus of the ENC3Pro console.

Due to the limited possibilities of presenting information on the small screen of this device, many entries have been shortened and/or simplified, and the only interface language currently available is English.

For ease of use, the following table lists some of the most important words in the device menu along with their context of use

Term	Meaning
Target, Destination (Dest.)	Parameters determining the goal we are aiming for
Dive Plan	Plan in the form of waypoints with a defined sequence of occurrence (ordered list)
Route	All parameters that can be measured during dive (location, depth, speed) together with time marker are combined as Route container in the device internal memory.
Azimuth (Az.)	Compass course (heading), takes into account declination and deviation
Distance (Dist.)	Shortest length between 2 points
Waypoint	Component of Dive Plan. Each Waypoint can be selected as temporary Target when operating in DivePlan Mode.
Markpoint	Component of the Route. When you switching from the REC to the HOLD state, new Markpoint is stored inside the current Route.

Return	Go back to start point
Navigate	Program and go to your goal
Clear (Clear target)	Clear (cancel target setting - delete values)
Home	Starting point (origin)
M (ai-M)	End point, final target
Part	Part (e.g. 1 of 3 parts of the coordinates in the MGRS record)
Item	Element (e.g. single digit)
Set	Change value

Troubleshooting

Symptoms	Cause	Solution
The device cannot be turned on. The screen is dark, the red LED above the screen does not flash when the buttons are pressed.	The battery is completely discharged.	Connect the charging device for at least 30 minutes.
	Damaged device (flooded, charged from an inappropriate source) - no reaction to charging.	Must be sent to the manufacturer's service.
The device turns on and off alternately.	One of the internal transducers is damaged.	Connect the charging device for at least 1 minute. If this does not help, leave the device alone until the battery is completely discharged. Then charge the device and check its operation.
After switching on, the message "Battery is low!" Is displayed and the device switches off automatically.	The battery is discharged in a way that prevents further safe operation.	You must charge the device.
The loading process does not end. The charge indicator does not reach 90%.	Internal battery defective.	Factory service required.
	Damaged charging cable or dirty contacts.	Rinse the contacts gently with isopropyl alcohol. Check that the charging cable is not cut or crushed. You may use compressed air to remove dirt and/or water from the contacts if they were flooded by accident.
	The charging source is too weak.	Connect the charging cable to a different power source. You can use any USB port on your computer or laptop.
The depth display is 0 and never changes. The depth indication is incorrect	Pressure transducer defective.	Go to Settings --> Pressure / salin. If the pressure reading (without immersion) is close to 0, the transducer is damaged and the

		device should be sent to the manufacturer's service.
The device does not turn on automatically after immersion in water.	The pressure transducer gap is clogged with dirt or mud	Wash the device under a gentle stream of warm, fresh water. Repeat until the symptoms disappear. You may leave the whole device in the warm fresh water (30-40°C = 86-104 F) for 1-2 hours to dissolve salt in the pressure chamber and rinse in fresh water after that.
An external log is connected, but the speed is not displayed.	Incorrect connection of the log plug or dirty contacts.	Disconnect the log plug from the device. Examine the contacts carefully. If soiled, proceed as if you were having trouble charging the battery.
	The console works in Const speed mode.	Go to Settings --> Log / Speed, and set the correct mode (see chapter 16)
	Log connected to the improper socket	Log should be connected to the lower socket (opposite to the lower button – REC/HOLD). Socket is marked as USB/LOG.
Compass is showing improper readings	Calibration required	The calibration procedure is described in sections 13.1 and 13.2
	There is a strong source of constant magnetic field nearby	Remove objects that may be the source of magnetic interference from the ENC console environment or move the console to another location
	Compass sensor damage	The device must be sent to the manufacturer's service.
	The compass sensor has been overloaded	Turn off the device. Wait 10 seconds. Connect the charger for at least 10 seconds. Check that the device has returned to normal operation.
No GPS readouts – GPS icon is red	Broken GPS sensor	Go to the GPS check screen described in chapter GPS – checking GPS receiver. Check if (after 15 seconds) a green circle is blinking at the bottom of the screen. If not – GPS sensor is not responding.
	Broken or disconnected GPS cable	Verify if the GPS wire is in good condition, all plugs are connected and tightened. GPS cable should be connected to the upper socket (marked as GPS).

No GPS readouts – GPS icon is gray	Too much strong radio interference	Try to change location. Go away from strong electromagnetic devices (big electric powered machines, radio- or cellphone relays, etc).
	GPS receiver is locked in computations (received damaged data)	Reset the GPS receiver as described in chapter GPS – checking GPS receiver

CAUTION!
It is recommended to completely review the device's functions after 36 months from the date of purchase and then every 24 months thereafter.

Notice
It is a good idea to check the manufacturer’s website www.seacraft.eu and its F.A.Q. page, for information about well-known troubles and ways to manage with them. Some of the problems experienced by users are simply due to the limitations of available technology and the prevailing laws of physics, which cannot be challenged.

Auxiliary Windows® software- installation

In order to take full advantage of the device's functions, you need to install the support software and drivers provided by the manufacturer. The software is provided in the form of a physical medium or network location, depending on the capabilities of the equipment owned by the user.

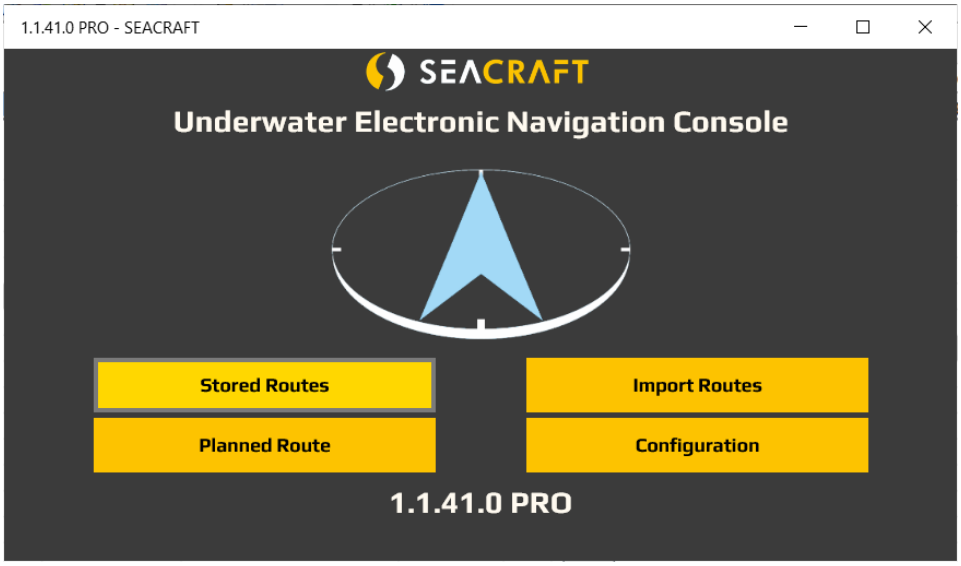
The minimum requirements for the computer on which this software will be installed:

