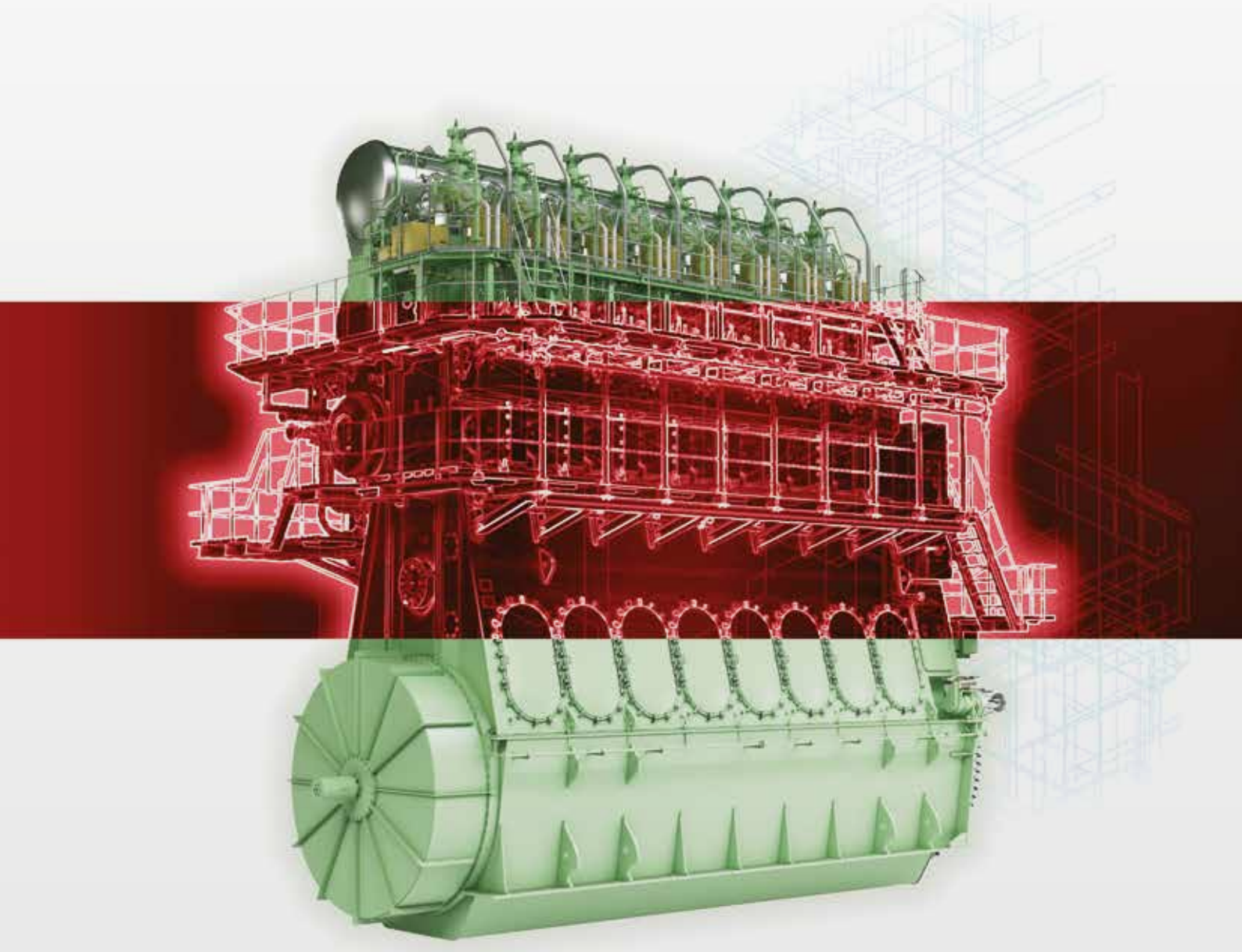
GRAVINER™

Mk7 Oil Mist Detection System

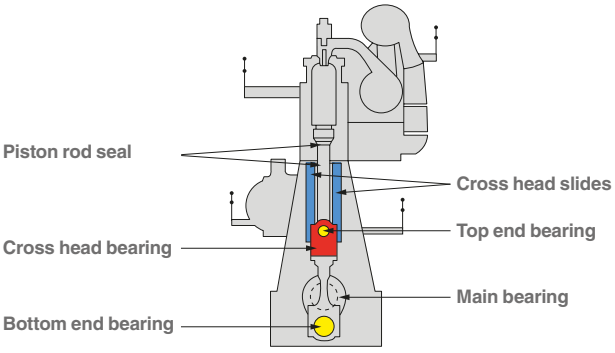


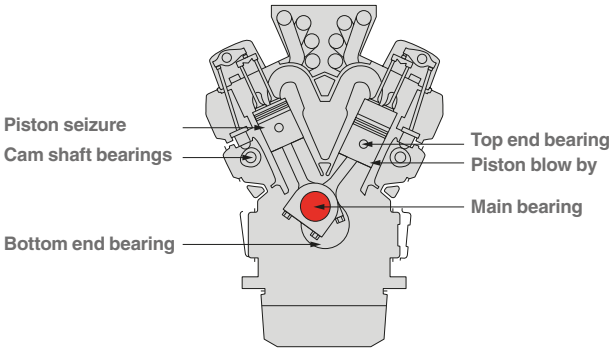
Carrier

Mk7 Oil Mist Detection System

High temperatures in excess of 200°C that occur on bearing surfaces can lead to a rapid generation of oil vapour. When the hot vapour contacts the relatively cooler atmosphere of the crankcase it condenses into a fine mist, with typical particle sizes of around 0.5 to 5 microns in diameter. When the density of these particles reaches between 40 to 50 mg/l (milligrams per litre), depending upon the type of oil, the Lower Explosive Limit (LEL) of the oil is reached and then an explosive condition exists.

Oil Mist Detection (OMD) techniques have been used to monitor diesel engine crankcases for potential explosive conditions and early detection of bearing failures.
The Graviner Mk7 system locally analyses the optical density of oil mist samples drawn from the crankcase compartments, at each individual detector.





A fire or explosion needs three constituents: fuel, oxygen and an ignition source, remove one of these and no explosion will occur. Within the crankcase, the three constituents which could cause an explosion are air, oil mist and an ignition source usually a hot spot or foreign object. Using optical measuring (light scatter) techniques, oil mist density can be measured at levels as low as 0.05 mg/l and give early warning of a rise in oil mist density.

Under the International Association of Class Societies (IACS) rules, an OMD system is required if any of the following apply:

- Engines with a bore size above 300mm
- Engine output greater than 2,200kW (2,950hp)
- Engine room routinely unmanned

Benefits of the Graviner Mk7 OMD system include:

- Auto addressed system monitoring of up to 10 Detector heads per Control Unit – saving configuration time and removing installation errors.
- Up to 10 Control Units per single system so can be used for multi-engine systems -
- Suitable for both 2 stroke and 4 stroke engines.
- Elimination of sample pipes - reduced installation costs.
- Engine mounted Control Unit – local control & indication, reduced cabling requirements
- Remote Colour Display Unit (touch screen operation) mounted in a safe area – intuitive, easy to read colour display typically installed in the Engine Control Room (ECR).

