People. Ideas. Solutions

Operators Panel – User Manual

Insatech Performance Solutions

Version 2.0 rev. 1

Table of Contents

1. General

The Operators Panel is designed as a centralized screen-based information hub that provides easy access to real-time data on the operational status of the vessel's performance based on the installed equipment.

Any element of the interface that has been greyed out is not currently active. This may be due to the lack of an instrument to measure this parameter or that the instrument has not been connected to the system.

Note: Any communication regarding the use, troubleshooting or modification of the Operators Panel interface must be sent to marinesupport@insatech.com.

1.1. Three layers of detail

The interface consists of three layers of information, the ''Menu'' with its main categories, one or more ''Overview tabs'' for main categories and finally a ''Detail view'' for each individual element on each of the ''Overview tabs''.

1.1.1. The Menu

The Menu provides access to the ''Overview tabs'' of each of the main categories.

1.1.2. The Overviews

The Overviews allows you to navigate back to the Menu and to select between the Overviews available for the selected category.

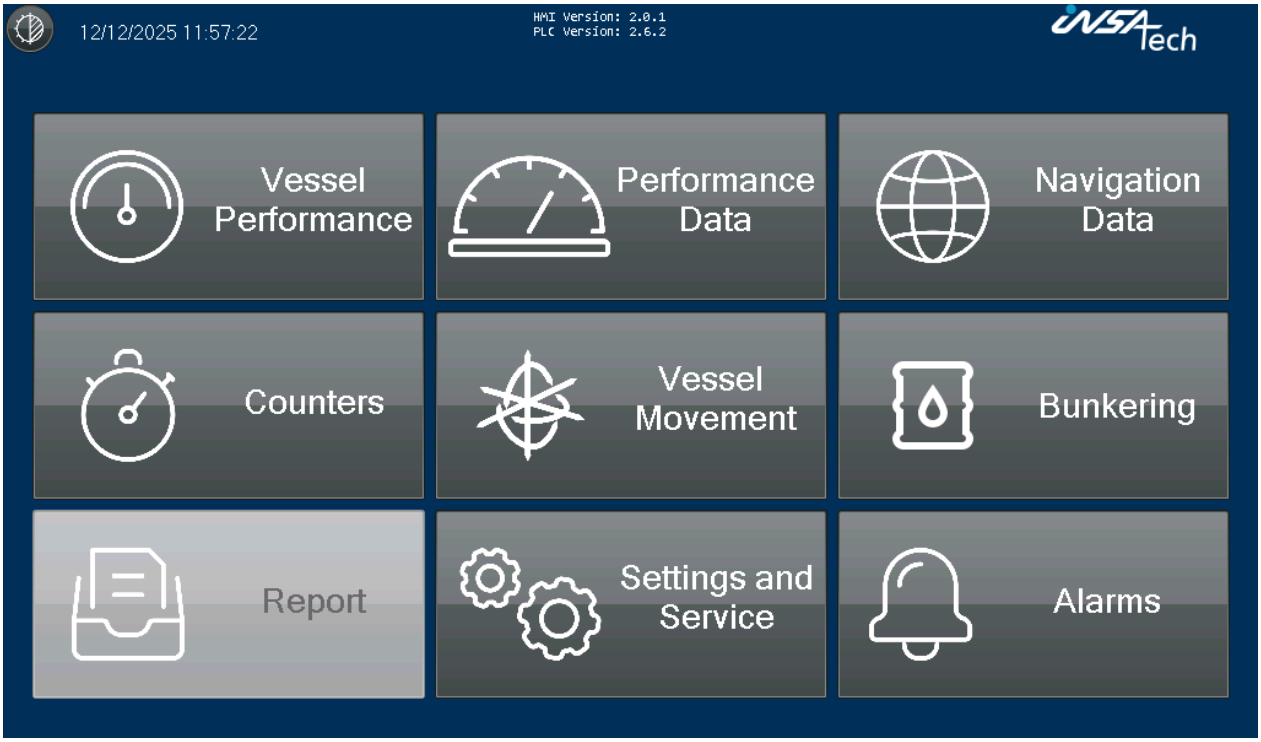
1.1.3. The Detail Views

The Detail Views are large pop-ups that give you in depth information about a piece of machinery or a measurement instrument. They may be accessed by pressing the piece of machinery or the measurement instrument that is shown on an Overview.

Some Detail Views allow you to access other Detail Views from the same Overview tab, that naturally belong together.

2. The Menu

The Menu gives you access to each of the main categories of Overviews. A piece of data may be available in multiple categories, but it will be presented differently depending on the category, in order to provide value in its specific context.



2.1. Vessel Performance

This page shows a general overview of the most important data to monitor.

- Propulsion
- Power

2.2. Performance Data

This page shows information about:

- Fuel Consumption
- Propulsion
- Power Production
- Power Consumption

2.3. Navigation Data

This page shows information about the vessel navigational data, like GPS position, Speed, Direction, Depth, and Wind data.

2.4. Vessel Movement

This page shows information about the vessel’s movement and draft.

2.5. Bunkering

This page shows bunkering information.

2.6. Report

- This feature has not yet been released.

2.7. Counters

This page shows manual counters for fuel consumption and power production and consumption.

2.8. Settings and Service

This page shows information about:

- Project information
- Scaling settings
- Clean display function

2.9. Alarms

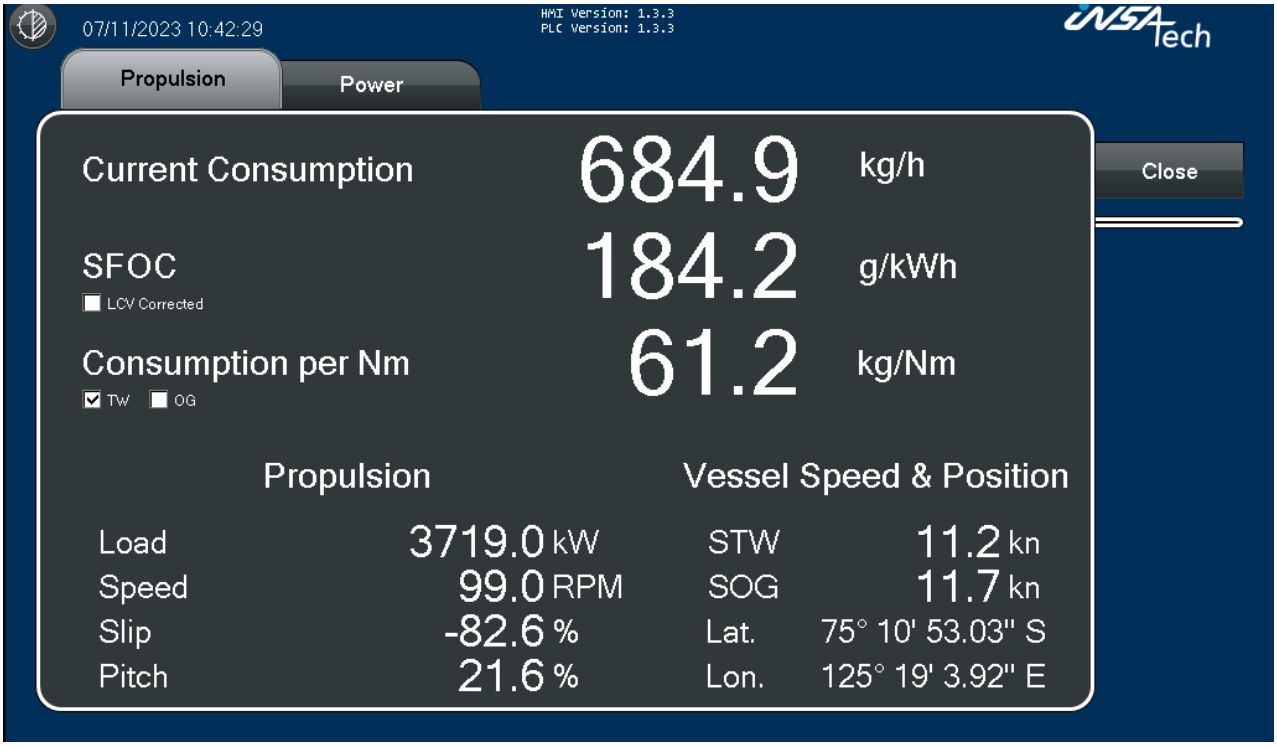
The complete list of alarms.

3. Vessel Performance

3.1. Propulsion

On the ‘’Vessel Performance’’ → ‘’Propulsion’’ page the most important data for the Vessel propulsion is displayed.

The Main Engine(s) consumption and performance is an important parameter to monitor during sea passage so this page gives the overview of these parameters in a way that they can be monitored from a distance.



3.1.1. Current Consumption (kg/h)

The current consumption shows the amount of fuel the Main Engine(s) are consuming. The fuel consumption rate is displayed in kilograms per hour (kg/h).

3.1.2. SFOC (g/kWh)

SFOC: Represents the unadjusted or raw measurement of the fuel consumption rate of the Main Engine(s) relative to its power output. Displayed in grams per kilowatt-hour (g/kWh), this metric offers insights into the engine's efficiency.

LCV Corrected SFOC: This represents the SFOC value adjusted for the Lower Calorific Value (LCV) of the fuel. LCV correction accounts for the energy content of the fuel, providing a more accurate measure of engine efficiency.[1]

3.1.3. Consumption per Nm (kg/Nm)

Consumption per Nautical Mile (Nm) is a measure of the amount of fuel a vessel uses to travel one nautical mile, serving as a critical efficiency metric for maritime operations. Displayed in kilograms per nautical mile and helps in determining the most fuel-efficient speed.[2]

3.1.4. Propulsion

Explore various aspects critical to the functioning and efficiency of a vessel's propulsion system.

[1] Only available if Shaft Power Meter/s are installed.
[2] Only available if Vessel Speed input is installed.

3.1.4.1. Load (kW)
Load indicates the real-time power output of the propulsion system, measured in kilowatts (kW). Monitoring power helps in ensuring optimal performance and efficiency.[3]

3.1.4.2. Speed (RPM)
Revolutions Per Minute (RPM) indicates the rotation speed of the shaft. A consistent RPM ensures smooth operation, while sudden changes might signal potential issues.[4]

3.1.4.3. Slip (%)
Slip the calculation of slip, indicates the efficiency of the propeller by comparing theoretical and actual distances travelled.[5]

3.1.4.4. Pitch (%)
Pitch indicates the angle adjustments of a controllable pitch propeller.[6]

3.1.5. Vessel Speed & Position[7]

3.1.5.1. STW (kn)
Speed Through Water (STW) refers to the speed at which a vessel is moving through the water.

3.1.5.2. SOG (kn)
Speed Over Ground (SOG) is how fast the vessel is moving from one point on the earth to another.

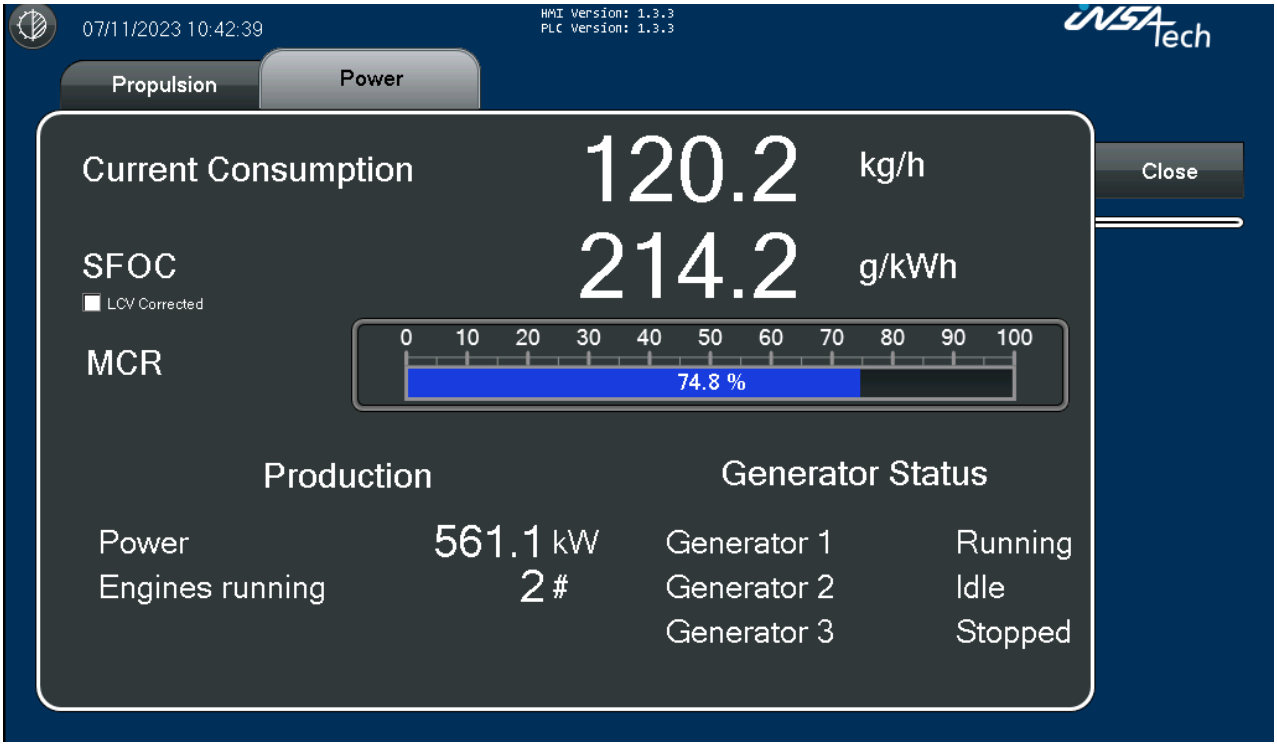
3.1.5.3. Lat. & Lon.
Current GPS position of the vessel.

[3] Only available if Shaft Power Meter is installed.
[4] Only available if Shaft Speed and Vessel Speed input is installed.
[5] Only available if Shaft Speed input is installed.
[6] Only available if Controllable Pitch Propeller feedback input is installed.
[7] Only available if Speed and GPS are installed.

3.2. Power

On the Vessel Performance → Power page the most important data for the Power Production is displayed.

The Generator Engine(s) consumption and performance is an important parameter to monitor during port stay so this page gives the overview of these parameters in a way that they can be monitored from distance.



3.2.1. Current Consumption (kg/h)

The current consumption shows the amount of fuel the Generator Engines are consuming. Fuel consumption rate displayed in kilograms per hour (kg/h).

3.2.2. Specific Fuel Oil Consumption (SFOC) (g/kWh)

SFOC: Represents the unadjusted or raw measurement of the fuel consumption rate of the Generator Engines relative to their power output. Displayed in grams per kilowatt-hour (g/kWh), this metric offers insights into the engine's efficiency.

LCV Corrected SFOC: This represents the SFOC value adjusted for the Lower Calorific Value (LCV) of the fuel. LCV correction accounts for the energy content of the fuel, providing a more accurate measure of engine efficiency.[8]

3.2.3. Maximum Continuous Rating (MCR) (%)

This visual representation indicates the engine's current performance as a percentage of its rated maximum power.

The bar graph, ranging from 0% to 100%, offers a quick visual cue to assess whether the engine operates within its optimal range or near its limits.

MCR is calculated for the Generator Engines that are engaged and producing power.

[8] Only available if Power Meters are installed.

3.2.4. Production

Each generator provides a real-time power output in kilowatts (kW). This metric reflects the current energy being produced by the generators.

Monitoring this can help ensure that each generator is operating efficiently and providing the necessary power to meet the vessel's demands.

Also, the number of running engines can be monitored.

3.2.5. Generator Status

Status of the Generators can be monitored as:

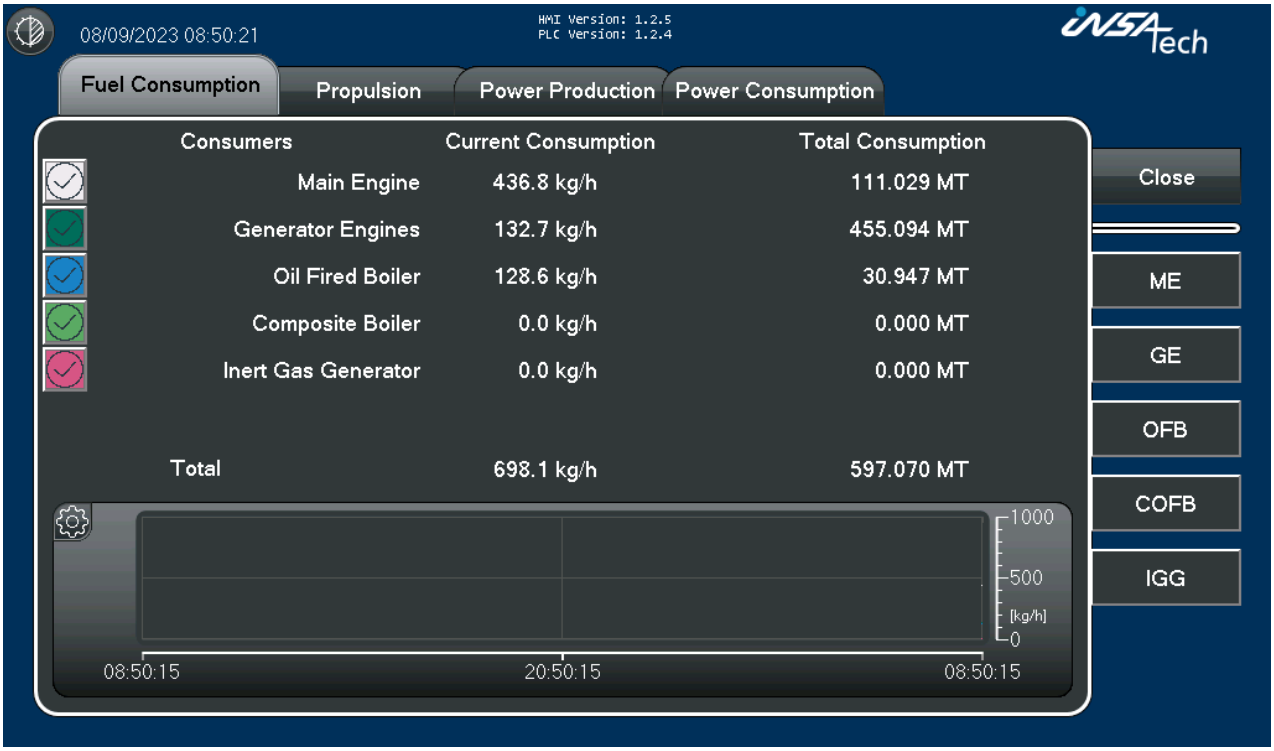
- Stopped: Engine is stopped and is not consuming any fuel.
- Idling: Engine is running in idle condition, consuming fuel but doesn’t produce any energy.
- Running: Engine is running, consuming fuel, engaged and producing energy.

