# VMH 70 MARINE DISPLAY

**USER MANUAL**
**rev. AC**

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# INTRODUCTION

The VMH 70 is a multifunctional display designed to monitor your boat engines and navigation.
Up to four engines can be monitored with a single display.

The integrated NMEA 2000 gateway lets you acquire engine data also via analog sensors or SAE J1939, to then convert and distribute them on the NMEA 2000 network.
The display manages up to six resistive sensors, three voltage sensors and one digital alarm.

All data are also distributed on two EasyLink channels to a maximum of 16 VMH 14 gauges per channel.
NMEA 2000 connectivity lets you view navigation data from other devices on the network, such as wind, compass, GPS, speed, and depth data.



## ARCHITECTURE

Following is an example of an application with a VMH 70 display, used as a gateway and as a NMEA 2000 monitor.
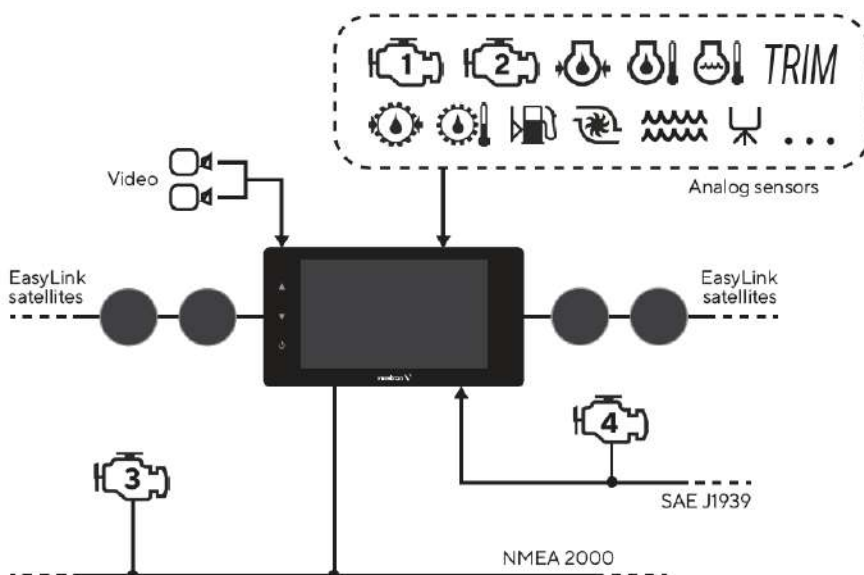
# SAFETY INFORMATION

- No smoking! No open fire or heat sources!

- The product was developed, manufactured and inspected according to the basic safety requirements of EC Guidelines and state-of-the-art technology.
- The instrument is designed for use in grounded vehicles and machines as well as in pleasure boats, including non-classified commercial shipping.
- Use our product only as intended. Use of the product for reasons other than its intended use may lead to personal injury, property damage or environmental damage. Before installation, check the vehicle documentation for vehicle type and any possible special features!
- Use the assembly plan to learn the location of the fuel/hydraulic/compressed air and electrical lines!

## SAFETY DURING INSTALLATION

- During installation, ensure that the product's components do not affect or limit vehicle functions. Avoid damaging these components!
- Only install undamaged parts in a vehicle!
- During installation, ensure that the product does not impair the field of vision and that it cannot impact the driver's or passenger's head!
- A specialized technician should install the product. If you install the product yourself, wear appropriate work clothing. Do not wear loose clothing, as it may get caught in moving parts. Protect long hair with a hair net.
- When working on the on-board electronics, do not wear metallic or conductive jewelry such as necklaces, bracelets, rings, etc.
- If work on a running engine is required, exercise extreme caution. Wear only appropriate work clothing as you are at risk of personal injury, resulting from being crushed or burned.
- Before beginning, disconnect the negative terminal on the battery, otherwise you risk a short circuit. If the vehicle is supplied by auxiliary batteries, you must also disconnect

- Note possible modifications to the vehicle, which must be considered during installation!
- To prevent personal injury, property damage or environmental damage, basic knowledge of motor vehicle/shipbuilding electronics and mechanics is required.
- Make sure that the engine cannot start unintentionally during installation!
- Modifications or manipulations to Veratron products can affect safety. Consequently, you may not modify or manipulate the product!
- When removing/installing seats, covers, etc., ensure that lines are not damaged and plug-in connections are not loosened!
- Note all data from other installed instruments with volatile electronic memories.

the negative terminals on these batteries! Short circuits can cause fires, battery explosions and damages to other electronic systems. Please note that when you disconnect the battery, all volatile electronic memories lose their input values and must be reprogrammed.
- If working on gasoline boat motors, let the motor compartment fan run before beginning work.
- Pay attention to how lines and cable harnesses are laid so that you do not drill or saw through them!
- Do not install the product in the mechanical and electrical airbag area!
- Do not drill holes or ports in load-bearing or stabilizing stays or tie bars!
- When working underneath the vehicle, secure it according to the specifications from the vehicle manufacturer.
- Note the necessary clearance behind the drill hole or port at the installation location. Required mounting depth: 65 mm.

- Drill small ports; enlarge and complete them, if necessary, using taper milling tools, saber saws, keyhole saws or files. Deburr edges. Follow the safety instructions of the tool manufacturer.
- Use only insulated tools, if work is necessary on live parts.
- Use only the multimeter or diode test lamps provided, to measure voltages and currents in the vehicle/machine or boat. Use of conventional test lamps can cause damage to control units or other electronic systems.

- The electrical indicator outputs and cables connected to them must be protected from direct contact and damage. The cables in use must have enough insulation and electric strength and the contact points must be safe from touch.
- Use appropriate measures to also protect the electrically conductive parts on the connected consumer from direct contact. Laying metallic, uninsulated cables and contacts is prohibited.

## SAFETY AFTER INSTALLATION

- Connect the ground cable tightly to the negative terminal of the battery.
- Reenter/reprogram the volatile electronic memory values.

- Check all functions.
- Use only clean water to clean the components. Note the Ingress Protection (IP) ratings (IEC 60529).

## ELECTRICAL CONNECTION

- Note cable cross-sectional area!
- Reducing the cable cross-sectional area leads to higher current density, which can cause the cable cross-sectional area in question to heat up!
- When installing electrical cables, use the provided cable ducts and harnesses; however, do not run cables parallel to ignition cables or to cables that lead to large electricity consumers.
- Fasten cables with cable ties or adhesive tape. Do not run cables over moving parts. Do not attach cables to the steering column!
- Ensure that cables are not subject to tensile, compressive or shearing forces.
- If cables are run through drill holes, protect them using rubber sleeves or the like.
- Use only one cable stripper to strip the cable. Adjust the stripper so that stranded wires are not damaged or separated.
- Use only a soft soldering process or commercially available crimp connector to solder new cable connections!

- Make crimp connections with cable crimping pliers only. Follow the safety instructions of the tool manufacturer.
- Insulate exposed stranded wires to prevent short circuits.
- Caution: Risk of short circuit if junctions are faulty or cables are damaged.
- Short circuits in the vehicle network can cause fires, battery explosions and damages to other electronic systems. Consequently, all power supply cable connections must be provided with weldable connectors and be sufficiently insulated.
- Ensure ground connections are sound.
- Faulty connections can cause short circuits. Only connect cables according to the electrical wiring diagram.
- If operating the instrument on power supply units, note that the power supply unit must be stabilized and it must comply with the following standard: DIN EN 61000, Parts 6-1 to 6-4.

# INSTALLATION

⚠ **WARNING**

Before starting work, disconnect the negative terminal of the battery to avoid the risk of a short circuit. If the vehicle is equipped with additional batteries, the negative terminal of all batteries must also be disconnected if necessary. Short circuits can burn cables, explode batteries and cause damage to other electronic systems. Remember that by disconnecting the battery, all data entered in the temporary electronic memory will be lost and will have to be reprogrammed.

## BEFORE THE ASSEMBLY

1. Before starting work, switch off the ignition and remove the ignition key. If necessary, remove the main power switch.
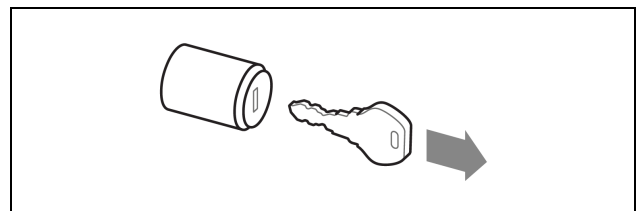
2. Disconnect the negative terminal of the battery. Do not allow the battery to be reconnected by mistake.
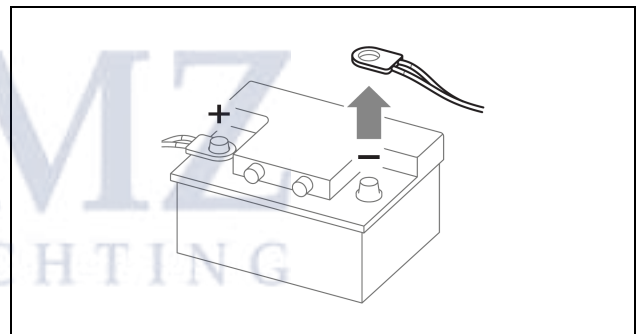
3. When mounting the device in the vicinity of a magnetic compass, maintain a protective distance from the compass.
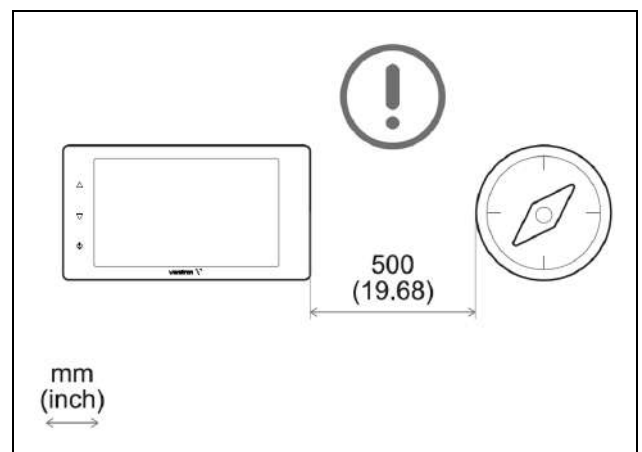
4. If required for the system, purchase an NMEA 2000 drop cable with five-pin M12 connector (max drop cable length 6 m) and a video cable with a compatible four-pin M12 connector (A2C1845710001).
   These are not included.

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## PANEL MOUNTING

1. Make a rectangular hole in the panel using the drilling template (see next page of this document) and considering the device dimensions [A].

2. Turn in the four grub screws of the installation kit on the backside of the device

3. Thread the cables through the hole and connect the connectors.

   **NOTE:** screw in M12 connectors with care. If they screw with difficulty, remove and screw them back in.

4. Insert the device from the front and tighten the four nuts on top of the plastic clamps to pull the display towards the panel [B].