The Mk7 OMD system is an intelligent, auto addressed Oil Mist Detection System capable of monitoring up to 10 Control Units per system with each Control Unit having up to 10 Detectors connected to it. This is achieved without external sample pipes and with minimum cabling. Each detector monitors a single crank space and is an intelligent stand-alone device. The detector gathers oil mist density data and converts it to a digital signal for transmission via the data lines in the detector cable to the Control Unit typically mounted on the side of the engine. Alarm levels and alarm output parameters are configurable from either the Remote Display or a PC connected directly to the Control Unit.

The Remote Display Unit houses a 7.5" LCD Colour Touch Screen display that shows,the oil mist level for each engine and when required each detector as well as the status of the system. In the event of an alarm, the easy to read display immediately shows the oil mist levels for the relevant engine. It also enables the individual readings of each detector on the engine to be displayed on demand and automatically under alarm conditions.

In the event of a local fault, a detector can be isolated without affecting the function of the other Detectors on the engine. The Mk7 system will continue to operate while the faulty Detector is replaced, repaired or maintenance is carried out.

The Mk7 detectors use optical sensing; (light scatter) as it's detection method and continually monitors the oil mist density in the crank space to which it is connected.
In addition, it self checks for any internal faults by implementing an automatic 24 hour self test and then identifies any issues which are recorded in the Event Log.
The Control Unit interrogates each detector in turn, identifies the position connected at the Control Unit, the oil mist density value and determines the status of the detector.

The Control Unit can be supplied with or without a control membrane. The control membrane has coloured LED indication to show the status of the each Detector connected, plus buttons to locally accept and reset alarms and isolate and de- isolate Detectors if required.

The Mk7 OMD system is tested and approved in accordance with IACS M67/M10 by the following class societies:

- American Bureau of Shipping
- Bureau Veritas
- China Classification Society
- Det Norske Veritas
- Indian Register of Shipping
- Korean Register of Shipping
- Lloyd's Register
- Nippon Kaiji Kyokai
- Polish Register of Shipping
- Registro Italiano Navale
- Russian Maritime Register of Shipping

Approved engine makers MAN 2-stroke, Wartsila 2-stroke and Caterpillar.

