Data Logs - Data Recorder

One of EVOLUTION's main features is the automatic and unlimited recording of all sailing data.

This document describes concepts related to "Data Logs" and the procedures for extracting and using the stored information.

Data Logs

Data logs are files where EVOLUTION stores data obtained from instrumentation, calculated by the system, or entered manually.

The system records the complete boat data every second. The recording starts automatically when EVOLUTION receives the first data item from the instruments and stops when EVOLUTION is closed.

Where are they Stored?

EVOLUTION stores these files in the "Data Logs" subfolder under the yacht folder. For example, for the yacht "ESP-6848 Viking IX" the Data Logs are found in:

> C:\ProgramData\EVOLUTION\Yachts\ESP-6848 Viking IX\Data Logs

Each recording (log) consists of a pair of files: one with a .data extension that contains the information and another with a .index extension that provides access to the data for a specific point in time. Both files have the same name. For example:
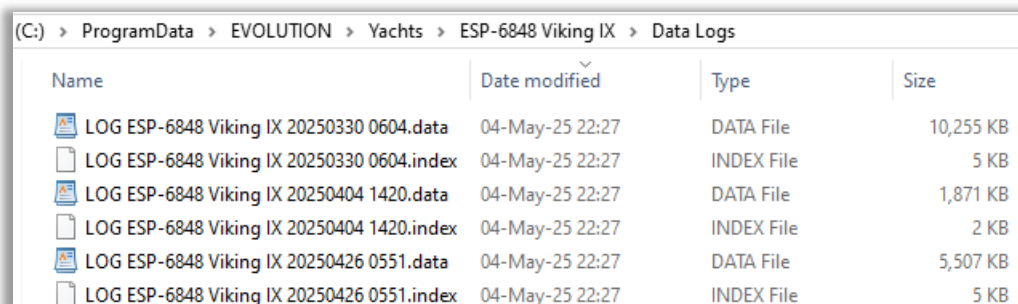
> LOG ESP-6848 Viking IX 20250328 1503.data

> LOG ESP-6848 Viking IX 20250328 1503.index

Where "20250328 1503" represents the UTC date and time (year, month, day, hour, minute) on which the recording began.

These two files should be treated as a single unit. EVOLUTION does not recognize the other as a valid log if one is missing. Additionally, the system validates the files' names, so you should never change them.

Beyond these restrictions, these files can be treated like any other file. They can be compacted and archived for safekeeping and deleted using Windows File Explorer.

The accumulation of logs does not degrade EVOLUTION's performance; however, it is advisable to maintain the Data Log subfolder and eliminate insignificant recordings.

EVOLUTION records Data logs using an efficient data compression mechanism, requiring only about 1 Mbyte for each hour of recording.

What are Data Logs used for?

EVOLUTION uses the Data Logs in several ways:

- To show the sailed track on the "Chart" page. Please check the Nautical Chart manual.
- Create and display the wind plot and analysis on the "Wind" page.
- Extract sets of data items using the "Tools→Extract Data from Log" function, detailed in the next section.
- Allows you to reproduce sailed segments using the "Tools→Replay from Log" function.
- Export all data items relevant to specific data analysis services (i.e., Njord Analytics).

EVOLUTION writes and reads files using a proprietary encoding algorithm, making their direct use impossible.

Can I Copy Data Logs to other Computers?

Yes! You can move the .index and .data files to other EVOLUTION installations, where all the options mentioned above will be available. A system license is not required in the receiving computer; full functionality will be accessible.

Please take into consideration the following:

1. EVOLUTION must be installed on the receiving computer before it can be used. As always, ensure you have the latest version of the system.
2. The yacht folder must retain the same name as in the original installation, as it must match the .index and .data file names exactly. Thus, yacht folders or log files should NEVER be renamed!
3. The log files should be placed in the "Data Logs" folder on the receiving computer.
4. Zooming in for detailed track analysis is impossible if the computer lacks C-MAP cartography for the navigated area. An alternative is using the "World Shoreline" cartography option in "Chart Options."

Extracting Information from Data Logs

This section explains how to access logs for specific information. The procedures relate to the "Tools→Extract Data from Log" menu option.

The information obtained from the recordings has countless uses. Some common examples include:

- Instrument calibration.
- Polar curves verification and adjustment.
- Analysis of how the boat is sailed.
- Exploring how the boat's specific settings affect its performance.

Log Extract Form

The Extract Data from Log form, displayed by selecting "Tools→Extract Data from Log", controls data extraction functions.

This form consists of two sub-forms located under their respective tabs:

- [Format & Data] Specify the data items to be extracted, as well as the destination and format of the resulting file.
- [Scope] To enter the period on which the extraction will be conducted.

Set of Options

For each extraction, you will have a goal in mind, so you will want to include a specific group of data items related to this goal. You will also decide on the different options that control how the results are presented.

Since you will likely want to apply your options for conducting the same extraction across multiple periods, EVOLUTION provides a method for creating and saving any number of "Options Set" under the names you choose.

On new installations where no options set have been created, EVOLUTION will provide a "Default" set.

Here are some of the procedures to handle Option Sets:

Create a New Set of Options

1. Use this button . The system responds with the following form.
2. Enter an indicative name; for example, "Wind Calibration".
3. Check the "Clone Current" box to replicate the options currently in use.
4. Use the "Create" button.

The new set of options is created and selected. EVOLUTION will automatically preserve any changes incorporated into it for future use.

Delete an Option Set

1. Use this button to delete the Option Set currently selected.

2. The system asks for confirmation before proceeding.

Select an Already Defined Option Set

1. Select it from the "Set Name" list.

Once selected, the system shows the options and data items included the last time this set was used.

Remember that EVOLUTION will automatically save any modifications to the selected Options Set for future use.
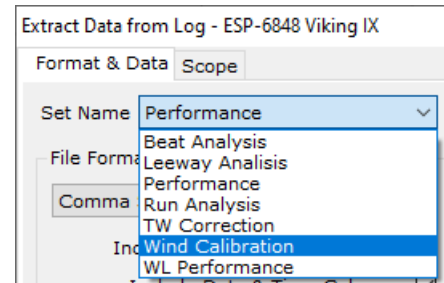
Data Items to Extract

After creating a new Options Set, we must add the data items we want to extract from the logs. Data Items are simply metrics that come from:

- Input from the instruments: AWA, AWS, TWA, TWS, TWD, STW, HDG, etc.
- Items calculated by EVOLUTION: multiple performance targets, tactic targets, and other relevant items.

Refer to Appendix A for a comprehensive list of available data items and their corresponding meanings.

Selecting Data Items

1. Press this button to open the form on the left, which includes the full menu of available data items.

   The top section of this form displays a tree list organized into groups, subgroups, and data items.