Operating system	Microsoft Windows 10 and 11
Cable connection	USB type A socket in 2.0 standard or compatible, adapters can be used as well
Bluetooth connection (not required)	Bluetooth in version 4.1 or above, may require manual device pair in Control Panel
Internet connection	Required for displaying maps

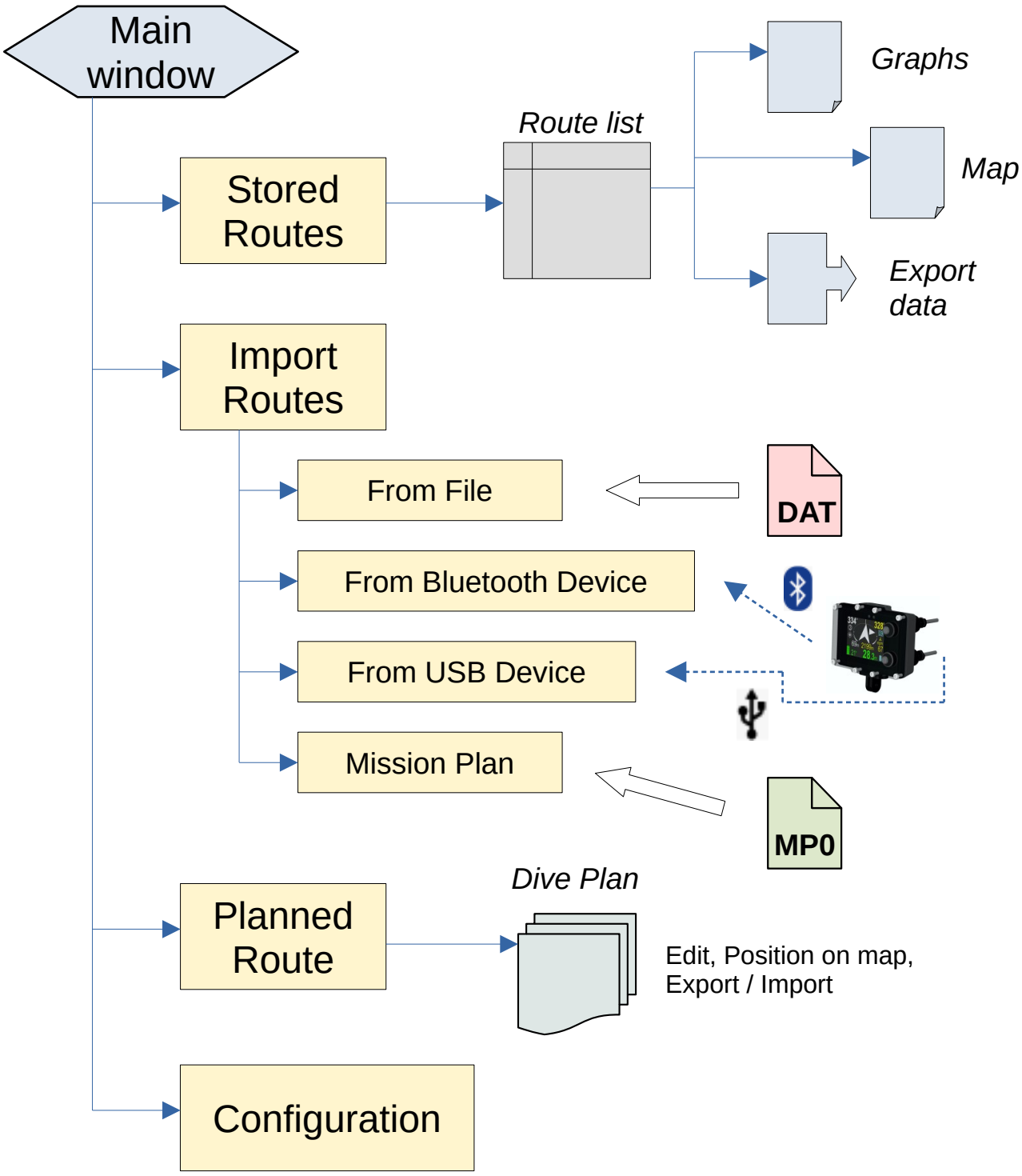
Notice	
	For ease of reference, the helper software described here will be referred to as the "Seacraft application," "application," or "software" hereinafter.

Auxiliary software usage

After starting the Seacraft application, the main program window looks like the figure below:

