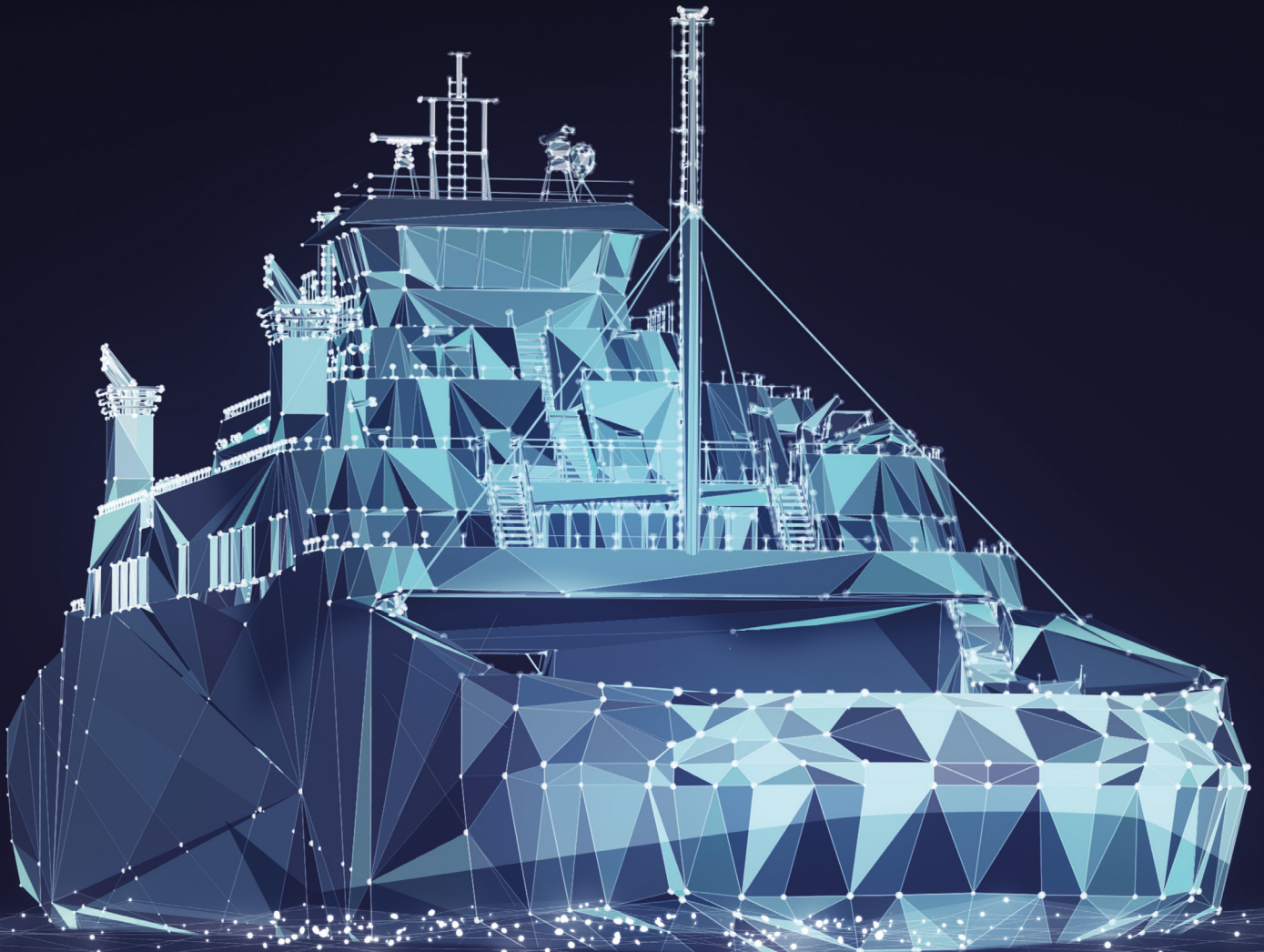


YOUR PROPULSION EXPERTS



# SCHOTTEL MariHub

IoT & Monitoring system

# Valuable insights with SCHOTTEL MariHub

**F**or ship operators the focus is on safe, reliable and economical operation over the vessel's entire service life. In addition to parameters such as propulsion thrust or power, the focus for ship propulsion is increasingly on topics such as reliability, maintenance strategy, life cycle costs and operational optimization.