4. Performance Data

4.1. Fuel Consumption

On the fuel consumption page, you find the information of all the consumers that currently have flow meters measuring the fuel consumption.

With flow meters installed, the accuracy and reliability of the fuel consumption data is enhanced, ensuring that the vessel's operations can be optimized based on trustworthy metrics.



4.1.1. Consumers

This list represents the various consumers on the vessel with installed flow meters to accurately measure their fuel consumption. The presence of flow meters ensures precise monitoring and accountability of fuel use for these consumers.

4.1.2. Current Consumption (kg/h)

For each consumer, the fuel consumption rate is measured based in kilograms per hour (kg/h) on the consumer's specific fuel system setup.

Different setups, such as a 3-way system, inlet and outlet measurement, or a feed supply measurement, can influence the consumption figures.

Incorporating these specifics ensure a more nuanced understanding of the fuel consumption patterns for each system. This metric is crucial for monitoring and adjusting operations to ensure optimal fuel efficiency.

4.1.3. Total Consumption (MT)

Next to the Current Consumption, the Total Consumption in metric tons (MT) shows an accumulated measure of how much fuel each consumer has used.

This figure, like the Current Consumption, is calculated based on the fuel system setup of each consumer, ensuring a detailed and accurate understanding of long-term fuel usage patterns.

4.1.4. Total of All Consumers

At the bottom of the list, a cumulative total indicates the overall fuel consumption by all consumers combined.

4.1.5. Trend

This trend displays the current consumption rate over time, providing insights into history patterns of fuel use. This trend can assist in:

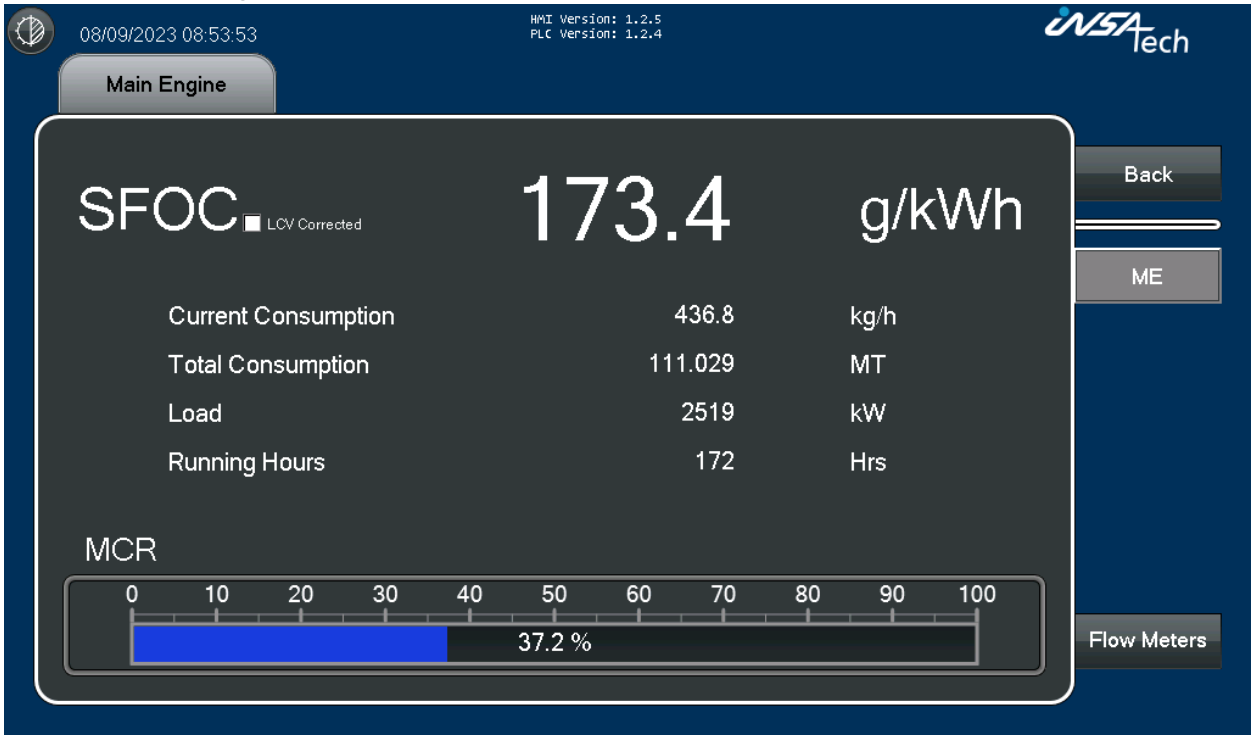
- Identifying periods of high or low fuel consumption.
- Making predictions about future fuel needs.
- Spotting any anomalies or sudden spikes in fuel usage, which might indicate a problem.

For more information see section Performance Data – Trend Settings

4.2. Fuel Consumption → Detailed View

The detailed Fuel Consumptions pages focus on the individual consumers. Data is presented differently depending on consumer type, installed hardware and flow meter setup.

Example of a Main engine where a Shaft Power Meter is installed:



4.2.1. Current consumption (kg/h)

The fuel consumption rate is measured in kilograms per hour (kg/h) based on the consumer's specific fuel system setup.

Different setups, such as a 3-way system, inlet and outlet measurement, or a feed supply measurement, can influence the consumption figures.

4.2.2. Total Consumption (MT)

Total Consumption in metric tons (MT) gives an accumulated measure of how much fuel each consumer has used.

This figure, like the Current Consumption, is calculated based on the fuel system setup of each consumer, ensuring a detailed and accurate understanding of long-term fuel usage patterns.

4.2.3. Running Hours

Counts the total number of hours the consumer has been operational.

4.2.4. Load (kW)

Load indicates the real-time power output of the propulsion system, measured in kilowatts (kW). Monitoring power helps in ensuring optimal performance and efficiency.[9]

4.2.5. Production (kW)

Production indicates the current energy being produced by the generators.[10]

4.2.6. SFOC (g/kWh)

SFOC: Represents the unadjusted or raw measurement of the fuel consumption rate of the engine relative to its power output. Displayed in grams per kilowatt-hour (g/kWh), this metric offers insights into the engine's efficiency.

LCV Corrected SFOC: This represents the SFOC value adjusted for the Lower Calorific Value (LCV) of the fuel. LCV correction accounts for the energy content of the fuel, providing a more accurate measure of engine efficiency.[11]

4.2.7. MCR (%)

This visual representation indicates the engine's current performance as a percentage of its rated maximum power.

The bar graph, ranging from 0% to 100%, offers a quick visual cue to assess whether the engine operates within its optimal range or near its limits.

4.2.8. Start/hour

This gauge indicates the number of times the oil-fired boiler has been started within an hour.[12]

4.2.9. Min/start

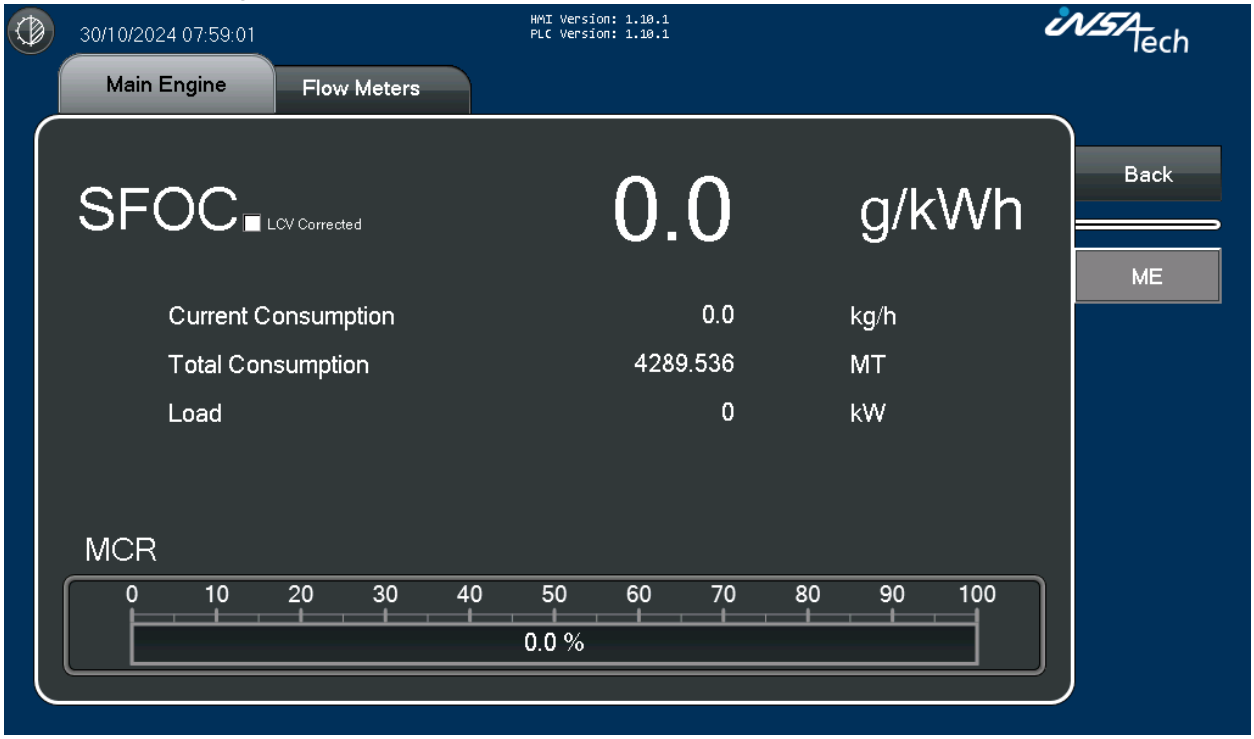
Represents the average duration the boiler operates each time it's started.[13]

4.2.10. Examples

Depending on the consumers integrated into the system, different views appear when pressing the consumers button on the right side of Fuel Consumption page.

[9] Only available on Main Engine page if Shaft Power Meter is installed.
[10] Only available on Generator Engines page if Power Meters are installed.
[11] Only available on Main Engine and Generator Engines pages if Shaft Power Meter / Power Meters are installed.
[12] Only available on Oil Fired Boiler and Composite Boiler pages.
[13] Only available on Oil Fired Boiler and Composite Boiler pages.

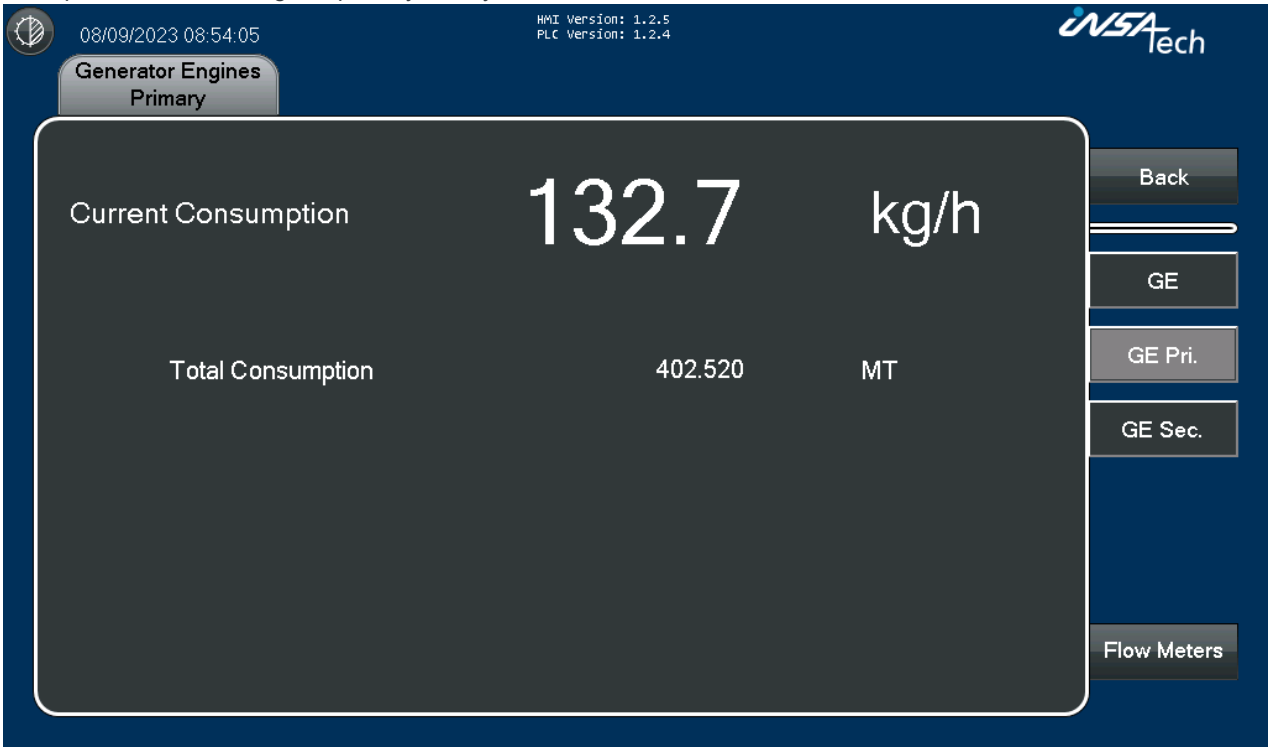
Example of a Main engine where Shaft Power Meter is installed:



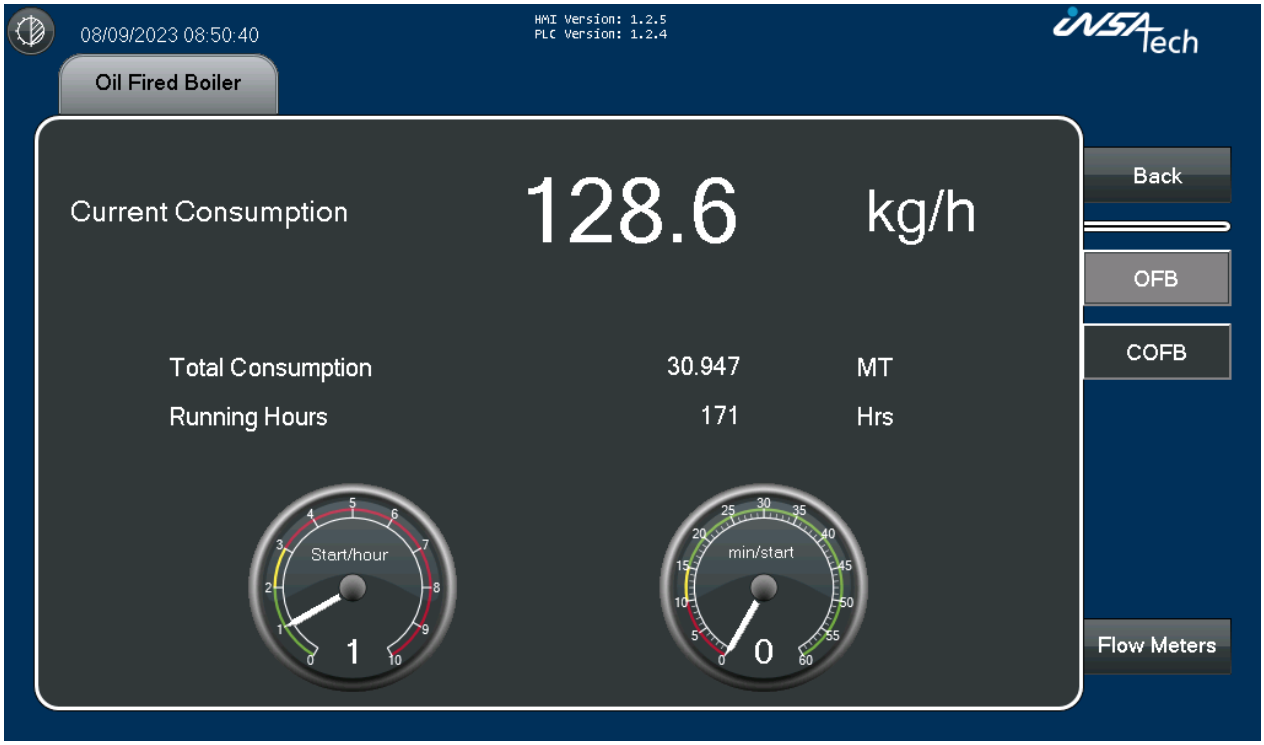
Generator Engines can have fuel supply from multiple systems, primary and secondary. In this case there is a combined consumer for both systems, showing the combined values of both systems.

