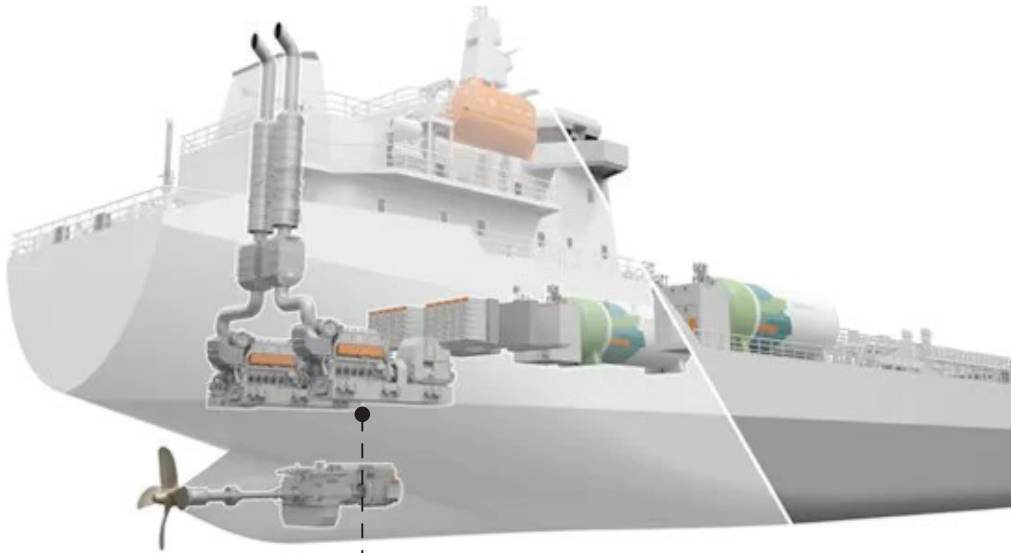


# LOTUS

*Lube Oil Testing Unit for Ships*

Condition monitoring & preventive analysis for lube oil

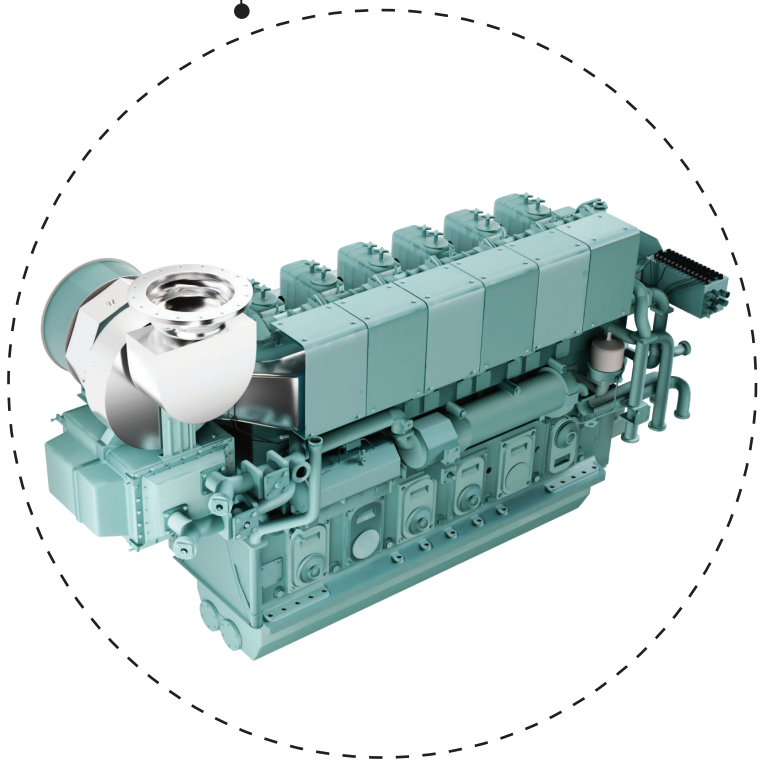


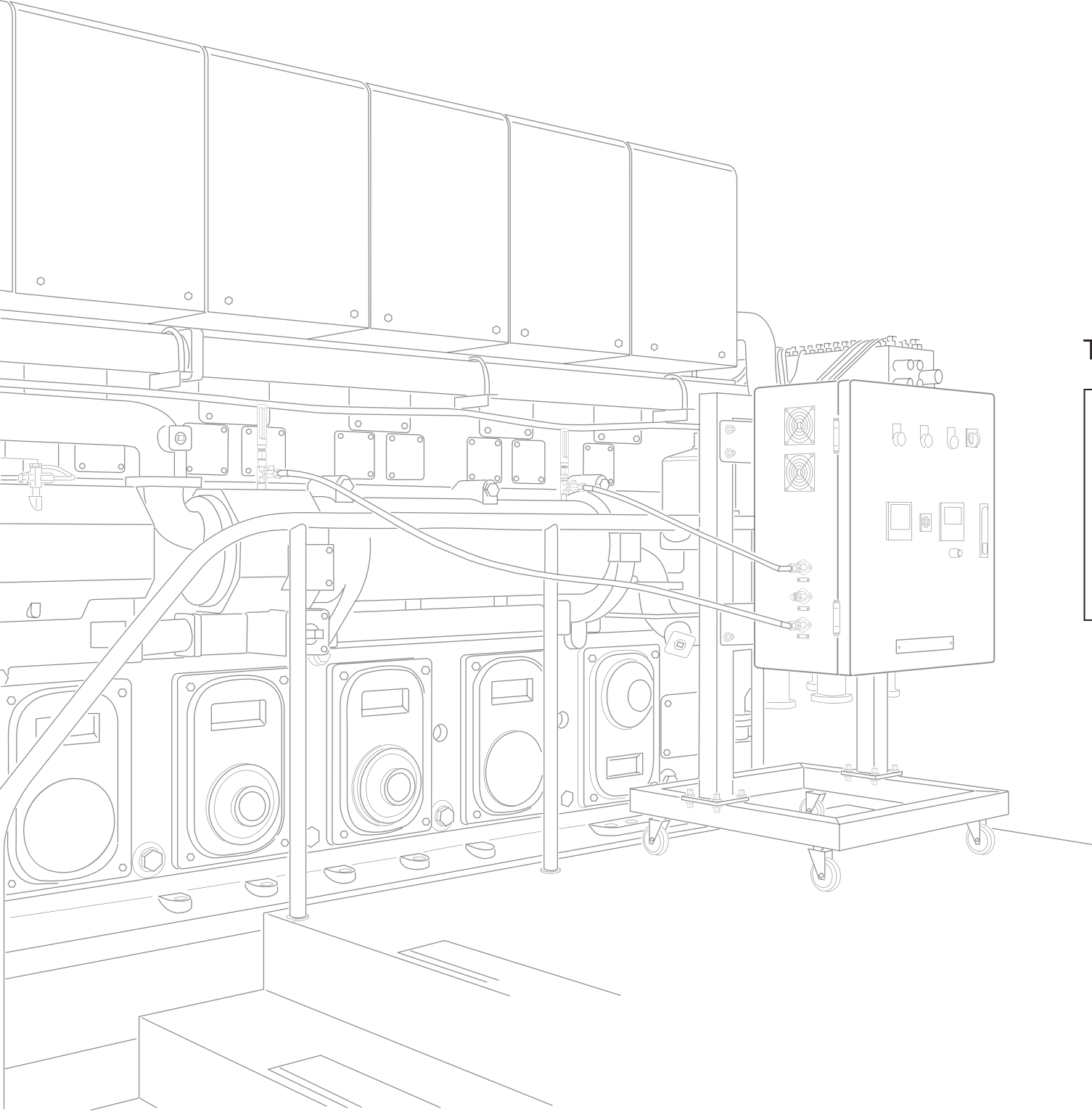
## Engine Lubrication Monitoring

The industry is experiencing a significant shift towards condition monitoring, transitioning from traditional time-based maintenance to proactive strategies that reduce unexpected machinery failures. Real-time, continuous monitoring solutions now provide operators with immediate data on vital parameters such as viscosity, moisture content, total acid number (TAN), total base number (TBN), and contamination levels. This shift enables a comprehensive view of oil quality and machinery health, facilitating timely interventions.

Recent technological innovations have introduced advanced sensing technologies. The development of miniature sensors made from highly durable materials allows for seamless integration into machinery, providing continuous monitoring without disrupting operations.

These advancements are particularly effective in detecting trace elements and wear metals, critical indicators of machinery degradation.





### Table of Content

Lotus Device.....	1-3
ASTER software.....	4-6