In order to achieve the greatest possible potential in these areas, the use of intelligent, data-based systems plays a decisive role in addition to a robust mechanical SCHOTTEL propulsion design.

Regardless of whether the operator is pursuing optimization goals in the area of maintenance or operation, data serves as the basis for making the right operational decisions. SCHOTTEL provides the MariHub tool for this purpose, which acts as a data processing and IoT solution for the propulsion system.



## Data for preventive maintenance

- Monitoring of current measured values to detect acute signs of wear or damage
- Minimizes the risk of consequential damage and improves root cause analysis

## Data for predictive maintenance

- Regular monitoring, processing and analysis of measured values to predict or detect damage patterns at an early stage
- Execution of maintenance according to drive condition possible with the help of MariHub together with ProCMS

## Data for the fleet benchmark

- Optimization of current vessel operations
- Data-based decision making supports strategic fleet deployment and development planning

# What is the SCHOTTEL MariHub?

The MariHub collects and analyzes signals from sensors, machines and other components and transmits them to the MariNet IoT platform. With MariHub, the operator can use additional data services, such as a condition monitoring service or a cloud-based live data view for technicians in the office.

MariHub has an integrated control panel for live viewing of current equipment and vessel data for technicians on the vessel.

In addition, MariHub offers the option of sending data automatically (Internet connection required) to the MariNet cloud platform. From there, ship operators can access data visualization and analysis applications.

The crew can also transmit the data manually. In conjunction with the condition monitoring service (ProCMS), MariHub allows for the system to be monitored continuously at component level. Integrating the MariHub messages into the global alarm system is also possible.