5. Remove the protection film from the display and make sure it is clean and dry.

6. Install the sun cover in front of the display by placing it onto it and pressing it on the lateral sides with your fingers to clamp it.
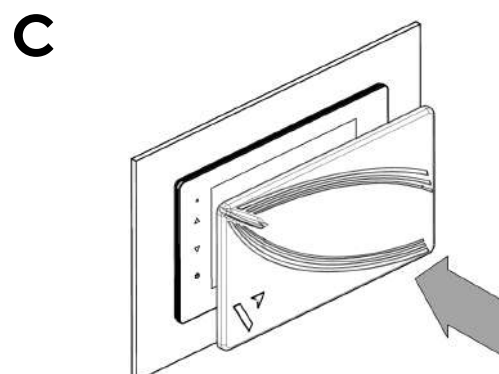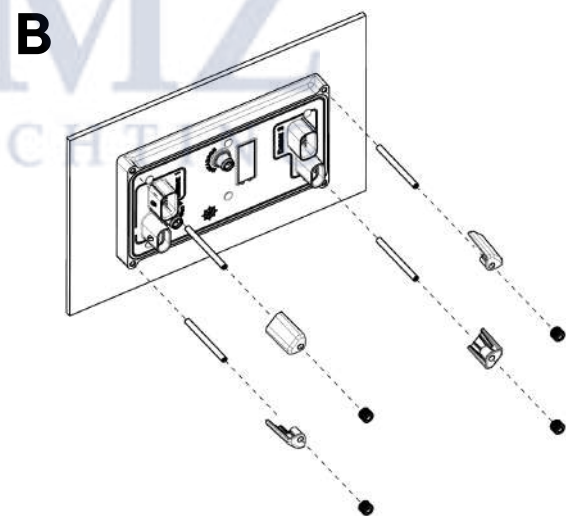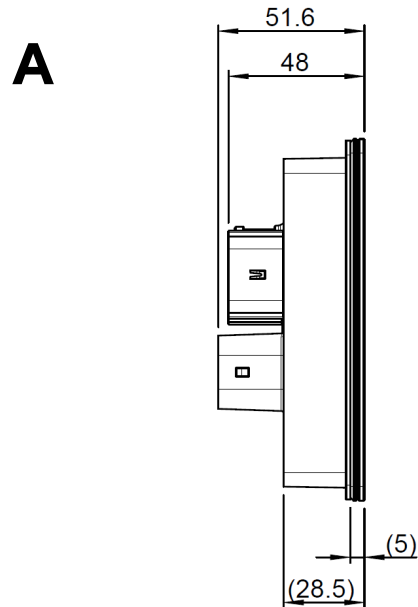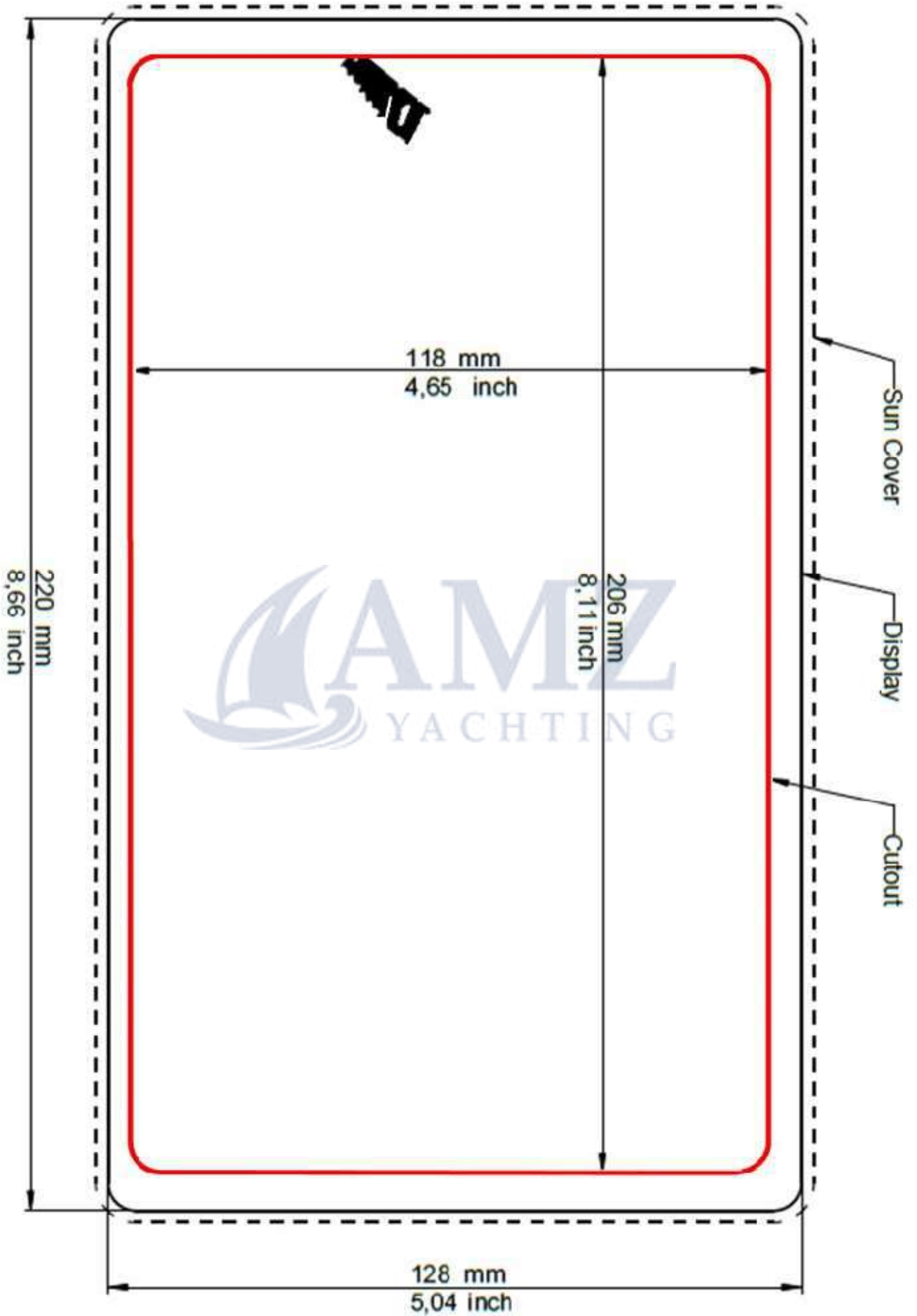
**A**

51.6

48

(5)

(28.5)

**B**

**C**

118 mm
4,65 inch

206 mm
8,11 inch

220 mm
8,66 inch

128 mm
5,04 inch

Sun Cover

Display

Cutout

# ELECTRICAL CONNECTIONS
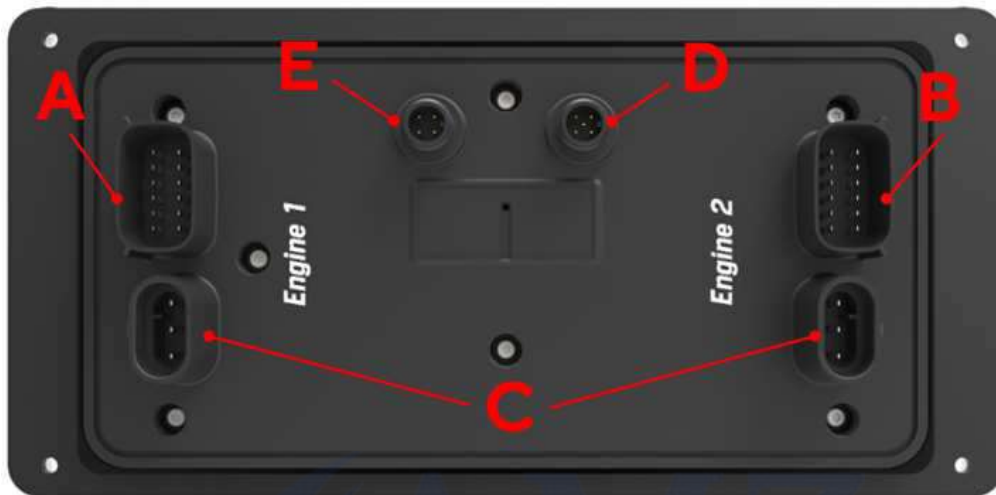
## ENGINE 1 CONNECTOR [A]

| Pin No. | Wire color | Description |
|---|---|---|
| 1 | Red | KL. 30 – Battery power 12 / 24 V |
| 2 | Black | KL. 31 – Ground |
| 3 | White | Alarm output |
| 4 | Green | Frequency sensor signal – RPM |
| 5 | Blue | SAE J1939 – CAN Low |
| 6 | Blue / White | SAE J1939 – CAN High |
| 7 | Yellow | KL. 15 – Ignition positive |
| 8 | Grey | Resistive sensor input |
| 9 | Brown | Resistive sensor input |
| 10 | Orange | 0-5 V sensor input |
| 11 | Light Blue | 4-20 mA sensor input |
| 12 | Violet | 4-20 mA sensor input |
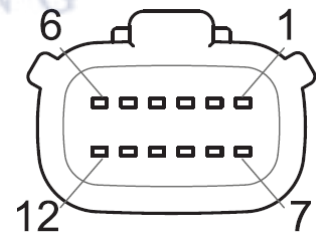


Molex MX150 12-poles connector, cable view and wire harness A2C1507870001 (included)

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## ENGINE 2 CONNECTOR [B]

| Pin No. | Wire color | Description |
|---------|------------|-------------|
| 1 | Pink | Configurable alarm input |
| 2 | Black | KL. 31 – Ground |
| 3 | White | Alarm output |
| 4 | Green | Frequency sensor signal – RPM |
| 5 | Blue | SAE J1939 – CAN Low |
| 6 | Blue / White | SAE J1939 – CAN High |
| 7 | Yellow | 0-5 V sensor input |
| 8 | Grey | Resistive sensor input |
| 9 | Brown | Resistive sensor input |
| 10 | Orange | 0-5 V sensor input |
| 11 | Light Blue | Resistive sensor input |
| 12 | Violet | Resistive sensor input |
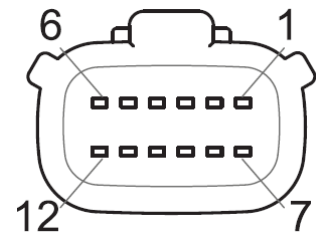
Molex MX150 12-poles connector, cable view and wire harness A2C1507870001 (included)

## EASYLINK CONNECTORS [C]

| Pin No. | Description |
|---------|-------------|
| 1 | +12V Power |
| 2 | GND |
| 3 | EasyLink Data |

AMP SuperSeal 1.5 3 poles plug female, cable view

The EasyLink interface is meant for connecting VMH 14 satellites.
It is possible to connect up to 16 gauges per channel (daisy-chain) as shown in the picture on the right.

Each channel can display the data from one engine. The engine displayed can be configured in [SYSTEM CONFIGURATIONS] >[EASYLINK].

OceanLink satellites are not supported.

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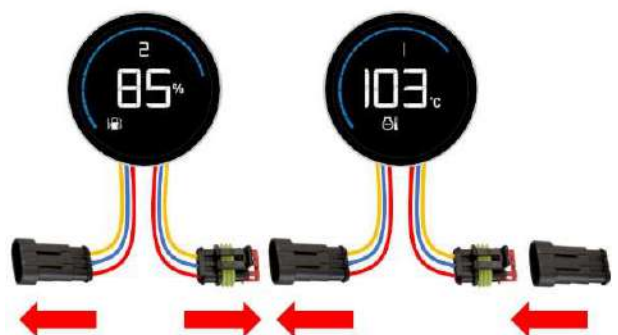
## NMEA 2000® CONNECTOR [D]

| Pin No. | Description |
|---------|-------------|
| 1 | Shield |
| 2 | NET–S (V+) |
| 3 | NET–C (V–) |
| 4 | NET–H (CAN High) |
| 5 | NET–L (CAN Low) |
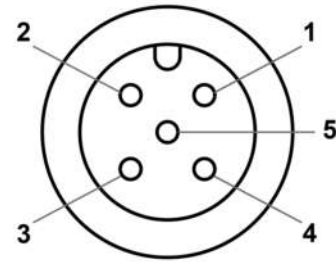
Micro-C M12 5 poles plug
male, cable view

Once the installation is complete, you can interface the device to the NMEA 2000® network through the dedicated connector [D].

Be sure to tighten the M12 connector by screwing it onto its counterpart in order to preserve its watertightness.

An accessory drop cable is required. (Not included)

Note that NMEA 2000® does not allow drop cables longer than 6 meters.

Refer to the NMEA 2000® standard for proper network design.