   As is familiar with this list type, clicking on the + and - symbols expands or collapses a specific group or subgroup.

2. Navigate the tree structure to the data item you want to extract.

3. Double-click on the data item.

4. Repeat this process for all the items you want to extract.

At the bottom of this form, you will find a brief description of the selected item, including its name, code, and any clarifications or notes to help interpret the extracted values.
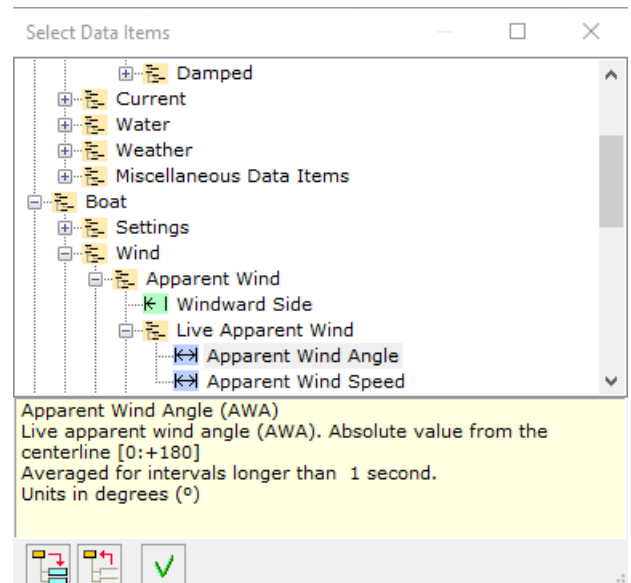
You should now see the items you selected on the right side of the Data Extract form [Format & Data] tab.

In this example, we have chosen the Windward Side, Apparent Wind Angle and Speed, and Percentage of Polar Speed through the Water.

Organizing the Data Items for Export

EVOLUTION will export each selected data item in a column according to the order in the list. Subsequently, the rows will contain the values for each consecutive time interval.

To change the order of the column, you can use these buttons ⬚ ⬚ to move a selected data item up or down in the list.

To exclude a data item from the list, select it and click this button ⬚ .

File Format Options

On the left side of the Data Extract Form [Format & Data] tab, you will find several options that control the format of the output file. Here is a brief explanation of each one:

- File type: Comma-separated values, used by spreadsheet analysis or as a text file, which is easier to read.
- Include Headers: Set to export column titles as well.
- Dictionary: Include a brief description of each data item.
- Include Date and Time Columns: Add a column with the timestamp of each row.
- Include Interval Length Column: Add a column indicating the duration of averaging for each row.
- Include Gap (Empty) Records: A blank row is added when no data is available.
- Cut a New Record: The interval between rows. If it is greater than 1 second, data is averaged.
- Open File when Extract is Done: If the file is in CSV format, it opens in Microsoft Excel; if it is in TXT format, it opens in WordPad.

DATE.UTC−03	WIND.SIDE	AWA	AWS	STW.PLR%
45781.36802	Stbd	45.1	21.02	49.3
45781.36813	Stbd	38.3	21.57	51.8
45781.36825	Stbd	37.3	23.48	46.1
45781.36836	Stbd	34.4	24.53	43
45781.36848	Stbd	34.8	25	43.2
45781.36859	Stbd	35.1	24.9	62.9
45781.36871	Stbd	25.6	25.02	77.5
45781.36883	Stbd	36.3	23.65	78.9
45781.36894	Stbd	46.4	22.96	85.3
45781.36906	Stbd	45.9	22.91	86.9
45781.36917	Stbd	54	21.32	85.1
45781.36929	Stbd	50.5	22.23	82.9
45781.3694	Stbd	44.1	22.7	81.7

Extract Data from Log - ESP-6848 Viking IX

Format & Data | Scope

Set Name: Wind Calibration

File Format

Comma Separated Values (.csv)

Include Headers ☑ Dictionary ☐
Include Date & Time Columns ☑
Include Interval Length Column ☐
Include Gap (Empty) Records ☐
Cut New Record: 10 seconds ☑

Open File when Extract is Done ☑

Notes:

1) As mentioned above, you can extract several seconds of data per row. If that is the case, some of the data types in the interval will be averaged. Other data types that cannot be averaged, such as latitude or longitude, will display their values at the beginning of the interval.

    In the Select Data Items form, averageable items are displayed with an ⟷ icon, and non-averaged items are indicated with this icon ⊬ .

2) When exporting data to an Excel CSV file, the "Data & Time" and "Interval Length" columns will be displayed in date and time numeric format. You can apply any Excel date and time format.

Period to Extract

Now that you have selected the data types to extract, you need to specify the period for which you want to obtain the information. The form under the [Scope] tab allows you to define this period using two distinct methods.

Extract Data from Log - ARG-4134 Utopia ✕

Format & Data | Scope

Extract
◉ Data from a Specific Race or Trial
◯ All Data Available in a Period

Period
Start: Wed 04-Jun-2025 14:07:02
End: Thu 05-Jun-2025 14:07:02

Race or Trial
2025.02 - BUE-MDQ 2025
2025.01 - CRAS 2025
2025.01 - Firebird Track
2024.11 - BuqueBus
2024.07 - Triangulo del Plata
2023.12 - Capetown
2023.02 - Buenos Aires - Rio
2023.01 - Cape to Rio
2020.02 - Cruce del Mitre
2020.02 - Colonia San Fernando
2008.03 - AIS from 2200nm

Extract

Setting the Period from a Race or Trial

One option is to select a race or trial that has already been created using the Race/Trial Registry tool, as outlined in a separate document.

This is the simplest choice for setting the start and end of the extraction period, as they are part of the race or trial definition. When you select any of these events, you will have a defined period.

Please note that the date and time will follow the specific time zone associated with the area where the event occurred, which in this case is UTC-3.

Tracking your races, tests, or training sessions is a best practice to follow, as it transforms automatic logs into valuable data segments that you can easily access from other functions in EVOLUTION. Please refer to the relevant document for further information.

Setting the Period Manually

Manually entering the extract's start and end is possible using the following form fields.

Remembering the exact date and time can be challenging. To help, on the right side of the form, the system will display a list of log segments, including their start date and duration, which you can use as a reference.

These times can also be selected from the boat's track, as shown on the chart, by using the buttons.

The standard method for using this option is to select the "Tools→Replay from Log" menu option, which is explained in detail in the "Replay from Log" document.