Alarm philosophy

Each Mk7 Control Unit has 3 separate alarms, two of which are user configurable, to indicate the presence of key Oil Mist levels which are also password protected to prevent unauthorised access.

Each alarm operates independently and drives a set of volt free relay contacts which can be connected to warning beacons or the Slowdown and/or Shutdown circuitry for the associated engine as required.

Pre-Alarm This indicates that the oil mist levels are increasing in a particular crank space and that investigation should be undertaken. This condition is visually indicated as amber on the RDU engine screen

Slowdown and/or Shutdown Alarm When any detector reaches this threshold then the slowdown or shutdown relays will be operated if they are connected This condition is visually indicated as red on the RDU engine screen

Back-up alarm Additionally the Mk7 also provides a Back-up alarm which operates at a fixed oil mist level and is intended to protect the vessel should the pre-alarm or Slowdown and/or Shutdown Alarm relay not operate The Backup alarm is usually connected to a warning beacon or siren; however the customer may choose to connect the relay to another device or the engine slow down circuitry.

On receipt of either a Pre-Alarm or Slowdown alarm the engine should unless connected to a slowdown / shutdown relay, be stopped if safe to do so and allowed to cool down so that the background oil mist levels reduce before entering the engine room.

When the oil mist levels have returned to normal then the accept and reset buttons can be operated from the control unit membrane if fitted or alternatively from the Remote Display Unit and the system will then return to normal operation.

Fault diagnosis

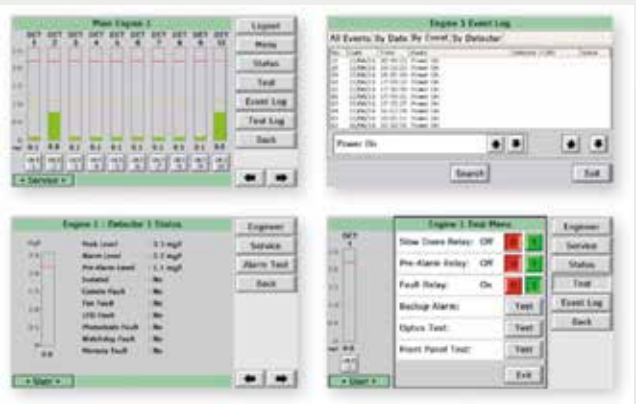
The Mk7 system is highly intelligent and is continually self-checking for local fault conditions. The system includes a Fault Alarm Relay which can be connected to a warning beacon or siren and provide a remote indication of a fault condition.

Details of the Fault and system warnings are clearly indicated on the Remote Display Unit to assist the user in the appropriate fault finding procedure.

To ensure these messages are not missed the indications are displayed until the user manually accepts and resets the message on the Remote Display Unit.

Event log

All alarms, faults, programming changes and events are recorded in an Event Log which is date and time stamped to assist the analysis of the events at a later time. The Event Log has a capacity of 1024 events and is a rolling buffer. The Event Log is down loadable to support remote service and maintenance and can be sorted by date of event, type of event etc.



Technical specification

Detector

Mounting	¾ inch BSP	
Enclosure rating	IP65	
Material	sample tube - carbon loaded PTFE Detector - black Zytel 70G30 nylon 66	
Indicators	Green Red Amber	Detector on Alarm Detector fault
Power consumption	1.5W	
Temperature rating	0 – 70°C	
Height	153mm	
Width	90mm	
Length	205mm	
Weight	0.5kg	

Control Unit

Enclosure rating	IP65
Material	aluminium
Max Detector inputs	10
Output relays	volt-free change over contacts rated at 30Vdc 1A
Back-up alarm	1 set (de-energised during normal operation)
Pre-Alarm	1 set (de-energised during normal operation)
Fault alarm	1 set (energised during normal operation)
Slowdown and/or Shutdown	1 set (de-energised during normal operation) Alarm
Alarm ranges	Pre-Alarm 0.5mg/l to 1.2mg/l (adjustable) default value 0.9mg/l alarm 1.3mg/l to 2.4mg/l (adjustable) default value 1.8mg/l backup 3.0mg/l (fixed)
Power consumption	3.9W
Temperature rating	0 – 70°C
Power supply	24Vdc (+30% -25%)
Humidity level	95%
Dimensions	
height	186mm (110mm mounting centres)
width	318mm (240mm mounting centres)
depth	90mm
weight	2.8kg

Remote Display Unit

Enclosure rating	IP32
Material	ABS (PA-765+)
Max n° of detectors	100
Max n° of engines monitored	10
Power consumption	6.0W
Temp rating	0 – 70°C
Dimensions	
bulkhead mounted	height: 225mm (202mm mounting centres) width: 240mm (217mm mounting centres) depth: 58mm
panel mounted	height 225mm (202mm mounting centres)
width	240mm (217mm mounting centres)
depth	55mm
weight	1.0kg

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