ANCHOR GUARDIAN

by Swiss Ocean Tech Ltd.

Safe Anchoring for sailor, ship and sea

www.anchorguardian.com

Bringing **safety** to anchoring

Anchoring is a routine and age-old operation, built on mastery, experience and sensitivity. It is as frequent as mooring or loading and unloading cargo. The anchoring process – from laying to lifting the anchor – is critical for the safety of crew and passengers as well as sealife below. It is a dangerous operation that requires specific skills and continuous attention.

Even when ship's crew work diligently to lay anchor in the most secure way possible, dragging can happen. Immediately recognizing anchor drag can avoid dangerous collisions and even grounding.

AnchorGuardian offers a new dimension of safety at sea by minimizing the risk of anchor dragging, providing immediate alarms and predictions.

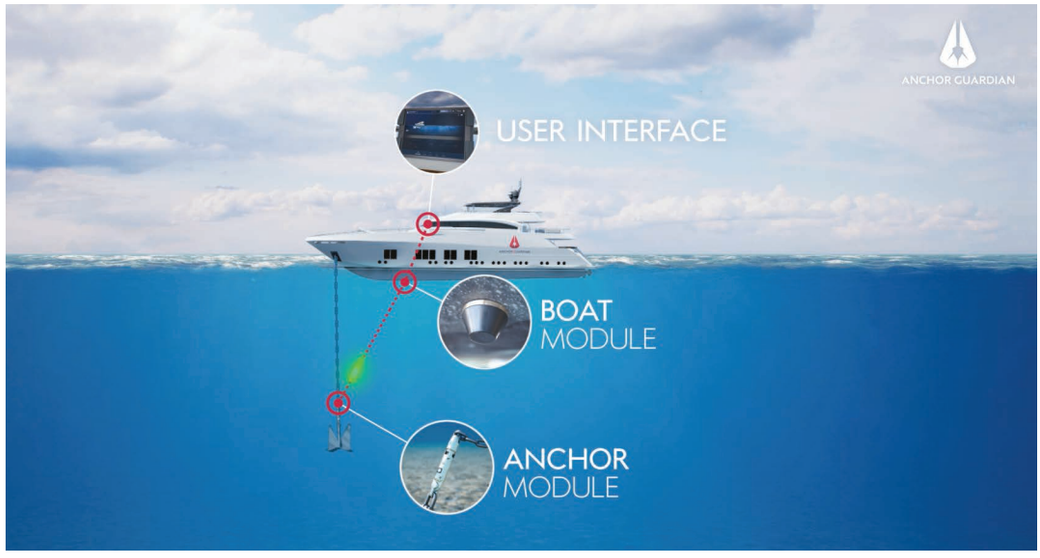
Our disruptive, patented technology offers safety during anchoring by identifying in real-time dangerous anchor drag, independent of GPS and any movement of the ship.

Additionally, AnchorGuardian predicts the anchor hold with early warnings and provides essential information while laying the anchor, while at anchor and when lifting the anchor.

For the first time ever, using sensor fusion and sophisticated algorithms, our technology can build a stable dataset of the anchor's relative and absolute position providing reliable information over the entire anchoring procedure.

AnchorGuardian offers a complete range of intelligent data while anchoring...when you need it.

The **AnchorGuardian** Solution



The complete go-to-market AnchorGuardian solution planned for end of 2023 is based on four principal modules:

- **Anchor module**: The heart of our innovation is driven by our proprietory algorithm and sensor fusion technology independent of any GPS signal.
- **Boat module**: A sophisticated transducer integrated into the ships hull exchanges underwater datasets to the user interface and transports user requests back to the anchor module.
- **Charging module**: An autonomous charging unit with an initial operating time of 48h - 168h, depending on the size of the ship.
- **User interface module (provided as an option)**: A standalone display providing the user with all AnchorGuardian information on our graphical interface. Alternatively, the information is made accessible to the GPS plotter or ECDIS through a NMEA interface.

AnchorGuardian transmits data every few seconds (or at longer intervals as required) to the vessel providing the captain and crew with vital real-time information. For further details go to:

www.anchorguardian.com

Features of **AnchorGuardian**

Providing critical information and alarms

LAYING THE ANCHOR

- anchor depth
- anchor distance to seafloor
- scope
- when the anchor reaches the seafloor
- orientation of anchor

WHILE AT ANCHOR

- anchor displace-ment
- anchor velocity
- prediction of anchor reliability
- force on anchor
- anchor chain angle
- anchor position in electronic chart

LIFTING THE ANCHOR

- anchor location
- anchor aweigh
- anchor in sight
- anchor stowed

Anchor Module

The anchor module is the heart and soul of AnchorGuardian and the eyes and ears of the captain and crew. Our proprietary movement detection technology allows the anchor module to detect sub-meter shifts and transmits this data in real-time to the user.

The anchor module reports seabed characteristics, the force on the anchor, the depth of the anchor, the anchor roll angle, the estimated anchor hold, the scope required at the given depth and the changes in the distance between the anchor and the boat. Our sensors provide feedback during slow and consistent movements, sporadic and uncoordinated anchor motion and everything in between.

The anchor module is inserted between the anchor and anchor chain and is housed together with the anchor in the boats hawsepipe or on the anchor roller. It communicates via underwater ultrasound to the boat module. The strong stainless steel exterior protects the unit from excessive force and corrosion in even the most demanding environments.