Data flow.....	7
Technical Specification.....	8-9
Installation & maintenance.....	10

## LOTUS

Lube oil testing unit for ships



### Integrated Control Panel Design

- Compact, robust enclosure designed for harsh marine environments.
- Includes multiple safety indicators (red, yellow, green) for real-time status updates.

### Built-In Connectivity

- Ethernet and USB ports for data extraction and remote diagnostics.
- Supports integration with external systems for seamless data transmission.

### User Interface and Control

- Centralized digital display for monitoring key oil parameters
- Touchscreen interface for easy navigation and data input/output.
- Emergency stop button and reset functions for operational safety.

### Durability and Safety

- Designed with high-grade materials to withstand extreme temperatures, humidity, and vibrations.
- Built-in ventilation and cooling systems to maintain optimal operational conditions.



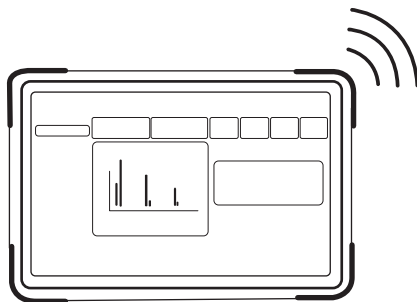
## LOTUS : Components

### Panel (Engine Room Installation)

- Mounted in the engine room next to the monitored equipment.
- No integrated display – data is collected and transferred to a provided tablet.
- Functions as the main hub for gathering operational data (lube oil parameters).