Picking a Date and Time from the Track

Using the Replay from Log tool, you can set EVOLUTION to a previously logged date, where the chart page will show, among other information, the boat's track.
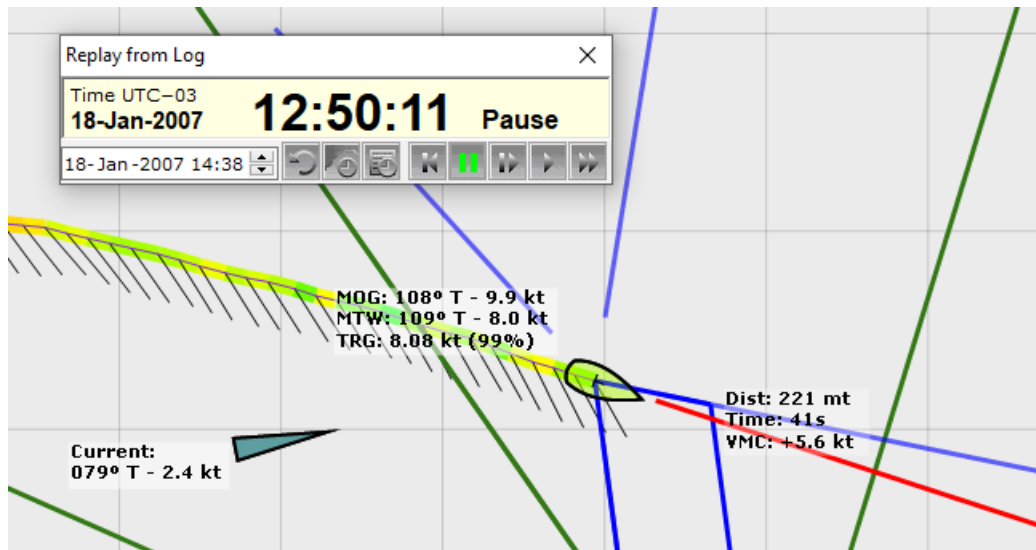
Now, on the Extract form Scope tab, click the button next to the "Start" time field.

The cursor over the chart will change to the following shape: .

Next, position the cursor over the track at the point where you want to select the time and perform a long click (lasting more than one second). This action will copy the time to the start field on the Data Extract form.
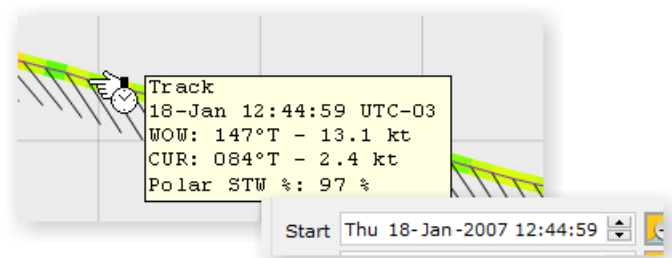
Next, repeat this process to establish the end of the extraction period.

Please note that you can still use all the mouse chart's area selection and scaling actions while in the pick time from chart mode.

A Simple Example

Suppose you want to investigate the relation between true wind angle and speed, heel, and rudder angle when beating against the wind with values for both tacks.

1) Access the Tools menu and select Extract Data from Log to open the extract form.
2) Create a new "Extraction Options Set" (don't use the checkbox "Clone Current"). Use a relevant name (i.e., Rudder Angle).
3) Click the "Pick Data Items to Extract from Log" button to open the "Select Data Items" form.
4) Navigate to each of the following data items and double-click on them.
    a. Boat→Wind→Apparent Wind→Windward Side
    b. Boat→Wind→True Wind→True Wind Angle
    c. Boat→Wind→True Wind→True Wind Speed
    d. Boat→Motion through Water→Heel Angle
    e. Boat→Settings→Rudder Angle

It is also helpful to extract the polar speed % to have an idea of when the boat is sailing correctly (in equilibrium).

    f. Boat→Performance→Polar Speed through Water→Percent of Polar Speed over Water

On the Extract Data form, the selected items should look like this:

Code	Data Item Name
WIND.SIDE	Windward Side
TWA	True Wind Angle
TWS	True Wind Speed
HEEL	Heel Angle
RUDDER	Rudder Angle
STW.PLR%	Percent of Polar Speed through Water

5) Complete the Extract Options.
    a. Select a comma-separated value file format.
    b. Check the boxes for 'Headers' and 'Date & Time'. Leave the others unchecked.
    c. Select 10-second averaging for each row.
    d. Check the "Open File when Extract is Done" box.
6) Set the Period to Extract using the "All Data Available in a Period" option.
    a. Open the "Replay from Log" option in the Tools menu.
    b. Set the replay time to a few minutes after the period end time.
    c. In the Data Extract form, use the "Pick Start" and "Pick End" buttons on the chart to select the desired time range.

The figure below illustrates this procedure.
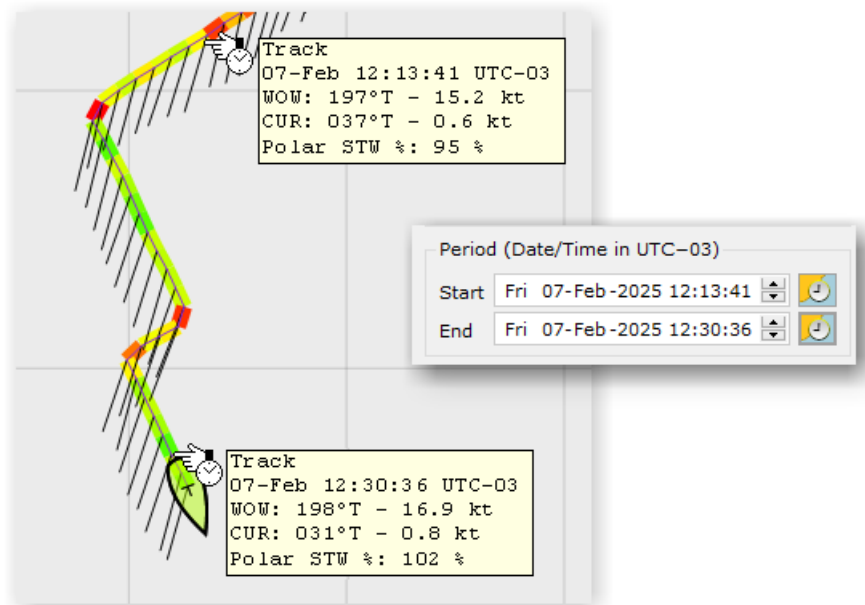
7) Next, click the "Extract" button to start the data extraction. The following sequence will occur:

a. The system will prompt you to select a location to save the resulting file using the standard Windows Save dialog.

    The default location is C:\Users\<user>\Documents\My EVOLUTION\Data Extracts.

b. Choose a name that reflects the purpose of the extraction, such as Rudder.

c. The system will then extract the data, creating the Rudder.css file in this case.

d. If Microsoft Excel is installed, the system will open this document.