Boat Module

The boat module is the main communication hub that links users and modules of the AnchorGuardian solution. It consists of the hull mount boat transducer made of seawater resistant bronze alloy and the communication electronics integrated in a box. The boat module communicates underwater via ultrasound with the anchor module and above water via bluetooth or cable with the user interface.

The boat module can be permanently connected to mains power via the provided battery charger.

Charging Module

While the AnchorGuardian series product will use a patented wireless inductive solution to charge the battery of the anchor module, the prototypes still need manual attachment of a charging plate. This charging plate is equipped with a telescope handle and four alignment pins with magnets to align and fix the plate on the anchor module.

The charging plate is connected to the boat's electrical system (24VDC or 230VAC) via the galvanic isolated charging box. A sensor in the charging plate ensures that charging is enabled only if correctly attached to the anchor module. When charging starts, the charging box displays the charging voltage (24V) and the charging current (40-600 mA) depending on the charging state. The charging process is finished if the charging current drops below 60 mA.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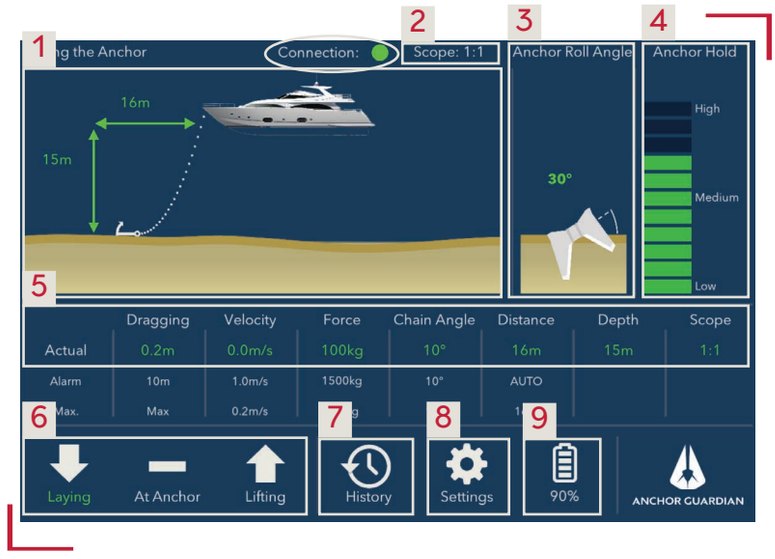
User Interface Module*



The user interface module translates information to the crew and communicates with the mother board for processing. It is the main point of interaction between man and machine.

Key points to remember when using this module:

- Use the stand-by mode (under settings [8]) to save battery power if you intend on anchoring for more than one night and want to save power for adverse conditions. The battery level will be periodically displayed. Once in stand-by mode, other than battery status, no information will be available.

- To wake AnchorGuardian up, click on the “wake-up” button and follow the instructions. It can take up to 5 min to have full functionality.

- The tablet is protected via a waterproof cover however the bluetooth technology is mounted outside. We do not recommend that the tablet be exposed to moisture.

- The connection ● indicator at the top of the screen will light green for good connection, yellow for fair connection (individual data packets will not be received) and red for no connection. If there is no connection, clicking on the circle will show the WiFi, Bluetooth and Ultrasound connection statuses. This can be used to determine why no data is being received.

* Interface image is from a pilot version and used here for demonstration purposes only

The user interface features are designed to be intuitive:

- 1/Overall boat view: with a zoom in/out feature, a visual depiction of the actual anchoring process is shown. When zoomed in, the anchor roll angle and table of values sections disappear, focusing on key information only.
- 2/Scope: chain length / depth ratio
- 3/Anchor role angle: the roll angle of the anchor on the seafloor.
- 4/Anchor hold: anticipated hold capacity between low, medium and high.
- 5/Table of values: real-time updates of dragging distance, dragging velocity, force at anchor, chain angle, anchor depth, scope and horizontal distance to anchor. The first row provides the actual value in green. If the color changes from green to red, this, in addition to alarm and pop-up window, indicate that the alarm value has been exceeded. The second row initially shows the default alarm values but these can be manually set/adapted by the user. If there is no alarm value shown, it means the alarm is disabled. The bottom row displays the max. value during this specific anchoring procedure. When the alarm sounds, click the pop-up text to silence the alarm.
- 6/Operating modes: whether laying the anchor, operating in at anchor mode or lifting the anchor (active mode will appear green), information specific to that phase will be displayed. The operating mode is only a visual depiction and does not interfere with the operation of AnchorGuardian nor lead to errors if a mode is wrongly selected.
    - Laying the anchor - the system automatically realises when it is in laying mode and will provide relevant information. When the anchor is set and the chain laid out, the user must manually click at anchor to view the best graphical user interface for that mode.
    - At anchor - once the at anchor phase has been selected, the dragging distance is reset to 0 and alarms are activated. It is not possible to return to the “laying the anchor” mode.
    - Lifting the anchor - the user can manually switch between the at anchor and lifting states when the anchor is on the seabed to be assisted in lifting the anchor. The system will automatically detect when the anchor leaves the seabed and switch modes. The following values will not be visible in this mode: scope, dragging distance and anchor hold.
- 7/History: a history of dragging, velocity and force can be accessed for the current anchoring procedure.
- 8/Settings: select the anchor type display, colour and stand-by mode.
    - In stand-by mode, AnchorGuardian is asleep - no data is transferred to the yacht and no alarms will sound. Wake-up the system to begin anchor watch. This can take up to 5 minutes.
- 9/Battery level: battery status displaying remaining capacity.