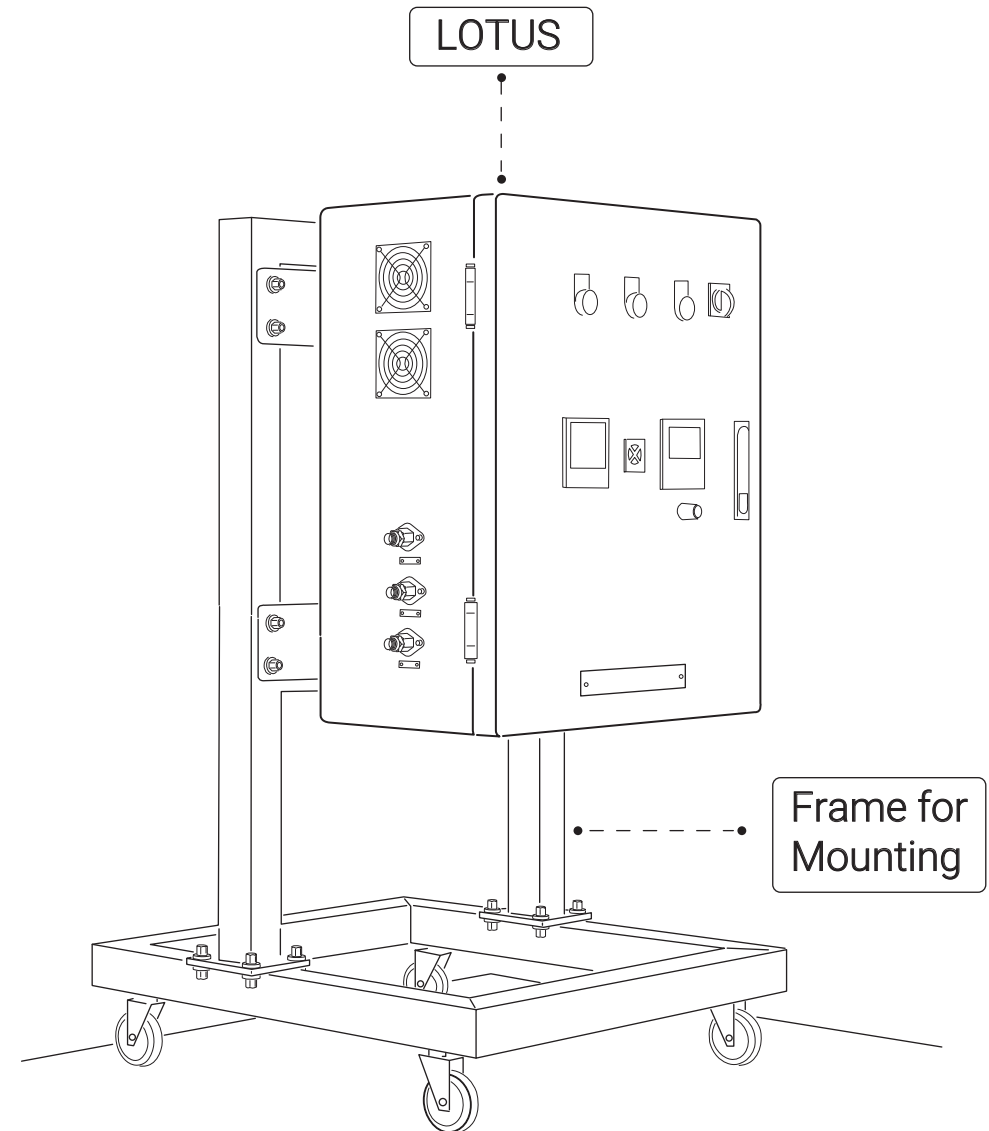
### Tablet (Data Visualization & Transfer)

- Pre-installed with ASTER software.
- Displays dashboard with real-time data, trendlines, and threshold breaches.
- Allows data visualization and report generation.
- Transfers data to computer or cloud via Ethernet (RJ45) or Modbus (RS485).



Tablet

For Data Visualization & Transfer



LOTUS

Frame for Mounting

## Advanced Monitoring Capabilities

- Direct connections for multiple oil sampling points, enabling multi-system monitoring.
- Real-time data acquisition and processing for on-the-spot analysis and alerts.

## PC Unit (Control Room Data Monitoring)

- Installed in the engine control room for continuous data collection.
- If not wired, data is stored locally and uploaded later via internet gateway.
- Ensures secure data storage and cloud synchronization for shore-based management.