	A	B	C	D	E	F	G	H
1	DATE.UTC−03	WIND.SIDE	TWA	TWS	HEEL	RUDDER	STW.PLR%	
2	45695.50951	Port	35.4	13.7	21.7	8.2	92.4	
3	45695.50962	Port	37.4	14.85	22.4	7.7	97.4	
4	45695.50974	Port	37.4	15.65	24	7.9	94.9	
5	45695.50986	Port	34.2	16.99	23.7	8.6	95.3	
6	45695.50997	Port	34.1	15.01	26	9	97.3	
7	45695.51009	Port	35.2	14.61	24.3	9.1	98.5	
8	45695.5102	Port	35.5	14.72	25.9	9.5	98.1	

Keep in mind that, in this example, the values in each row represent the 10-second average.

Please note that a CSV file does not retain formulas, graphics, formatting, or any special Excel features. If you plan to use Excel for data analysis, it is highly recommended that you save this file in .xlsx format.

Next Steps

If you wish to use Microsoft Excel, you can start by formatting the time and date columns to suit your needs. Additionally, normalize the decimal places for the numeric values, align titles, and so on.

	A	B	C	D	E	F	G
1	DATE.UTC−03	WIND.SIDE	TWA	TWS	HEEL	RUDDER	STW.PLR%
2	12:13:42	Port	35.4	13.70	21.7	8.2	92.4
3	12:13:52	Port	37.4	14.85	22.4	7.7	97.4
4	12:14:02	Port	37.4	15.65	24.0	7.9	94.9
5	12:14:12	Port	34.2	16.99	23.7	8.6	95.3
6	12:14:22	Port	34.1	15.01	26.0	9.0	97.3

Excel is a powerful tool for data analysis, but a clear understanding of how to use it effectively is essential. Most importantly, always keep your focus on the specific purpose of the study.

In this example, we can remove the rows where the STW.PLR% is below 95%. Next, average all metrics for successive tracks. We can then identify asymmetries that require further explanation, such as rudder calibration and masthead unit alignment, or recognize differences in sail trimming for each tack.

WIND.SIDE	TWA	TWS	HEEL	RUDDER	STW.PLR%
Port	36.6	14.1	24.1	8.6	95.8
Stbd	36.1	16.0	-28.3	-4.5	98.7
Port	36.8	15.3	22.3	6.5	94.5
Stbd	37.3	16.4	-28.1	-4.0	97.9

Python is also a powerful tool for data analysis, capable of producing intuitive reports and charts.
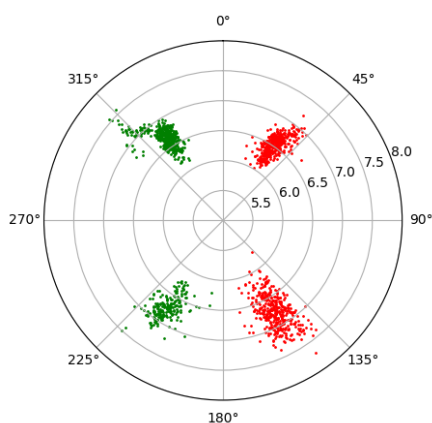

```python
fig, ax = plt.subplots(subplot_kw={'projection': 'polar'})

ax.set_rlabel_position(70)  # Move radial labels away from plotted line
ax.grid(True)
ax.set_theta_zero_location('N', offset=0)  # theta 0 is north with a -5º offset
ax.set_theta_direction(-1)                 # theta run clockwise

theta = np.radians(port.TWA)
r = port.STW
ax.scatter(theta, r, s=1, color='red', label='Port')

theta = np.radians(-stbd.TWA)
r = stbd.STW
ax.scatter(theta, r, s=1, color='green', label='Stbd')

ax.set_title("Fandango CR24-R6\nTWA vs STW (POLR% > 95)", va='bottom')
ax.set_rmax(8)
ax.set_rmin(5)
plt.show()
```

There are numerous reports on the boat's initial setup, its performance in races, and the tactical decisions made during these events. If you feel overwhelmed, you can depend on training or support from experienced sailors and navigators who have been in your shoes. After all, in serious racing, a data analyst is a crucial member of the crew.

Appendix A

Here's the complete list of data types that can be extracted.

Environment - Group

Environmental Conditions Data Items: Wind, Air, Current, Water, etc.

Wind - Group

Wind-Related Data Items: Wind over Ground and Wind over Water.

Wind over Ground - Group

Wind Motion Referenced to Ground (Geographical).

Wind over Ground Direction - Item code: WOG.DIR

Units: degrees (º), Decimals: 1, Averages

Measured from true north [0 : +360]

Wind over Ground Speed - Item code: WOG.SPD

Units: knots (kt), Decimals: 2, Averages

Measured range [0 : 80]

Wind over Water - Group

Wind Motion Referenced to Water Surface

Instantaneous - Group

Wind over Water - Instant Values

Wind over Water Direction - Item code: WOW.DIR

Units: degrees (º), Decimals: 1, Averages

Measured from true north [0 : +360]

Wind over Water Speed - Item code: WOW.SPD

Units: knots (kt), Decimals: 2, Averages

Measured range [0 : 80]

Damped - Group

Wind over Water Moving Average Values

Wind over Water Direction (damped) - Item code: WOW.DIR.DMP

Units: degrees (º), Decimals: 1, Averages

Measured from true north [0 : +360]

Wind over Water Speed (damped) - Item code: WOW.SPD.DMP

Units: knots (kt), Decimals: 2, Averages

Measured range [0 : 80]

Current - Group

Current Motion

Current Set (heading) - Item code: CUR.SET

Units: degrees (º), Decimals: 1, Averages

The current direction toward it flows (heading) per oceanographic convention). Measured from true north [0 : +360].

Current Speed - Item code: CUR.SPD

Units: knots (kt), Decimals: 2, Averages

Current Drift (speed) in knots. Measured range [0 : 80]

Water - Group

Water-Related Data Items: Depth, Water Temperature.

Water Depth - Referenced to de transducer offset - Item code: DEPTH

Units: meters (mt), Decimals: 2, Averages

Measured range [-10 : +10000]

Water Temperature - Item code: WTEMP

Units: centigrade degrees (ºC), Decimals: 2, Averages

Measured [-100 : +100]

Weather - Group

Weather-Related Data Items: Air Pressure, Air Temperature.

Air Pressure. - Item code: AIR.PRES

Units: hectopascals (millibars) (hPa), Decimals: 1

Measured referenced at mean sea level range [0 : 1100]

Air Temperature - Item code: AIR.TEMP

Units: centigrade degrees (ºC), Decimals: 2

Outside, Measured range [-100 : +100]

Miscellaneous Data Items - Group

Miscellaneous Data Items: Sun & Luminosity, Magnetic Variation.