Example of Generator Engines where Power Meters are installed in a setup with a primary and secondary fuel system:

Example of Generator Engines primary fuel system:



Example of Oil Fired Boiler:



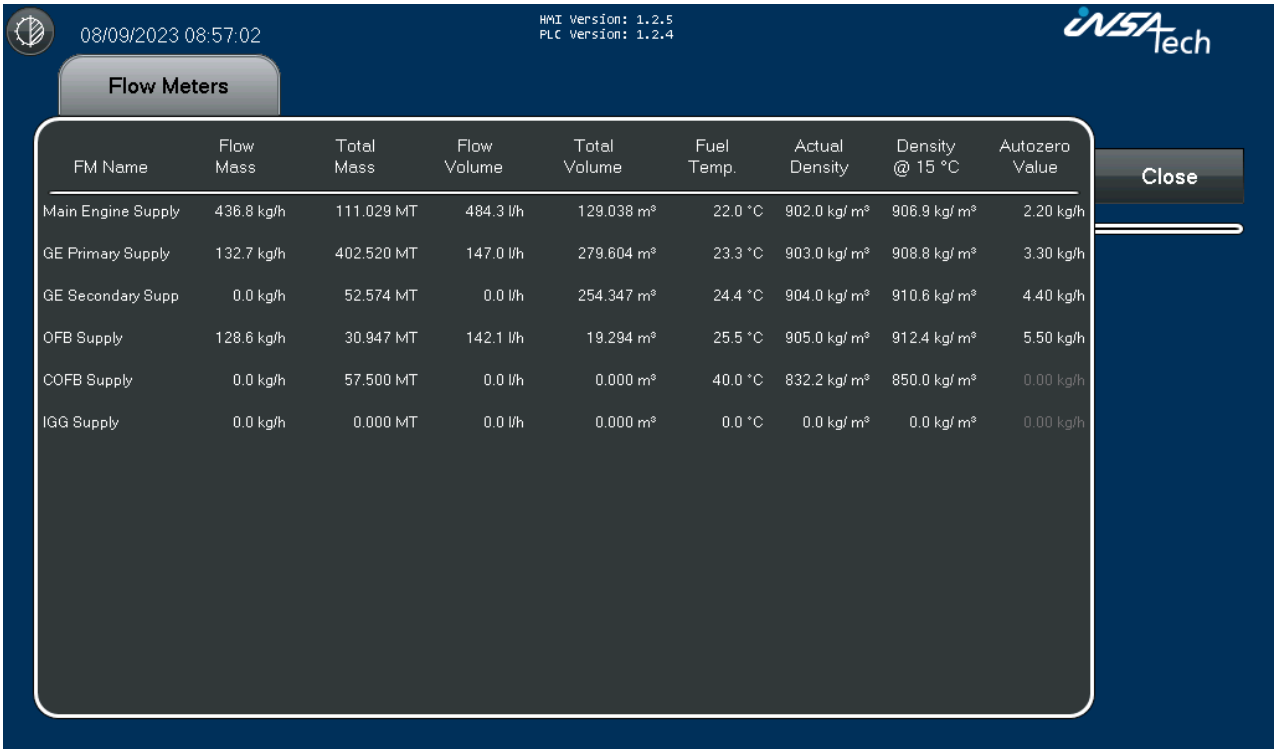
Example of a consumer, in this case Inert Gas Generator, where Fuel Consumption is the only measurement.

4.3. Fuel Consumption → Flow Meters

When pressing the Flow meter button, you will gain access to the HMI display below that shows all data for each flowmeter.

Coriolis meters utilizes a measurement technology which can calculate the Density at 15°C.
On flowmeters like mechanical, Density at 15°C need to be manually entered in the setting menu, see section Setting and Service → Scaling Settings → Flow Meters.

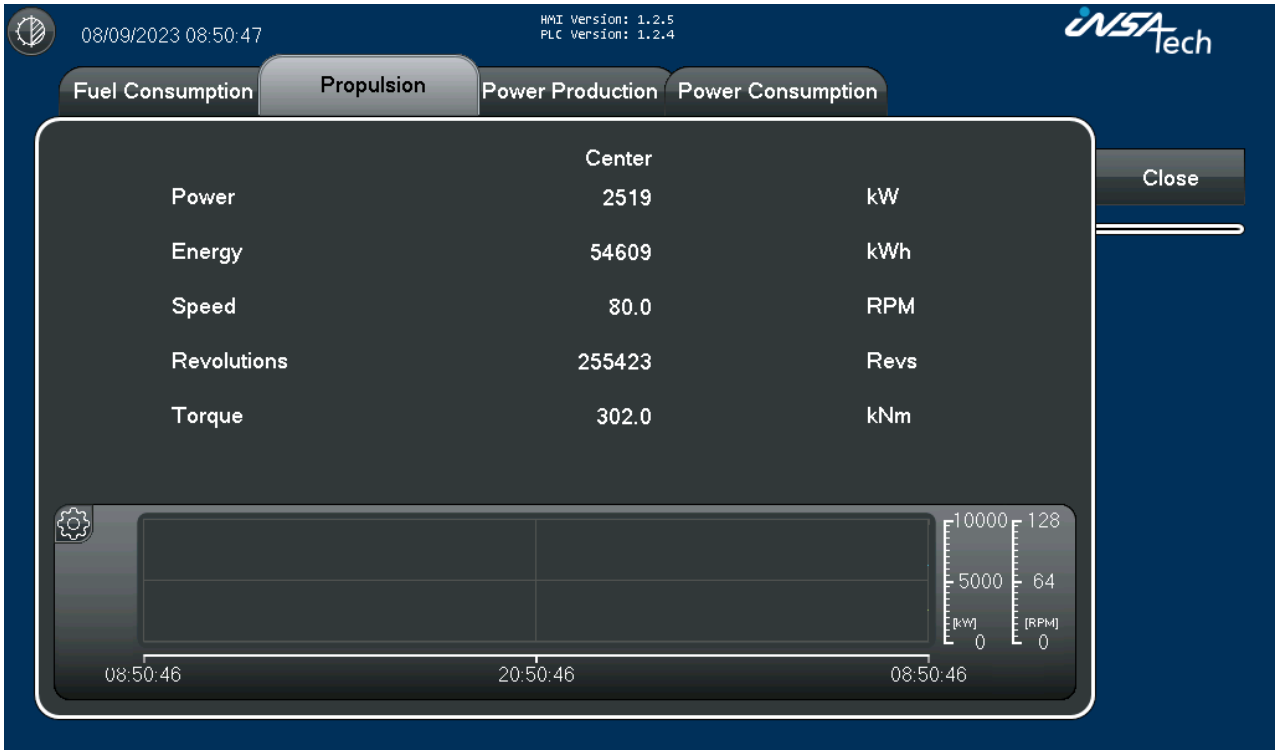
The Detail View can be closed using the “Close” button on the top right-hand side. Pressing this button will bring you back to the Consumer from which the Detail View was accessed.



FM Name	Flow Mass	Total Mass	Flow Volume	Total Volume	Fuel Temp.	Actual Density	Density @ 15 °C	Autozero Value
Main Engine Supply	436.8 kg/h	111.029 MT	484.3 l/h	129.038 m³	22.0 °C	902.0 kg/ m³	906.9 kg/ m³	2.20 kg/h
GE Primary Supply	132.7 kg/h	402.520 MT	147.0 l/h	279.604 m³	23.3 °C	903.0 kg/ m³	908.8 kg/ m³	3.30 kg/h
GE Secondary Supp	0.0 kg/h	52.574 MT	0.0 l/h	254.347 m³	24.4 °C	904.0 kg/ m³	910.6 kg/ m³	4.40 kg/h
OFB Supply	128.6 kg/h	30.947 MT	142.1 l/h	19.294 m³	25.5 °C	905.0 kg/ m³	912.4 kg/ m³	5.50 kg/h
COFB Supply	0.0 kg/h	57.500 MT	0.0 l/h	0.000 m³	40.0 °C	832.2 kg/ m³	850.0 kg/ m³	0.00 kg/h
IGG Supply	0.0 kg/h	0.000 MT	0.0 l/h	0.000 m³	0.0 °C	0.0 kg/ m³	0.0 kg/ m³	0.00 kg/h

4.4. Propulsion

The propulsion data is collected from installed shaft power meters on the vessel. These meters provide crucial insights into the vessel's propulsion system performance.



4.4.1. Power (kW)

This metric indicates the real-time power output of the propulsion system, measured in kilowatts (kW). Monitoring power helps in ensuring optimal performance and efficiency.

4.4.2. Energy (kWh)

Energy, measured in kilowatt-hours (kWh), signifies the accumulated power consumption. It gives insights into the total energy expenditure of the propulsion system.

4.4.3. Speed (RPM)

Revolutions Per Minute (RPM) indicates the speed at which the shaft rotates. A consistent RPM ensures smooth operation, while sudden changes might signal potential issues.

4.4.4. Revolutions (Revs.)

This metric counts the total number of shaft rotations. Monitoring revolutions can assist in maintenance planning and detecting wear and tear.

4.4.5. Torque (kNm)

Torque, measured in kilonewton-meters (kNm), represents the force applied to turn the shaft. It's an essential metric in understanding the propulsion system's load and efficiency.

4.4.6. Thrust (kN)

Thrust, measured in kilonewtons (kN), provides insights into the force propelling the vessel forward. However, this data is available only if the vessel has a thrust shaft power meter installed. Thrust measurements can be crucial for vessels requiring precise maneuvering or performance assessments.[14]

4.4.7. Trend

This trend displays the Power of the propulsion and Speed of the shaft over time.

Interpreting the trends:

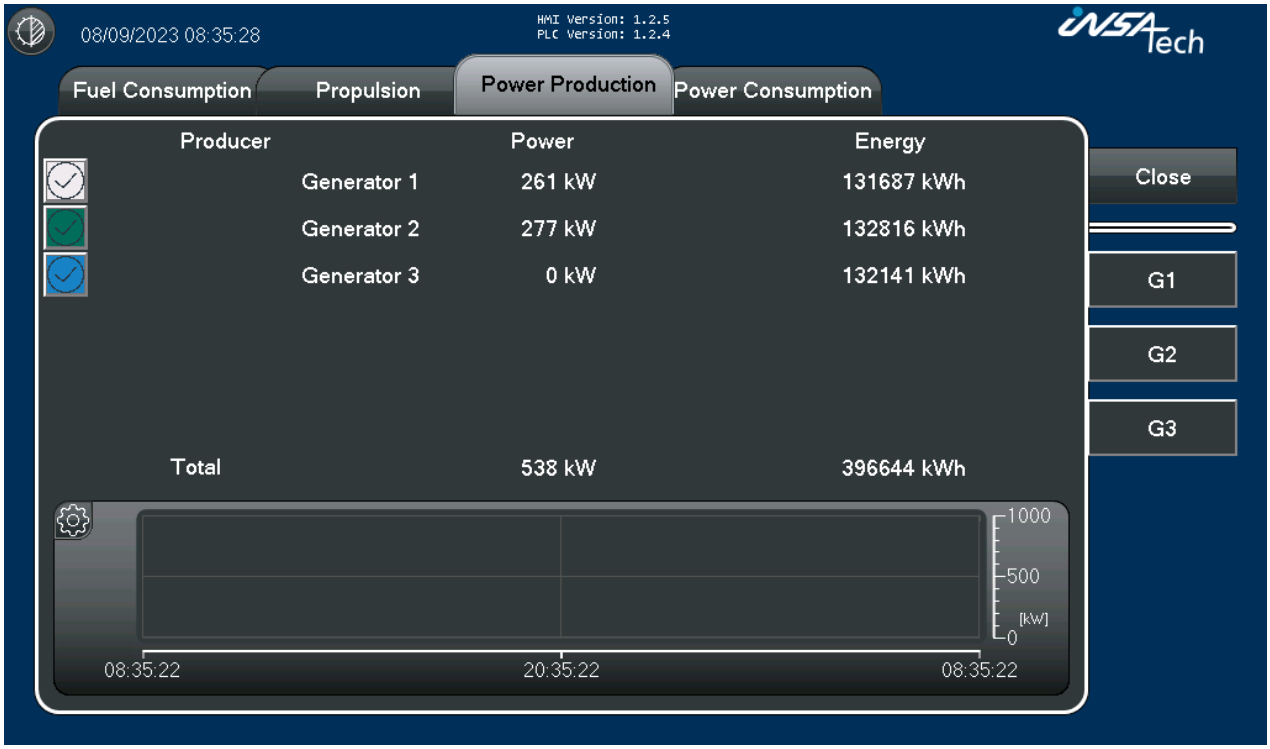
- Correlation between the two trends:
  - If you see a spike in kW and a corresponding increase in RPM, it means the vessel increased power to accelerate.
- Look for anomalies:
  - If the kW spikes but RPM doesn't change much, it might indicate inefficiency or a potential issue.
- Identify stable periods:
  - Consistent kW and RPM suggest efficient and steady cruising.

For more information see section Performance Data – Trend Settings

[14] Only visible if a Shaft Power Meter supports thrust measurement.

4.5. Power Production

On the Power Production page, you find information about the energy-producing systems on the vessel if a power meter is installed.



4.5.1. Producers

This list represents the various energy-producing systems on the vessel, such as generators and shaft generators. Each of these has power meters installed to accurately measure their energy output.

4.5.2. Power (kW)

Each generator or energy producer provides a real-time power output in kilowatts (kW). This metric reflects the current energy being produced by the generator.

Monitoring this can help ensure that each generator is operating efficiently and providing the necessary power to meet the vessel's demands.

4.5.3. Energy (kWh)

Each generator or energy producer's cumulative energy is displayed in kilowatt-hours (kWh).

This aggregated metric can help in understanding the overall contribution of each generator to the vessel's energy needs over time.

4.5.4. Trend

This trend displays the power in kilowatts (kW) and can provide historical insights into the performance of the generators.

Interpreting the trend can provide actionable insights:

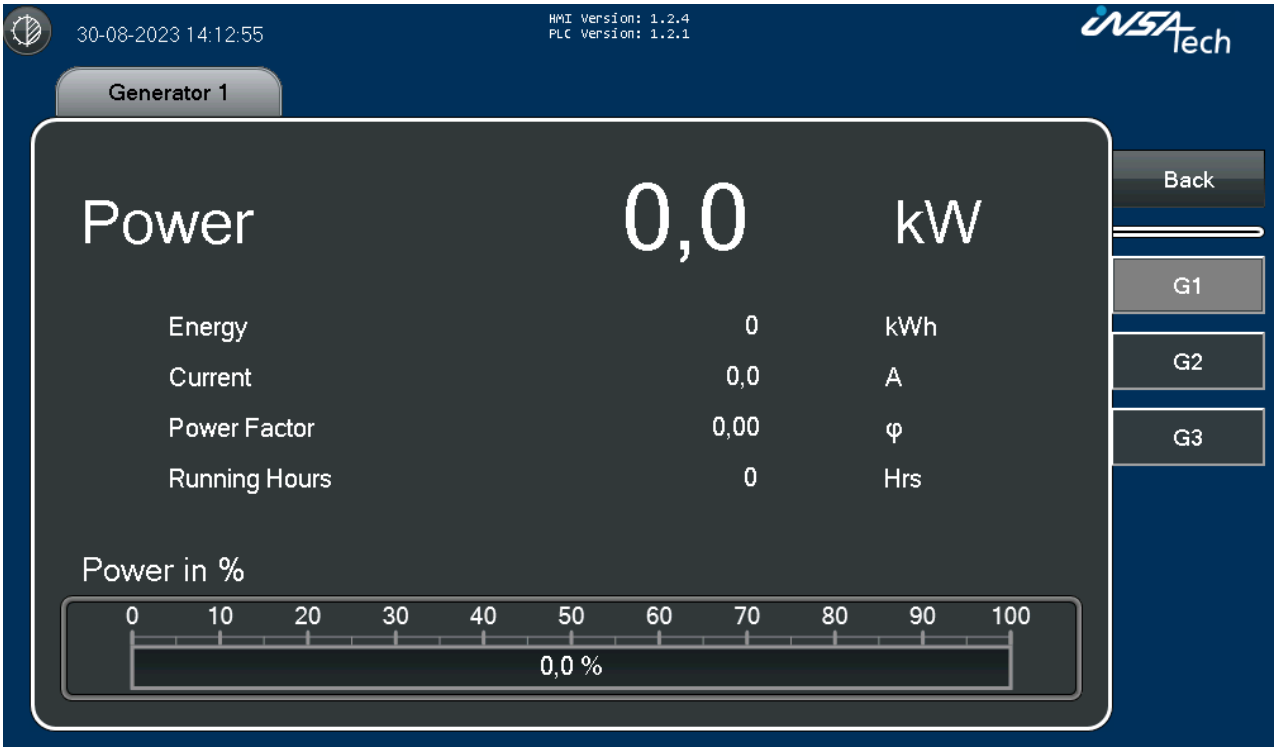
- Operational Adjustments:
  - If the power production frequently fluctuates, it might be worth investigating the cause and making operational adjustments for efficiency.

- Maintenance Indicators:
    - Consistent drops in power output can be early indicators of required maintenance or potential issues with the generators.
- Efficiency Assessment:
    - Periods of consistent power output can be used to assess the efficiency of the generators and their ability to meet the vessel's energy demands.

For more information see section Performance Data – Trend Settings

4.6. Generator → Detailed View

The detailed Power Production pages focus on the individual power producers. Data is presented differently depending on the type of Power Meter used to measure power production.