## VIDEO INPUT CONNECTOR [E]

| Pin No. | Description |
|---------|-------------|
| 1 | Video input 2 |
| 2 | Video input 1 |
| 3 | GND 2 |
| 4 | GND 1 |
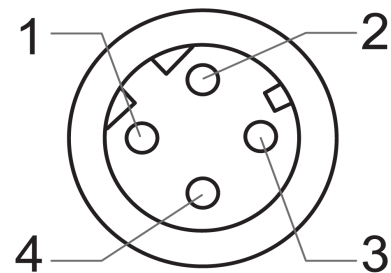
M12 4 poles plug
female, cable view

## ELECTRICAL SCHEMATIC
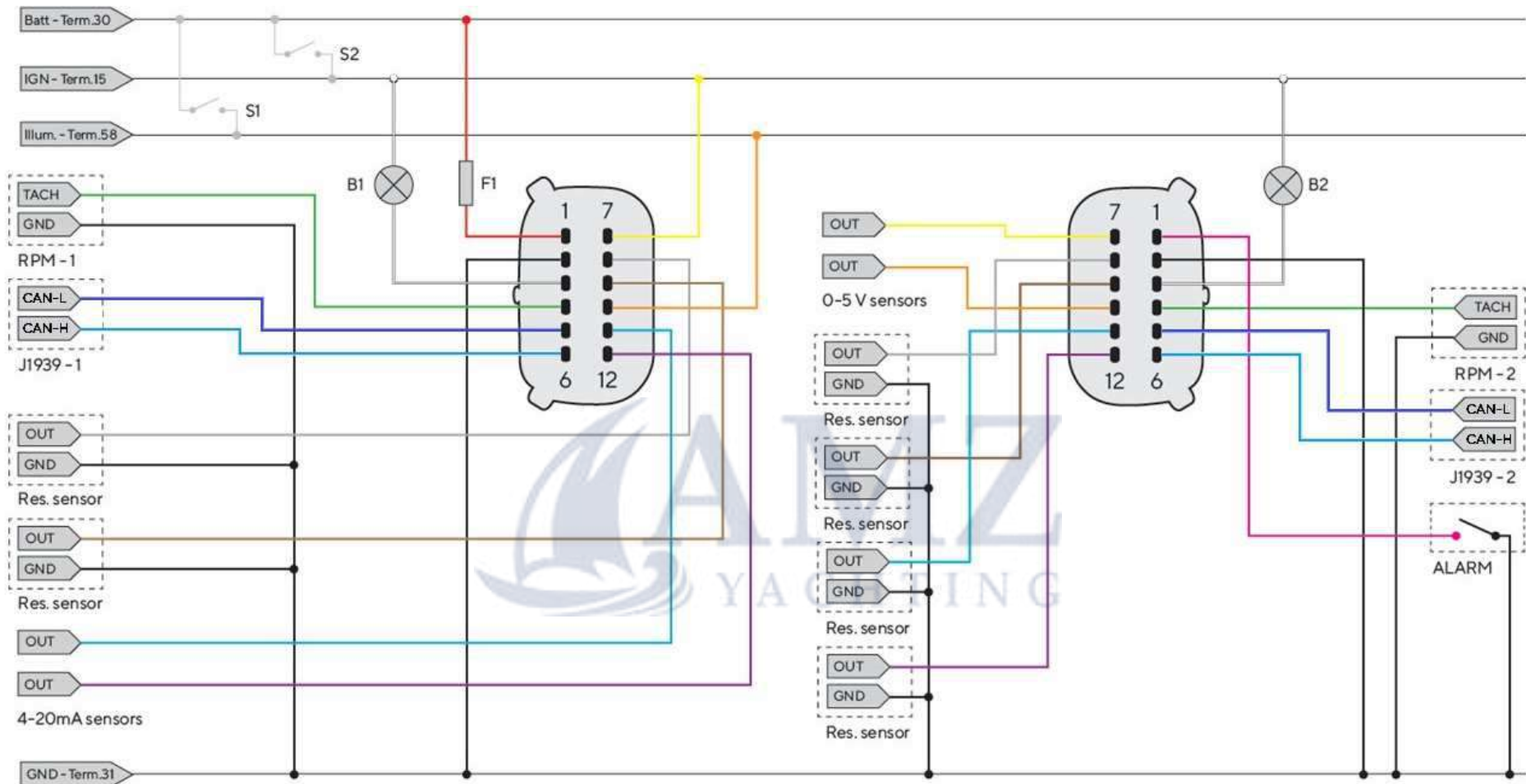


### Designations in the circuit diagram

**Batt** – Term.30 – Battery Power 12/24 V
**IGN** – Term. 15 – Ignition positive
**GND** – Term. 31 – Ground
**Illum.** – Term.58 – Illumination positive

**S1** – Day/Night mode switch (not included)
**S2** – Ignition key
**F1** – 3A fuse (not included)
**B1/B2** – External acoustic alarm (not included)

**RES** – Resistive inputs
**RPM** – Frequency inputs
**ALARM** – External digital alarm
**J1939** – SAE J1939 CAN ports

## RPM SENSOR CONNECTION

The engine RPM signal can be obtained from different sources, respectively the alternator "W" terminal, the ignition coil terminal "1", or from dedicated sensors such as a generator or an inductive sensor.
It is advisable to use sensors with isolated ground, and it is necessary to ensure that the sensor ground is connected to the display ground to avoid incorrect readings.
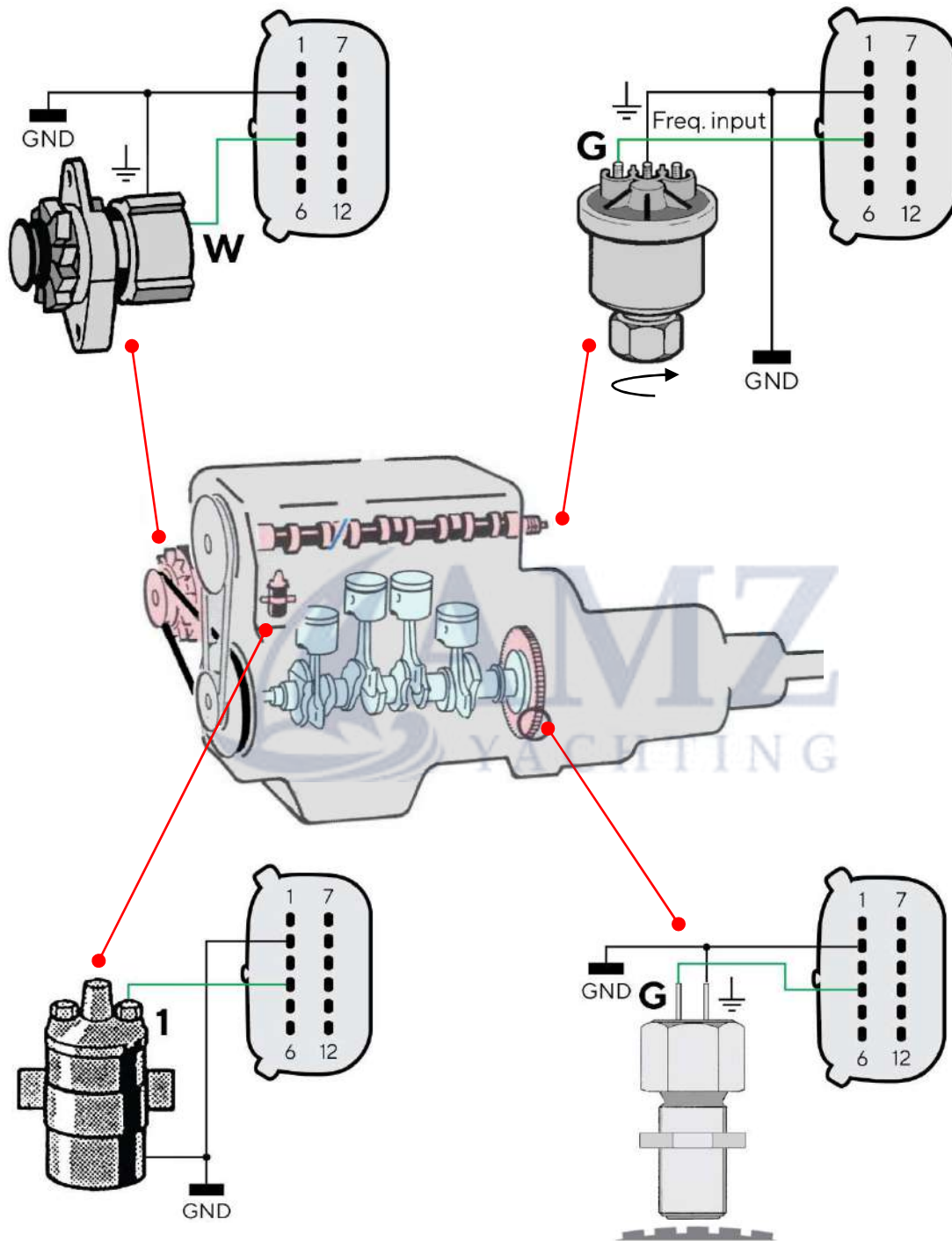
## RESISTIVE SENSOR CONNECTION

Any sensor connected to a resistive input of the display must be connected as shown in the figure.
It is advisable to use sensors with isolated ground, and it is necessary to ensure that the sensor ground is connected to the display ground to avoid incorrect readings.



| Tank level sensor connected to resistive input 8 | Temperature sensor with isolated ground connected to resistive input 9 | Pressure sensor with isolated ground connected to resistive input 8 |
|---|---|---|

## EXTERNAL BUZZER CONNECTION (B1)

The display supports the connection of two external alarms (B1/B2) via the dedicated alarm outputs.

This buzzer/lamp can be powered at different voltages (consult the buzzer manufacturer's manual), as the alarm output is connected to ground inside the display. (Open collector output)

It is important to note that the maximum current supported is 500mA.
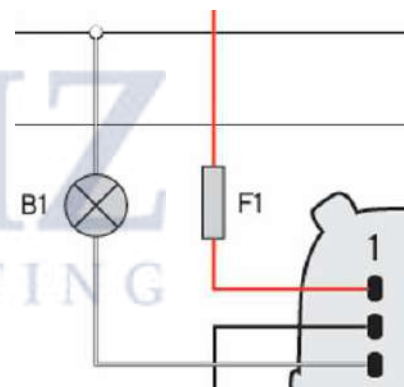


## DAY / NIGHT MODE SELECTOR SWITCH (S1)

The display allows you to set two display illumination levels, one for day and night.
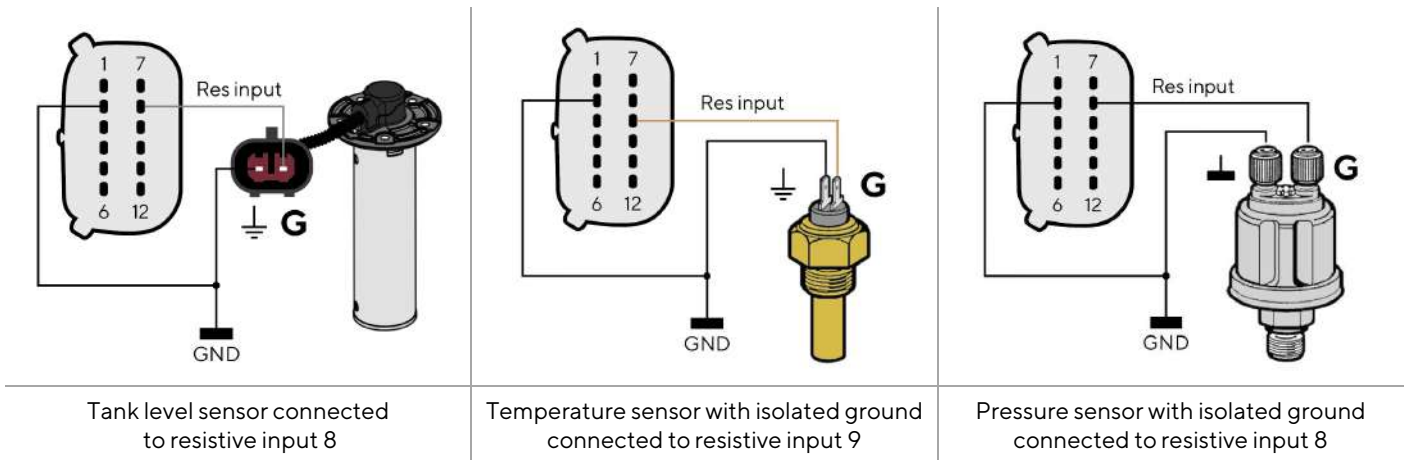It is possible to switch between day and night mode by means of a switch external to the display (S1) connected to the power supply (KL.30), or by connecting to the lights signal onboard KL.58, if present.
Every 0–5V input of the display can be configured for this purpose (see "Sensors' configuration").

To set the desired mode, act on the selected illumination input pin on the MX150 connector as follows:

| To set the mode... | Then... |
|---|---|
| day | move the pin switch to **GND/OPEN**. |
| night | move the pin switch to **BATTERY PLUS**. |

In the sensor settings the function of the according voltage input must be defined as illumination input.