Magnetic Variation - Item code: MAG.VAR

Units: degrees (º), Decimals: 1

Measured: East is + or 'E', and West is - or 'W' [-180 : +180]

Sun & Luminosity - Group

Sun and Luminosity Data Items: Sun Elevation & Azimuth, Luminosity

Sunlight - Item code: SUNLIGHT

Illumination Based on Sun Altitude at the Boat's Fix. ['Darkness' below -10º, 'Twilight', and 'Daylight' above -2º]

Sun Altitude - Item code: SUN.ALT

Units: degrees (º), Decimals: 1

Sun Altitude from Boat's Fix. Measured from the horizon. [-90:+90]

Sun Azimuth - Item code: SUN.AZT

Units: degrees (º), Decimals: 1

Sun Azimuth from Boat's Fix. Measured from true north. [0:+360]

Boat - Group

Boat-specific data items: wind, motion, navigation, performance, tactic mode, max VMC mode, etc.

Settings - Group

Different equipment settings: mast rake angle, rudder angle, forestay load, and Code0 load.

Rudder Angle - Item code: RUDDER

Units: degrees (º), Decimals: 1, Averages

Measured for centerline: '+' rudder to starboard, '-' rudder to port [-90 : +90]

Mast Rake Angle - Item code: RAKE

Units: degrees (º), Decimals: 1, Averages

Measured for vertical: [-90 : +90]

Forestay Load - Item code: FSTAY

Units: Kilograms (Kg), Decimals: 0, Averages

Measured range [0 : +7000]

Forestay Load Target - Item code: FSTAYTRG

Units: Kilograms (Kg), Decimals: 0, Averages

Target range [0 : +7000]

Code Zero Load - Item code: CODE0

Units: Kilograms (Kg), Decimals: 2, Averages

Measured range [0 : +7000]

Wind - Group

Wind Motion Referenced to the Boat: Apparent and True Wind.

Apparent Wind - Group

Wind perceived by the boat in motion.

Windward Side - Item code: WIND.SIDE

The windward side of the boat. [Port:Stbd]

Live Apparent Wind - Group

Live Apparent Wind as received from the instruments.

Apparent Wind Angle - Item code: AWA

Units: degrees (º), Decimals: 1, Averages

Live apparent wind angle (AWA). Absolute value from the centerline [0:+180]

Apparent Wind Speed - Item code: AWS

Units: knots (kt), Decimals: 2, Averages

Live apparent wind speed (AWS). Measured range [0:+80]

Corrected Apparent Wind - Group

The apparent wind angle (AWA) as calculated backward from the corrected True Wind and the boat's Speed through the Water.

Corrected Apparent Wind Angle - Item code: AWA.CORR

Units: degrees (º), Decimals: 1, Averages

The apparent wind angle (AWA) as calculated backward from the corrected True Wind (TW) and the boat's Speed through Water (STW). Absolute value from the centerline [0:+180]

Corrected Apparent Wind Speed - Item code: AWS.CORR

Units: knots (kt), Decimals: 2, Averages

The apparent wind Speed (AWS) as calculated backward from the corrected True Wind (TW) and the boat's Speed through Water (STW). Range [0:+80]

True Wind - Group

True Wind as received from the instruments.

True Wind Angle - Item code: TWA

Units: degrees (º), Decimals: 1, Averages

Live true wind angle (TWA). Absolute angle relative to the boat's centerline. [0:+180]

Virtual True Wind Angle - Item code: TWA.VIRT

Units: degrees (º), Decimals: 1, Averages

Virtual true wind angle, calculated from the difference of TWD and HDG. Absolute angle relative to the boat's centerline. [0:+180]

True Wind Speed - Item code: TWS

Units: knots (kt), Decimals: 2, Averages

Live true wind speed (TWS). Measured range [0:+80]

Polar Wind Angle - Group

Polar Wind relative to boat line of motion (centerline + leeway).

Polar Wind Angle - Item code: PWA

Units: degrees (º), Decimals: 1, Averages

Live polar wind angle (PWA). Absolute angle measured to the boat's motion line (centerline + leeway angle). [0:+180]

Motion through Water - Group

Heading, Speed through Water, Leeway, Distance Sailed through Water, etc.

True Heading - Item code: HDGT

Units: degrees (º), Decimals: 1, Averages

Live true heading. [0:+360]

Speed through Water - Item code: STW

Units: knots (kt), Decimals: 2, Averages

Measured STW. [0:+80]

Motion through Water Direction - Item code: MTW.DIR

Units: degrees (º), Decimals: 1, Averages

Direction of Boat's Motion through Water; including Leeway. From true north [0:+360]

Motion through Water Speed - Item code: MTW.SPD

Units: knots (kt), Decimals: 2, Averages

Speed of Boat's Motion through Water; including Leeway. Includes Leeway. [0:+80]

Distance Sailed through Water - Item code: DIST.SLTW

Units: nautical miles (nm), Decimals: 4

Distance effectively accrued sailing trough water [0 : 10000]

Leeway - Group

Motion induced lateral force.

Leeway Angle - Item code: LWY.ANG

Units: degrees (º), Decimals: 1, Averages

Leeway angle, measured from the centerline. [-2:+12]

Leeway Direction - Item code: LWY.DIR

Units: degrees (º), Decimals: 1, Averages

Direction of Boat's Leeway Motion. From true north [0:+360]

Leeway Speed - Item code: LWY.SPD

Units: knots (kt), Decimals: 2, Averages

Speed of Boat's Leeway Motion. [0:+80]

Attitude - Group

Heel, ROT, Pitch (Trim).

Heel Angle - Item code: HEEL

Units: degrees (º), Decimals: 1, Averages

Live boat heel angle. Negative to port, positive to starboard [-90:+90]

Heel Angle Target - Item code: HEELTRG

Units: degrees (º), Decimals: 1, Averages

Live boat heel angle. Negative to port, positive to starboard [-90:+90]

Pitch Angle - Item code: PITCH

Units: degrees (º), Decimals: 1, Averages

Live boat pitch angle. Zero is calibrated at rest, negative is bow down, positive is bow up [-90:+90]

Pitch Angle Mean - Item code: PITCH.MEAN

Units: degrees (º), Decimals: 1, Averages

Moving average (Mean) boat pitch angle. Zero is calibrated at rest, negative is bow down, positive is bow up [-90:+90]

Pitch Angle RMS - Item code: PITCH.RMS

Units: degrees (º), Decimals: 1, Averages

Pitch angle moving root of mean squared (RMS). Rough idea of pitch amplitude, always positive.