## + ANYTIME

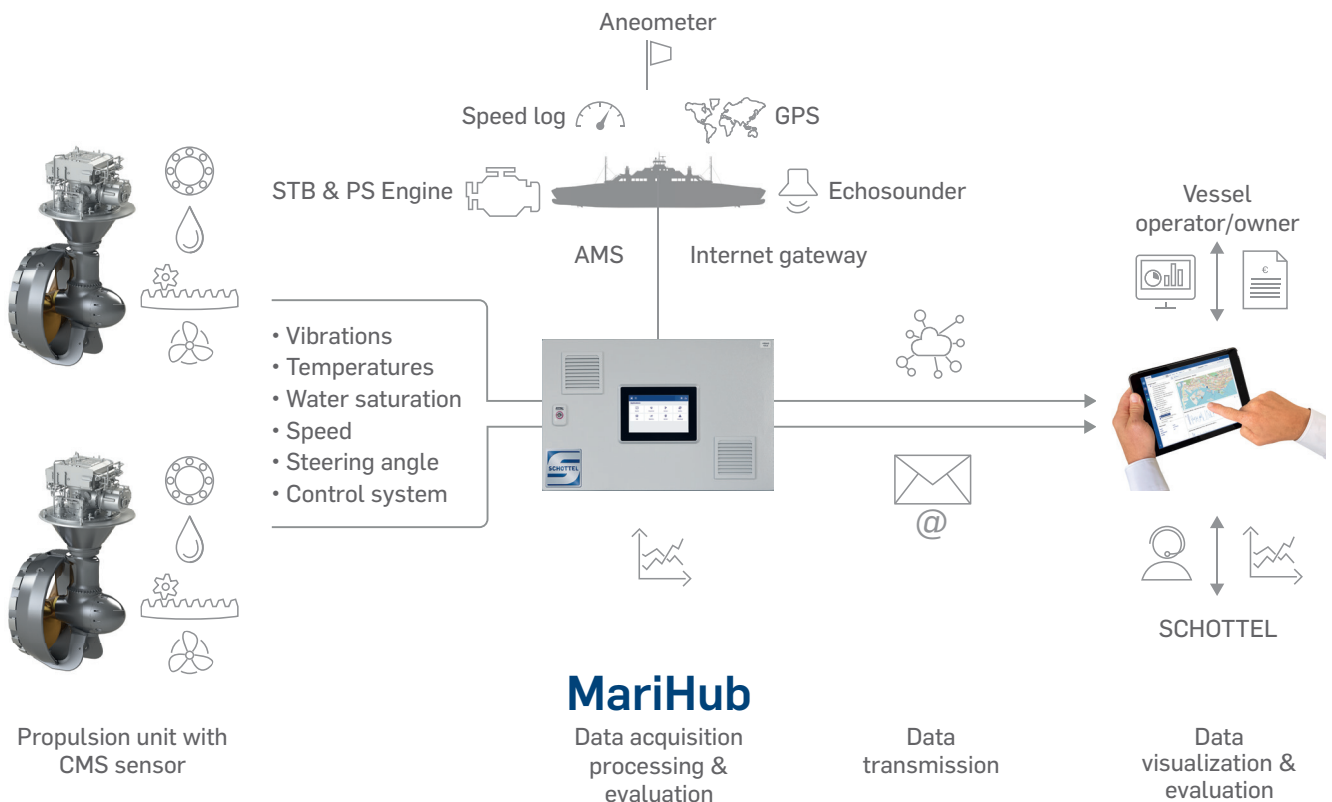
24/7 real-time data and insights

## + CONNECTED

Link equipment from ship to shore

## + SECURE DATA

Reliable and encrypted data transfer



# Functions in detail

## Data acquisition

- ▶ MariHub offers a variety of interfaces for data acquisition. Common variables such as temperature (PT100), water saturation in the lubricating oil, vibration (ICP) and data from the SCHOTTEL propulsion system can be processed for detailed analysis. Condition monitoring in particular places high demands on the acquisition frequency, e.g. of the vibration sensors. MariHub supports the acquisition of vibrations in the high kHz range to enable subsequent spectral analyses.

Additionally, data of the vessel or its environment can be stored. NMEA-based interfaces to common devices such as GPS, anemometer, speed log, gyro and echo sounder provide the basis for analyzing the vessel's operation. Other measured variables, such as fuel consumption, torque, etc., can be stored depending on the customer's requirements.

Due to the modular design of the I/O modules, between one and four SCHOTTEL systems can be monitored with one MariHub, depending on the complexity of the propulsion systems.

## Data storage

- ▶ MariHub has an internal memory that can store the vessel data for at least one year. Even in the event of an Internet connection loss, they are cached until the Internet connection is restored or the data is manually downloaded from the device.

## Connectivity and data transfer

- ▶ The data recorded by the MariHub can be made available for deeper analysis on shore by means of the SCHOTTEL MariNet IoT platform. Data transfer is ensured via a continuous internet connection over the ship's network or via a manual data upload by the crew using USB. By pre-processing the data directly on the ship, the amount of data for transmission is reduced to a minimum.

MariHub is equipped with an integrated hardware firewall. It has a security concept that allows changes only by authorized users. During data transmission, AES-256 encryption is used to prevent unauthorized access to the data.

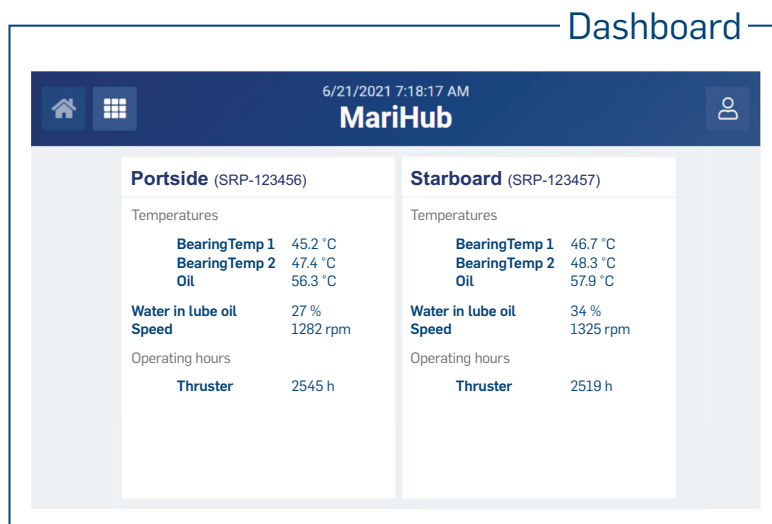
Description	Specification
Storage time on device	1 year
Hardware firewall	✓
Encrypted data transmission	✓
Data dispatch	Automatically via Internet Manually via USB/e-mail
Data available in IoT platform SCHOTTEL MariNet	✓