## PRIORITY OF RECIEVED SIGNALS

If the same data is available from more than one source for the same engine, the received signal priority is the following:

- Analog input
- SAE J1939
- NMEA 2000

# GETTING STARTED

## OPERATIONAL CONCEPT

During normal operation the display shows one out of the up to ten customizable data pages. Swipe the touchscreen to the left or right to scroll through these pages.

To access the VMH 70 menu, press the field MENU in the screens lower left corner. This button leads to the main menu from where there are four sub-menus:

- **System Configuration**
  Change the system parameters like brightness, units or time.
- **Screen Configuration**
  Delete pages, add new ones or personalize the data to be displayed on the current ones.
- **Alarms**
  See the active alarms and define the settings for when an alarm should be displayed, sent out or trigger the external buzzer.
- **Sensor Configuration**
  Define all the settings for the analog inputs.

For more information on these menus refer to the respective chapters of this document.

The display brightness can be changed at any time by pushing the arrow buttons on the left side of the device.
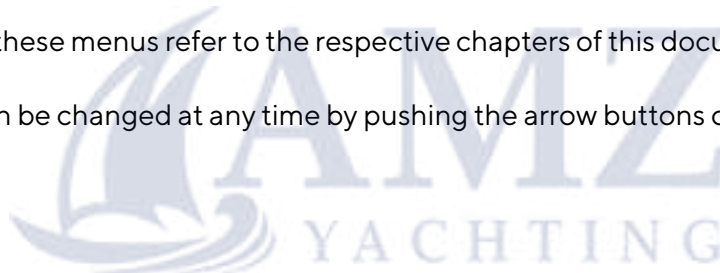
## STANDBY MODE

The VMH 70 display supports a standby mode, where the display is simply shut off to either reduce the current consumption or just to turn off the illuminated display in dark conditions when not needed.
Please note that during standby mode the unit is totally operative, and it can be instantly turned back on.
To activate the standby mode, just press the touch button with the power symbol.

## SWITCHING ON AND OFF

The on/off mode depends on the ignition signal on terminal 15 (connected to Engine1 connector, pin 7 – yellow wire).
At power up, logo and software version followed by a security message appear followed by the last data page viewed before turned off.

While the VMH 70 is turned on, it can be put into standby mode as described above.

You can customize the loading image displayed at power up using the Veratron Configuration Tool. Contact your Veratron dealer for more information.

## MENU BUTTON FUNCTIONS

When operating the menu these buttons will be displayed on the right edge of the display. Use them to navigate through the menu. It is not possible to scroll the menu by swiping the list.

| Button | Name | Function |
|--------|------|----------|
| < | BACK | • Return to the previous menu |
| ▲▼ | UP DOWN | • Scroll options |
| ENTER | ENTER | • Open a sub-menu<br>• Confirm the selection |

## TOUCH BUTTON FUNCTIONS

The following touch buttons are incorporated into the glass on the left of the screen. While the data screens are displayed the buttons serve the following functions:

| Button | Name | Function |
|--------|------|----------|
| ▲▼ | UP DOWN | • Change illumination brightness |
| ⏻ | STANDBY | • Push this button to bring the display in the standby mode or to start it up after being in standby.<br>(Only works if the ignition signal is turned on as well.) |

## CALIBRATION WIZARD

The Calibration wizard appears when first turned on after reset and every time turned on until sensors are calibrated.

The display prompts you to configure your sensors.
Choose [Yes], to open menu SENSOR CONFIG.
Choose [No], to display the first default data page and configure the sensors later.

## SET THE DAY/NIGHT MODE

There are three ways to steer the display to be in day- or night mode:

- **Illumination input**
  Define one of the 0-5Volt analog inputs to be an illumination input and connect it to an external switch or to the vessel's illumination signal. For more information on the installation see chapter "Day / Night Mode Selector Switch (S1)" in the section "Electrical Connections".
- **Light sensor**
  Enable the built-in light sensor in [SYSTEM CONFIGURATION]>[DISPLAY]>[Auto Day/Night Switch] so the display automatically toggles between day and night mode depending on the surroundings brightness.
- **Manually through menu**
  To manually switch between the different modes, make a selection in the menu [SYSTEM CONFIGURATION]>[DISPLAY]>[ILLUMINATION MODE].

## STARTUP CHECKLIST

Following are the steps for initial configuration:
1. Connect any sensors to analog inputs.
2. When turned on, read the security message, then select [Yes] to open the menu SENSOR CONFIGURATION and define the sensors parameters (see "Sensor configuration").
3. Set up general device operations (see "System settings").
4. Add/remove data pages selecting the best layout and data to be viewed (see "Data page configuration").
5. If a page layout with bar graphs is used, customize the minimum and maximum intervals (Bar graph settings, see "System settings").
6. Enable/disable local, NMEA 2000 and J1939 alarms (see "Alarm management").

## UPLOAD A CUSTOM SPLASH LOGO

A custom splash logo can be loaded from a PC using the Veratron Configuration Tool. That logo will be displayed each time during the startup process.
For more information, please refer to the Veratron Configuration Tool user manual or contact your Veratron reseller.

# DATA SCREENS

Data screens show the data received from the various sources. The display can store up to 10 data screens.
By default, five screens are displayed [Dual Engine, NavDash, Quad Data, Battery Screen, Video].
The alarms page appears at the end of the data pages if there are any active alarms.

## SCREENS SCROLLING

To scroll pages, swipe the touch screen horizontally with your finger. See "Data page configuration" to find out more about adding, deleting or editing pages.

## SCREEN LAYOUTS

Every screen contains some common elements, which are always displayed independently of the screen layout which is chosen.
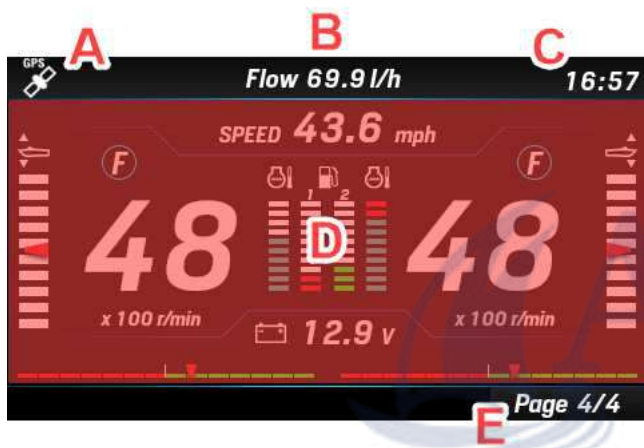


| Part | Description |
|------|-------------|
| A | GPS signal availability (GPS not included) |
| B | Screen title or additional data field (fixed) |
| C | GPS time (if received) |
| D | Screen content |
| E | Page number |

The screen content [D] depends on the screen configuration that the user has selected for a specific screen (see "Screen Configuration").
Each screen can be customized with one of the following available layouts:
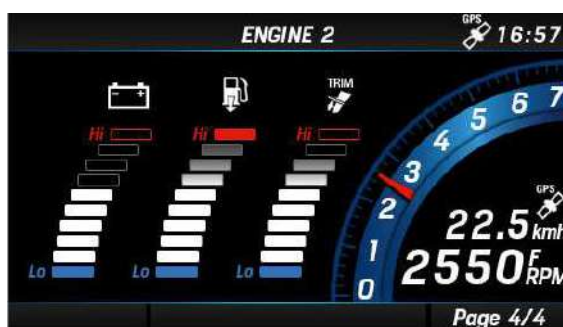


**SINGLE ENGINE LAYOUT**
gauge for engine revolutions and speed to ground with three bar graphs for data selected from Boost pressure, Trim, Engine coolant temperature, Battery voltage, Fuel consumption.
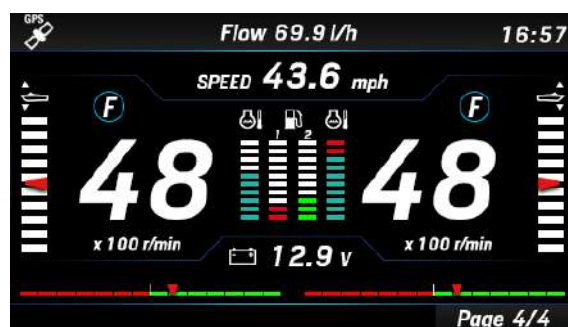


**DUAL ENGINE LAYOUT**
with three bar graphs for the three defined data: trim, engine coolant temperature, fuel level. Also the rudder angle, the engine speed, the battery voltage, the speed and the gear are displayed.

**SINGLE DATA LAYOUT**
Single data display. The data value is numeric or displayed by a gauge.

**TRIPLE DATA LAYOUT**
Three boxes, from three data to nine data.
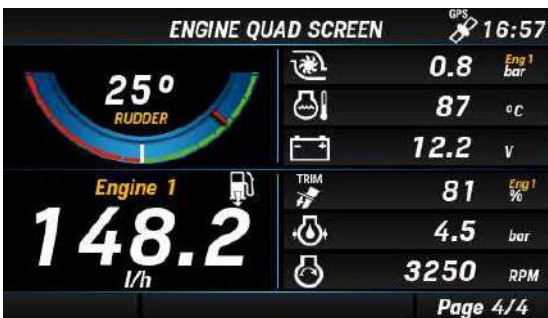
**QUAD DATA LAYOUT**
Four boxes, from four data to twelve data.
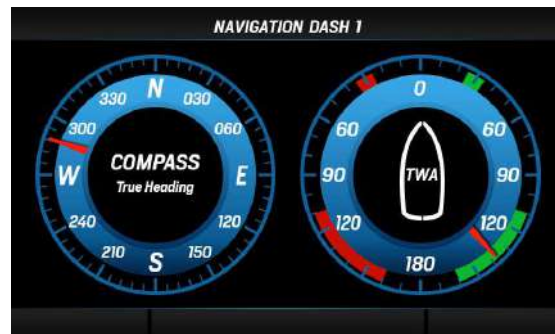
**NAV DASH SCREENS**
This layout allows to display data in an analog fashion. Three NavDash layouts are available with two, three, or eight gauges into the screen.
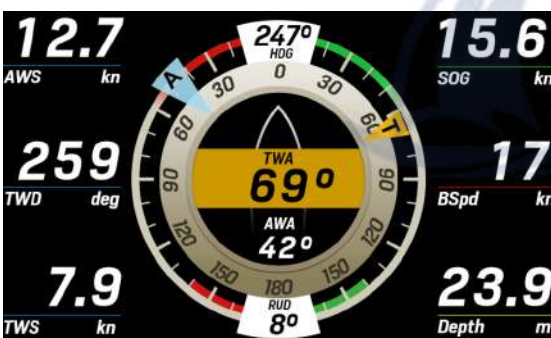
**WIND SCREEN**
Dedicated screen layout for navigation with graphical representation of both apparent and true wind data. Six customizable data fields are designed aside.
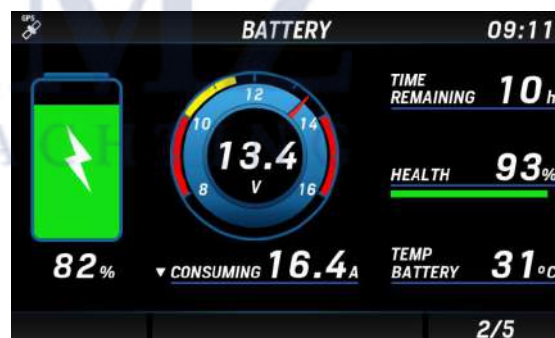
**INTELLIGENT BATTERY MONITOR SCREEN**
Dedicated screen for battery monitoring including extensive battery information coming from the Intelligent Battery Sensor (IBS).
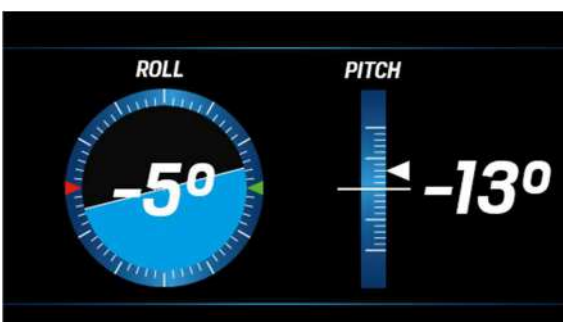
**PITCH AND ROLL SCREEN**
Monitors your boat inclination, with the information retrieved from a connected NavSensor, for example.
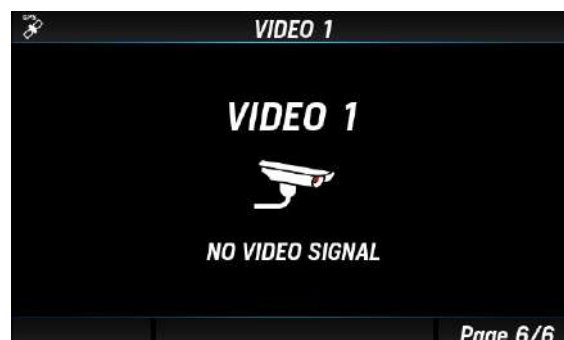
**VIDEO SCREEN**
Displays the video received from the external video camera.