Pitch Angle Period - Item code: PITCH.PERIOD

Units: seconds (sec), Decimals: 1, Averages

Moving average of pitching period (crossing the pitch mean). Rough idea of pitch period, always positive.

Rate of Turn - Item code: ROT

Units: degrees per second (º/sec), Decimals: 1, Averages

Horizontal rate of turn, negative for turn to port, positive for turn to starboard. [-180:+180]

Rate of Turn RMS - Item code: ROT.RMS

Units: degrees per second (º/sec), Decimals: 2, Averages

Horizontal rate of turn RMS. Rough idea of heading steadiness [0:+??]

Motion over Ground - Group

Course over Ground, Speed over Ground, etc.

Course over Ground - Item code: COG

Units: degrees (º), Decimals: 1, Averages

Live course over ground (COG). From true north [0:+360]

Speed over Ground - Item code: SOG

Units: knots (kt), Decimals: 2, Averages

Live speed over ground (SOG). [0:+80]

Distance Traveled - Item code: DIST.TRVL

Units: nautical miles (nm), Decimals: 4

Distance traveled over a point to point great circle [0 : 10000]

Distance Sailed over Ground - Item code: DIST.SLOG

Units: nautical miles (nm), Decimals: 4

Distance effectively accrued sailing over ground [0 : 10000]

Navigation - Group

Navigation Data Items: Fix, Distance Traveled, Distance Sailed over Ground and through Water.

Fix - Group

Fix Position and UTC.

Fix Latitude - Item code: FIX.LAT

Units: degrees (º), Decimals: 10

Boat Fix Latitude, North is + or 'N', and South is - or 'S' [-90:+90]

Fix Longitude - Item code: FIX.LON

Units: degrees (º), Decimals: 10

Boat Fix Longitude, East is + or 'E', and West is - or 'W' [-180:+180]

Fix UTC - Item code: FIX.UTC

Units: Day Month Hours Minutes and Seconds (dd-mmm hh:mm:ss), Decimals: 0

UTC at which the Fix was taken.

To Mark - Group

Mark Name and Position, Bearing, Distance, Velocity Made on Course, Time to Go, etc.

Tactic Mark Name - Item code: MARK.NAME

Tactic Mark Name as set in a Race Course or TACTIC

Tactic Mark Latitude - Item code: MARK.LAT

Units: degrees (º), Decimals: 10

Tactic Mark Latitude, North is + or 'N', and South is - or 'S' [-90:+90]

Tactic Mark Longitude - Item code: MARK.LON

Units: degrees (º), Decimals: 10

Tactic Mark Longitude, East is + or 'E', and West is - or 'W' [-180:+180]

Bearing to Tactic Mark - Item code: MARK.BRNG

Units: degrees (º), Decimals: 1

Bearing to Tactic Mark from the Boat's Fix

Distance to Tactic Mark - Item code: MARK.DIST

Units: nautical miles (nm), Decimals: 4

Distance to Tactic Mark from the Boat's Fix

Velocity Made on Course - Item code: VMC

Units: knots (kt), Decimals: 2, Averages

Live VMC to Tactic Mark. [-80:+80]

Race Course - Group

Active race course data.

Race Course Name - Item code: RACE.NAME

Active race course in use file name.

Performance - Group

Performance Targets and Deltas: Polar Speed through Water and Velocity Made Good.

Performance Polar Name - Item code: POLAR.NAME

Active performance polar file name.

Polar Speed through Water - Group

Polar Speed through Water Target and Percentage

Polar Speed through Water - Item code: STW.PLR

Units: knots (kt), Decimals: 2, Averages

Calculated STW from polars for current TWA/TWS. [0:+80]

Percent of Polar Speed through Water - Item code: STW.PLR%

Units: Percent (%), Decimals: 1, Averages

Calculated percentage by comparing actual STW to Polars STW. [0:...]

Velocity Made Good - Group

Velocity Made Good Targets and Deltas for Beats and Runs

Velocity Made Good - Item code: VMG

Units: knots (kt), Decimals: 2, Averages

Live VMG, calculated from STW * COS(PWA). Speed positive for upwind and negative for downwind. [-80:+80]

Delta Velocity Made Good - Item code: VMG.DLT

Units: knots (kt), Decimals: 2, Averages

Difference between Live VMG, and Optimum Beat/Run VMG. Absolute speed delta, positive for faster and negative for slower than target. [-80:+80]

Optimum Beat VMG Targets - Group

Optimum Beat (Upwind Optimum VMG): Polar Wind Angle, Speed through Water and VMG Targets and Deltas.

Optimum Beat True Wind Angle - Item code: BEAT.TWA

Units: degrees (º), Decimals: 1, Averages

TWA target at optimum beat (maximum upwind VMG), calculated from Performance Polar for Live TWS, minus leeway. Absolute angle measured to the boat's centerline line (Beat PWA - leeway angle). [0:+180]

Optimum Beat Polar Wind Angle - Item code: BEAT.PWA

Units: degrees (º), Decimals: 1, Averages

PWA target at optimum beat (maximum upwind VMG), calculated from Performance Polar for Live TWS. Absolute angle measured to the boat's motion line (centerline + leeway angle). [0:+180]

Optimum Beat Speed through Water - Item code: BEAT.STW

Units: knots (kt), Decimals: 2, Averages

STW target at optimum beat (maximum upwind VMG), calculated from Performance Polar for Live TWS. Speed [0:+80]

Optimum Beat Velocity Made Good - Item code: BEAT.VMG

Units: knots (kt), Decimals: 2, Averages

VMG target at optimum beat (maximum upwind VMG), calculated from Performance Polar for Live TWS. VMG speed upwind always positive [0:+80]

Optimum Run VMG Targets - Group

Optimum Run (Downwind Optimum VMG): Polar Wind Angle, Speed through Water and VMG Targets and Deltas.

Optimum Run True Wind Angle - Item code: RUN.TWA

Units: degrees (º), Decimals: 1, Averages

TWA target at optimum run (maximum downwind VMG), calculated from Performance Polar for Live TWS, minus leeway. Absolute angle measured to the boat's centerline line (Run PWA - leeway angle). [0:+180]

Optimum Run Polar Wind Angle - Item code: RUN.PWA

Units: degrees (º), Decimals: 1, Averages

PWA target at optimum beat (maximum downwind VMG), calculated from Performance Polar for Live TWS. Absolute angle measured to the boat's motion line (centerline + leeway angle). [0:+180]

Optimum Run Speed through Water - Item code: RUN.STW

Units: knots (kt), Decimals: 2, Averages

STW target at optimum beat (maximum downwind VMG), calculated from Performance Polar for Live TWS. Speed [0:+80]

Optimum Run Velocity Made Good - Item code: RUN.VMG

Units: knots (kt), Decimals: 2, Averages

VMG target at optimum run (maximum downwind VMG), calculated from Performance Polar for Live TWS. VMG speed downwind is always negative. [-80:0]

Tactics - Group

Tactics Mode Targets and Deltas: Speed, Apparent and True Wind, Navigation to Mark.