PC Unit

## Quality Parameters Detected

	Parameter	Unit	Accuracy
Oil Quality	Density	Kg/m <sup>3</sup>	0.97
	Viscosity	cst	0.95
	Total Base number	MgKOH/G	0.85
	Temperature	°C	0.99
Contamination	Moisture Content	ppm	0.97
	Free water	Aw(%)	0.90
	Fuel in oil	----	----
Machinery Wear	Particle Count		
	Ferrous Content Lowest Range : 40 Microns		0.85
	Non-Ferrous Content Lowest Range : 150 Microns		0.85

w.r.t. laboratory measurements and sensor data sheet

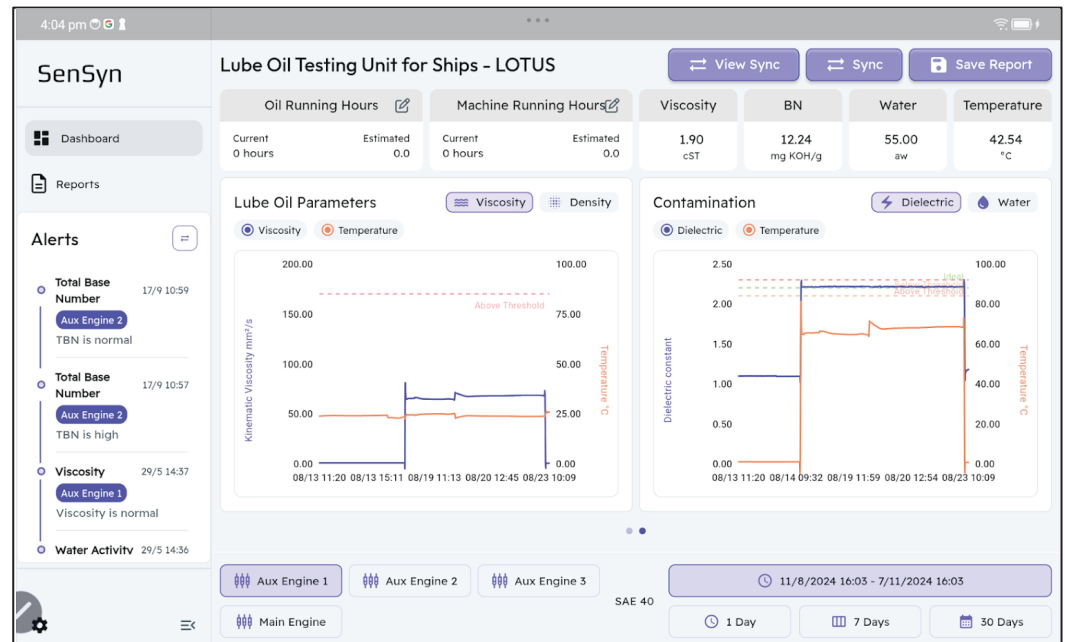
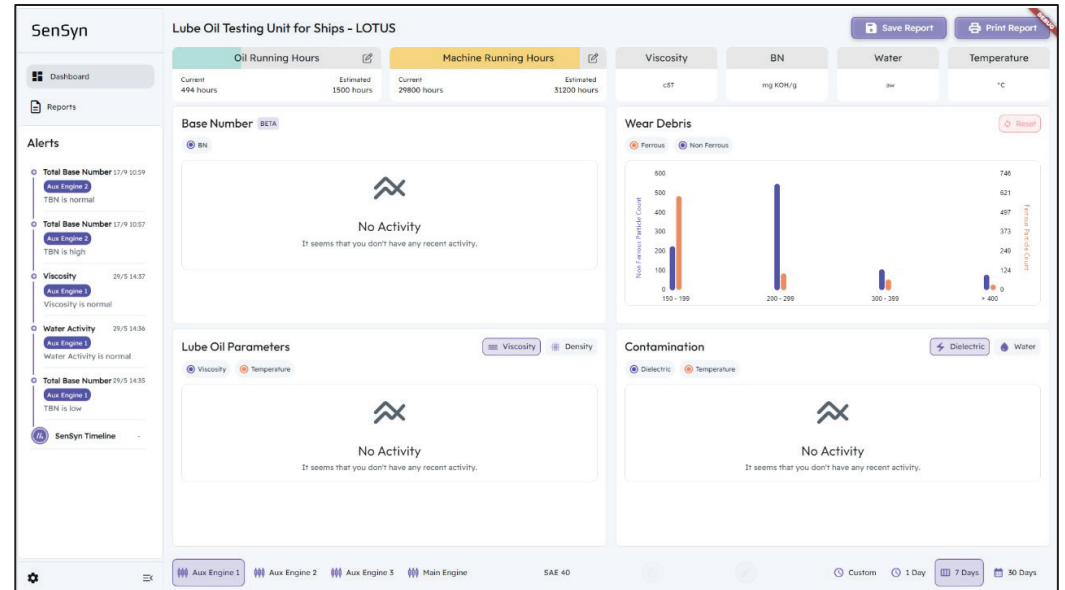
# ASTER Software

Sensyn's proprietary cloud and local software intended to provide data from past, live and provide predictive analytics into further degradations of the oil quality.

The software is available across Tablet, PC and Cloud version, for use by Crew, Shore Management and if needed to be referenced by third party inspection.