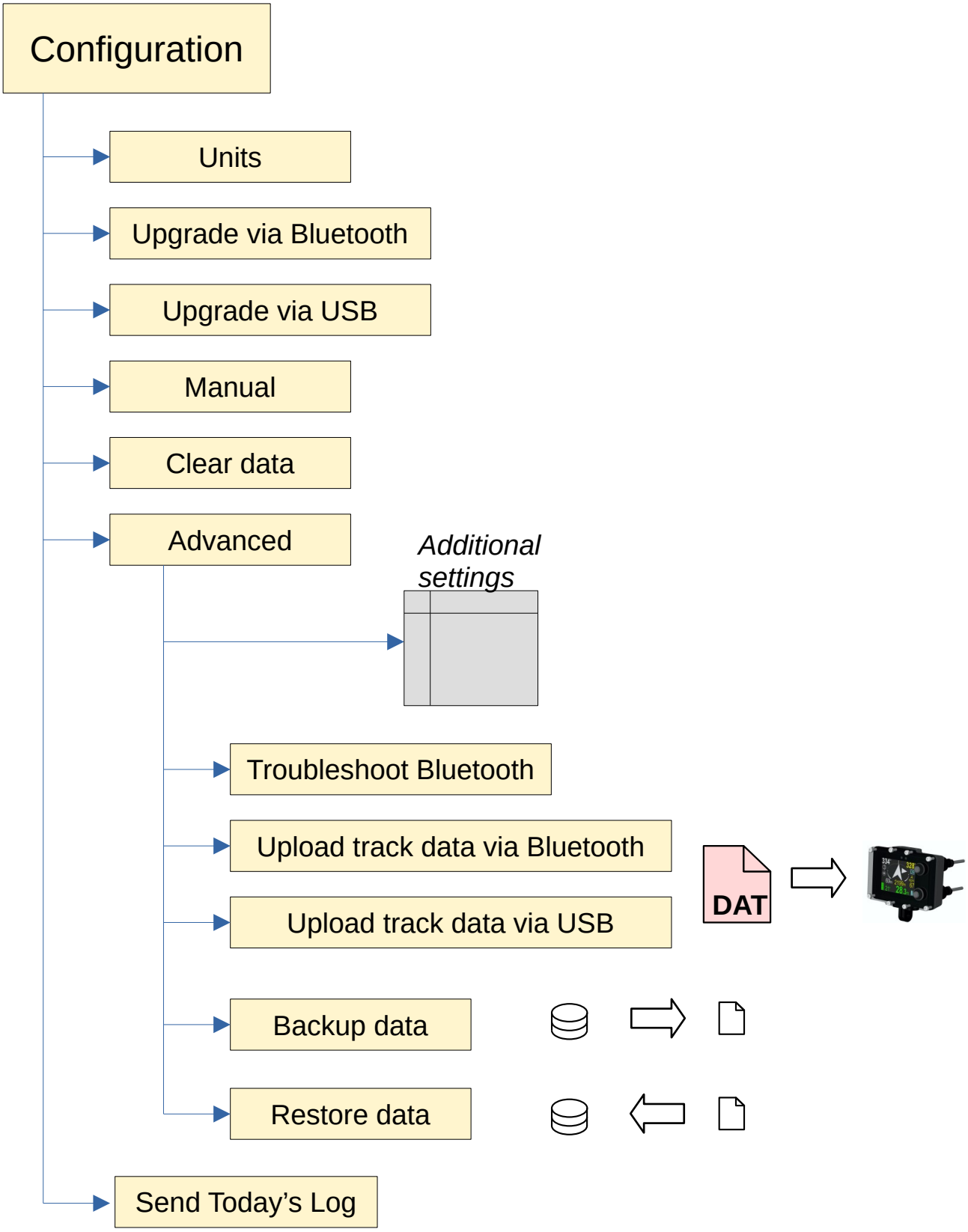


The application control menu can be briefly presented as an operation tree (below):



The **Configuration** section allows to customize the application to the user needs and also contains some additional functions (database backup) which are seldom used.

Below you can see the **Configuration** menu structure :


Configuration
Units
Upgrade via Bluetooth
Upgrade via USB
Manual
Clear data
Advanced
Additional settings
Troubleshoot Bluetooth
Upload track data via Bluetooth
Upload track data via USB
DAT
Backup data
Restore data
Send Today's Log

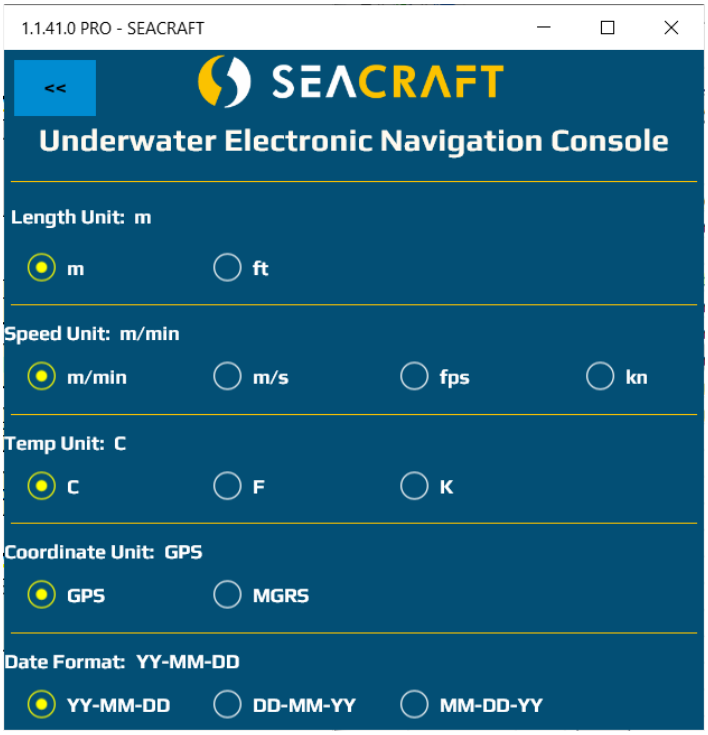
More detailed information about some of the commands listed above you can find in the table below :

Command		
Stored Routes		View and edit records downloaded from the ENC3Pro console to your computer
Import Routes		Downloading route records from the ENC3Pro console to your computer
	From File	Downloading records as a file (e.g. sent by someone else, from another computer)
	From Bluetooth Device	Downloading data directly from the connected ENC3Pro console using the Bluetooth (wireless)
	From USB Device	Downloading data directly from the connected ENC3Pro console using the USB (cable connection)
	Mission Plan	Import Mission Plan from file (e.g. sent by someone else, from another computer)
Planned Routes	Show GPS/Bearing	Planning mission routes, Switching between GPS planning mode and planning mode in the form of 'Distance-Azimuth'
	Save and Export Route	Save the Dive Plan as a file – it can be shared with others (e.g. via e-mail)
	Import MP	Import the Dive Plan from file (e.g. sent by someone else, from another computer)
	Send Bluetooth	Send the Dive Plan to the ENC using Bluetooth
	Send USB	Send the Dive Plan to the ENC using USB cable
	Map	Display the Dive Plan on the map
		View – just show the Dive Plann Edit – allow to add or remove points Change Start – allow to move the Start Point by dragging the map
	New	Clear the current Dive Plan and start from the beginning
Configuration		Program settings
	Units	Units of measurement used in the program
	Upgrade via Bluetooth	Firmware update of the ENC3Pro console using the wireless Bluetooth connection
	Upgrade via USB	Firmware update of the ENC3Pro console using the USB connection
	Manual	Display application help
	Clear data	Deleting all data collected in the program
	Advanced	Advanced settings *)
	Send Today’s	Sending information on data transmission *)

Log

*) elements marked in this way should be used only to find the cause of technical problems with the application, if they occur. They should be used in consultation with the Marine Tech technical service.

Once installed on your computer, it's best to start working with the Seacraft application by configuring its settings. The configuration screen is shown below



In the upper left corner of the application there is a button << that allows you to return to the previous (parent) screen. This property is present in all Application windows.