4.6.1. Power (kW)

The Current Power production rate is displayed in kilowatts (kW).

4.6.2. Energy (kWh)

Cumulative energy production displayed in kilowatt-hours (kWh).

4.6.3. Power Factor (φ)

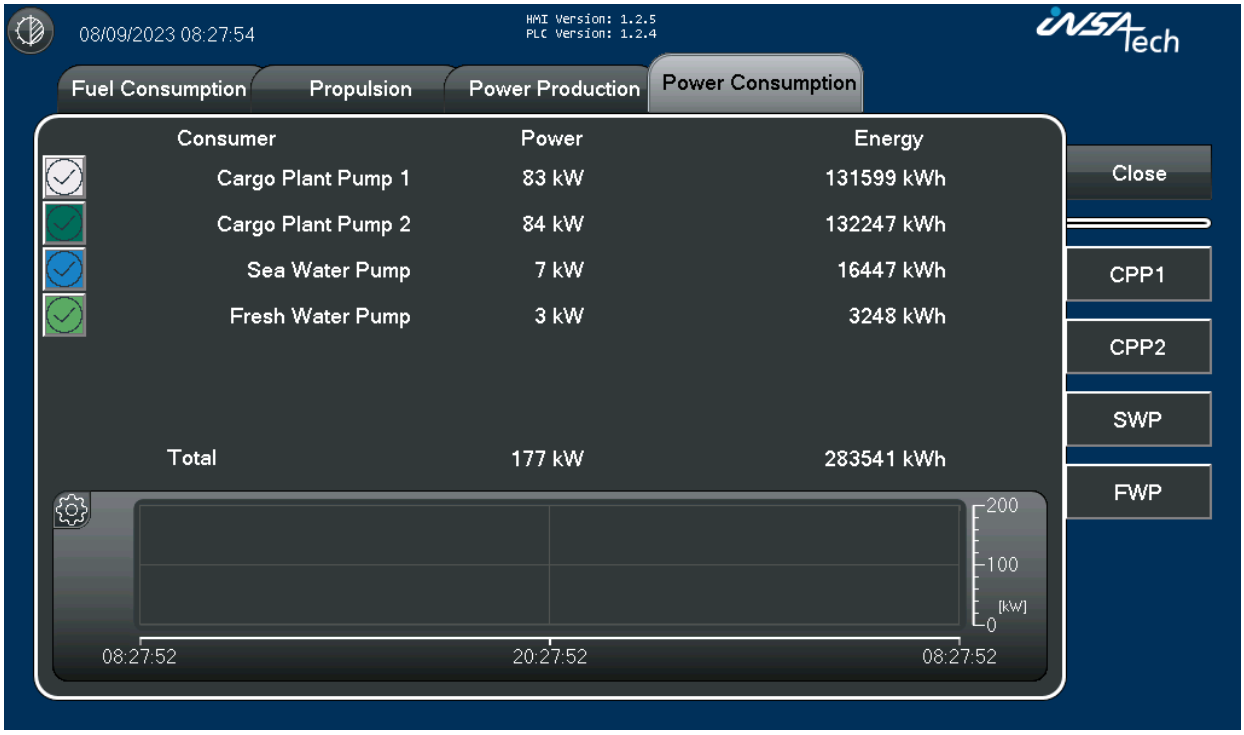
Power Factor is a measure of how effectively electrical power is being used in a system.

4.6.4. Running Hours (Hrs.)

Counts the total number of hours the producer has been operational.

4.7. Power Consumption

On the Power Consumption page, you find information about the energy-consuming systems on the vessel that has an integrated power meter.



4.7.1. Consumers

This list represents the various systems or components on the vessel that consume power. These can include cargo pumps, cooling pumps, lighting systems, and other equipment. Each of these has power meters installed to accurately measure their energy consumption.

4.7.2. Power (kW)

Each power consumer provides a power consumption rate in kilowatts (kW). This metric reflects the current energy being drawn by the equipment or system.

Monitoring this can help ensure that each piece of equipment operates efficiently and that the vessel's overall energy demands are met.

4.7.3. Energy (kWh)

Each power consumer cumulative energy consumption displayed in kilowatt-hours (kWh).

This aggregated metric can help in understanding the overall energy demands of each piece of equipment or system.

4.7.4. Trend

This trend displays power in kilowatts (kW) and can provide insights into how the equipment and systems draw power over different periods.

Interpreting the trend can provide actionable insights:

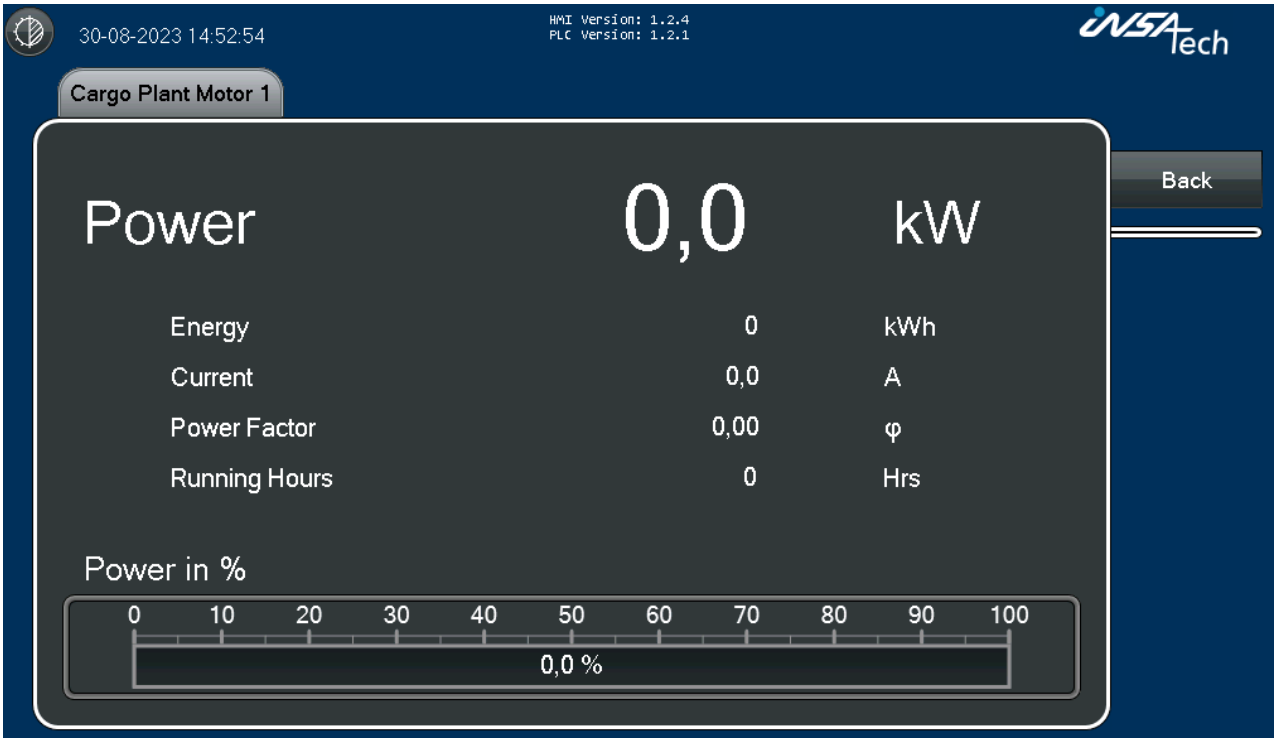
- Operational Adjustments:
  - If power consumption frequently fluctuates, it might be worth investigating the cause and making operational adjustments to ensure energy efficiency.

- Maintenance Indicators:
  - Consistent increases in power consumption can be early indicators of required maintenance or potential inefficiencies in the systems.
- Efficiency Assessment:
  - Periods of consistent power consumption can be used to assess the efficiency of the equipment and their ability to operate without overloading the vessel's energy resources.

For more information see section Performance Data – Trend Settings

4.8. Power Consumer → Detailed View

The detailed Power Consumption pages focus on the individual power consumers. Data is presented differently depending on the type of Power Meter used to measure power consumption.



4.8.1. Power (kW)

Power consumption rate is displayed in kilowatts (kW). This metric reflects the current energy being drawn by the equipment or system.

4.8.2. Energy (kWh)

Cumulative energy consumption displayed in kilowatt-hours (kWh).

4.8.3. Power Factor (φ)

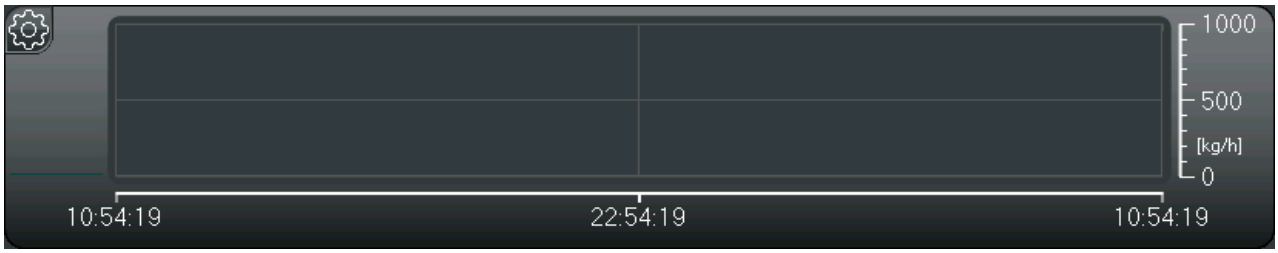
Power Factor is a measure of how effectively electrical power is being used in a system.

4.8.4. Running Hours (Hrs.)

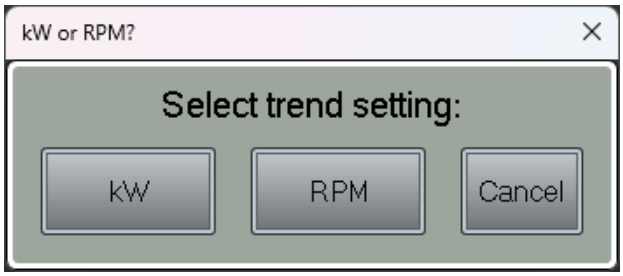
Counts the total number of hours the consumer has been operational.

4.9. Trend Settings

The gear icon in the top left corner of the trend allows the user to change the setup for the trend.



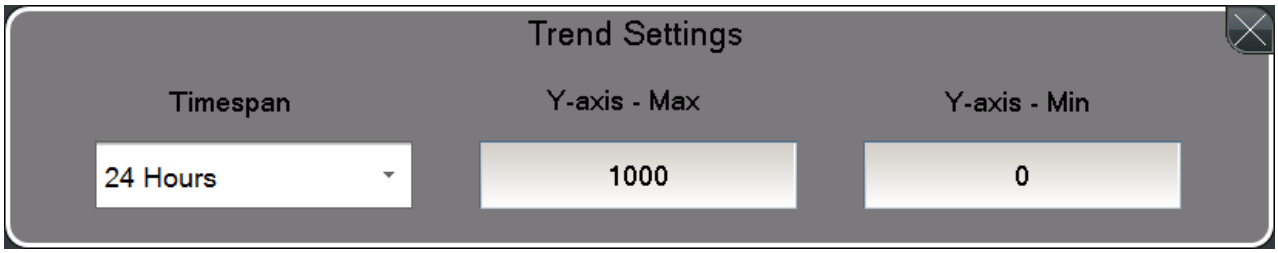
When pressing the gear icon on the Propulsion page the user gets the opportunity to change between kW or RPM.



4.9.1. Scalable settings

- Timespan:
  - From 10 minutes to 7 days
- Y-axis – Max:
  - Adjust the maximum value of the trends y-axis.
- Y-axis – Min:
  - Adjust the minimum value of the trends y-axis.

When finished adjusting the settings press the cross in the top right corner.



4.9.2. Visibility

A trend line can be removed from the trend by pressing the button to the left of the names. If it

 Trend line is visible.

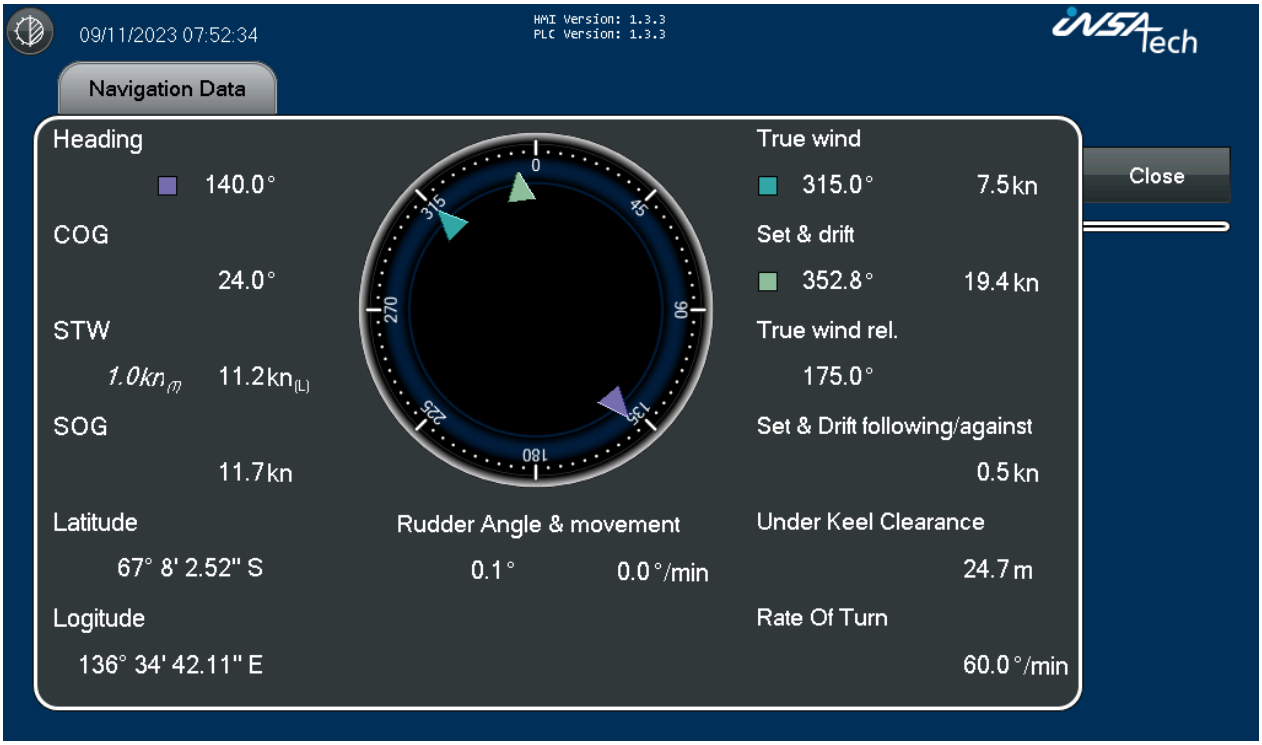
 Trend line is invisible.

5. Navigation Data

5.1. Navigation Data

Combines data from GPS, Gyro Compass, Doppler Log, Anemometer, etc. to give you an overview of the weather and the current conditions.

Of special interest is the True wind speed and the True wind direction relative to the vessel as well as the component of the current vector that is acting following/against the vessel.



Depending on the vessel inputs some data will not be visible.

6. Counters

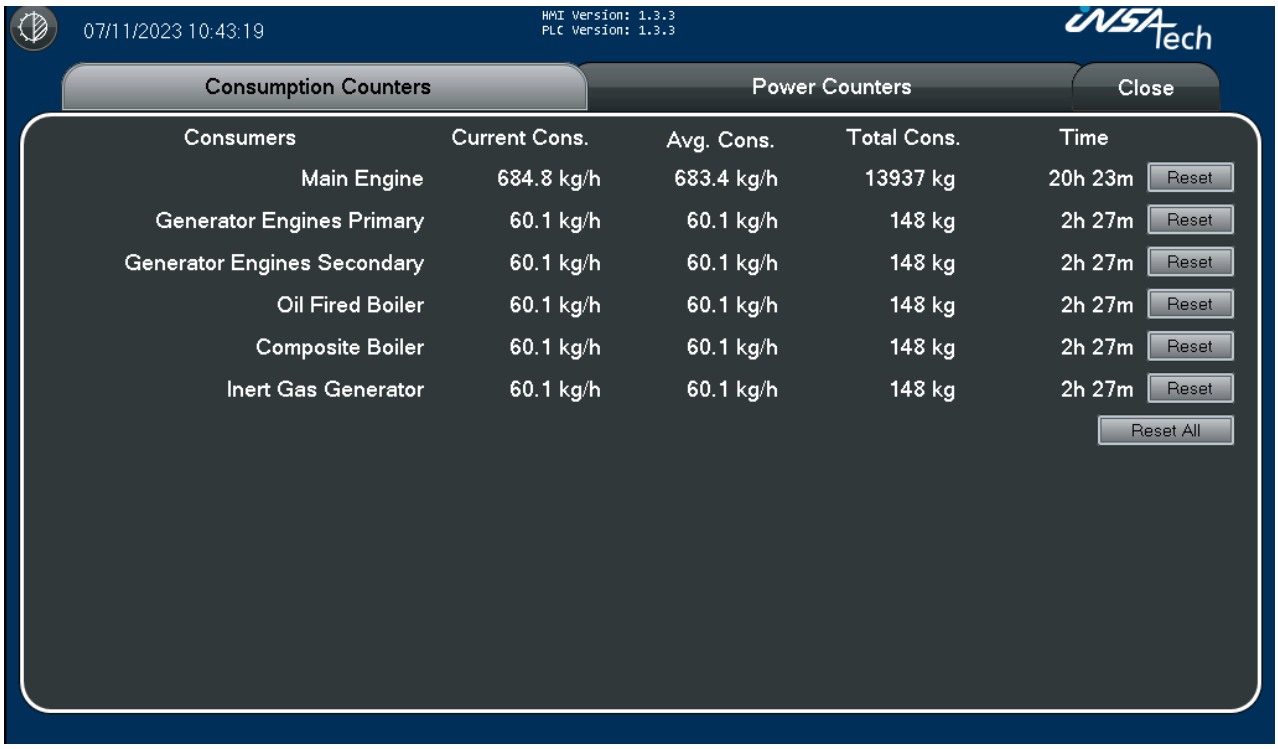
Manual counters can be used to understand fuel consumption or power management during different scenarios.