# Functions in detail

## Data analysis

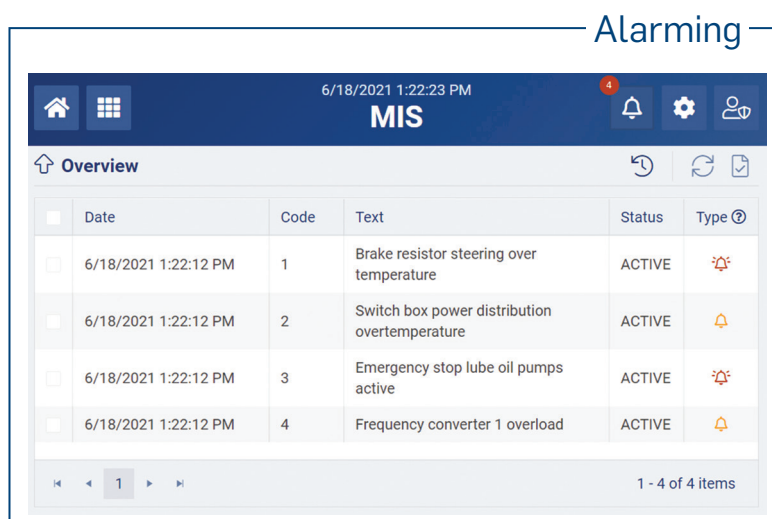
- ▶ The system already performs a large part of the analyses independently on site and is thus able to generate automatic messages based on common process and measured variables (temperature, water saturation in the lubricating oil, RMS vibration velocities) even without an Internet connection directly on site. The current measured values can be viewed by the crew via a dashboard. In addition to the individual measured values, other statistics are also available on the vessel, e.g. the operating hours of the propulsion drive train.



In conjunction with the ProCMS condition monitoring service, the integrated algorithm additionally records the vibration behavior of the drive machine by means of a spectral analysis. This analysis makes it possible to subsequently make statements about the actual condition of a specific drive component and to initiate the appropriate maintenance measures in advance.

## Alerting

- ▶ MariHub has an integrated notification and alarm module that directly outputs fault messages of the monitored drives on the display. In addition, these messages can also be transferred to the vessel's higher-level warning system via an interface.



# Achieving full potential

**B**ased on the data collected from the ship, a wide variety of services are available to the operator. MariHub monitors local vessel conditions and generates alarms onboard when limit values are exceeded. In addition, selected services include:

## ProCMS

ProCMS is a service from SCHOTTEL for condition monitoring of marine propulsion systems. It continuously monitors machine conditions by measuring and analyzing physical variables. The aim is to increase operational reliability and also the service life of the propulsion system. By detecting a possible fault condition as quickly as possible, potential malfunctions or failures can be counteracted in time.

With ProCMS, users benefit from an algorithm for condition analyses that is active around the clock as well as from a regular monitoring by certified SCHOTTEL experts (ISO 18436-2 category II/III).

## ProData

SCHOTTEL ProData enables the display of historic and real-time data of a vessel's monitored systems. With ProData, the level of information between crew and shore is synchronized. By means of remote data service, better support of the crew and at the same time closer monitoring of the vessel's operation and condition is achieved.

For vessels equipped with the MariHub data acquisition and transmission system, the basic version of ProData is generally included.

### + INCREASED UPTIME

Due to condition-based equipment evaluation

### + QUICK RESPONSE

Shortened process time for solving problems

### + PREDICTIVE

Early fault detection to keep downtimes to a minimum

### + INCREASED AWARENESS

Information about operation and status of the vessel and monitored equipment

### + REMOTE SUPPORT

For the crew during operation, maintenance or emergencies

### + EASY ACCESS

Web-based application available via tablet or computer

# SCHOTTEL worldwide