# SUPPORTED DATA

| Icon | Data | Input | | | Output | Unit |
|---|---|---|---|---|---|---|
| | | NMEA 2000 | SAE J1939 | Analogue | NMEA 2000 | |
| | Engine rpm | x | x | x | x | rpm |
| TRIM | Engine trim | x | – | x | x | % |
| | Engine boost pressure | x | x | x | x | bar , psi , kPa |
| | Engine coolant temp | x | x | x | x | °C , °F |
| | Battery voltage | x | – | x | – | V |
| | Fuel rate | x | – | – | – | gal/h , L/h |
| | Fuel pressure (PGN 127489) | x | x | – | – | bar, psi |
| | Air Intake Temperature | – | x | – | – | °C , °F |
| LOAD | Engine load | x | x | – | – | % |
| | Exhaust temperature | x | x | – | – | °C , °F |
| | Engine oil temperature | x | x | x | x | °C , °F |
| | Engine oil pressure | x | x | x | x | bar , psi , kPa |
| | Transmission oil temperature | x | x | x (PC Tool required) | x | °C , °F |
| | Transmission oil pressure | x | x | x | x | bar , psi , kPa |
| | Engine hours | x | x | x | x | h |
| | Rudder angle | x | – | x | x | ° |
| | Depth | x | – | – | – | m , ft |
| | Fuel level (Tank: 1–4) | x | x | x | x | % |
| | Fresh water level (Tank: 1–4) | x | – | x | x | % |
| | Waste water level (Tank: 1–4) | x | – | x | x | % |
| | Sea water temperature | x | – | – | – | °C, °F |
| - | Air temperature | x | – | – | – | °C, °F |
| BARO | Atmospheric pressure | x | – | – | – | hPa |
| | Course over ground (COG) | x | – | – | – | ° |
| | True heading | x | – | – | x | ° |
| AWA | Apparent wind angle (AWA) | x | – | – | x | ° |
| A | Apparent wind speed (AWS) | x | – | – | x | km/h |
| TWA | True wind angle (TWA) | x | – | – | – | km/h |

| Icon | Data | Input | | | Output | Unit |
|------|------|-------|---|---|--------|------|
| | | NMEA 2000 | SAE J1939 | Analogue | NMEA 2000 | |
| ⚑T | True wind speed (TWS) | x | - | - | x | km/h |
| ◯ | True wind direction (TWD) | x | - | - | x | ° |
| ⬟ | Speed through water (STW) | x | - | - | - | mph, kn, km/h |
| A⟋B | Trip distance | - | - | - | - | km, mi, nm |
| CA⟍B | Trip time | - | - | - | - | h |
| B⛽A | Trip fuel | - | x | - | - | L, gal |
| GPS⟋ | GPS speed | x | - | - | - | mph, kn, km/h |
| - | Roll | x | - | - | - | ° |
| - | Pitch | x | - | - | - | ° |
| - | Position | x | - | - | - | ° |
| SOC | Battery Charge | x | - | - | - | % |
| - | Battery Current | x | - | - | - | A |
| - | Battery Autonomy | x | - | - | - | h, d |
| SOH | Battery Health | x | - | - | - | % |
| - | Battery Temperature | x | - | - | - | °C, °F |

## ENGINE HOURS

In the absence of data received from the NMEA 2000 network, the indicator considers the internally counted value. The time is counted as engine hours when the engine speed is more than 300 RPM. In the presence of data from the NMEA 2000 network, the indicator considers the data received from the network only if higher than the internal data.

## DISTANCE TRAVELED

The indicator internally calculates the distance travelled based on the speed while taking in account the correction factor set in [SENSOR CONFIGURATIONS] > [SPEED].

# NAVDASH LAYOUT

The NavDash layout is available in three different configurations with respectively two, three, and eight round gauges displayed.

Every layout is displayed in blue or amber color palette, and in day or night mode depending on the current display setup.



The slots of these configurations can be customized with different gauges, selectable among the following:



- Engine revolutions
- Depth
- Rudder angle
- Apparent wind angle (AWA)
- Apparent wind speed (AWS)
- True heading
- Speed through water (STW)
- Speed over ground (SOG)
- Fuel level
- Fresh water level
- Waste water level
- Trim
- Battery voltage
- Engine- and transmission oil pressure
- Engine- and transmission oil temperature
- Coolant temperature
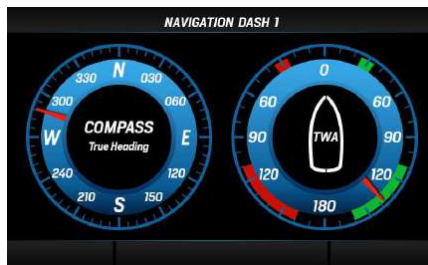
# SCREENS CONFIGURATION

To access the screens configuration settings, enter the HOME screen by pressing the MENU button and select [SCREENS CONFIGURATION] to enter the settings.

1.  Access the HOME screen by pressing [MENU] and select [SCREENS CONFIGURATION] to enter the screens' configuration.
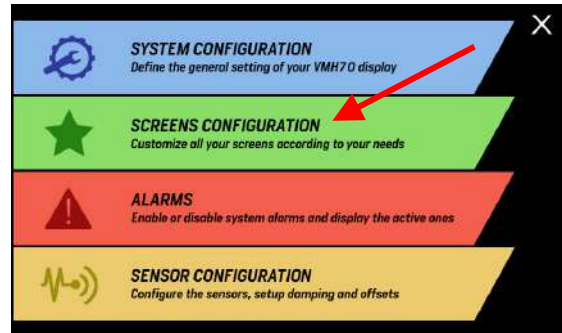
2.  Scroll the favorite screens until the one to be customized (or deleted) is displayed and press [ENTER] to confirm.

    To add a new screen at the end of the favorites, just scroll until an empty screen slot is selected.
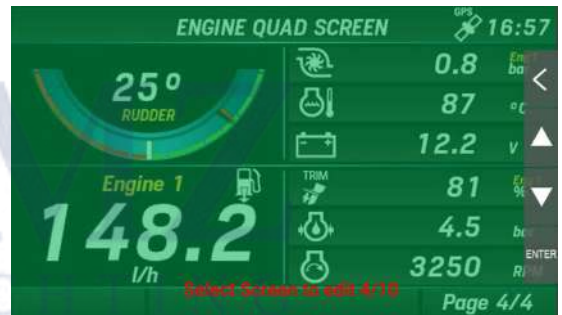
3.  Choose the screen layout for the new screen among the ones described in "Screens layouts".

    To delete the selected screen, select [REMOVE PAGE.]
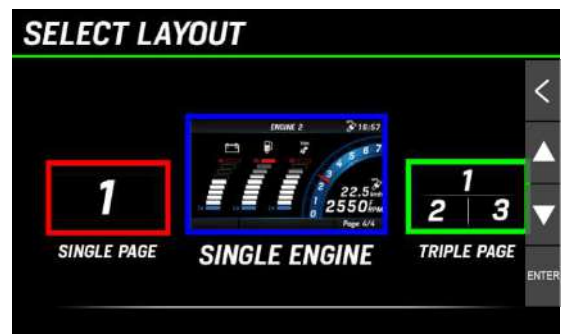
4.  Depending on the chosen layout it is possible to customize some parts of the screen like data fields or bar graphs.

    The currently selected item is highlighted in green color.
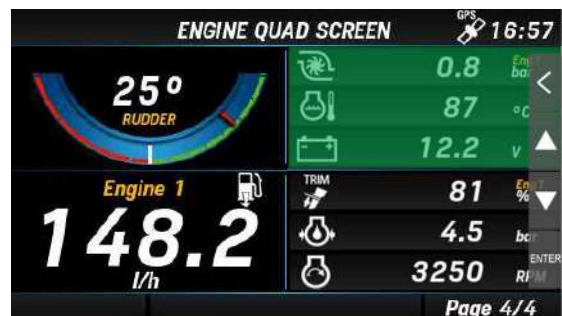
Press ▲ or ▼ to select the next field

Scroll through the customizable items by pressing the UP and DOWN buttons.

Press [ENTER] to select the item to be customized.
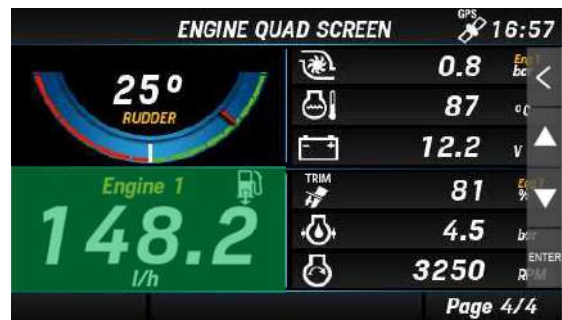
5.   Once an item is selected it will be highlighted in red color.

Press the UP/DOWN buttons to modify the data displayed on that item.

See the chapter "Supported Data" for the complete list of available data.

Once the displayed data is found, press [ENTER] to confirm the selection and the item is highlighted in green color again.
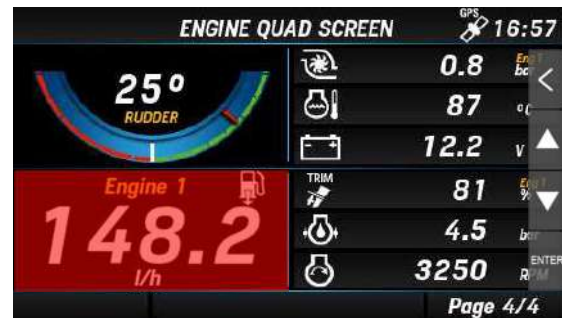
Press ▲ or ▼ to change the data
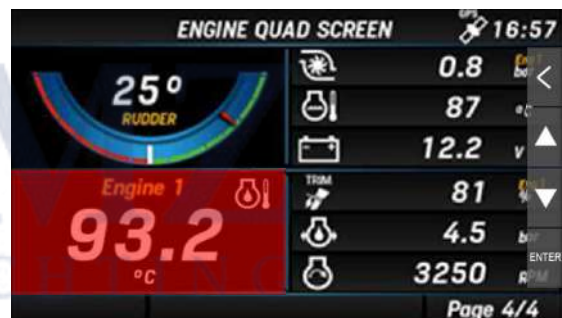
6.   To customize another screen, press [BACK] several times until you're back to the screen selection described at point 2.

To quit the settings and return to normal operation, also press [BACK] several times.

# SYSTEM CONFIGURATION

To access the system settings, enter the HOME screen by pushing [MENU] and selecting [SYSTEM CONFIGURATION] to enter the screens' configuration.