Use these counters during test scenarios to understand how your vessel is performing.

These counters are constantly running, until the counter is reset.

6.1. Consumption Counters

Each consumer has a manual consumption counter, that accumulate Total consumption and Time when the current consumption is higher than the low cut set on the Scaling Setting page.



6.1.1. Current Consumption (kg/h)

The current consumption is showing the amount fuel the Consumer is consuming. Fuel consumption rate displayed in kilograms per hour (kg/h).

6.1.2. Avg. Consumption (kg/h)

The average consumption of the Consumers consumption since the last reset. Average consumption is displayed in kilograms per hour (kg/h).

Average consumption is calculated when the Consumer has a consumption higher that the low cut set in the Scaling Settings page.

6.1.3. Total Consumption (kg)

Total Consumption in kilograms gives an accumulated measure in kilograms (kg) of how much fuel each consumer has consumed since last reset.

6.1.4. Time

Time is displayed in days, hours, minutes and shows the time since last reset.

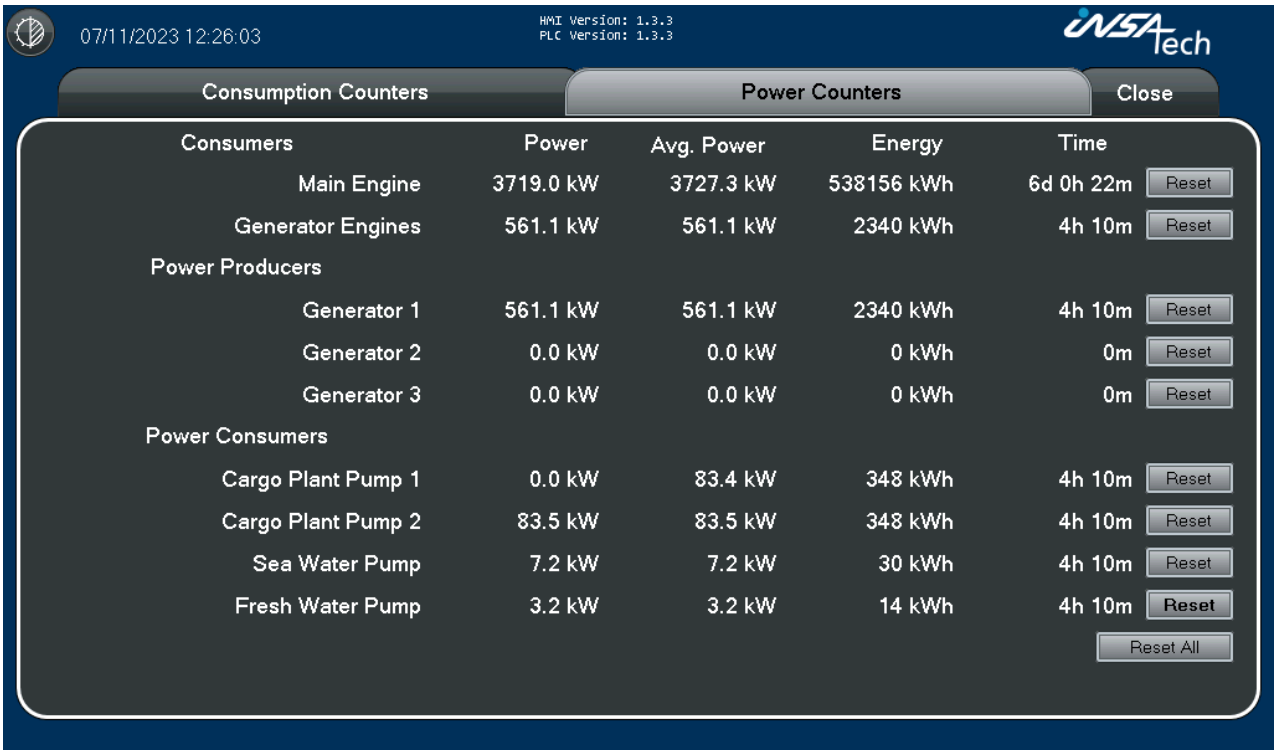
6.2. Power Counters

The manual Power counters differ a bit from the fuel counters as there are different groups of counters.

Consumers group is for the power counters in relation to Main Engines and Generator Engines.

Power Producer group is for the power counters for the generators where kW is available.

Power Consumer group is where kW is measured on equipment consuming power, like Cargo Plant Pumps etc.



6.2.1. Power (kW)

The current power is showing the amount power the Consumer/Producer is Consuming or Producing. Current Power rate is displayed in kilowatts (kW).

6.2.2. Avg. Power (kW)

The average power production or consumption since the last reset. Average Power is displayed in kilowatts (kW).

Average Power is calculated when the Consumer or Producer has a Power Consumption or Production higher than the low cut set in the Scaling Settings page.

6.2.3. Energy (kWh)

Energy is the cumulative energy production or consumption displayed in kilowatt-hours (kWh) since last reset.

6.2.4. Time

Time is displayed in days, hours, minutes and shows the time since last reset.

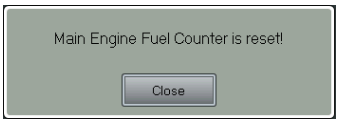
6.3. Reset of Counters

Reset of the Counter is a simple 4 step action.

1. Press the Reset button to the right of the selected consumer, or the Reset All button.
2. A popup appears and asks to confirm the reset of the selected consumer. Press Reset if you want to proceed or Cancel to cancel the reset action.

3. A Question box appears and Yes is pressed to continue the reset of the consumer. No can be pressed to cancel the reset.

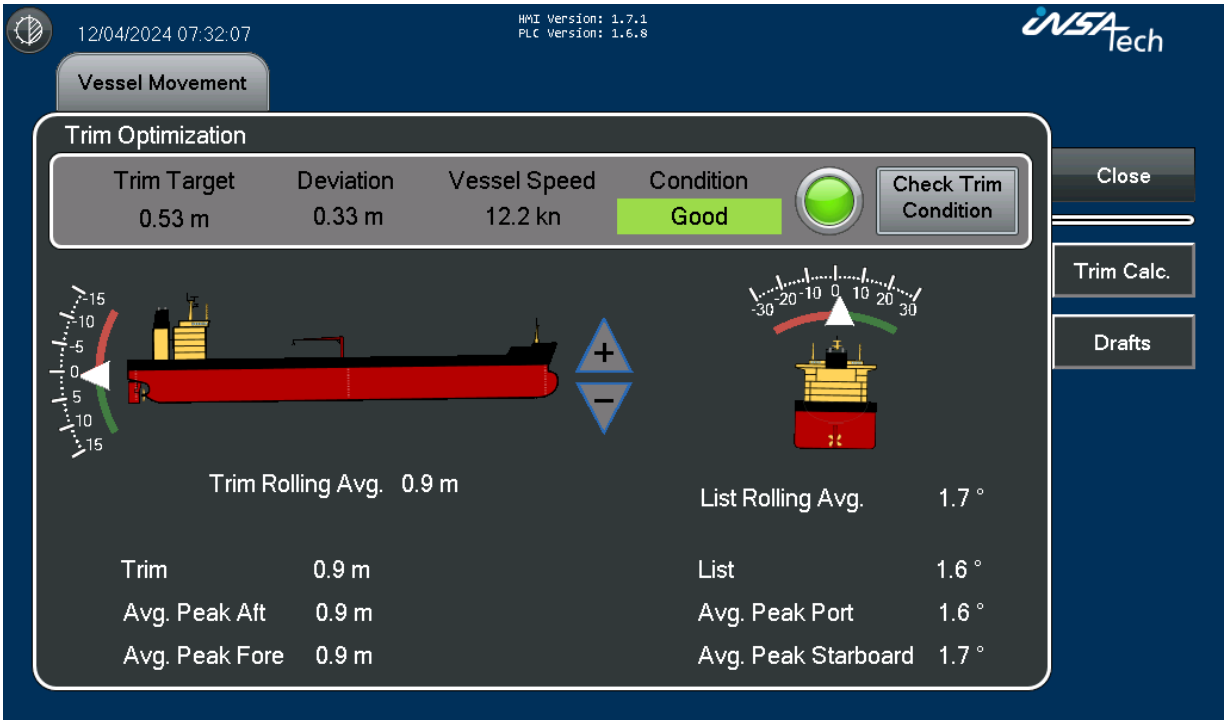
4. A Confirmation box appears and confirms the reset of the counter is completed with success. Press Close to close the box.



7. Vessel Movement

On this page the vessels movement[15] and draft signals[16] can be monitored.

This interface is designed for the vessel's crew to monitor and maintain optimal balance and stability during various operational conditions. It assists in detecting any deviations from normal operating parameters, enabling timely corrective actions to be taken.



7.1. Motion Sensor

The Motion Sensor is used to measure the angles of the Pitch and Roll of the vessel and can help understand the actual position of the vessel during sea passage.

Trim, List and Peak values are shown in the gauges next to the vessels. Peak values are shown with red and green colors, and the needle indicates the max peaks in all directions, for a fast indicator of the current movement of the vessel.

Rolling avg. shows the value within the last 15 minutes, and indicates the current trim and list, and can be used to optimize trim during sea passage.

Trim and List Values:

- Trim: The longitudinal inclination of the vessel, shown as a numerical value in meters.
- List: The lateral inclination of the vessel, presented as an angle in degrees.

[15] Only available if a Motion Sensor is installed.
[16] Only available if Draft Signals are installed.

7.2. Draft

By pressing the Draft button, the draft signals will pop up and show the current measurement.

Draft signals are used when in port to monitor the vessel position in the water and help determine the correct trim before another sea passage.

They indicate the depth of water beneath the vessel's keel at different points, including fore, aft, port, and starboard sides. The numerical values are displayed in meters.

Trim and Mid draft are calculated based on the fore and aft sensors.

List is calculated based on the port, starboard and aft sensors.

7.2.1. Trim Optimization[17]

Trim Optimization is a tool designed to maintain the optimal trim throughout a sea voyage. Variations in speed, draft, and trim can significantly affect a vessel's performance. Utilizing a vessel-specific Trim Table enables the provision of advice, adjustments, and feedback on the current trim, assisting the crew in optimizing the vessel's trim during the sea passage.

7.2.1.1. Trim Target

The optimal Trim Target calculated from the vessel speed and mid draft.

7.2.1.2. Deviation

The deviation between the Trim Target and the current Trim (avg. over 15 minutes)

7.2.1.3. Vessel Speed

Vessel speed through water, input from the Speed Log.

7.2.1.4. Condition

There are 3 conditions:

1. Good: If the current Trim is less than 0.5 meters from target.
2. Fair: If the current Trim is between 0.5 and 1 meter from target.
3. Avoid: If the current Trim is more than 1 meter from target.

Condition limits can be changed by Insatech on request.[18]

To help adjust the trim during sea passage, the arrows with + and – will indicate with a blinking orange color if trim needs to be raised or lowered at the stern.

The condition is checked every 15 minutes but can be manually triggered by pushing the button **Check Trim Condition**.

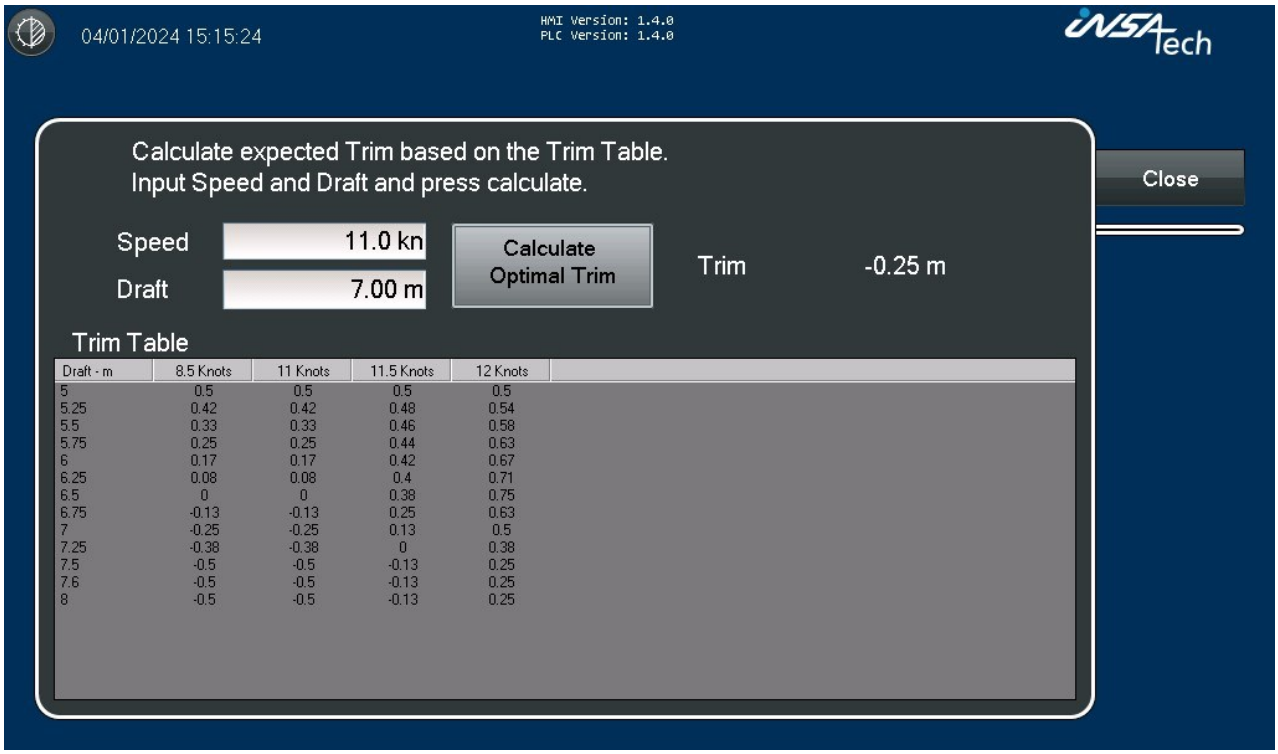
Example of Good Condition:

Example of Fair Condition:

Example of Avoid Condition:

[17] Only available if Motion Sensor, Draft Sensors, and Speed Log signal installed and trim table is provided for the given vessel.
[18] Requires InsaConnect Marine Remote Support functionality.

7.2.2. Trim Calc.



The Trim Calc. page can help you calculate the optimal trim at different speeds based on the provided Trim Table.

By entering Speed and Draft, the optimal Trim from the table is returned and can be used as a guideline when ballasting the vessel in port after cargo operations.

7.2.2.1. Trim Table

The Trim Table is provided by the owner of the vessel.

The left column is the Draft in meters and the columns with a Speed in Knots headline holds the value of the optimal trim in meters.

Trim Tables can be updated by Insatech Service Users on request[19]

[19] Requires InsaConnect Marine Remote Support functionality.

8. Bunkering

The purpose of the Bunkering System is to help the crew during bunkering, and especially after, when a possible claim may be raised towards the supplier. A Coriolis mass flow meter is mounted on the bunker line to measure the amount of received bunker oil.

8.1. General information about bunker operations

To get the full benefit of your Bunker Management System, it is essential that:

1. You trust your equipment.
2. Understand the influence of temperature.
3. Understand the influence of air in the bunker oil.
4. Understand how to operate during bunkering.

The equipment used is a Mass flow meter with an accuracy under reference conditions of 0,1% of actual flow. The key word is “Reference conditions”. If you can get as close to reference conditions as possible, during bunker operations, the likelihood of a wrong measurement is minimized.

This requires that:
- flow is kept within flow meter specifications,
- a stable temperature is maintained,
- correct zero adjustments has been made,
- and no air is present in the bunker oil.

Bunker oil is normally measured in actual cubic meters at a certain temperature by tank gauging.

The temperature of the oil, and the compensation to the standard, which is volume at 15°C, is therefore very important. A volume compensation of 2-3 % is normal.

Along with the mass flow, and the volume flow, the flow meter measures the temperature and density of the oil. An automatic calculation of the volume at 15°C, and the volume correction factor helps in comparing final values.

Air in the oil is commonly used to “boost” or raise the volume figures. Therefore, air should be detected.

The system measures the density of the oil, and along with that, the temperature. It is therefore possible to calculate the Density at 15°C (generally referred to as “Dens 15”, or “Density @ 15°C”), which is one of the figures seen on the Bunker Delivery Note, and which is the reference density of the delivered oil. These two figures are therefore directly comparable.

The system continually monitors the density @ 15°C and compares it with the manually entered BDN density. If the measured density @ 15°C differs too much from the BDN density, a warning is shown on the Bunker display.

If this happens, it is important that the crew understands how to act in the situation.

Stripping a tank (switching from one tank to another on the supplier side) is a common cause of air in the oil and must to some extend be accepted under certain conditions.

If stripping takes too long, the purpose could be to pump air in the already delivered oil, and therefore long-lasting stripping should be avoided.