Sn	Feature	Description
1	Multi-equipment usage	Selection of auxiliary engines (1,2,3) and main engine.
2	Equipment operations	Oil usage understanding
3	Live Data	Data Visualization @ 0.5 Hz
4	Trending data view	Indicative of property changes overtime
5	Threshold overlay	To understand breached in critical parameters
6	Notification Records	Time stamped records of quality breach
7	Alarm Records	Sustained Breaches triggered alarm
8	Report module	Record keeping of data of equipment

# ASTER Software Interface on Tablet



## Report Module

### Visual Status Summary

- Color-coded indicators for quick identification of degradation, contamination, and wear.
- Anomaly detection with clear visual indicators.

### Comprehensive Parameter Monitoring

- Provides recorded values, ideal ranges, and variance percentages.

### Graphical Data Representation

- Line graphs depict trends over time for each parameter.
- Threshold breaches highlighted in yellow for easy identification.

### Multi-Parameter Monitoring


- Consolidates data for parameters like TBN, Density, Moisture Content, and Dielectric Properties in a single view.
- Correlates oil properties with operating conditions (e.g., temperature) for root cause analysis.


### Predictive Maintenance Support


- Monitoring combined with historical data trends for predictive analysis.

## LOTUS Report

### Status Summary

**Degradation Check:**  Density: Density Below Min: 2024-08-13 11:12 - 2024-08-14 09:57  
Viscosity: Viscosity Below Min: 2024-08-13 11:12 - 2024-08-14 09:57

**Contamination Check:**  Viscosity: Viscosity Above Max: 09:57 - 18:18, 2024-08-14  
Dielectric: Dielectric Below Min: 2024-08-13 11:12 - 2024-08-14 09:57

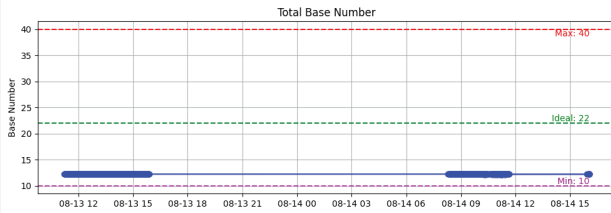
**Wear Check:** 

### Parameters

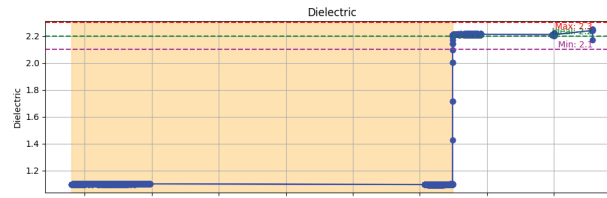
SN	Parameters	Recorded Value	Units	Ideal Value	Variation (%)	Lower Limit	Upper Limit
1	Density	638.16	kg/m3	830	-23.113%	910	940
2	Kinematic Viscosity	11.12	cSt	105	-89.410%	98	160
3	Total Base Number (TBN)	12.24		122	-89.967%	98	160
4	Dielectric	1.27	const.	0.22	477.273%	0	0.3
5	Water Activity	0.74	aw			0	3000
6	Moisture Content	56.35	ppm			2.08	3
7	Ferrous Content						
	40-99 um	0	count				
	100-199 um	0	count				
	200-399 um	0	count				
	>400 um	0	count				
8	Non-Ferrous						
	150-199 um	0	count				
	200-299 um	0	count				
	300-399 um	0	count				
	400-499 um	0	count				
	>500 um	0	count				