Length unit - unit selection for length (meters, feet)

Speed unit - unit selection for speed (meters per minute, meters per second, feet per second, nautical knots)

Temp unit - temperature unit selection (Celsius, Fahrenheit or Kelvin degrees)

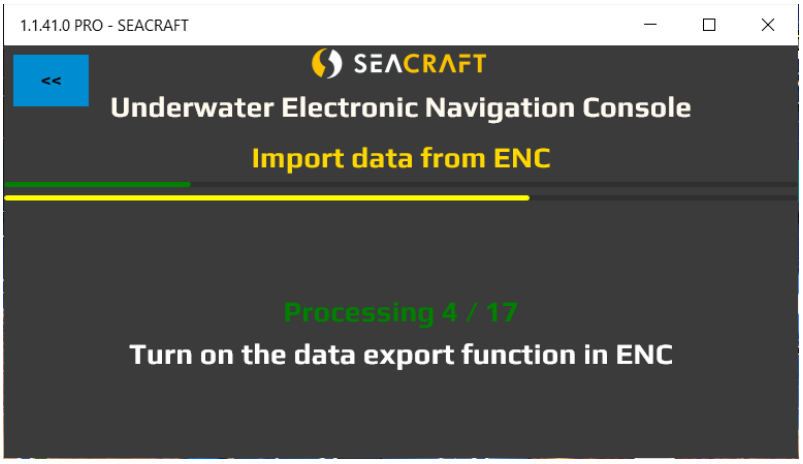
Coordinate unit - choice of coordinate presentation method (GPS - geographical degrees, MGRS - Military Grid Reference System)

Date Format - date and time display format (DD- day, MM-month, YY-year) The set values are remembered when exiting this window to the parent screen.

IMPORTING THE DATA TO THE SEACRAFT APPLICATION

Importing data to the application can take place in two modes: from file and from the device. Importing from a file is limited to the file whose data is to be processed (e.g. sent to us by another operator or copied from our own archive).

Importing data from the device requires an ENC3Pro console connected to the computer with the Send data mode enabled. After fulfilling this condition and selecting **Import Routes → From Device** in the Application, the Application screen will look like this:

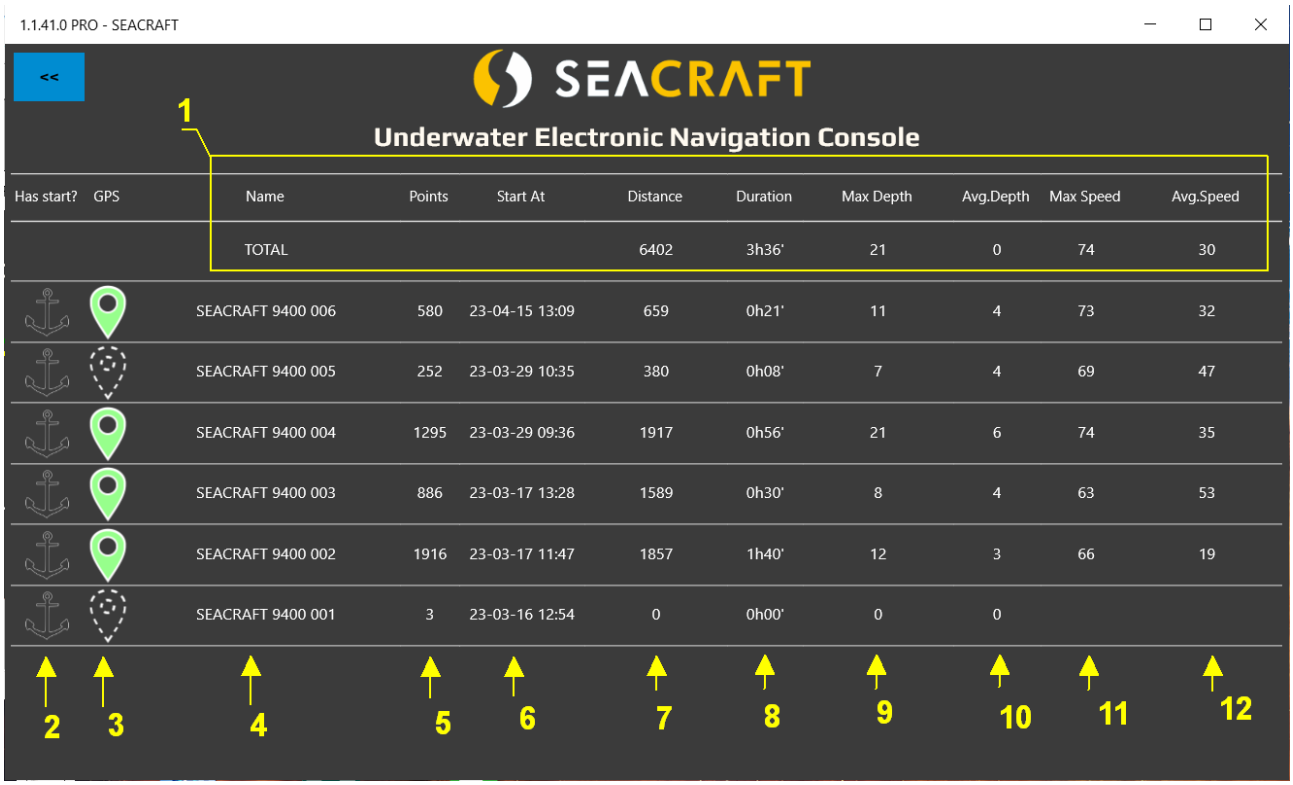


The screen shows the transfer progress of all records (green line), the progress of the current item transfer (yellow line). After importing all the required elements, the word **TRANSFER COMPLETED** will appear in green. You can then end the operation with the button << (left, top).

Caution!	
	The ENC3Pro console can store 50 entries in memory. Position and depth data are recorded independently of the GPS data, although they have the same marker (record number). For example, if a record of 10 routes has been stored in memory, the application may indicate to us that it processes 10, 11, 12 or even 20 files. If each record has an additional GPS measurement, the number of downloaded files will be twice as large.

PREVIEW AND EDIT OF DOWNLOADED ROUTES

All downloaded data can be viewed in the section called Stored Routes, available from the main screen of the application:



The meaning of the individual elements on the above screen:

1. Table headers. By clicking on a given header we sort the data according to this size (once ascending, once descending)