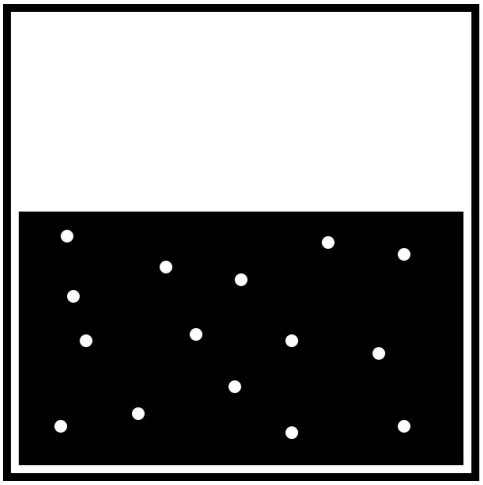
Stripping is very easily seen as Density warning. Density 15°C jumps up and down, because a mixture of air and oil is pumped through the flow meter.

The best and the easiest solution to detect and avoid air, is to increase the back pressure in the bunker delivery line. By “pinching” the valve after the flow meter, the pressure is gradually increased, this decreases the volume of the air (if present) and thereby stabilize the density. A clear proof that air is present.

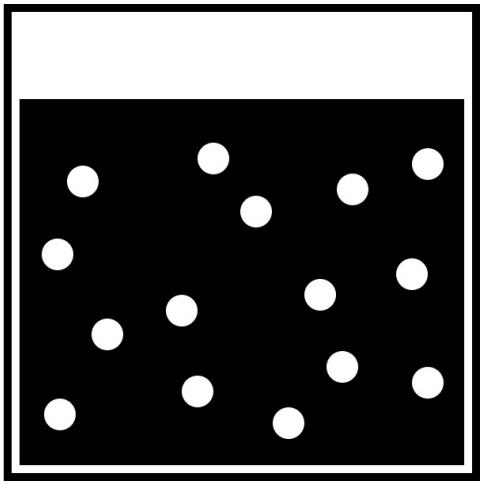
Furthermore, the more stable density ensures that the flow meter is much more accurate, and the volume measurement of the flow meter is much more likely to be correct. It does decrease flow a bit, but is worth waiting for.

NOTE!

A tank measurement by sounding will in case of air in the oil show a higher volume than delivered, because the trapped air inside the oil will return to normal pressure and thereby expand in volume resulting in an increase in the volume of the oil containing the air – see explanatory illustration below.
In this case… Trust your flow meter.

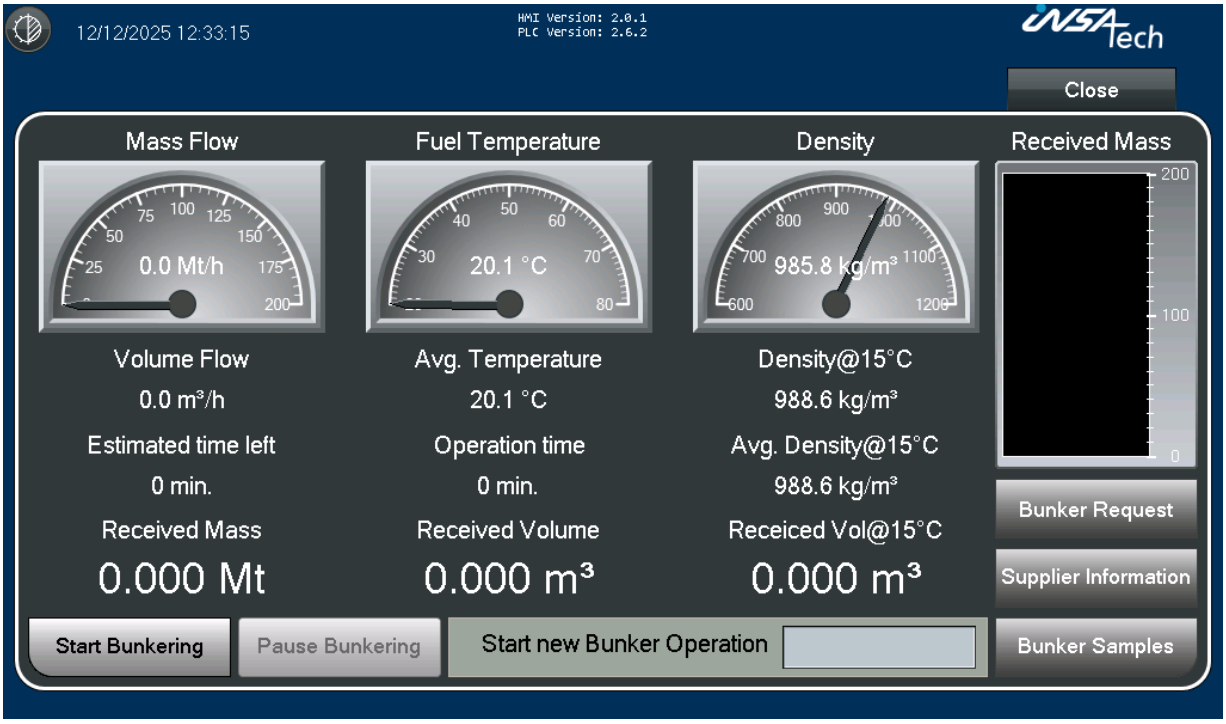


Oil containing air under pressure
As the air is compressed, the overall volume is affected. This is what happens when the Bunker Management System “pinches” the valve to detect air.



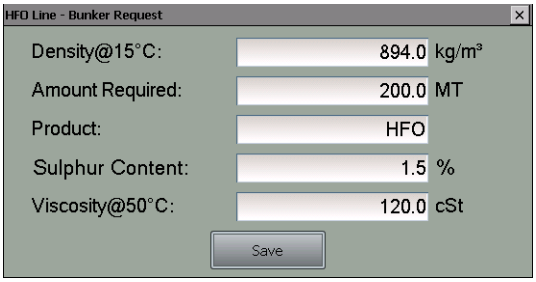
Oil containing air when pressure is released
With no pressure to compress the air, the overall volume is affected. This is the resulting increase in volume after the oil containing air has passed the valve in the Bunker Management System

8.2. Bunker Operation



8.2.1. Bunker Request

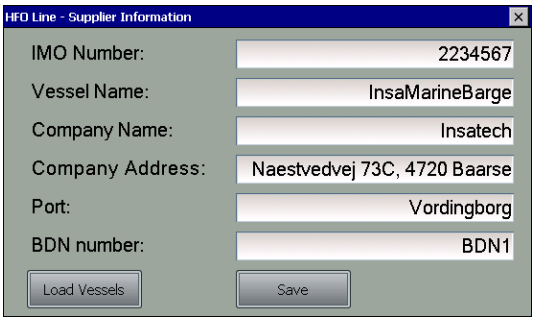
Before start of the operation Bunker Request information must be entered.



Parameter	Explanation
Density @ 15°C:	Information from the BDN. Should always be entered in kg/m3. It is used to give an alarm if density of the delivered oil is too low. This could be a sign of air in the oil.
Amount Required:	Required quantity from the Supplier.
Product:	Name of the required Bunker oil product.
Sulphur Content:	Sulphur Content of the required oil.
Viscosity @ 50ºC:	Information from the BDN. Used to calculate viscosity at any given temperature, and to suppress drive gain alarms if viscosity is high.

After entering the parameters press *Save* button and continue.

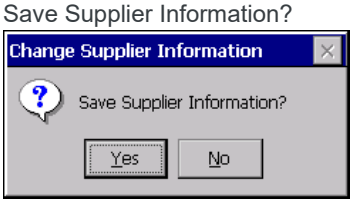
8.2.2. Supplier Information



Parameter	Explanation
IMO No.:	IMO number of the Supplier delivering the oil.
Vessel Name:	Name of the Supplier delivering the oil.
Company Name:	Name of the Bunker Oil Company delivering the oil.
Company Address	Address of the Bunker Oil Company delivering the oil.
Port:	Name of port where the operation takes place.
BDN No.:	Bunker delivery note number from Supplier.

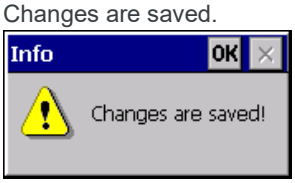
When saving a vessel by pressing the *Save* button, the vessel can be saved for later use.

1. Save Supplier Information?



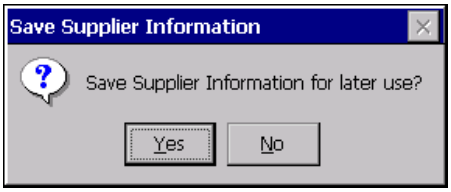
Confirm by pressing *Yes* or cancel by pressing *No*.

2. Changes are saved.



Confirm by pressing *OK*.

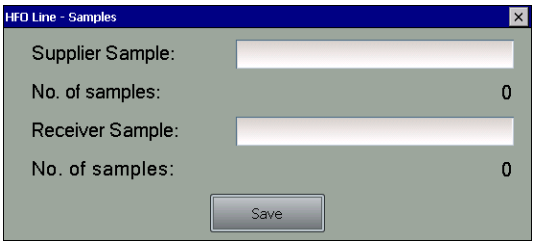
3. Save Supplier Information for later use?



If *Yes* is pressed the vessel will be saved in a list of vessel and can be loaded for later use by pressing *Load Vessels*

When *Load Vessels* button is pressed, a drop down list of saved vessels will appear together with a *Select Vessel* button. Select a vessel on the list and press *Select Vessel* and follow above procedure for saving the vessel, to be used for the bunker report.

8.2.3. Bunker Samples



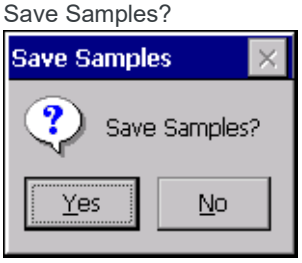
During bunkering, samples can be taken and numbered. The sample numbers can be entered into the system and will be part of the final Bunker report.

To distinct the samples between the Supplier and the receiver there are two input fields.

There are no limitations in number of samples for each bunker operation.

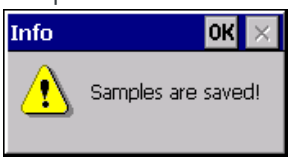
When pressing *Save* the samples are saved.

1. Save Samples?



Confirm by pressing *Yes* or cancel by pressing *No*.

2. Samples are saved.



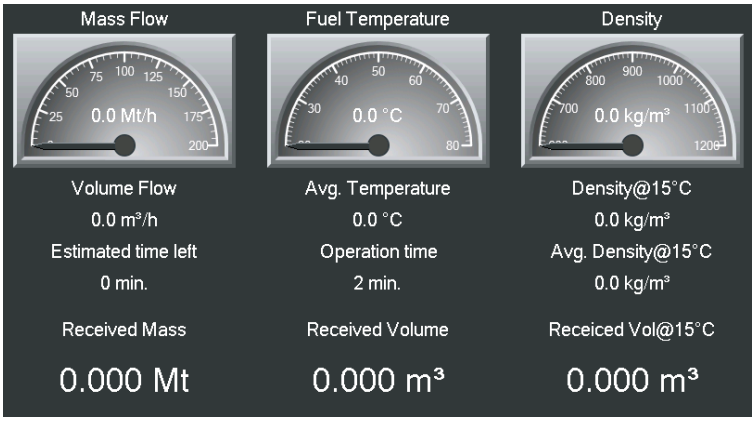
Confirm by pressing *OK*.

If only one of samples inputs are entered only that sample will be saved.

Best practice is to enter Samples after the Bunker Operation is started.

Note! If the Application is closed entered samples will not be saved, when starting the application again.

8.2.4. Operation Parameters



Parameter	Explanation
Mass Flow:	Mass flow measured in tons per hour. Is independent from temperature.
Volume Flow:	Volume flow measured in cubic meters per hour at actual temperature.
Fuel Temperature:	Actual Temperature of the bunker oil
Average Temperature:	Average temperature of the bunker oil.
Density:	Density of the bunker oil measured in kilograms per cubic meter at actual temperature.
Density @ 15°C:	Density of the bunker oil, calculated back to 15 °C, using the ASTM 54B equation.
Average Density 15:	Average Density 15°C of the bunker oil. The Density 15°C is weighed against flow, which means that the average calculation stops if for some reason the flow is stopped. This will give the most accurate density measurement
Received Mass:	The total mass of the received bunker oil in Metric ton, calculated from START BUNKERING is pressed.
Received Volume:	The total volume at actual temperature of the received bunker oil, calculated from START BUNKERING is pressed.
Received Vol@15 °C:	Total delivered volume calculated back to 15°C, calculated from START BUNKERING is pressed.
Operation time:	Displays the time from Start Bunkering was pressed
Estimated time left:	Based on current flow rate, the estimated time is calculated and displayed

8.2.5. Operation steps

A bunker operation consists of different steps, which will be explained in turn as they occur during the operation.

Buttons and status bar will change during the various steps of the operation. The status bar will show *Start new Bunker Operation* when the system is ready, and the lamp is grey.

8.2.5.1. Start Bunkering

To start the operation, press the *Start Bunkering* button and answer *Yes* to the question “Start Bunker Operation:

This will start the operation; the counters will be enabled and start counting when flow starts.

After Start Bunkering has been pressed, the *Pause Bunkering* button will be enabled, and *Finish Bunkering* button will appear.

The status bar will show *Bunker Operation Running* and the lamp is solid green.

8.2.5.2. Pause Bunkering

Pressing *Pause Bunkering*, will Pause the operation, and have to be started again by pressing the button *Resume Bunkering*.

Pausing the Bunker operation can be useful during stripping, or if a pause is required for other reasons.

Pausing will stop the counters even though the flow meter registers flow.

During stripping or a pause where air enters the flow meter, the flow meter will be unable to detect a proper flow reading, and in some cases a negative flow can be seen. To avoid false counting in this case, pausing the operation is recommended.

The status bar will show *Bunker Operation Paused* and the lamp is blinking yellow.

8.2.5.3. Finish Bunkering

Pressing the *Finish Bunkering* button will stop the bunker operation. It is important that the bunker operation is finished just before the Supplier is going to blow the pipe!

After the operation is finished there is a delay of maximum 60 seconds before the *Generate Report* button is visible. This is to ensure all data is available for the report that will be generated when the *Generate Report* is pressed.

The status bar will show *Preparing Data for Report* and the lamp is solid gray and a wait circle is visible.

8.2.5.4. Generate Report

When data is ready for the report the status bar will show *Ready to Generate Report* and the lamp is blinking orange.

Pressing Generate Report will create a Bunker Transfer Report in PDF format. The report is saved on the PC and not on the HMI screen.

The status bar will show *Generating Report* and the lamp is solid gray and a wait circle is visible.

To view or print the report, you must use the computer. It cannot be done via the HMI screen.

Use the “Reports” button on the PC to open the folder containing the reports.

The Report can be opened and viewed in a PDF viewer.

Copy the report for record keeping, printing, and signing.

Printing from within the PDF viewer is not possible unless a printer is attached to the system. In that case, please select the correct printer to print to.

8.2.5.4.1. Example of Bunker Transfer Report

Bunker Transfer Report

Insatech A/S
Næstvedvej 73C
4720 Præstø
Denmark
Station Name: Insa Bunker

Reporting periode [UTC]
From: 14/05/2024 08:25:53
To: 14/05/2024 14:34:25
Total Time: 6 hours 8 minutes
Report No: 319
BDN No: BDN1

Supplier Information

Name: Oil Barge 1
IMO no: 1234567
Port: Copenhagen

Bunker Company

Company: Copenhagen Bunker
Address:2150 Copenhagen

Samples

Receiver		Supplier	
Sample name	Comment	Sample name	Comment
1234A		4321A	
1234B		4321B	
1234C		4321C	

Product

Product Name: IFO380
Density at 15 °C[1]: 978.0 kg/m3
Sulphur Content[2]: 1.5 %
Average Temperature: 35.5 °C
Viscosity at 50°C 380.0 cSt
Stability Index: 97.7

Quantity

Gross Standard Volume at 15°C:	**203.412 m3**
Gross Standard Volume	**206.354 m3**
Metric Tons	**198.937 mt**

Remarks:

We hereby declare that the bunker fuel supplied conforms with Regulations 14(1) or (4) (a) and Regulation 18(1) of MARPOL 73/78 Annex VI.

We hereby acknowledge receipt of the above product and confirm that the samples were jointly taken by continuous drip sampler at the vessel's manifold, sealed and numbered.

Company Stamp Barge Stamp

Vessel Stamp

Bunker Barge Signature

Vessel Signature

[1] According to ISO 3675 or ISO 12185

[2] According to ISO 14596 or ISO 8754

8.2.5.5. Reset Counter

After the report are generated, the status bar will show *Reset Counter* and the lamp is blinking blue.

All counters can be reset by pressing *Reset Counters* and the system are ready for a new Bunker Operation.

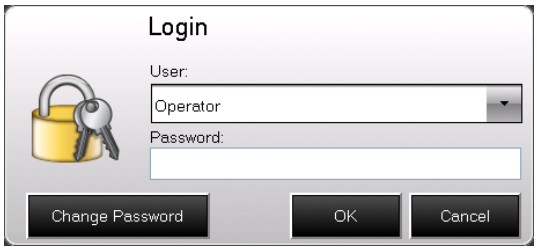
9. Settings and Service

Contains all administrative functions. Generally modifying settings on the Operators Panel will require an administrator login, that is not available to you on board, but some specific thresholds and settings may be available without this login and can be changed by the crew.

It’s necessary to login to change the settings.