# LOTUS Report

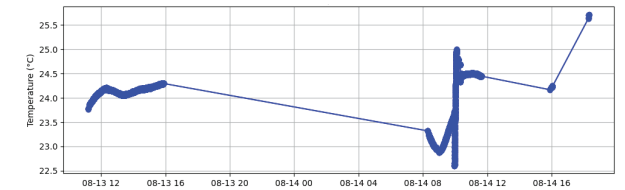
## Total Base number



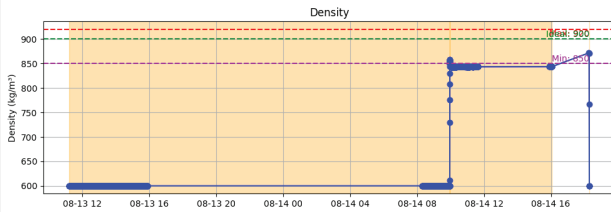
## Dielectric



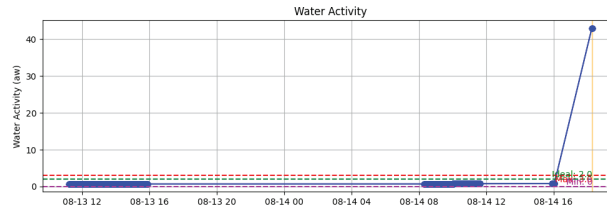
## Temperature



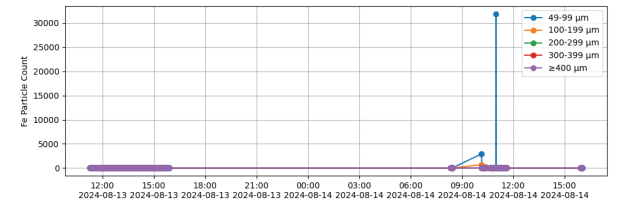
## Density



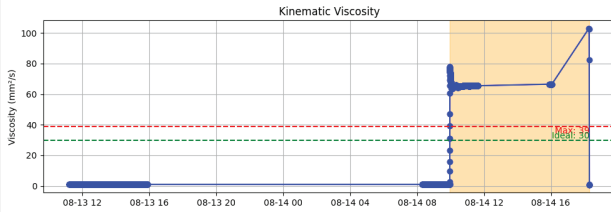
## Water Activity



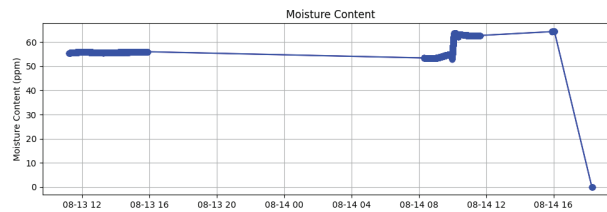
## Fe particle count



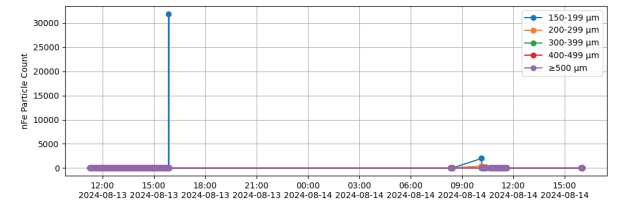
## Kinematic viscosity



## Moisture content



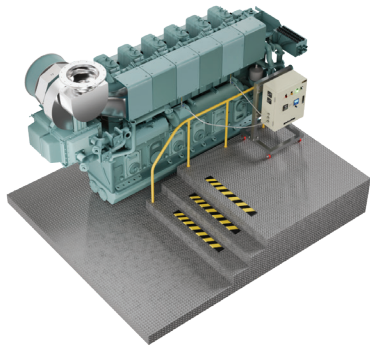
## nFe particle count



## Data Flow

1 • 2 • 3 • 4

### 1 Engine room



#### Lotus Panel & Tablet (engine room)

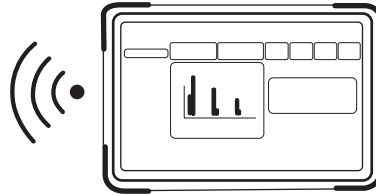
- Acquires Lube oil quality data
- Data is available for visualization trending & data record into tablet

### 3 ASTER Cloud

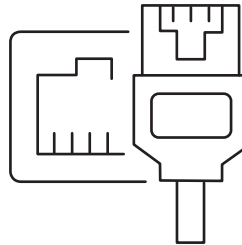


- Data backup from each ship onto the cloud
- Reports stored on cloud for further book keeping
- data utilized for retraining & analytics module

#### Wireless (Tablet)



#### Wired configuration (Optional)



### 2 Engine control room



#### Industrial PC (engine control room)

- Data record and visualization
- Possibility to run data analytics
- Integrable to ship's internet connection to transmit data to cloud
- Can bypass the tablet with wired connection of lotus to engine control room