2. The green anchor symbol means that the route has been positioned on the map.

3. This symbol, when green, indicates that the downloaded route had GPS data recorded

4. The route number it had in the device's memory.

5. Total number of records (separate registered data sets) accumulated for a given route

6. Route start time, according to the clock of the ENC3Pro console

7. Total distance traveled

8. Duration of the route - the difference between the time of the last and first recorded data record

9. Largest depth measured

10. Average depth

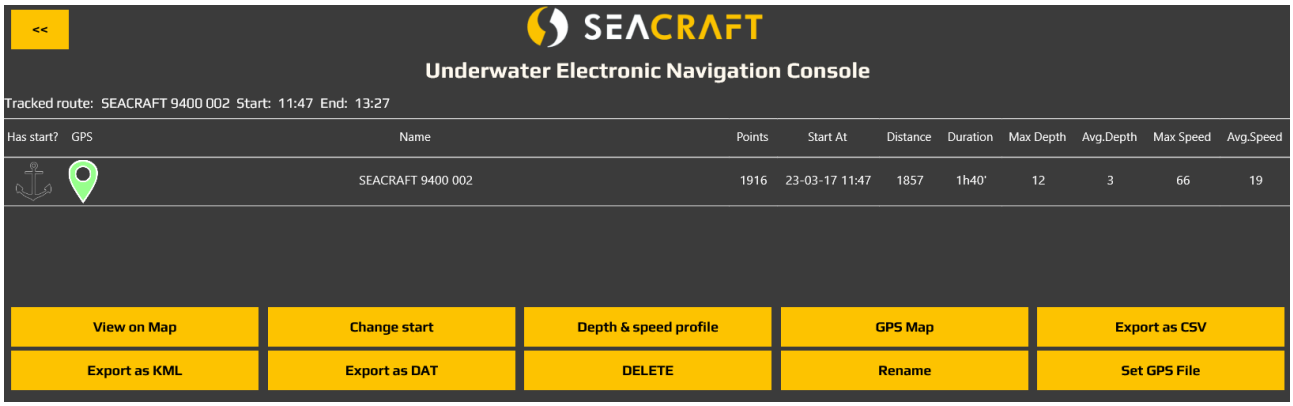
11. Highest measured speed

12. Average speed

Caution!	
	The application always downloads only the data from the ENC console that it does not yet have in its database, which allows you to finish downloading data without having to re-import already existing routes.

The application does not distinguish data in terms of which console they come from. The data is identified based on the route number and its start time. Keep this in mind if you connect different ENC consoles to the same computer. Downloading routes from the ENC console's memory to the application does not cause the ENC console's memory to be emptied. To delete routes from the ENC console, use the commands available in the device menu.

After clicking on the selected route in the window with the list of routes, we move to the following view:

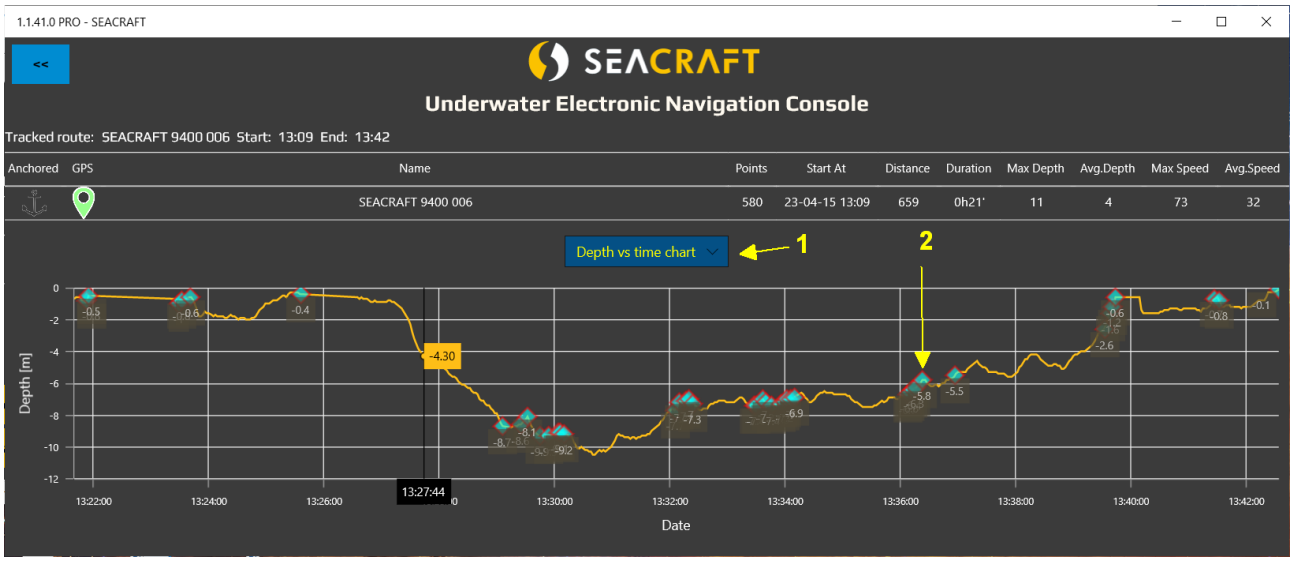


Buttons operation:

View on Map - allows you to display on the map (without editing) all route points connected by a line. Yellow (orange) line will show the route based on compass and log readouts. You could use **Show GPS** button to show raw GPS readouts with different color (white line).

Change start – by moving the map you can position the chart relative to known landmarks of the area. In this mode you can also adapt the scale and compensate compass readouts (see arrows 6,7)

Depth & speed profile - shows a graphic representation of data in two dimensions, drawing the dependence of depth on time and speed on time:



1 - Use this drop-down list to choose the chart type: depth versus time, depth versus distance, and speed versus time

2 - Blue dots indicate the location of the markers - places where the REC / HOLD function was used while driving.

GPS map - shows GPS record (if it exists) in the form of points on the map connected by a line.

Export as CSV - data of the current route (without GPS records) will be saved as a CSV file, which can be easily imported into e.g. spreadsheets.

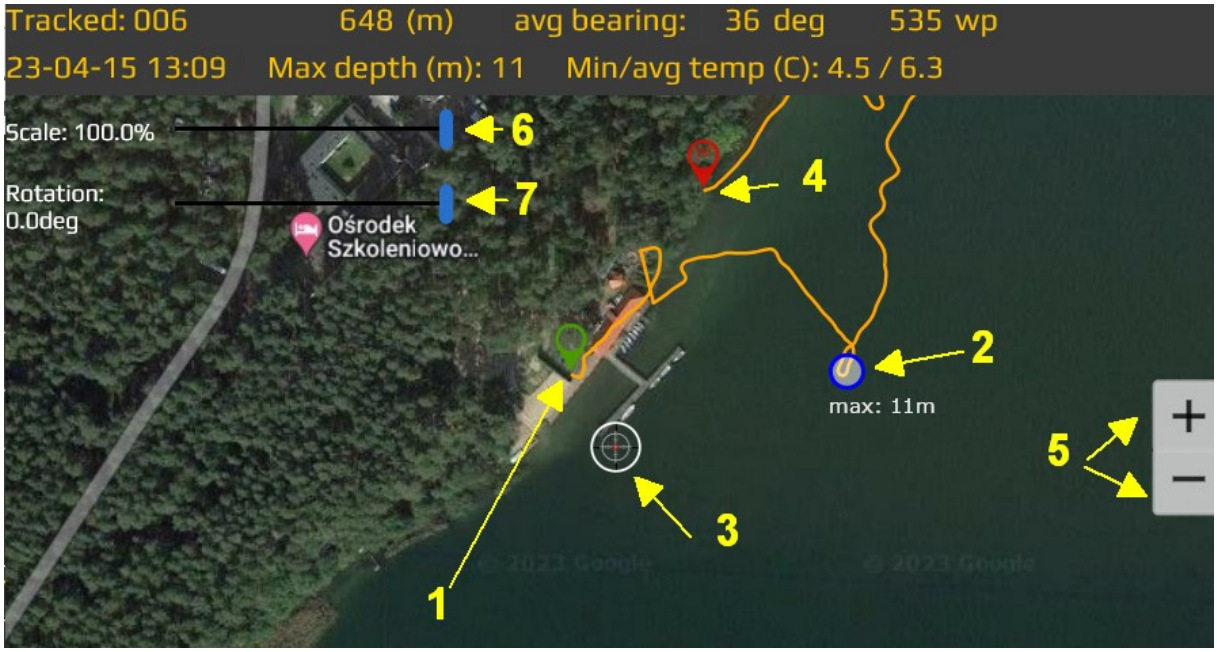
Export as KML - data of the current route (withGPS records) will be saved as a 2 KML files, (separate file for GPS readouts).