Tactic Speed through Water - Group

Speed through Water Tactic Target and Delta to Mark.

Tactic Speed through Water - Item code: STW.TAC

Units: knots (kt), Decimals: 2, Averages

Calculated Tactic Target STW. [0:+80]

Delta (Tactic) Speed through Water - Item code: STW.DLT

Units: knots (kt), Decimals: 2, Averages

Difference between Live STW and Tactic Target STW. [-80:+80]

Tactic Apparent Wind - Group

Apparent Wind Tactic Targets and Deltas to Mark.

Tactic Apparent Wind Angle - Item code: AWA.TAC

Units: degrees (º), Decimals: 1, Averages

Tactic target apparent wind angle (AWA). Absolute value from the centerline [0:+180]

Delta (Tactic) Apparent Wind Angle - Item code: AWA.DLT

Units: degrees (º), Decimals: 1, Averages

Difference between Live and Tactic target apparent wind angle (AWA). Delta [-180:+180]

Tactic Apparent Wind Speed - Item code: AWS.TAC

Units: knots (kt), Decimals: 2, Averages

Tactic target apparent wind speed (AWS). Target range [0:+80]

Delta (Tactic) Apparent Wind Speed - Item code: AWS.DLT

Units: knots (kt), Decimals: 2, Averages

Difference between Live and Tactic target apparent wind speed (AWS). Delta range [-80:80]

Tactic True Wind - Group

True Wind Tactic Targets and Deltas to Mark.

Tactic True Wind Angle - Item code: TWA.TAC

Units: degrees (º), Decimals: 1, Averages

Calculated Tactic Target TWA. From the centerline [0 : +180]

Delta (Tactic) True Wind Angle - Item code: TWA.DLT

Units: degrees (º), Decimals: 1, Averages

Difference between Live and Tactic Target TWA. Delta range [-180 : +180]

Tactic True Wind Speed - Item code: TWS.TAC

Units: knots (kt), Decimals: 2, Averages

Calculated Tactic Target TWS. Target range [0 : 80]

Delta (Tactic) True Wind Speed - Item code: TWS.DLT

Units: knots (kt), Decimals: 2, Averages

Difference between Live and Tactic Target TWS. Delta range [-80 : 80]

Tactic Navigation - Group

Navigation Tactic Targets and Deltas: VMC, Heading, Course, Distance and Time to Mark.

Tactic Sailing Mode - Item code: MODE.TAC

Tactic target sailing mode from boat fix to Tactic Mark. [Tacking, Reaching, Gybing, Impossible]

Velocity Made on Course - Group

Velocity Made on Course Tactic Targets and Deltas to Mark.

Tactic Velocity Made on Course (Port) - Item code: VMC.PTAC

Units: knots (kt), Decimals: 2, Averages

Tactic target velocity made on course (VMC) on port tack/gybe. [-80:+80]

Tactic Velocity Made on Course (Stbd) - Item code: VMC.STAC

Units: knots (kt), Decimals: 2, Averages

Tactic target velocity made on course (VMC) on port tack/gybe. [-80:+80]

Delta (Tactic) Velocity Made on Course - Item code: VMC.DLT

Units: knots (kt), Decimals: 2, Averages

Difference between Live VMC and 'Same Sailing Side' Tactic Target VMC. [-80:+80]

Course over Ground - Group

Course over Ground Tactic Targets and Deltas to Mark.

Tactic Course over Ground (Port) - Item code: COG.PTAC

Units: degrees (º), Decimals: 1, Averages

Tactic target course over ground (COG) on port tack/gybe. From true north [0:+360]

Tactic Course over Ground (Stbd) - Item code: COG.STAC

Units: degrees (º), Decimals: 1, Averages

Tactic target course over ground (COG) on starboard tack/gybe. From true north [0:+360]

Delta (Tactic) Course over Ground - Item code: COG.DLT

Units: degrees (º), Decimals: 1, Averages

Difference between Live COG and 'same sailing side' Tactic target COG. Angle [-180:+180]

True Heading Targets - Group

True Heading Tactic Targets and Deltas to Mark.

Tactic True Heading (Port) - Item code: HDGT.PTAC

Units: degrees (º), Decimals: 1, Averages

Tactic target true heading (HDGT) on port tack/gybe. [0:+360]

Tactic True Heading (Stbd) - Item code: HDGT.STAC

Units: degrees (º), Decimals: 1, Averages

Tactic target true heading (HDGT) on starboard tack/gybe. [0:+360]

Delta (Tactic) True Heading - Item code: HDGT.DLT

Units: degrees (º), Decimals: 1, Averages

Difference between Live HDGT and 'same sailing side' Tactic target HDGT. Angle [-180:+180]

Distance to Laylines or Mark - Group

Distance to Layline (or Mark) Tactic Targets.

Distance to Layline (Port) - Item code: LAYL.PDIST

Units: nautical miles (nm), Decimals: 4

Distance to starboard layline, sailing on port tack/gybe.

Distance to Layline (Stbd) - Item code: LAYL.SDIST

Units: nautical miles (nm), Decimals: 4

Distance to port layline, sailing on starboard tack/gybe.

Sailing Distance to Mark - Item code: MARK.DIST

Units: nautical miles (nm), Decimals: 4

Distance (over Ground) to mark by sailing all tacks, gybes or reach.

Time to Laylines or Mark - Group

Time to Layline (or Mark) Tactic Targets.

Time to Layline (Port) - Item code: LAYL.PTIME

Units: days hours minutes and seconds (dhms), Decimals: 4

Time to starboard layline, sailing on port tack/gybe.

Time to Layline (Stbd) - Item code: LAYL.STIME

Units: days hours minutes and seconds (dhms), Decimals: 4

Time to port layline, sailing on starboard tack/gybe.

Sailing Time to Mark - Item code: MARK.TIME

Units: days hours minutes and seconds (dhms), Decimals: 4

Time to mark sailing all tacks, gybes or reach.

MaxVMC - Group

Maximum VMC Mode Targets and Deltas: Speed, Apparent and True Wind, Navigation to Mark.

MaxVMC Speed through Water - Group

Speed through Water on Maximum VMC Target and Delta.