### 4 Web App for shore

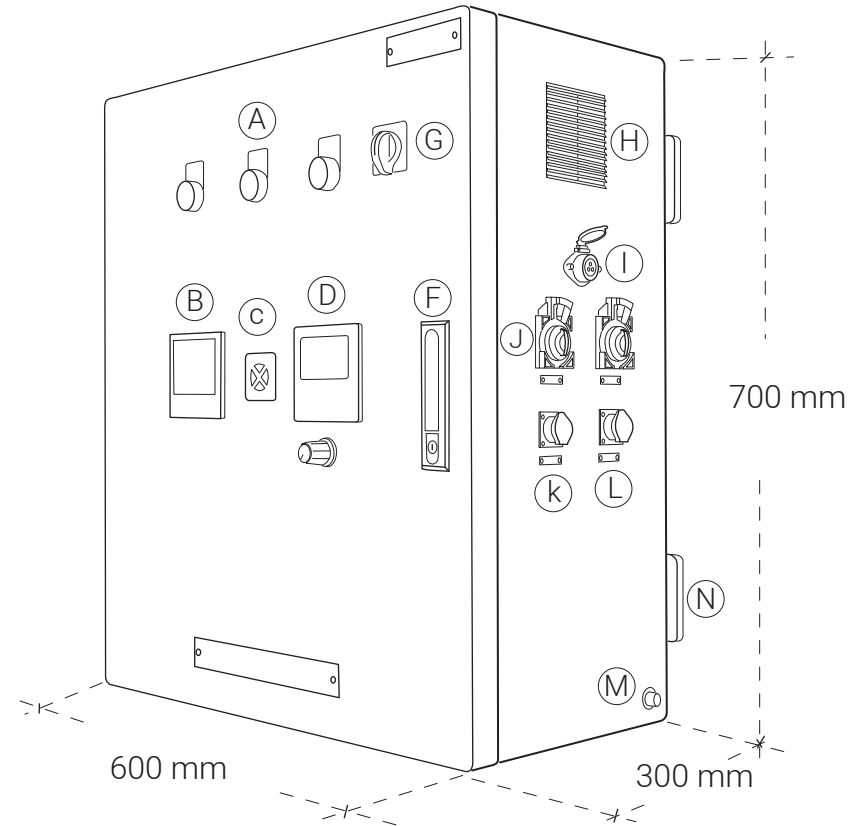


- Software modules made available for shore management

## Technical specifications

Category	Parameter	Specification
General information	Panel name	Lotus - V2
	Model number	24-S-C-11-A-A-S-64-E2
	Manufacturer	SenSyn
	Application	Monitoring hydraulic & Lube oil system
Physical Attributes	Dimensions (H x W x D)	700 mm x 600 mm x 300mm
	Weight	35 kg
	Enclosure material	Mild steel/stainless steel
	Mounting type	Wall-mounted
	Ingress Protection (IP) Rating	IP64(dust & water resistant)
	Cooling system	Fan-cooled
	Operating Temperature	-20°C - 60°C
	Colour	RAL 7032(Light grey)
Electrical Specifications	Power supply	220 - 230V AC,50/60 Hz
	Power Consumption	250 W
	Control voltage	24V DC
	Input/output Ports	Ethernet RJ45,RS485 Modbus, USB port
	Indicator lamps	Red (error),yellow (warning),green (normal operations)
	Communication Protocol	Modbus RTU/TCP
	Compliance Standards	IEC 60204-1, IEC 60529, IEC 61508