Export as DAT - data of the current route (without GPS records) will be saved in the form of a binary file that can be archived or sent to another person who has the application (e.g. for comparison or evaluation). The data is saved in the own format of the ENC console (not suitable for external processing).

DELETE - will delete the current route from the application database.

Rename – you can give your own name for the route. This name will be used in this application and for the exported files.

Setting the Start Point - The ENC3Pro console stores the data of the traveled route as a set of relative coordinates, which may or may not be associated with GPS records. To correctly display such a record on the map, you must indicate the actual location of its first point. This is done by clicking on the map displayed, and this process is known as route anchor. The anchor point can be changed many times. During the route anchoring procedure, the application screen looks like the picture below:



1 - Route start point (anchor) - green mark : first guess based on GPS readouts

2 - Deepest point - dark blue circle

3 – Route start – location set by user (based on what he/she remember)

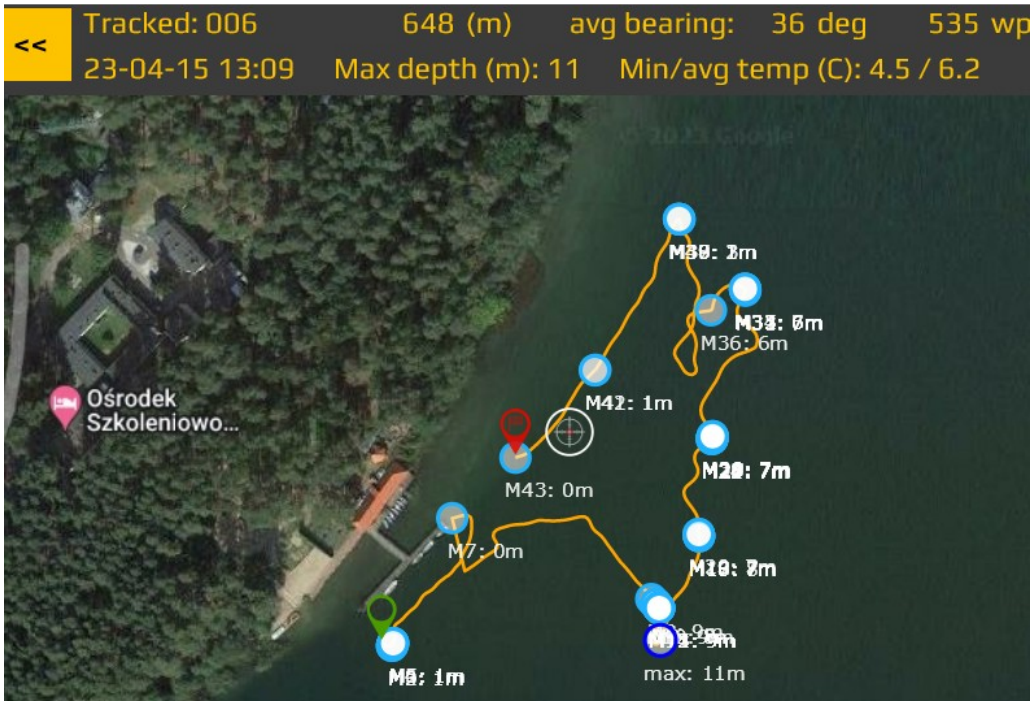
4 - Last route point - red circle

5 - Map zoom control buttons

6 - Scale adjustment slider

7 - Direction adjustment slider

And after the Start Point is set, you will see the same route as below :



Caution!
Use the Scale slider if you realize that our log has been calibrated incorrectly or there is a disturbance in its operation. In this case, the recorded distances may be proportionally too small or proportionally too large in relation to reality, and scaling will help to adjust them. The Rotation slider allows you to rotate the route graph by a fixed angle. This function is useful when the compass declination is set incorrectly or if an external factor caused a deviation of the compass readings. In this case, the rotation of the chart allows you to compensate for device calculation errors, the causes of which we have not noticed before. Please note that in order for the recorded route to be correctly plotted on the map, the ENC3Pro console compass must have the magnetic declination set correctly for the location before diving. The above actions will only have effect for plotting a map and generating a KML file. The export of binary data, despite the introduction of the above corrections, will not change, as it is assumed to be unchanged data, always reflecting the true content of the ENC3Pro console memory.

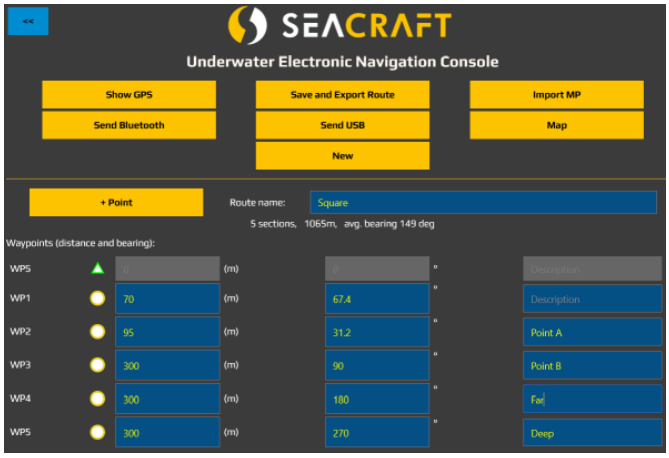
MISSION ROUTE PLANNING

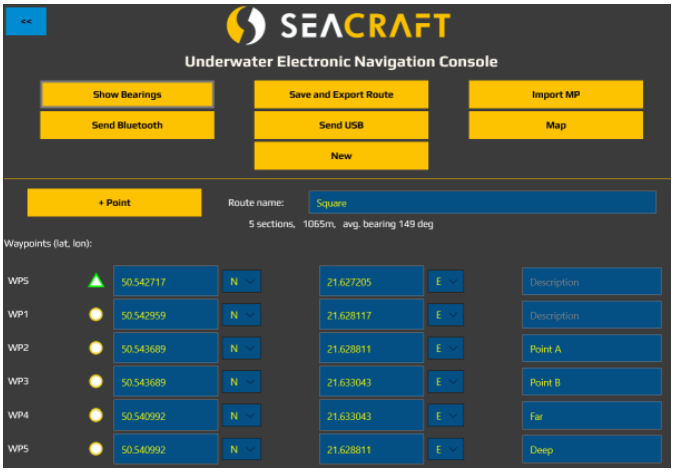
Using the Planned Route command, available from the main application screen, it is possible to plan a mission consisting of a maximum of 5 stages, save it as a file (for archiving or sending to another operator), as well as sending it to the connected ENC3Pro console.