User: Operator
Password: 1989

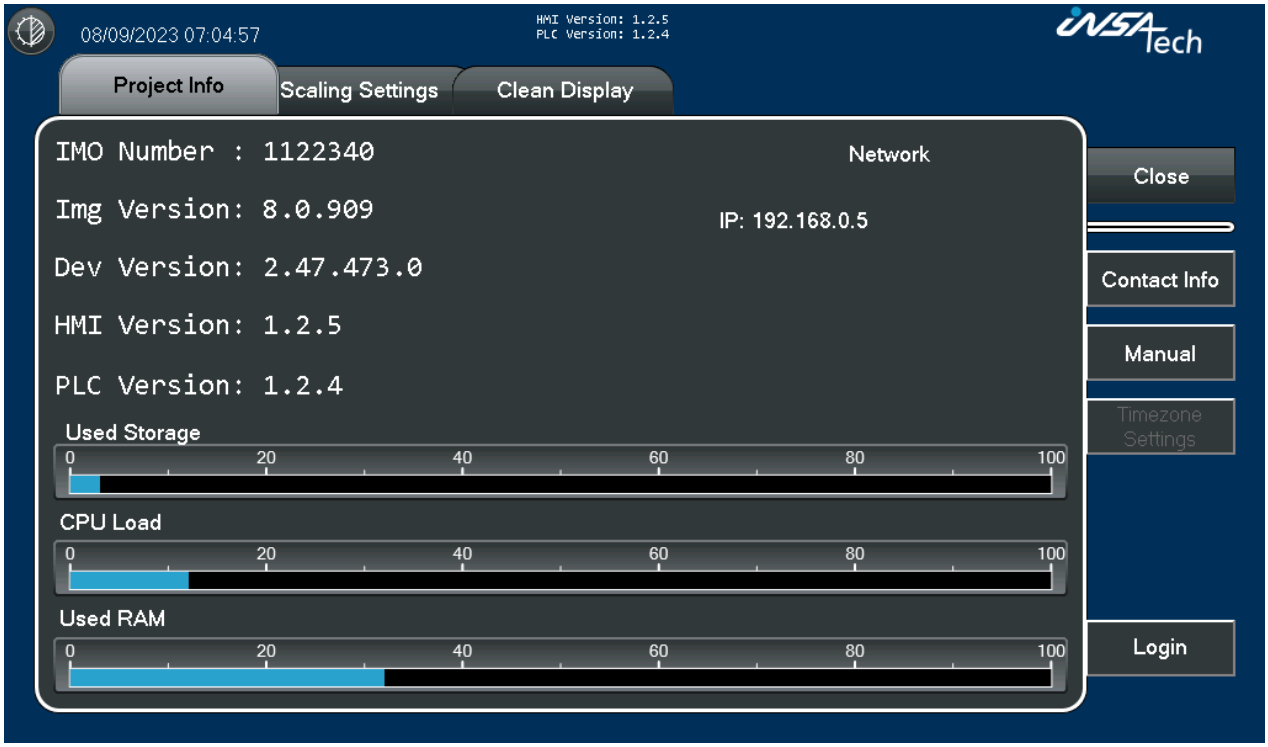
Custom password will reset on system update or service request.
We don’t recommend changing the password.



9.1. Project Info

This settings page allows you to see the device information and change contact, time zone and IP-settings.

Parameter	Description
IMO Number	IMO number of the vessel
Img Version	Image version of the HMI panel
Dev Version	Developer version if the HMI software
HMI Version	Version of the HMI program
PLC Version	Version of the PLC program



The menu on the right side gives the opportunity to change between the settings.

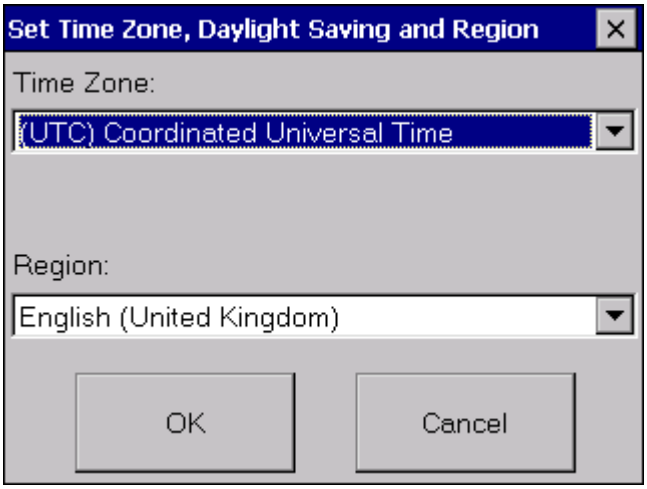
9.1.1. Setting and Service → Project Info → Contact Information

9.1.2. Setting and Service → Project Info → Manual

Download the Manual version matching the HMI user interface using the QR code or ULR link.

9.1.3. Setting and Service → Project Info → Time Settings

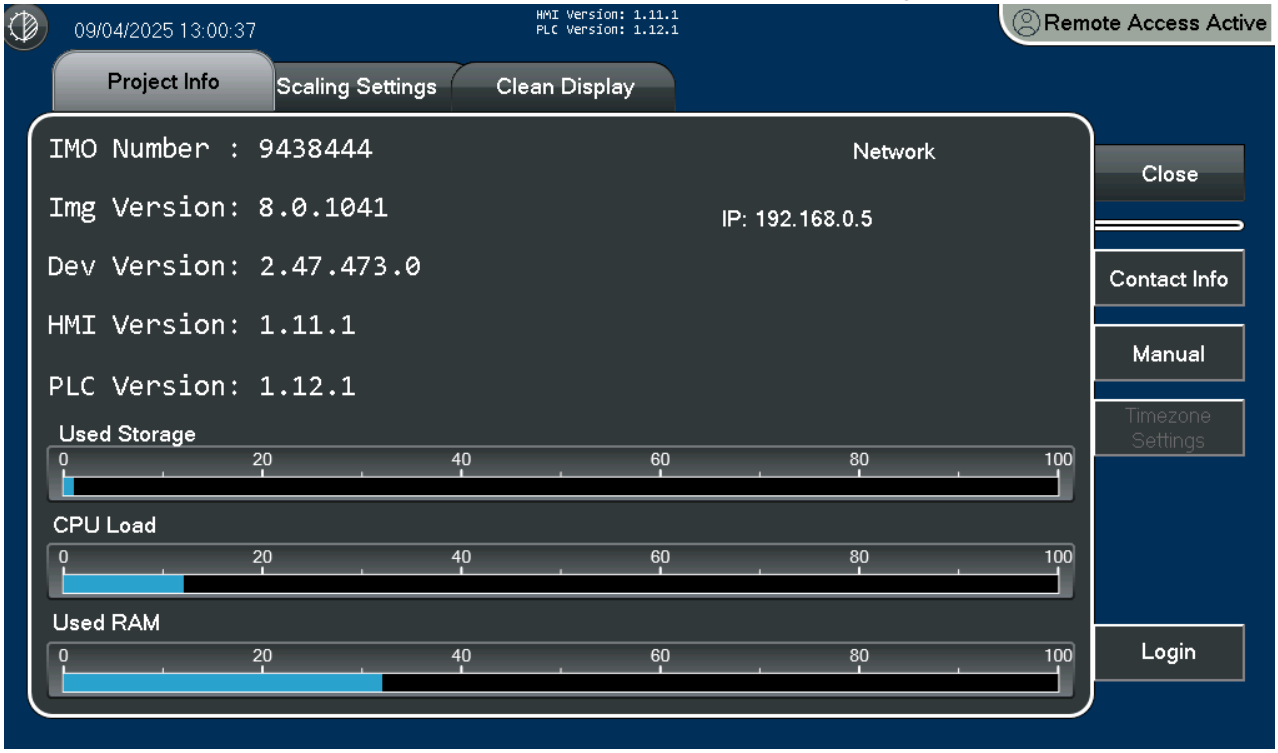
Standard settings for time zone are UTC Coordinated Universal Time, and it's not recommended to be changed.



To change the time zone, login as Operator is required.

9.1.4. Remote Access Active

Whenever a remote access to HMI is active a notification box will appear in the top right corner of the screen.



9.2. Scaling Settings

9.2.1. Consumers

This screen is dedicated to adjusting the scaling settings for various consumers on the vessel. Proper scaling ensures accurate representation and monitoring of fuel consumption and other relevant metrics.

On the left side, there's a list of all the consumers available in the system.

Parameter	Description
Low Cut	If consumption is below the low cut, consumption will be set to zero for the specified consumer.
LCV	Lower Calorific Value from bunker test report. Used for the LCV corrected SFOC calculations of the given consumer.
Running hours offset	Use to synchronize with local hour counters.

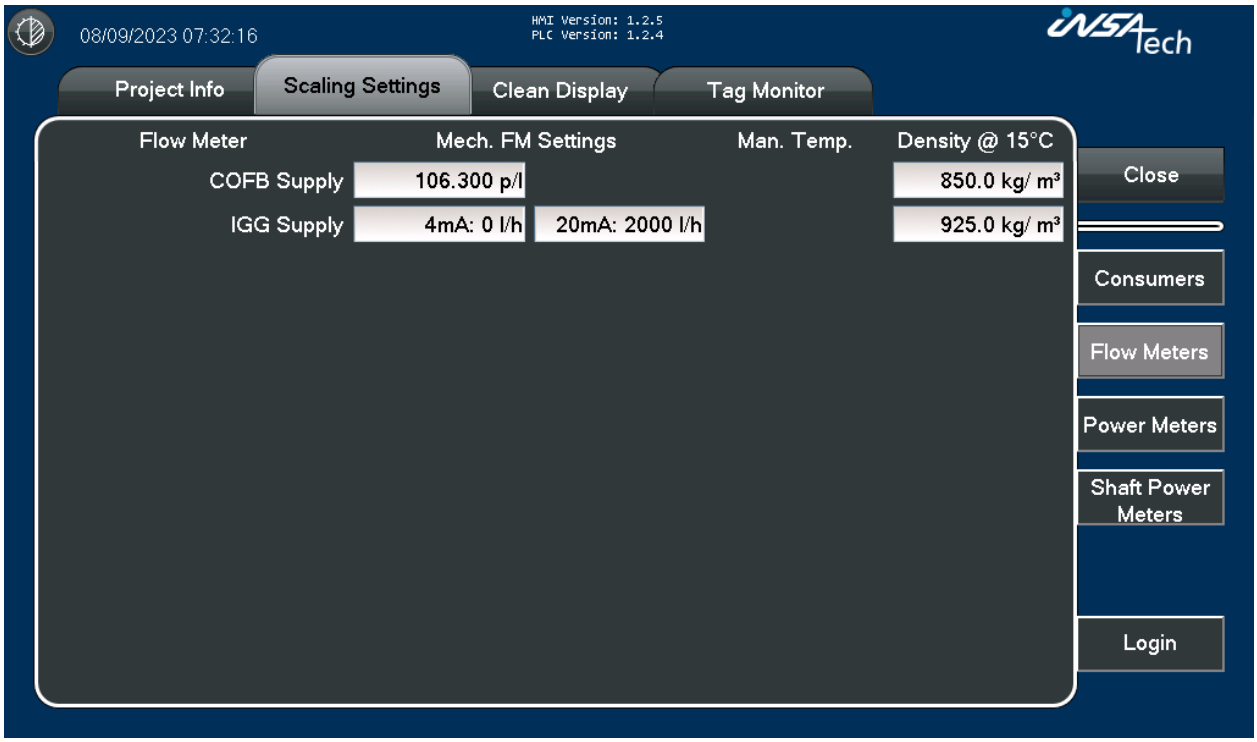
The menu on the right side gives the opportunity to change between the settings.

9.2.2. Flow Meters

This screen is dedicated to adjusting the scaling settings for various consumers on the vessel. Proper scaling ensures accurate representation and monitoring of fuel consumption and other relevant metrics.

On the left side, there's a list of all the mechanical flow meters available in the system. If no mechanical flow meters are present in the system nothing will be shown on the screen.

Parameter	Description
Mech. FM Settings	Constant for pulses per litres or mA limits used to calculate volume flow from volumetric flow meters.
Man. Temp.	A manual temperature can be entered if the temperature sensor of the flow meters is defect.
Density @ 15°C	Enter the Density15 from the bunker test report for fuel oil used.



9.2.3. Power Meter

This screen facilitates the adjustment of scaling settings that are specifically for the power meters on the vessel. Accurate scaling for power meters ensures precise monitoring of power production and consumption metrics.

On the left side of the screen, there's a list of all the power meters integrated into the system.

- Rated Power: Generators rated power
- Running hours offset: Use to synchronize with local hour counters.

Parameter	Description
Low Cut	If Power is below the low cut, Power will be set to zero for the specified Power Meter.
Rated Power	Rated power of the power producers and consumers.
Running hours offset	Can be used to synchronize with local hour counters.

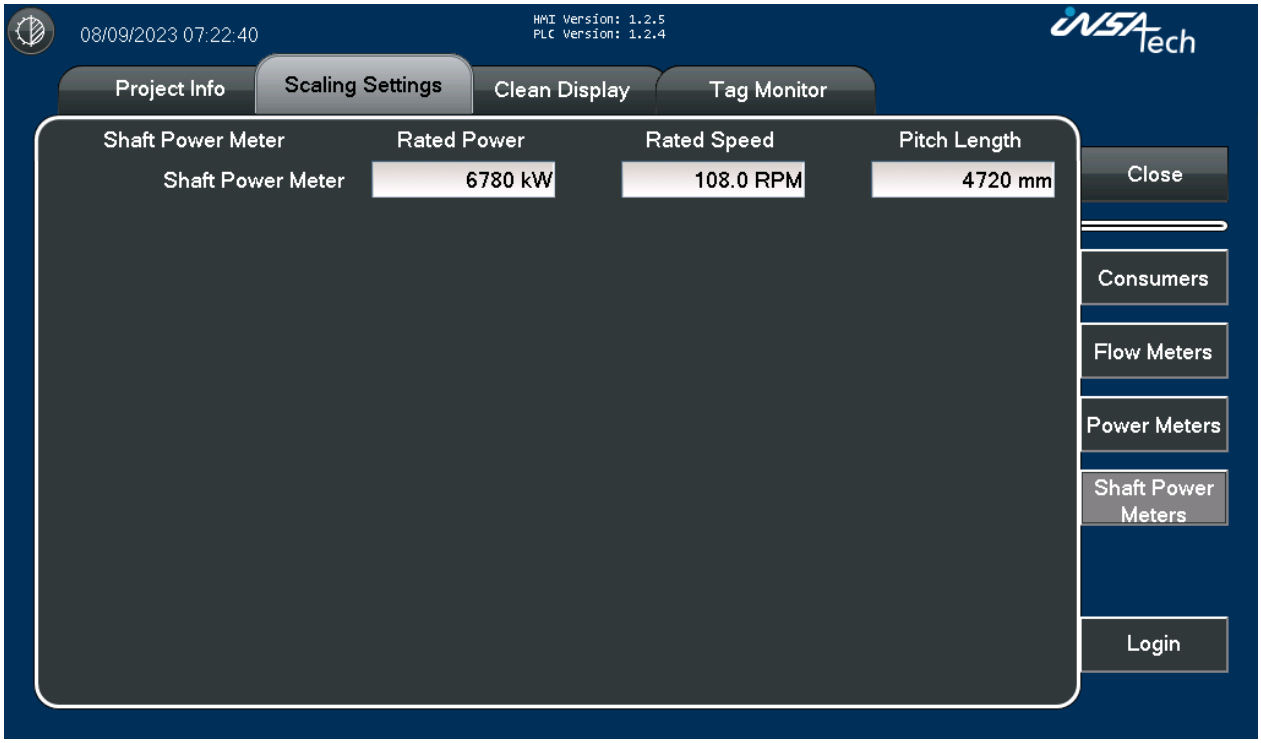
The menu on the right side gives the opportunity to change between the settings.

9.2.4. Shaft Power Meters

This interface is designed for adjusting the scaling settings specific to the shaft power meters on the vessel. Proper scaling of these meters is crucial for accurately monitoring the power transmitted through the shaft, which can be a vital metric in assessing propulsion efficiency and overall vessel performance.

On the left, a list displays all the shaft power meters integrated into the system.

Parameter	Description
Rated Power	Rated power of the Main Engine
Rated Speed	Rated speed of the shaft
Pitch Length	Enter the pitch length in mm of the propeller[20]



The menu on the right side gives the opportunity to change between the settings.