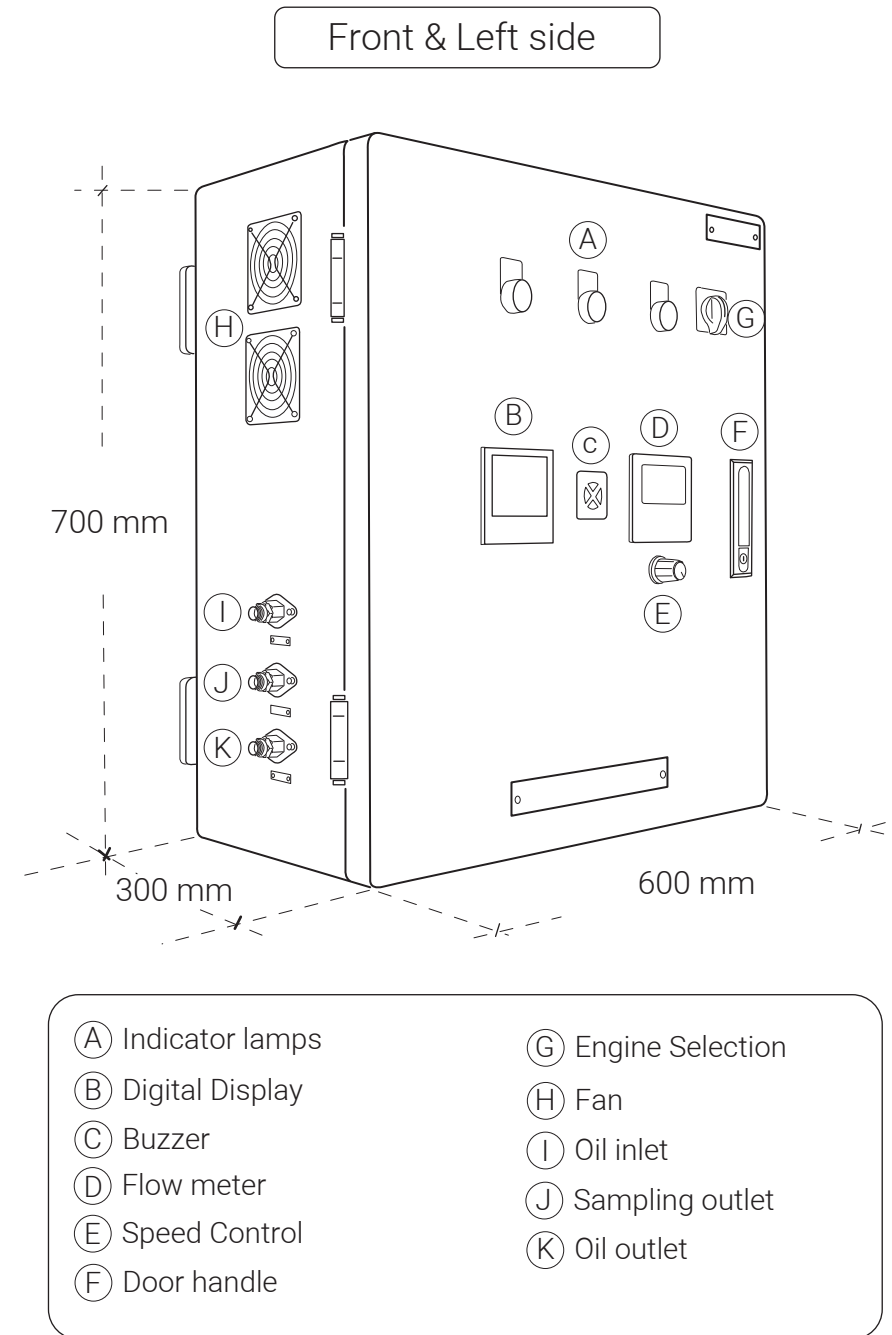
Front & Right side



- |                     |                         |
|---------------------|-------------------------|
| (A) Indicator lamps | (H) Air outlet          |
| (B) Digital Display | (I) Power socket        |
| (C) Buzzer          | (J) Power Switch        |
| (D) Flow meter      | (K) Ethernet port       |
| (E) Speed Control   | (L) USB port            |
| (F) Door handle     | (M) Earthing point      |
| (G) Selector Switch | (N) Wall mounting steel |



Category	Parameter	Specification
Hydraulic Specifications	Oil Inlet pressure	10 bar
	Flow rate	2-20 L/min
	Hydraulic Connections	1/4 "BSPP
	Sampling line Material	Stainless steel 316
	Oil Compatability	System oil,Cylinder oil (SE30,SA40)
	Operating oil Temperature	40°C - 90°C
Monitoring & Control	Sensor types	Oil condition & water debris
	Display	None (data output to external device)
	Data Logging	Via connected tablet/pc
	Reporting interface	ASTER software
	Alerts/Alarms	Configurable threshold alerts (eg. temprature,oil quality )
Safety Features	Emergency stop Button	yes (red push button)
	Overload protection	Circuit Breaker
	Lockout/Tagout	Key lock or padlock provision
	Warning Labels	High voltage,hot surface
Installations	Installation environment	Indoor (engine room)
	Vibration resistant	ISO 10816(machine vibration standard)
	Wiring	Pre-wired for easy installation
Compliance	Certifications	CE,ISO 9001



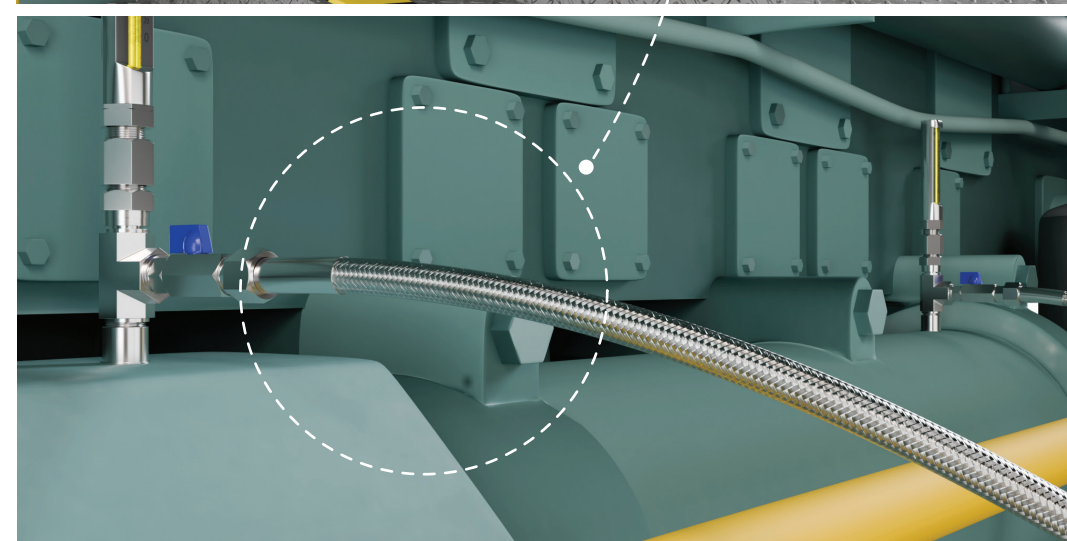
## Installation & Maintenance

### Installation Features :

- Connected across the lube oil cooler using high-grade, high-temperature, and pressure-resistant hydraulic hoses (>100 bar, >120°C).
- Equipped with industry grade high pressure fittings for reliable, leak-free connections without the need for welding.
- Crew-friendly installation—designed for quick setup with minimal time and no major interventions.
- Mounted on a portable frame with wheels, allowing easy movement between engines or equipment.
- No permanent wall-mounting required—reduces drilling, placement constraints, and fire hazards.

### Maintenance Features :

- Simplified maintenance with clear access to hydraulic components.
- Use of high-quality, easily sourced electronic components for reduced downtime.
- Safety and ease of access prioritized for routine checks and maintenance tasks.





## Support



At **SenSyn**, we understand the critical importance of minimizing downtime and ensuring your vessel operates at peak efficiency. Our dedicated team of marine engineering experts provides 24/7 technical support, offering fast, expert solutions tailored to your specific operational needs.

Global Reach, Local Expertise:

- 30 offices across 15 countries
- 24/7 technical support from dedicated marine engineering experts
- Extensive global network for rapid spares availability
- Ensuring swift resolution of issues and minimal operational downtime

Your Fleet, Always Supported.