Each mission should have a strictly defined (in the form of GPS coordinates) starting point. You cannot plan a mission without entering the coordinates for this point.

The mission may have an individual name. This is a descriptive field whose value can be up to 16 letters long and is not used in any calculations.

The mission must have at least 1 point different from the starting point. This point will be called the stage for the purpose of this manual. The coordinates of the stage can be specified in the form of GPS / MGRS coordinates, a pair of numbers DISTANCE + AZIMUTH (counting from the previous point) or in the form of clicks on the map. An example of the mission plan in the application is shown in this figure:





On the left you can see the application screen with the planned mission consisting of 3 stages, when we give them in the form DISTANCE + AZYMUT. On the right the same mission when we use the Show GPS button - saved as latitude and longitude coordinates.

WPS means the starting point (S) and always has the coordinates 0.0 (DISTANCE, AZIMUTH).

WP1 means the point visible with the number 1 in the ENC3Pro console (and so on). The ENC console always shows the last stage of a scheduled mission as M, regardless of what the application calls it.

Planning a new mission should always start with completing the Route name field, which is the mission description. Then click the Map button, which will display the window as below and access the functions:

View - preview of the route plan on the map

Edit - changing the location of mission stages in a graphic way directly on the map

Change start - definition of the starting coordinates (first point - M) by clicking on the map.

An example of a planned mission is shown in the next figure. As you can see on it, the beginning of the mission is marked with a green marker and the end point - with a red marker.

The individual stages of the mission are connected by a straight line for the user's convenience. The course of this ideal line in this case will certainly not correspond to the actual course of the mission, because it crosses the land area. This is a good example to make the user aware that when planning a mission, only points marked as stages are really important. The role of the ENC3Pro console is to indicate their direction and distance (relative to the current actual position of the diver), and the device operator can choose the route in accordance with the possibilities offered by the real shape of the underwater terrain.

Firmware updating

To use this function, it is necessary to have an update file (hereinafter referred to as ROM file), which should be provided by the device manufacturer (e.g. by e-mail or from the official website). To prepare the update file, the user may be required to provide the serial number of the device / devices. The resulting ROM file should be saved on the computer where the Seacraft application is installed in an easily accessible place.
Before you update the ENC3Pro console firmware:

– the console should be charged to at least 50%;
– the computer must have a stable power source that allows at least 15 minutes of uninterrupted operation;

– connect the console to the computer using the supplied USB cable;
– in the console MENU find the SETUP function and then select the Data transfer option and run it, the computer should display information about connecting a new USB device;
– start the support software and select Configuration → Upgrade;
– indicate / open the ROM file containing the correct update;
– wait for the update process to finish, and then check in the console MENU whether the program version has changed as expected. If the change has not occurred, the process should be repeated;
– after updating console software, check the correct operation of the function and device settings (SETUP).

When updating the software, the application screen looks like the figure below:

The progress bar and green text show the progress of the operation. When the data transfer is complete, the ENC console will restart automatically and start installing new software. This process may take about 1 minute.

TROUBLESHOOTING FOR FIRMWARE UPDATES

If the operation fails, follow the instructions below:

Symptom	**Solution**
The update process in the application has stopped for a longer period than 1 minute.	Press STOP on the ENC3Pro console to safely stop the data transfer operation. Disconnect the console from the computer and turn it off. Restart the application. Restart the console, enable data transmission, connect it to the computer and start the update procedure again.
The software has not been updated (the software version indicated by the console has not changed)	The update file was incorrect or was damaged during transfer to the device. Repeat the update procedure. In case of another failure, please ask the Manufacturer to send the update file again.
One of the sensors (compass, depth) works incorrectly after updating.	The upgrade process caused the sensor to be handled incorrectly in a way that blocked it. To unlock the sensor: – turn off the ENC3Pro console, wait 10 seconds, connect the

	charging cable to the console and the power source, charge for a minimum of 10 seconds, check whether the procedure helped, or – leave the ENC3Pro console turned on until the internal battery is completely discharged; To be sure, wait 1 more hour, charge the device for a minimum of 30 minutes, check whether the procedure helped.

Caution!	
	If it is necessary to interrupt the update procedure, always first use the bottom button on the ENC console (STOP) to interrupt the process. After the update is complete, when the ENC3Pro console restarts: – check the software version number (it should change according to the number that was marked with the update file); – check all console settings (new options may have appeared); – read the new instruction manual for the device (if the manufacturer has provided a new instruction manual).

Normal maintenance

Wearing-out parts (have to be inspected and replaced if there is a need to):