## MENU STRUCTURE

| Display | → | Illumination Day |
| Illumination Night |
| Bargraph settings |
| Illumination mode |
| Auto Day / Night switch |
| Touchscreen beep |
| Max RPM range |

| Units | → | Metric | | Distance |
| Imperial | | Boat speed |
| Nautical | | Wind speed |
| Custom | | Depth |
| | | Pressure |
| | | Fuel |
| | | Fuel flow |
| | | Temperature |

| Damping | → | Wind damping |
| Heading damping |

| Clock | → | Clock format |
| Clock offset |

| EasyLink | → | EasyLink connector 1 |
| EasyLink connector 2 |

| J1939 Gateway | → | J1939 connector 1 |
| J1939 connector 2 |

| Reset | → | Reset factory |
| Reset Trip Time |
| Reset Trip Distance |
| Reset Trip Fuel |

| Demo mode |

# OPERATING THE SYSTEM CONFIG MENU

NOTE: the underlined value/command is the factory default one.

| Setting | Description | Possible values / commands |
|---|---|---|
| Display > Illumination Day | Brightness of the display for the day mode.<br><br>*NOTE: this setup affects all the EasyLink gauges too.* | 0–7, <u>Auto</u> |
| Display > Illumination Night | Brightness of the display for the night mode.<br><br>*NOTE: this setup affects all the EasyLink gauges too.* | <u>0–7</u> |
| Display > Bargraph settings | Bar graphs minimum and maximum setup. | • Boost press: 0–13 bar (default = 0–1)<br>• Oil Press: 0–13 bar (default = 0–1)<br>• Engine temp 0–300 °C (default = 0–200)<br>• Battery voltage 8–32 V (default = 10–16)<br>• Fuel flow 0–800 L/h (default = 0–150) |
| Display > Illumination mode | Color palette and brightness profile selection. | • **<u>Blue day:</u>** blue dials, white numbers, Illumination: <u>7</u><br>• **Blue night:** blue dials, red numbers, Illumination: <u>2</u><br>• **Amber day:** amber dials, white numbers, Illumination: <u>7</u><br>• **Amber night:** amber dials, red numbers, Illumination: <u>2</u> |
| Display > Auto Day/Night Switch | Enable the built-in light sensor to automatically change between day and night mode and sets at which level of brightness the display should toggle.<br><br>*NOTE: This is only possible if the Illumination input (term. 58) is disabled in the sensor configurations.* | • <u>OFF</u><br>• Bright<br>• Medium<br>• Dark |
| Display > Touchscreen Beep | Enable or disable the sound feedback for the touchscreen interactions. | • <u>ON</u><br>• OFF |
| Display > Max RPM Range | Select the measurement range for the engine speed. The dials in the different layouts will adapt to this maximum value. | • 3000, <u>4000</u>, 7000 |
| Units | Unit of measure for the displayed data. | • <u>Metric</u><br>• Imperial<br>• Nautical<br>• Custom |

| Setting | Description | Possible values / commands |
|---|---|---|
| Damping > Wind damping/ Heading damping | Damping for wind and heading displayed data. | • No<br>• <u>Low</u><br>• Medium<br>• High |
| Clock > Clock format | Clock format. | • <u>12 h</u><br>• 24 h |
| Clock > Clock offset | Time zone setup. | From –12h to +12 h (<u>0 h</u>) |
| EasyLink > EasyLink connector 1 / EasyLink connector 2 | Which engine's data to be displayed on the VMH 14 EasyLink satellites.<br>Setting always applies for the whole daisy chain on that connector<br><br>*NOTE: OceanLink satellites are not supported.* | • Show engine data from: Engine <u>1</u>–4<br>• Show fuel level data from: Tank <u>1</u>–4 |
| J1939 > Connector1 / Connector 2 | Configuration for the SAE J1939 to NMEA 2000 gateway.<br><br>All the data received from the J1939 bus will be sent on NMEA 2000 with the instance specified here. | Send to NMEA 2000 As:<br>• <u>Auto</u>: the display keeps the J1939 engine identifier also for the NMEA 2000 network.<br>• Engine 1–4 |
| Reset > Reset factory | Reset the display to factory default. | • Yes<br>• <u>No</u> |
| Reset > Reset Trip time | | • Yes<br>• <u>No</u> |
| Reset > Reset Trip Distance | | • Yes<br>• <u>No</u> |
| Reset > Reset Trip Fuel | | • Yes<br>• <u>No</u> |
| Demo mode | Demo mode activation.<br>Simulated data are NOT sent on NMEA 2000.<br><br>*Note: the demo mode will remain active after the unit is restarted.* | • On: display data are simulated. The simulation is sent on EasyLink satellites too.<br>• <u>Off</u>: demo mode is off. |

## UNITS

| Setting | Metric | Imperial | Nautical | Custom |
|---|---|---|---|---|
| Distance | km | mi | nm | km, mi, nm |
| Boat speed | km/h | mph | kn | km/h, mph, kn |
| Wind speed | km/h | kn | kn | km/h, kn, m/s, bft |
| Depth | m | ft | ft | m, ft |
| Pressure | bar | psi | psi | bar, psi, kPa |
| Fuel | L | gal | gal | L, gal |
| Fuel flow | L/h | gph | gph | L/h, gph |
| Temperature | °C | °F | °F | °C, °F |

## SAE J1939 GATEWAY

The VMH display is equipped with two independent SAE J1939 ports to connect your CAN engines to the display and read the digital data coming from them.
Make sure to properly setup the J1939 gateway so that all the engine data are transmitted on NMEA 2000 with the correct instance.
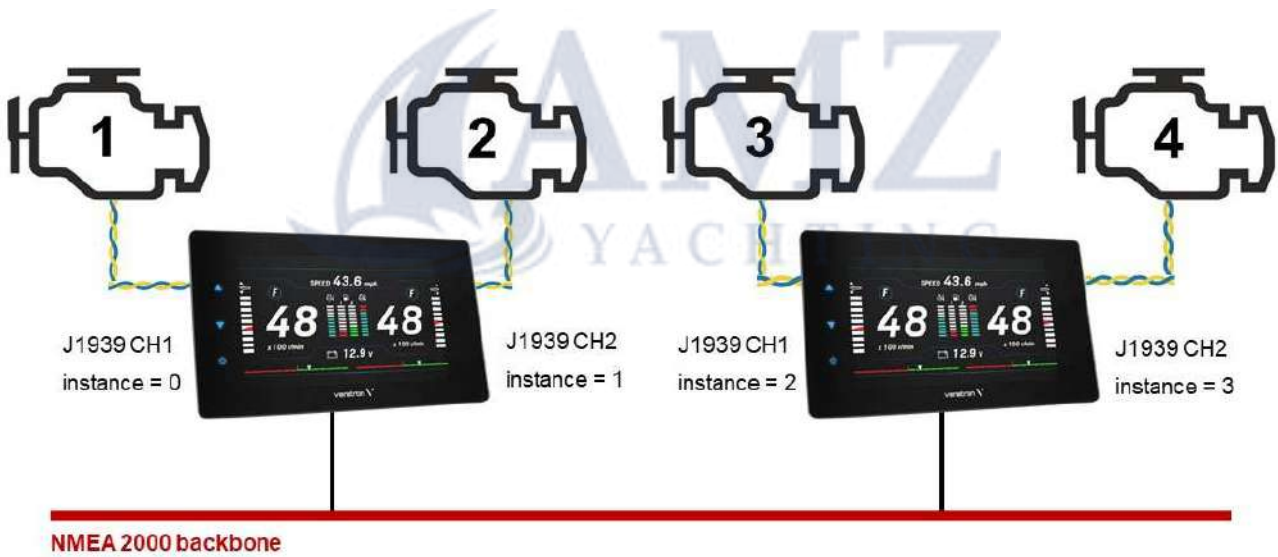
# SENSOR CONFIGURATION

To access the sensors' settings, enter the HOME screen by pressing the MENU button and select [SENSOR CONFIGURATION] to access it.

## MENU STRUCTURE
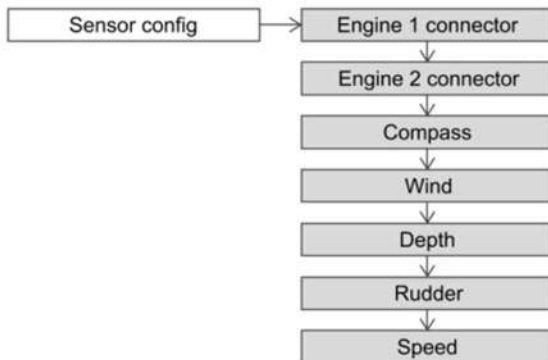


| Setting | Description | Possible values |
|---|---|---|
| Engine 1 connector | Configure the sensors connected to the display through the analogue inputs of the Engine 1 connector (see "Electrical Connections"). | – |
| Engine 2 connector | Configure the sensors connected to the display through the analogue inputs of the Engine 2 connector (see "Electrical Connections"). | – |
| Compass > Heading offset | Angular offset between the compass and the bow of the boat. | ± 0 – 180° |
| Compass > Variation | Magnetic variation offset (polar difference between Magnetic North and True North) | ± 0 – 180° |
| Compass > Send True Heading | Activate to let the display transmit the calculated True Heading over NMEA 2000. | Yes / No |
| Wind > Wind direction offset | Angular offset between the wind sensor 0° position and the longitudinal boat axis. | ± 0 – 180° |
| Wind > Send True Wind | Activate to let the display transmit the internally calculated True Wind data (TWA and TWS) over NMEA 2000. | Yes / No |
| Depth | Depth offset setup. Positive for depth below waterline, negative for depth below keel. | ± 0 – 9.9m (default 2m) |
| Rudder | Rudder offset setup. | ± 0 – 120° |
| Speed > Speed correction factor | Correction for the boat speed data received via NMEA 2000. See "Calculate the speed offset". | 0 – 199.99 (default: 1.00) |

## CONFIGURE A SENSOR CONNECTED TO THE DISPLAY

```
Engine 1 connector → Frequency pin 4 → Off
                                       On → Show value as
                                            ↓
                                            Pulse per revolution

                     Resistive pin 8 → Off
                                       Trim → Show value as
                                              ↓
                                              Calibration
                                       Fresh water → as "Trim"
                                       Rudder → as "Trim"
                                       Fuel → Show value as
                                              ↓
                                              Calibration → Tank volume
                                                            ↓
                                                            Sensor type
                                                            ↓
                                                            Calibration
                                       Eng cool temp 40-120 °C → Show Value As
                                       Eng oil temp 50-150 °C → as "Eng cool temp"
                                       Eng oil pres 0-5 bar → as "Eng cool temp"
                                       Eng oil pres 0-10 bar → as "Eng cool temp"
                                       Transm oil pres 0-25 bar → as "Eng cool temp"
                                       Transm oil pres 0-30 bar → as "Eng cool temp"
                                       Boost pressure 0-2 bar → as "Eng cool temp"
                                       custom → as "Eng cool temp"

                     Resistive pin 9 → as "Resistive pin 8"
                     Voltage pin 10 → Off
                                      Ext Illum
                                      Eng oil pres 0-10 bar → Show value as
                                      Eng oil pres 0-16 bar → as "Eng oil 0-10 bar"
                                      Eng oil pres 0-30 bar → as "Eng oil 0-10 bar"
                                      Custom → Show value as

                     Current pin 11 → Off
                                      Fuel → Show value as
                                             ↓
                                             Calibration
                                             ↓
                                             Tank volume
                                      Fresh water → Show value as
                                                    ↓
                                                    Calibration
                                      Waste water → as "Fresh water"
                                      Custom → Show value as

                     Current pin 12 → as "Current pin 11"
```

1. **INPUT SELECTION**

   Once in the SENSOR CONFIG menu, select "Engine 1 connector" or "Engine 2 connector" depending on which connector the sensor is electrically connected to.

   Then select the analogue input (on that connector) where the sensor output is wired.
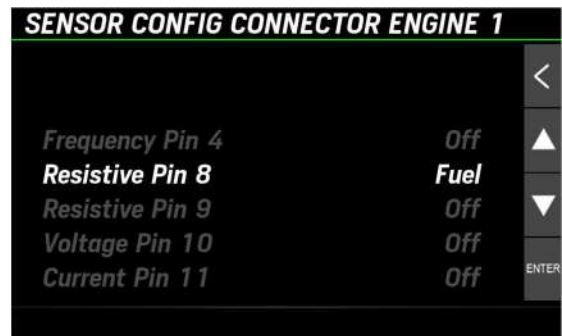
2. **CHOOSE THE SENSOR TYPE**

   Select what kind of sensor is connected to that input.

   See the menu diagram for the complete list of supported sensors.

   Select "Custom" for importing the complete input configuration from the PC Veratron Configuration Tool.
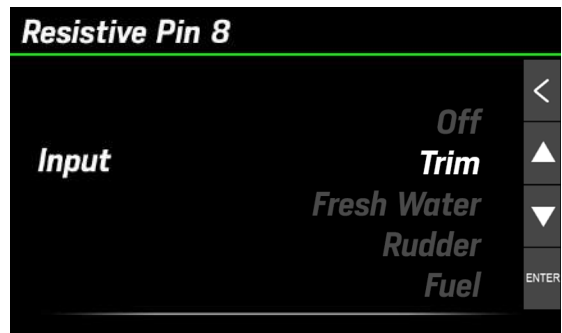
3. **CONFIGURE THE NMEA 2000 OUTPUT**

   The measured value for the configured analog sensor is also transmitted over NMEA 2000, so the VMH display will act as a source for that data.