MaxVMC Speed through Water - Item code: STW.XTAC

Units: knots (kt), Decimals: 2, Averages

Calculated Maximum VMC Target STW. [0:+80]

Delta (MaxVMC) Speed through Water - Item code: STW.XDLT

Units: knots (kt), Decimals: 2, Averages

Difference between Live STW and Maximum VMC Target STW. [-80:+80]

MaxVMC Apparent Wind - Group

Apparent Wind on Maximum VMC Targets and Deltas.

MaxVMC Apparent Wind Angle - Item code: AWA.XTAC

Units: degrees (º), Decimals: 1, Averages

MaxVMC target apparent wind angle (AWA). From the centerline [0:+180]

Delta (MaxVMC) Apparent Wind Angle - Item code: AWA.XDLT

Units: degrees (º), Decimals: 1, Averages

Difference between Live and MaxVMC target apparent wind angle (AWA). Delta [-180:+180]

MaxVMC Apparent Wind Speed - Item code: AWS.XTAC

Units: knots (kt), Decimals: 2, Averages

MaxVMC target apparent wind speed (AWS). Target range [0:+80]

Delta (MaxVMC) Apparent Wind Speed - Item code: AWS.XDLT

Units: knots (kt), Decimals: 2, Averages

Difference between Live and MaxVMC target apparent wind speed (AWS). Delta range [-80:+80]

MaxVMC True Wind - Group

True Wind on Maximum VMC Targets and Deltas.

MaxVMC True Wind Angle - Item code: TWA.XTAC

Units: degrees (º), Decimals: 1, Averages

Calculated Maximum VMC Target TWA. From the centerline [0 : +180]

Delta (MaxVMC) True Wind Angle - Item code: TWA.XDLT

Units: degrees (º), Decimals: 1, Averages

Difference between Live and Maximum VMC Target TWA. Delta range [-180 : +180]

MaxVMC True Wind Speed - Item code: TWS.XTAC

Units: knots (kt), Decimals: 2, Averages

Calculated Maximum VMC Target TWS. Target range [0 : 80]

Delta (MaxVMC) True Wind Speed - Item code: TWS.XDLT

Units: knots (kt), Decimals: 2, Averages

Difference between Live and Maximum VMC Target TWS. Delta range [-80 : 80]

MaxVMC Navigation - Group

Navigation on Maximum VMC Targets and Deltas: VMC, Course, and Heading.

Velocity Made on Course - Group

Velocity Made on Course on Maximum VMC Targets and Deltas.

MaxVMC Velocity Made on Course - Item code: VMC.XTAC

Units: knots (kt), Decimals: 2, Averages

MaxVMC target velocity made on course (VMC). [-80:+80]

Delta (MaxVMC) Velocity Made on Course - Item code: VMC.XDLT

Units: knots (kt), Decimals: 2, Averages

Difference between Live VMC and MaxVMC target VMC. [-80:+80].

MaxVMC vs. Tactic VMC - Item code: VMC.XDIF

Units: knots (kt), Decimals: 2, Averages

Difference between MaxVMC and Tactic Target VMC. [-80:+80]

Course over Ground - Group

Course over Ground on Maximum VMC Targets and Deltas.

MaxVMC Course over Ground - Item code: COG.XTAC

Units: degrees (º), Decimals: 1, Averages

MaxVMC target course over ground (COG), sailing in maximum VMC mode. From true north [0:+360]

Delta (MaxVMC) Course over Ground - Item code: COG.XDLT

Units: degrees (º), Decimals: 1, Averages

Difference between Live COG and MaxVMC target COG, sailing in maximum VMC mode. Angle [-180:+180]

True Heading Targets - Group

True Heading on Maximum VMC Targets and Deltas.

MaxVMC True Heading - Item code: HDGT.XTAC

Units: degrees (º), Decimals: 1, Averages

MaxVMC target true heading (HDGT), sailing in maximum VMC mode. [0:+360]

Delta (MaxVMC) True Heading - Item code: HDGT.XDLT

Units: degrees (º), Decimals: 1, Averages

Difference between Live HDGT and MaxVMC target HDGT, sailing in maximum VMC mode. Angle [-180:+180]

Man Over Board - Group

Man Overboard Data Items: Initial Fix and Drift-Corrected Fix.

Man Over Board Time in Water - Item code: MOB.TIW

Units: day month hours minutes and seconds (dd-mmm hh:mm:ss), Decimals: 0

Lapsed Time since Man Overboard Immersion.

MOB Initial Fix - Group

MOB Initial Fix: Latitude, Longitude, UTC, Bearing and Distance.

MOB Initial Fix Latitude - Item code: MOBI.LAT

Units: degrees (º), Decimals: 10

MOB Initial Fix Latitude, North is + or 'N', and South is - or 'S' [-90:+90]

MOB Initial Fix Longitude - Item code: MOBI.LON

Units: degrees (º), Decimals: 10

MOB Initial Fix Longitude, East is + or 'E', and West is - or 'W' [-180:+180]

Man Over Board Initial Fix UTC - Item code: MOBI.UTC

Units: day month hours minutes and seconds (dd-mmm hh:mm:ss), Decimals: 0

MOB Initial Fix UTC.

Bearing to MOB Initial Fix - Item code: MOBI.BRNG

Units: degrees (º), Decimals: 1

Bearing to MOD Initial Fix from the Boat's Fix. Reference to true north [0:+360]

Distance to MOB Initial Fix - Item code: MOBI.DIST

Units: nautical miles (nm), Decimals: 4

Distance to MOB Initial Fix from the Boat's Fix

MOB Drift Corrected Fix - Group

MOB Current Drift Corrected Fix: Latitude, Longitude, UTC, Bearing and Distance.

MOB Drift Corrected Fix Latitude - Item code: MOBD.LAT

Units: degrees (º), Decimals: 10

MOB Drift Corrected Fix Latitude, North is + or 'N', and South is - or 'S' [-90:+90]

MOB Drift Corrected Fix Longitude - Item code: MOBD.LON

Units: degrees (º), Decimals: 10

MOB Drift Corrected Fix Longitude, East is + or 'E', and West is - or 'W' [-180:+180]

MOB Drift Corrected Fix UTC - Item code: MOBD.UTC

Units: day month hours minutes and seconds (dd-mmm hh:mm:ss), Decimals: 0

MOB Drift Corrected Fix UTC (Last Fix Update).

Bearing to MOB Drift Corrected Fix - Item code: MOBD.BRNG

Units: degrees (º), Decimals: 1

Bearing to MOD Drift Corrected Fix from the Boat's Fix. Reference to true north [0:+360]

Distance to MOB Drift Corrected Fix - Item code: MOBD.DIST

Units: nautical miles (nm), Decimals: 4

Distance to MOB Drift Corrected Fix from the Boat's Fix