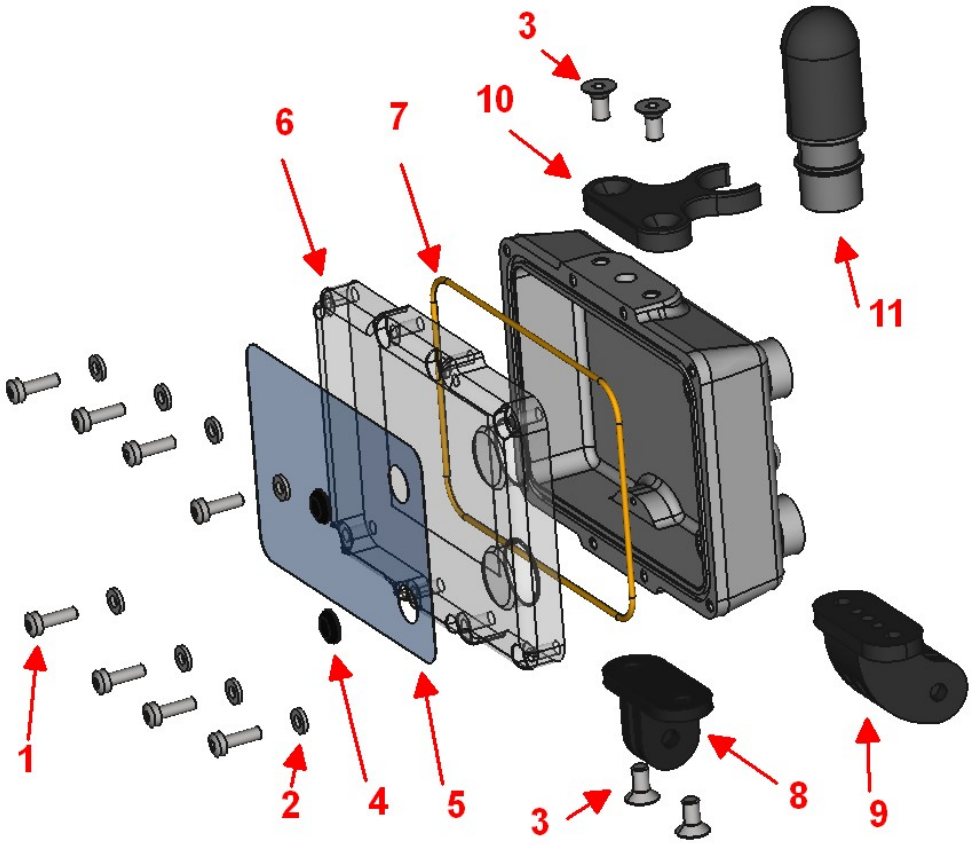
Item	Replace if
Front screen protection foil	scratched, hazy, sticks out
Rubber overlays on buttons	drops off / moves
Mounting screws	rusty, turns hard, loosens up
O-ring seals	discolored, loose, frayed / cut, not circular in shape
Log propeller	jams, broken arms, noisy, unbalanced
Log or GPS cable plugs	Noticeable green rust on electric contacts, broken or bent pins, secure nut loosens up or cannot be tighten
Log or GPS wire	cut deeply, worn outer insulation, visible break or crush
GoPro mounting bracket	visible cracks

Recommended maintenance schemes

Before first use	• Make sure you have all items you need and you can identify their purposes • Read out this manual remembering how do you plan to use this device • Charge the device for 2 hours at least • Optionally – clear all data from the ENC (will erase files from factory tests) • Connect the GPS receiver and the log sensor and check if they

	working properly • Fit the device on your underwater vehicle; make sure it won't drop off or move in unpredictable way, and the wires won't cause any troubles • Check and correct the date and time • Verify the Install Angle setting – see the chapter Compass Install Angle setting • Verify important settings : operation mode, Auto-ON, Auto-Off, … • Check in water if the depth gauge is working • Calibrate the compass (recommended way - with the vehicle) • If the accuracy is important for you, calibrate also the log sensor (if not – make sure it has default calibration coefficient programmed) • Note your favorite settings for future use
Before each use	• Check the battery level – recharge if needed • Download all routes with important data – to the PC or to the mobile device. This will prevent ENC from erase important data if the memory become full (overwrite will happen if you have 50 routes stored in memory). You may also manually erase routes with old or unimportant data. • Check if all plugs are tightened and the device is fixed to your vehicle in a safe way. • Blow into the log sensor propeller when ENC is on – you should see some speed on the main screen (sensor is working) • Go to the GPS screen and wait 15 seconds – you should see animated green circle if the GPS sensor is OK
After long disuse / return from loan or international shipment	• Visually inspect all wires and connectors, looking for damage marks, dirt and corrosion marks • Make sure no item is missing • Check if the front cover glass have cracks near the screw holes (should be none) • Check power on, charging, log and GPS work (as described above) • Verify the settings – compare with your notes • Check date / time • Delete unwanted routes from the memory
Once per year or sooner	• All described above and also : • Fully charge the ENC (leave connected to the charger for at least 2 hours, ignore the "Fully charged" message and depend on the clock only) • Inspect all sealing parts (o-rings), clean with soft wet cloth if soiled, lubricate with small amount of Vaseline, replace if the o-rings are damaged or deformed • Use compressed air to blow out any dirt from the sockets and plugs (if you find any)

ENC3Pro parts and accessories list



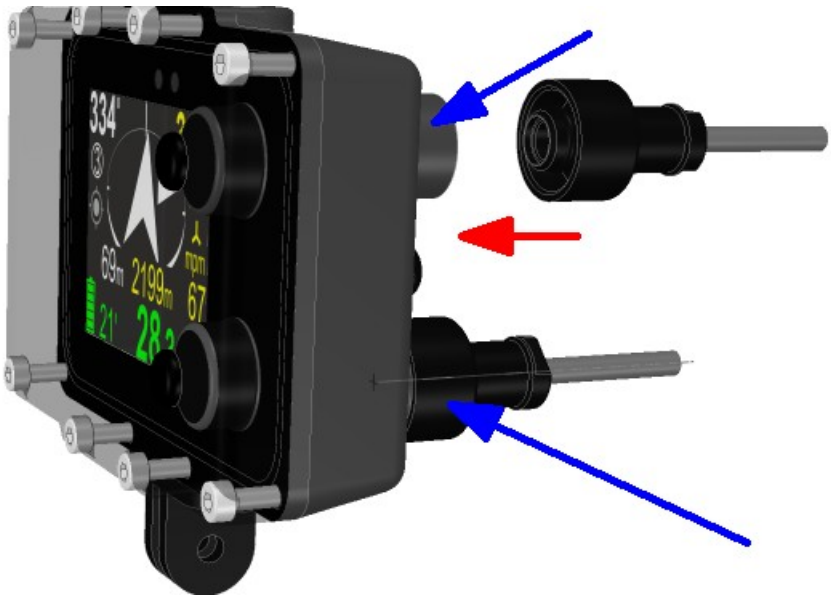
LP	Name	Serviceable by user	Comments
1	Screen cover screw (M3x12)	Not recommended	8 pcs / 1 ENC3Pro
2	Screen cover washer (M3)	Not recommended	8 pcs / 1 ENC3Pro
3	Holder / bracket screw (M4x8)	Yes	2 pcs for each holder/bracket
4	Rubber button	Yes	2 pcs / 1 ENC3Pro
5	Screen protective foil	Yes	
6	Screen cover	Not recommended	
7	Screen cover o-ring	Not recommended	
8	Mounting bracket straight (2 arms)	Yes	
9	Mounting bracket curved (3 arms)	Yes	For KIPP screw
10	GPS holding bracket	Yes	For use with 0.1m GPS cable
11	GPS module type B	(not applicable)	

Notice
Depending on other mounting equipment one can use mounting bracket 8 or 9, whichever fit best.

Before every dive…

Make sure your device is sufficiently charged. Turn on the device and check the important settings, including the date and time displayed by the navigation.

Before immersing in water, check that all connectors are fully inserted (red arrow) and that their nuts are fully tightened. Tighten the union nuts without using tools. If there is residue on the threads of the joints, remove them by rubbing the thread with a cloth moistened with clean water (blue arrows).



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