   Use the menu item "Show Value As" to modify the NMEA 2000 instance for that sensor.

   If a configuration conflict is detected in the setup (like when two sensors with same instance are configured on different analog ports), the display will show a warning.
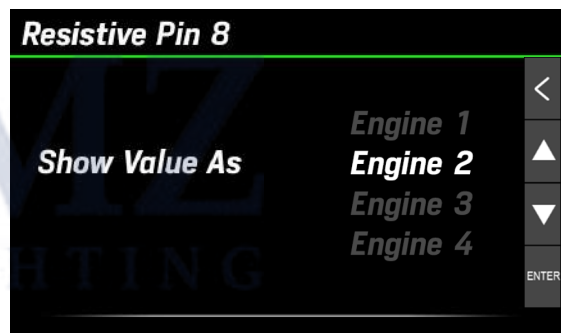
4. **CALIBRATE THE SENSOR**

   Every sensor type has a standard calibration (see "Default supported calibrations").
   Veratron sensors are by default supported.

   It is however possible, for some sensors, to calibrate the sensor through a calibration wizard (see next chapters).

   Every sensor type can be always calibrated via the PC-based Veratron Configuration Tool (see "Sensor calibration with Veratron Configuration Tool").

# FUEL LEVEL SENSOR CALIBRATION

1. In the input configuration menu described before, select "Calibration" to open the sensor's calibration options.

2. Select **Tank volume** to set the tank's capacity (not mandatory).

3. Select **Sensor type**, then select the sensor type among the proposed standard ones.

4. Select **Calibration**, then select the one or three-point calibration procedure (**Do 1 point cal/Do 3-point cal**).
Calibration instructions and the ohmic value read in real-time from the sensor [A] appear.

5. Empty the tank and wait for the read value to stabilize. Then confirm by pressing [ENTER].

6. For three-point calibration, follow the on-screen instructions.

7. Return to the data pages by pressing [<]
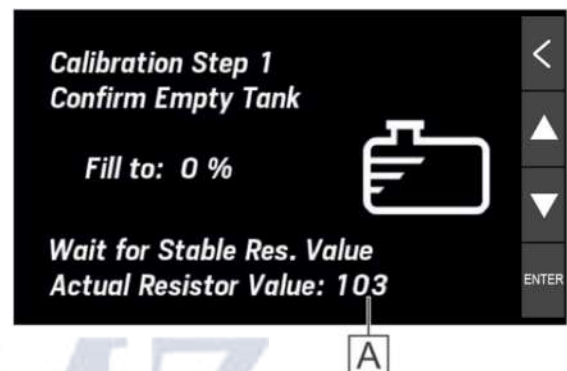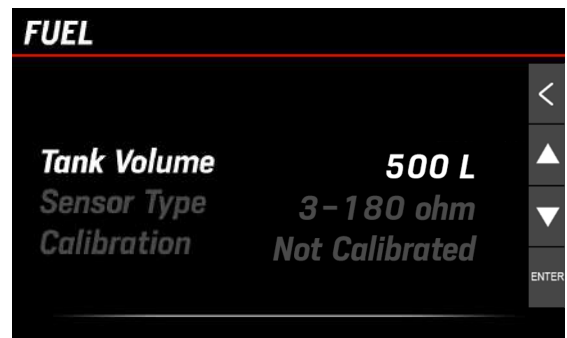
# OTHER SENSORS' CALIBRATION

1. In the input configuration menu described before, select **Calibration** to open the sensor's calibration options.

2. Then select the three-point calibration procedure by accessing **Do 3-point cal**.
Calibration instructions and the ohmic value read in real-time from the sensor appear.

3. For fresh and waste water sensors the tanks must be drained, then wait for the read value to stabilize. Confirm the reading by pressing [ENTER].

4. Proceed with all calibration points following the wizard.

5. Return to the data pages by pressing [<] several times.

B001517
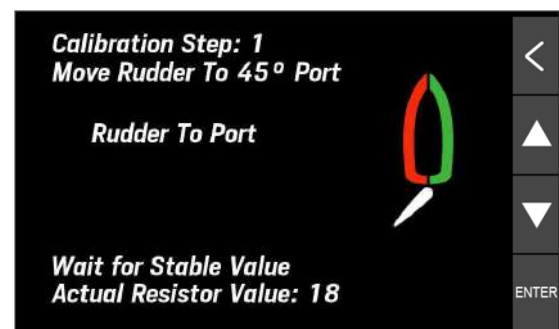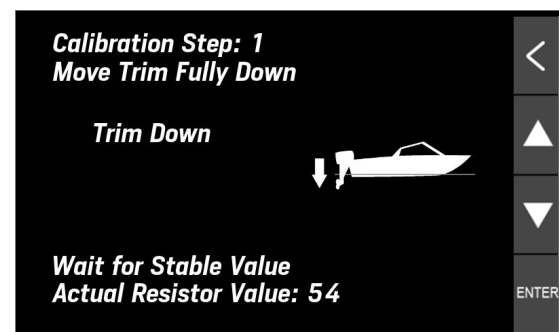
# CUSTOM SENSORS CONFIGURATION

In the bottom part of the Sensor Configuration panel, it is possible to fully customize the configuration of every analog port of your VMH display.

*NOTE: this operation still requires you to perform some setting on the display itself (set the input to "Custom" and select the data instance).*
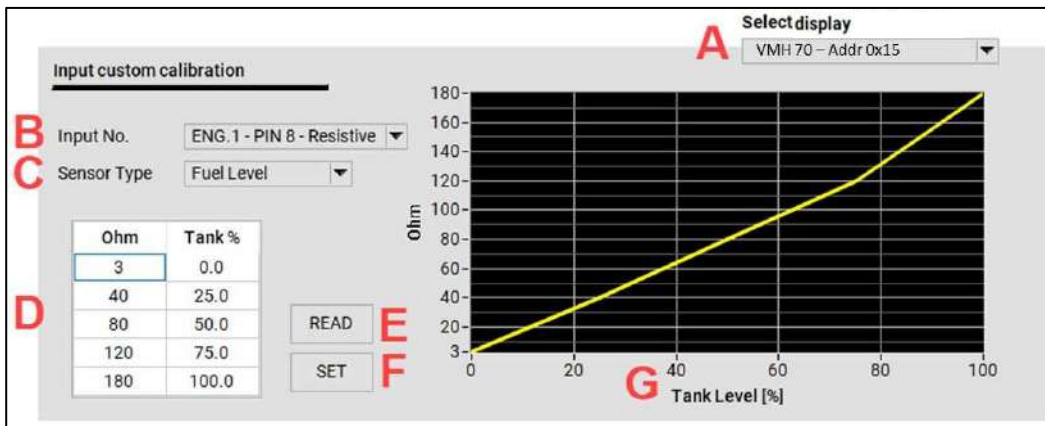


| | | |
|---|---|---|
| 1 | **Select the display** to be programmed from the drop-down list [A].<br>If more VMH displays are on the network, they will all be visible in this list.<br><br> |
| 2 | **IN THE DISPLAY MENU** set the pin configuration to "CUSTOM".<br>*Sensor Config → Choose the port to be configured → Input → Custom*<br><br>This setup is required on the display to allow the local pin configuration to be overwritten.<br>When CUSTOM is selected, the configuration must come from the Tool. |
| 3 | Back on the PC Tool, **select the input to configure [B].**<br>This selection must match the pin configured as CUSTOM on the display in the step before. |
| 4 | **Select the Sensor type** from the drop-down list [C].<br><br> |
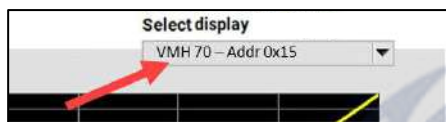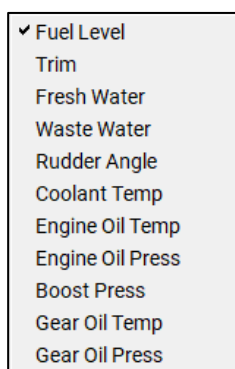
**5**    **Manually set the 5-points calibration** into the table [D] for the selected sensor.
The graph [G] will display the calibration being set.

| Ohm | Tank % |
|-----|--------|
| 3 | 0.0 |
| 45 | 25.0 |
| 90 | 50.0 |
| 135 | 75.0 |
| 180 | 100.0 |

*The example above is for a standard 3-180Ω fuel level sensor.*

**6**    **Upload the configuration** to the display**.**
Press the SET button [F] to write the configuration for the specific pin.
A pop-up will appear as a safety confirmation.

Press the READ button [E] to read back from the display the configuration for the pin defined in [A].

## DEFAULT CALIBRATIONS

| Sensor Type | Calibration |
|-------------|-------------|
| Fuel | 240-33 Ω |
|  | 3-180 Ω |
|  | 2-90 Ω |
| Fresh Water | 3-180 Ω (resistive inputs) |
|  | 4-20mA (capacitive inputs) |
| Waste Water | 3-180 Ω (resistive inputs) |
|  | 4-20mA (capacitive inputs) |
| Trim | 10-167 Ω |
| Rudder | 10-180 Ω |
| Eng Coolant Temp | 291-22 Ω |
| Eng Oil Temp | 197-11 Ω |
| Eng Oil Pressure | 10-184 Ω |
| Boost Press | 10-184 Ω |

## ADJUSTING THE SPEED CORRECTION FACTOR

The speed correction factor lets you align the speed through water (STW) to the actual speed. If the measured speed differs from the real boat speed for more than 0.5 kn, this factor can be adjusted. Increasing the offset factor reduces the displayed speed through water (STW).

# ALARMS

The VMH display can show active alarms coming from either NMEA 2000, SAE J1939, or from the analogue sensors directly connected to it.
Engine alarms concern all engines on the network.

## MENU STRUCTURE

```
Active alarms
    │
    ▼
Config alarm popup ──► Depth shallow ──► Alarm active ──► No
                           │                               │
                           │                               ▼
                           │                              Yes ──► Value
                           │                                        │
                           │                                        ▼
                           ▼                                      Buzzer
                          ...
                           │
                           ▼
                    Local alarm input ──► Alarm active ──► No
                           │                               │
                           │                               ▼
                           │                              Yes ──► Alarm active
                           │                                        │
                           │                                        ▼
                           ▼                                      Buzzer
                        Min RPM
                           │
                           ▼
                          CAN ──► NMEA 2000 ──► Alarms list ──► Alarm popup
                                      │                            │
                                      │                            ▼
                                      ▼                          Buzzer
                                   J1939 ──► as "NMEA 2000"
```
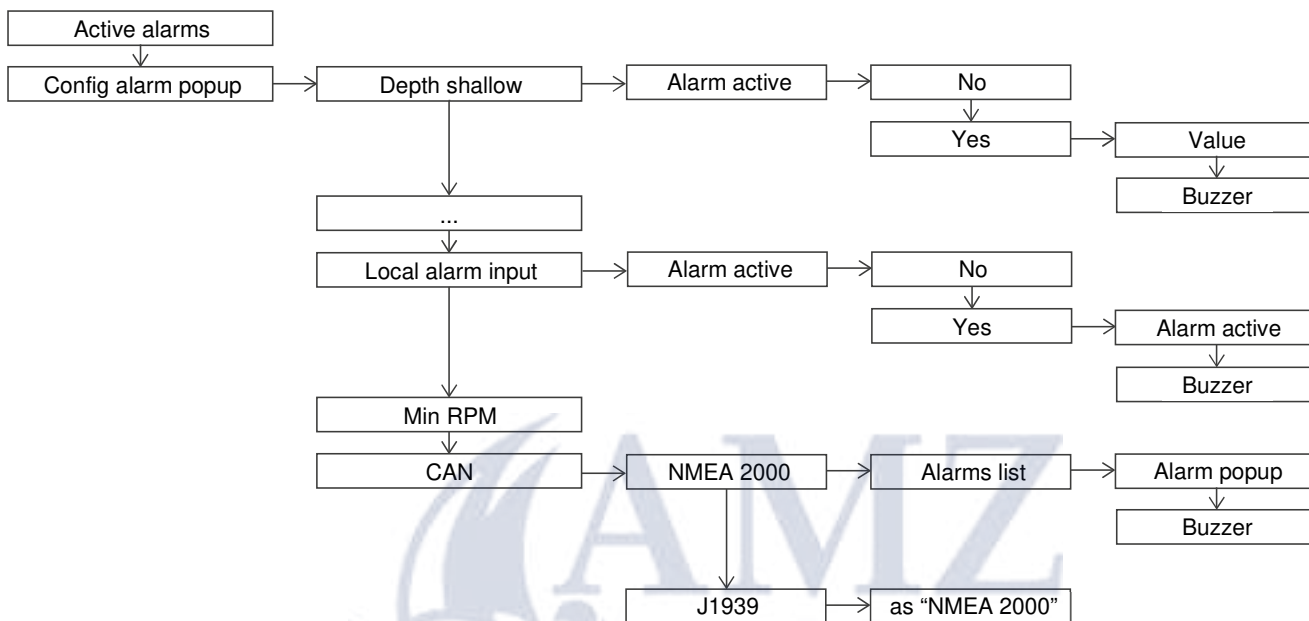
## ALARMS NOTIFICATION

In the event of an alarm, the following appears on the display:
• The alarm pop-up appears
• The buzzer gets activated, if connected and configured to do so
• The active alarm, including additional information, is visible in the Active alarms screen
• If supported, the local alarm is transmitted to the NMEA 2000 network

**ALARM**

Low Battery Voltage

12.3 V

## ACKNOWLEDGE AN ALARM

When an alarm is triggered, the Alarm notification pop-up appears and the buzzer sounds (if connected and configured).