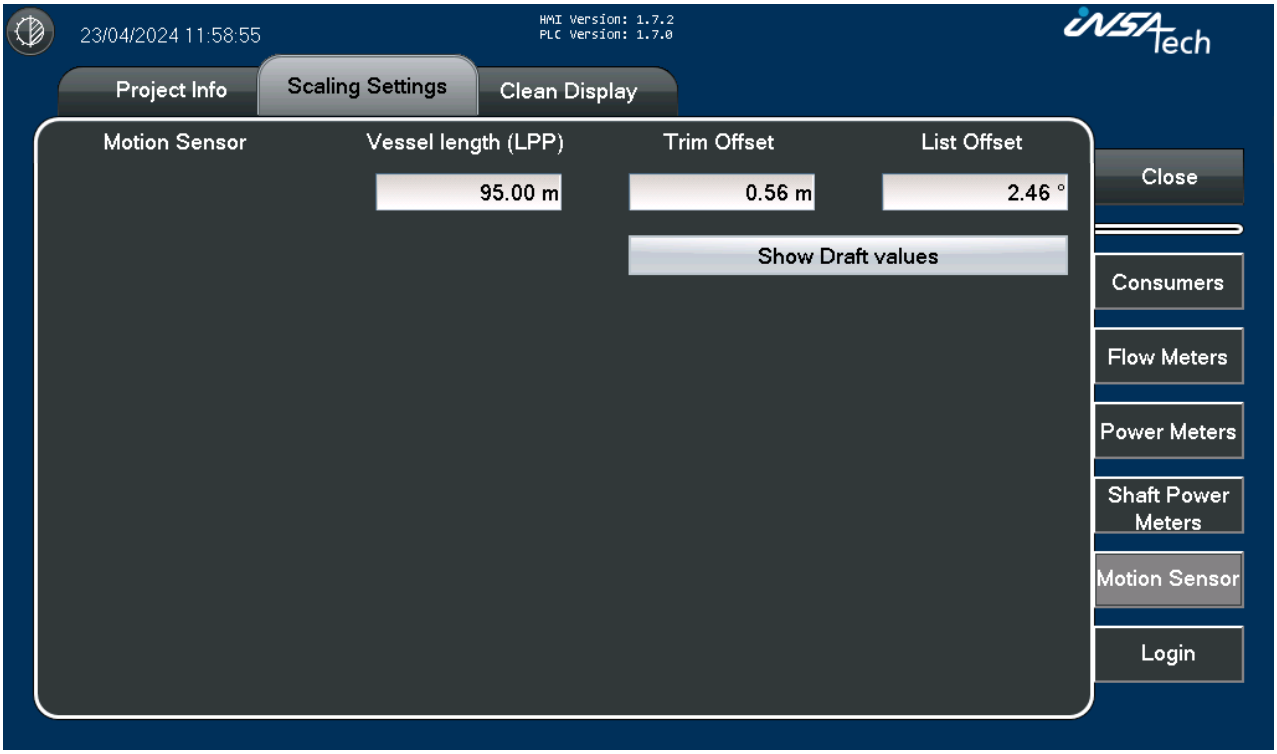
[20] Pitch Length: The theoretical distance a vessel would move forward with one full rotation of the propeller in a solid medium.

9.2.5. Motion Sensor

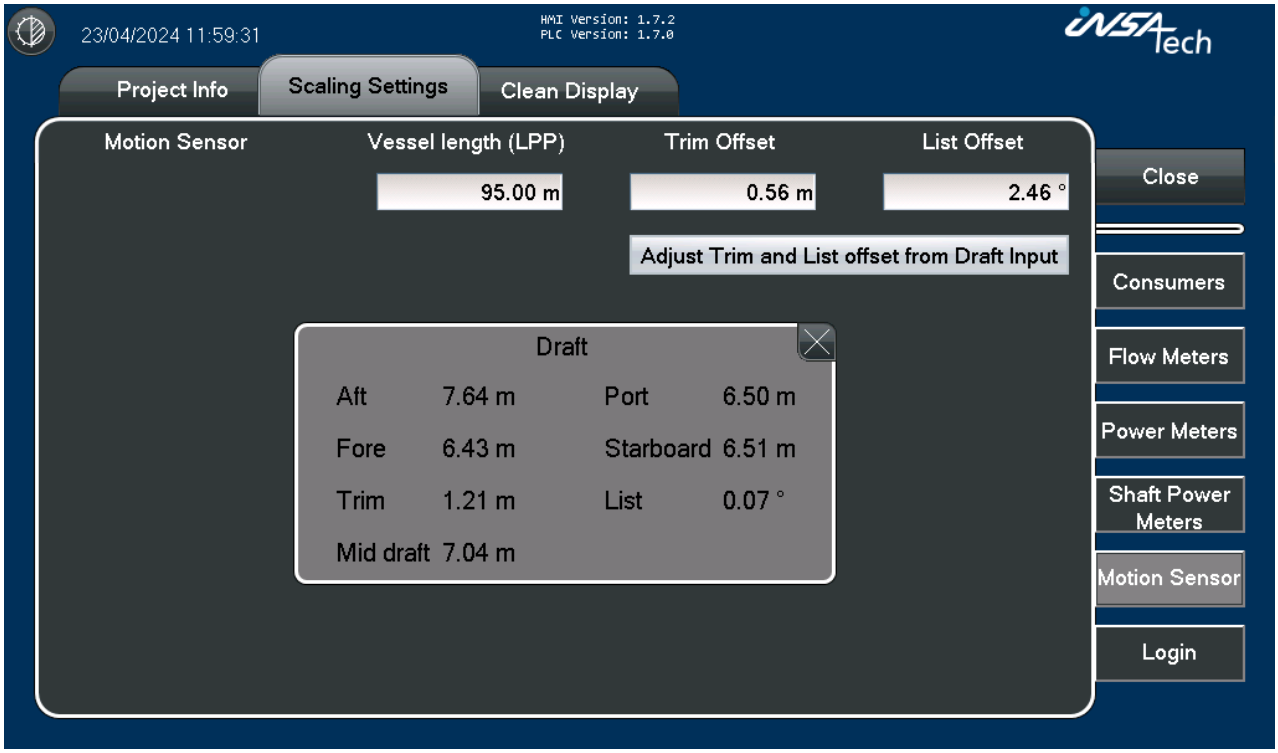
This interface is designed to adjust the Motion Sensor Offset according to the vessels actual position in water.

If Draft signals are available, they can be used to help offset the Trim and List to match the vessel actual position in water.

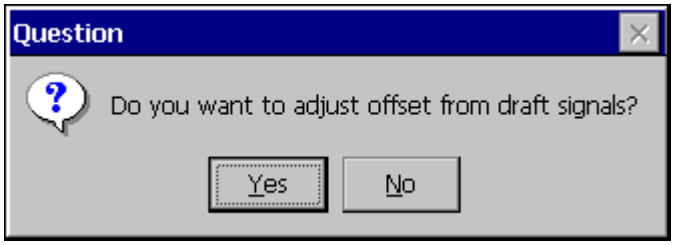
Parameter	Description
Vessel Length (LPP)	Vessel length between perpendiculars.
Trim Offset	Offset to adjust Trim of Motion Sensor.
List Offset	Offset to adjust List of Motion Sensor.



If Draft signals are available, the button Show Draft values appears. By pressing this, draft signals are shown on a pop-up and the button **Adjust Trim and List off from Draft Input** appears.



Pressing **Adjust Trim and List off from Draft Input** button a question is asked if you want to adjust the offset.



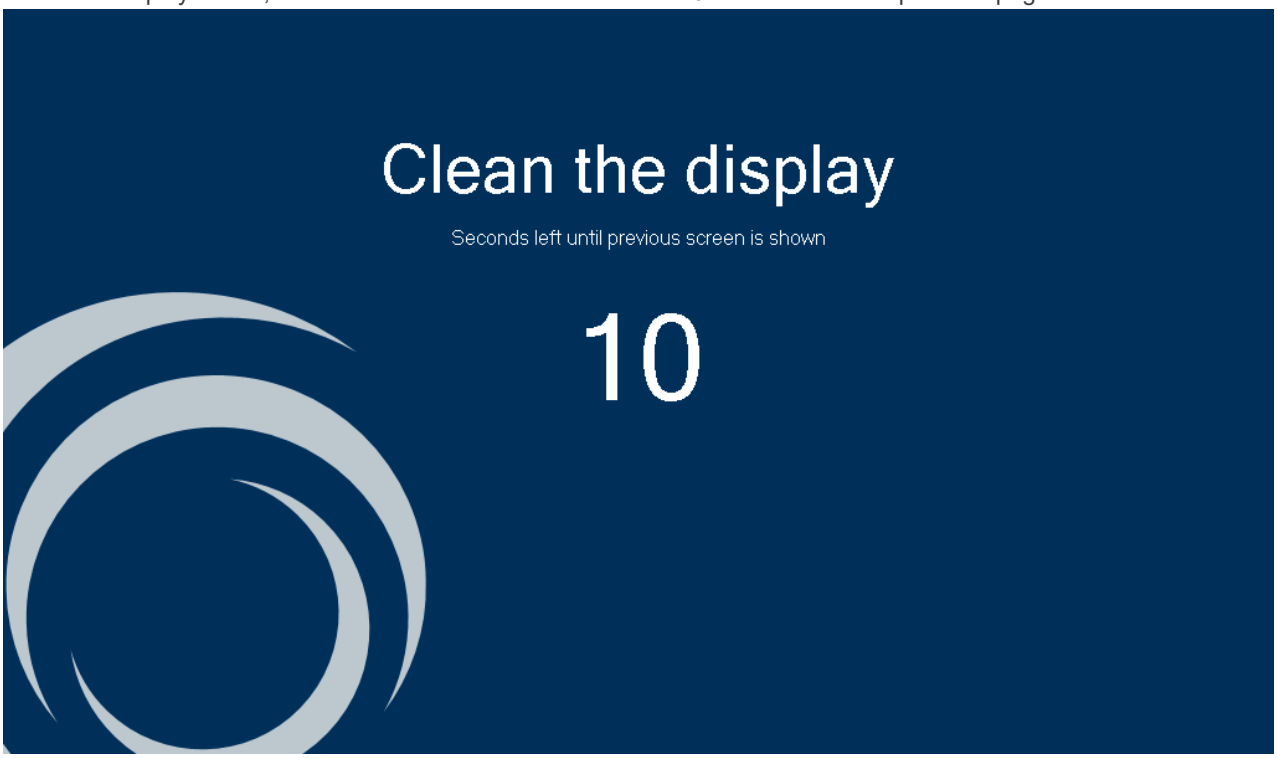
Accepting by press the Yes button will automatically calculate the offset and write it to the motion sensor.

This is recommended to be done every time the vessel have made cargo operations.

Make sure the vessel is stationary when adjusting the offsets and the draft are valid.

9.3. Clean Display

The clean display button, allows the user to clean the screen in 10 sec and return to previous page afterwards.

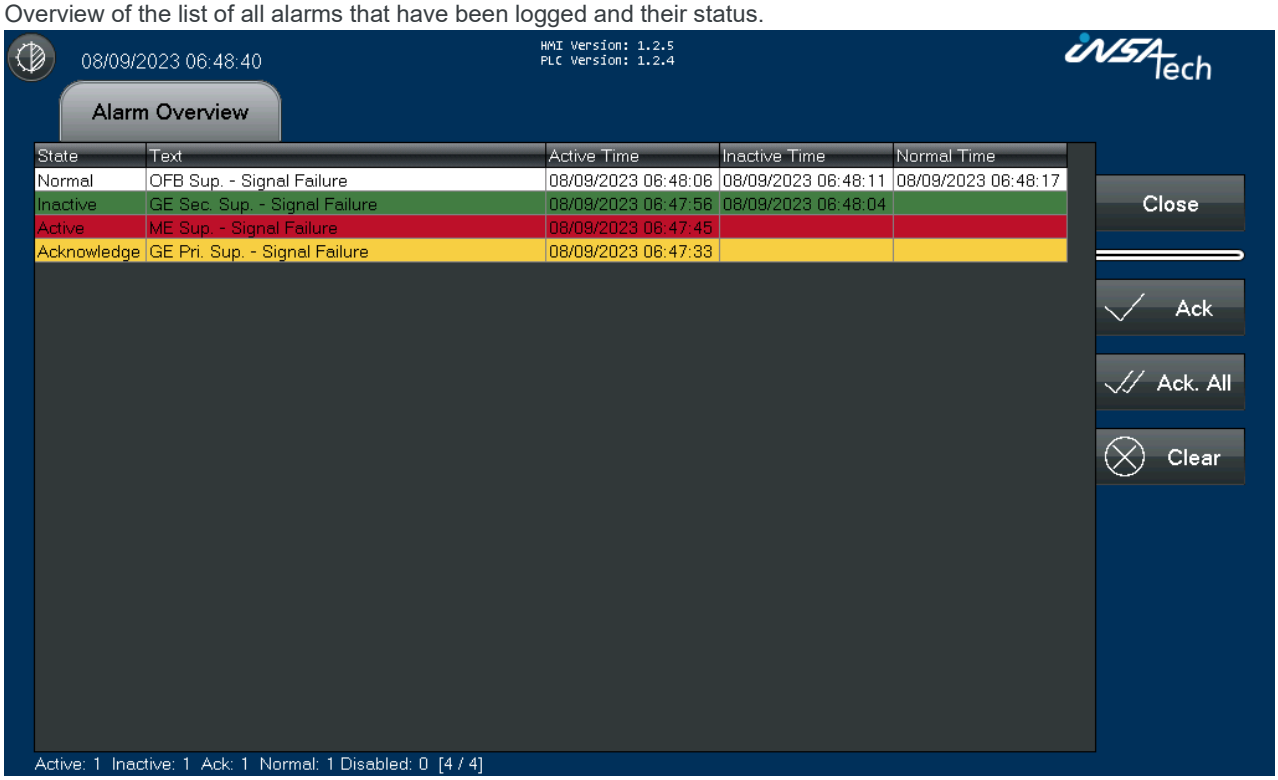


10. Alarms

Alarms will generally be shown on Detail Views as applicable, but only for the piece of machinery or measurement instrument that is selected. The full list of alarms can be found here.

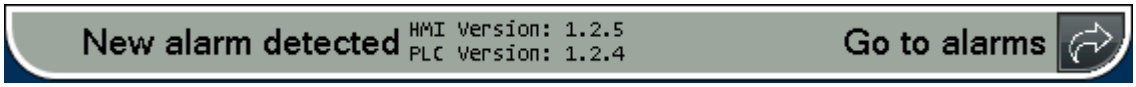
10.1. Alarm – Overview

Overview of the list of all alarms that have been logged and their status.



Alarm Colors	Description
White	Inactive Acknowledged Alarms (can be cleared)
Green	Inactive not Acknowledged Alarms
Yellow	Active Acknowledged Alarms
Red	Active Alarms

When new active alarms are detected, this box will appear in the top of the screen:



By pressing the arrow, it will navigate to the Alarm page, where acknowledgement of alarms can be done. And after handling the alarms, simply press close and it will return the page it came from.

On the Start page the Alarm button will blink red:

For more detail view and troubleshooting of each alarm see section List of alarms

11. Troubleshooting

This is a list of alarms that you may encounter as well as a detailed explanation of their meaning and how to resolve the underlying cause of the alarm.

11.1. List of alarms

11.1.1. Flow Meter Alarms

Message	Type	Reason	How to resolve	Ack. Required
Communication Error YPA	Error	Flow Meter is not responding to PLC Modbus requests, pulse rate too high or analog signal is out of range.	Check power supply to flow meter. Check wires and cables.	Yes
Frequency Failure Y	Error	Sensor (resonance/drive) frequency abnormality.	Check connection between sensor and transmitter.	Yes
Signal Failure Y	Error	Phase difference abnormal.	Reduce flow. Check connection between sensor and transmitter	Yes
Sensor 1 Error Y	Error	Sensor 1 signal line short.	Check connection between sensor and transmitter	Yes
Sensor 1 Defect or Drive Current Circuit abnormal Y	Error	Sensor 1 error or drive current circuit abnormal.	Check connection between sensor and transmitter	Yes
Sensor 2 Error Y	Error	Sensor 2 error	Check connection between sensor and transmitter	Yes
Sensor 2 Signal Failure Y	Error	Sensor 2 signal line short	Check connection between sensor and transmitter	Yes
Temp. Range Failure Y	Error	Temperature range violation. Measured temperature error.	Adjust temperature. Check connection between sensor and transmitter	Yes
Temp. Sensor Defect YPA*	Error	Temperature sensor failure	Adjust temperature. Check connection between sensor and transmitter	Yes
Transmitter Device Failure Y	Error	Critical internal error in transmitter.	Contact Insatech Marine.	Yes
Empty Pipe Detected Y	Alarm	No fuel in flow meter pipe	Fill pipe	No
Autozero Multiphase Error Y	Alarm	Unstable measurement when performing Autozero adjustment.	Stop multiphase flow. Fill pipe Reduce gas bubbles in process. Perform Autozero adjustment again	No
Autozero Flow Error Y	Alarm	Flow during Autozero adjustment.	Check valve. Check flow. Check vibration. Check density. Check electrical connections. Perform Autozero adjustment again	No
Autozero Temperature Error Y	Alarm	Unstable temperature during Autozero adjustment.	Stabilize process temperature. Perform Autozero adjustment again.	No
Analog Input Failure A	Alarm	Analog current input has exceeded measurement range.	Check analog current input cable connection. Check connected device.	Yes
Autozero adjustment is running Y	Warning	Autozero adjustment in progress.	Wait until zero adjustment has completed.	No
Autozero Error Y	Warning	Error during Autozero adjustment.	Delete errors and perform Autozero adjustment again.	No

Alarms supported by flow meters:

- Y: Yokogawa Rotamass TI
- P: Pulse flow meters
  - *Only if Temperature sensor is available
- A: Analog flow meters
  - *Only if Temperature sensor is available

11.1.2. Power Meters

Message	Type	Reason	How to resolve	Ack. Required
Communication Error	Error	Power Meter is not responding to PLC Modbus requests or analog signal is out of range.	Check power supply to Power meter. Check wires and cables.	Yes

11.1.3. Shaft Power Meters

Message	Type	Reason	How to resolve	Ack. Required
Communication Error	Error	Shaft Power Meter is not responding to PLC Modbus requests, NMEA0183 is not transmitted or analog signal is out of range.	Check power supply to Shaft Power meter. Check wires and cables.	Yes

11.1.4. Motion Sensor

Message	Type	Reason	How to resolve	Ack. Required
Communication Error	Error	Motion Sensor is not responding to PLC Modbus requests.	Check power supply to Motion Sensor Check wires and cables.	Yes