To acknowledge the alarm and mute the buzzer, press the touchscreen: the pop-up notification is closed, and the alarm is saved in the Active alarms screen.
The alarm remains displayed in the Active alarms screen as long as it remains active, and a warning icon is displayed in the bottom side of every screen to remind you that an alarm is currently active.

## ACTIVE ALARMS

If at least one alarm is active, an "Active alarm" screen will appear after the last screen. The same screen can be accessed via [ALARMS] > [Active alarms].
All the currently active alarms are listed here, together with some warning symbols.
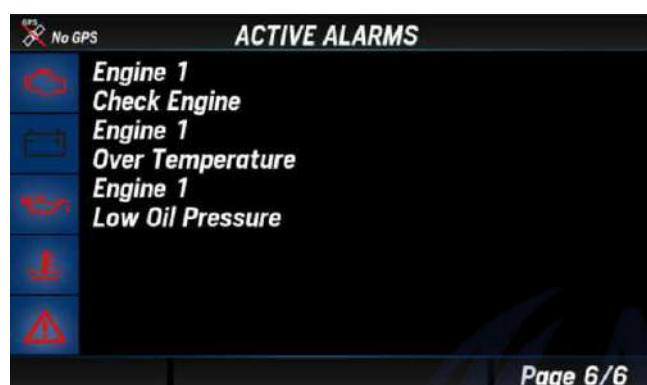


| Symbol | Description |
|---|---|
| | Engine alarms |
| | Battery alarms |
| | Oil alarms |
| | Engine temperature alarm |
| | Generic alarm |

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## CONFIGURE A LOCAL ALARM

1. Press the MENU button and select [ALARMS] > [Setup]
2. Select one of the supported alarms
3. Activate it by selecting [Active] > [Yes], the alarm parameters will appear
4. Then select and edit the threshold(s) and enable/disable the buzzer

| Setting | Description | Possible values | NMEA 2000 output |
|---------|-------------|-----------------|------------------|
| Depth shallow | Shallow water alarm. | 0 – 9.9 m (2m) | No |
| Depth navigation | Depth navigation alarms. Deep water alarm (e.g., a value near the maximum value measurable by the sensor) and safety depth minimum threshold. | 0 – 99.9 m (50m, 5m) | No |
| Wind | High wind speed. | 0 – 99.9 km/h (39.9km/h) | No |
| Battery voltage | Low battery voltage. | 0 – 32.9 V (10.8V) | Yes |
| Battery Temperature | High battery temperature. | 0 – 99 °C (50°C) | No |
| Battery Charge | Low battery state of charge. | 0 – 99 % (50%) | No |
| Engine water temp | High engine coolant temperature. | 0 – 139 °C (110°C) | Yes |
| Engine oil temp | High engine oil temperature. | 0 – 149 °C (120°C) | Yes |
| Engine oil pressure | Low engine oil pressure. | 0 – 9.9 bar (0.5bar) | Yes |
| Exhaust Gas Temp | High EGT. | 0 – 899 °C (500°C) | Yes |
| Fuel | Low fuel level. | 0 – 99 % (20%) | No |
| Fresh water | Low fresh water level. | 0 – 99 % (20%) | No |
| Waste water | High waste water level. | 0 – 99 % (80%) | No |
| Local alarm input | External digital switch (low active alarm). Refer to "Connections' diagram". The name of the alarm triggered can be configured in the Veratron Configuration Tool. Contact your dealer for more information. | – | No |
| Min RPM | Engine related alarms are only triggered when the engine speed exceeds this threshold. | 0 – 990 RPM (300RPM) | – |

## CONFIGURE A CAN ALARM

1. Press the MENU button and select [ALARMS] > [Setup]
2. Select [CAN] and then the [NMEA 2000] or [SAE J1939]
3. Choose the alarm to activate and select [Active] > [Yes], the alarm parameters will appear
4. If necessary, enable/disable the buzzer

| **NMEA 2000 alarms**<br>Engine (PGN 127489) | **NMEA 2000 alarms**<br>Transmission (PGN 127493) | **SAE J1939 alarms**<br>(DM1) |
|---|---|---|
| Check engine | Check transmission | Engine speed |
| Over temperature | Transm. over temp | Boost pressure |
| Low oil pressure | Transm. low oil pressure | Exhaust gas temperature |
| Low oil level | Transm. low oil level | Engine oil pressure |
| Low fuel pressure | Transm. sail drive | Engine coolant pressure |
| Low system voltage | | Engine coolant temp |
| Low coolant level | | Engine oil temp |
| Water flow | | Transmission oil press |
| Water in fuel | | Transmission oil temp |
| Charge indicator | | Fuel Level |
| Preheat indicator | | Water in fuel |
| High boost pressure | | |
| Rev limit exceeded | | |
| EGR system | | |
| Throttle position sensor | | |
| Engine emergency stop | | |
| Warning level 1 | | |
| Warning level 2 | | |
| Power reduction | | |
| Maintenance needed | | |
| Eng com error | | |
| Sub or secondary throttle | | |
| Neutral start protect | | |
| Engine shutting down | | |

# TROUBLESHOOTING

| Problem | Root cause | Solution |
| --- | --- | --- |
| The values displayed are not as expected. | Incorrect sensor configuration. | Check the configuration in the Sensors menu. |
| | Sensor connected incorrectly. | Check the connection, refer to the Installation Instructions. |
| | The NMEA 2000 network backbone has not been created correctly. | Check the connections and that there is a termination at both the beginning and end of the backbone. |
| "– – –" is displayed for a certain data or the pointer blinks in the NavDash layout. | The data is not available on the network. | Check that the device sending this information is functioning correctly. |
| | Sensor not connected. | Connect the sensor, refer to the Installation Instructions. |
| | The NMEA 2000 network backbone has not been created correctly. | Check the connections and that there is a termination at both the beginning and end of the backbone. |
| The same data is displayed with two different alternating values. | Incorrect sensor configuration. Two different sources are sending the same data on NMEA 2000. | Check the engine/tank IDs (Show value as) in the sensor configuration. |

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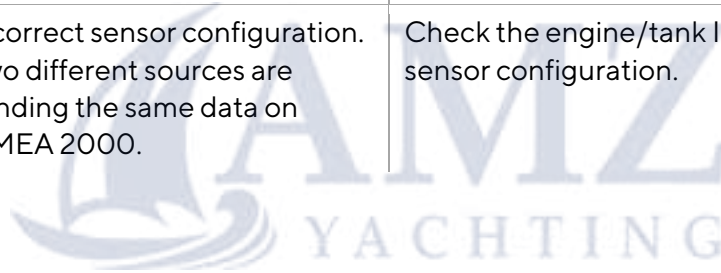
# TECHNICAL DATA

## GENERAL FEATURE

| Material | Aluminum case<br>PC-FR back cover<br>Mineral glass front screen |
|---|---|
| Display | IPS TFT 7" – 800x480 – Transmissive touch screen<br>Full 24 bit / 16 mio. colors |
| Connectors | • 2x Molex MX150 12 pin<br>• 1x NMEA 2000 Micro-C M12 5 pin<br>• 2x AMP SuperSeal 1.5 Series (EasyLink)<br>• 1x M12 4 pins "D" coding (Video) |
| Input data | • CAN (NMEA 2000 and SAE J1939)<br>• 6x resistive inputs (0-400 Ω)<br>• 2x capacitive inputs (4-20mA)<br>• 2x frequency inputs (0-4 kHz)<br>• 3x voltage inputs (0-5V)<br>• 1x digital alarm input |
| Output data | • NMEA 2000<br>• 2x EasyLink<br>• 2x Alarm outputs (500mA max) |
| Degree of protection (according to IEC 60529) | IPX7 |

## ENVIRONMENTAL FEATURES

| Operating temperature | From –25 to +70 °C |
|---|---|
| Storage temperature | From –40 to +85 °C |

## ELECTRICAL FEATURES

| Rated voltage | 12/24 V |
|---|---|
| Operating voltage | 9–32 V |
| Current consumption | < 900 mA @ 12 V (display only)<br>100mA for each EasyLink satellite gauge |
| Absorption (LEN) | 2 |

## COMPLIANCE

| Compliance | CE, UKCA, Reach, RoHS, UL94 |
|---|---|
| Directives | 2014/30/EU (Electromagnetic compatibility)<br>2011/65/EU (Hazardous substances in electrical and electronic equipment) |
| Reference standards | IEC 60945: 2002–08 (environmental class: exposed) |

## SUPPORTED NMEA 2000 MESSAGES

| Description | PGN | Description | PGN |
|---|---|---|---|
| J1939 Generator Average Basic AC Quantities | 65030 | Water depth | 128267 |
| J1939 Diagnostic Message #1 | 65226 | Position: Rapid update | 129025 |
| J1939 Diagnostic Message #2 | 65227 | COG and SOG: Rapid update | 129026 |
| J1939 Diagnostic Message #3 | 65228 | GNSS position data | 129029 |
| J1939 Diagnostic Message #4 | 65229 | Local Time Offset | 129033 |
| J1939 Diagnostic Message #5 | 65230 | Datum | 129044 |
| J1939 Diagnostic Message #6 | 65231 | Cross track error | 129283 |
| J1939 Diagnostic Message #8 | 65232 | Navigation data | 129284 |
| J1939 Diagnostic Message #10 | 65234 | Navigation route and waypoint info | 129285 |
| J1939 Diagnostic Message #11 | 65235 | GNSS dilution of precision (DOP) | 129539 |
| J1939 Diagnostic Message #12 | 65236 | GNSS satellites in view | 129540 |
| System time | 126992 | Wind data | 130306 |
| Rudder | 127245 | Environmental parameters | 130310 |
| Vessel heading | 127250 | Environmental parameters | 130311 |
| Rate of Turn | 127251 | Temperature | 130312 |
| Attitude | 127257 | Humidity | 130313 |
| Temperature (Old Version) | 127258 | Actual Pressure | 130314 |
| Engine Parameters, Rapid Update | 127488 | Entertainment – Current File and Status | 130569 |
| Engine Parameters, Dynamic | 127489 | Entertainment – Data File | 130570 |
| Transmission Parameters, Dynamic | 127493 | Entertainment – Data Group | 130571 |
| Engine Parameters, Static | 127498 | Entertainment – Data Search | 130572 |
| Fluid level | 127505 | Entertainment – Supported Source Data | 130573 |
| DC Detailed Status | 127506 | Entertainment – Supported Zone Data | 130574 |
| Battery status | 127508 | Small Craft Status | 130576 |
| Speed: Water referenced | 128259 | | |

## DISPOSAL RESPONSIBILITY

Dispose of by separate collection through government or local government designated collection facilities.

Proper disposal and recycling will help prevent potentially negative consequences for the environment and people.