

BEAROMOS® 2020

BEARING MONITORING SYSTEM



Real-Time Condition Monitoring for Oil-Lubricated Plain Bearings.

Your Benefits at a Glance

BEAROMOS is a fast, highly sensitive, and reliable sensor designed for the early detection of bearing damage in engines.

Why BEAROMOS?

The service life of oil-lubricated plain bearings in crankshaft systems is inherently limited. Manufacturers define engine-specific replacement intervals to ensure that bearing damage does not occur during normal operation. Nevertheless, unexpected bearing failures can still arise within the intended lifetime — typically resulting in high repair costs, unplanned downtime, and in severe cases, complete engine failure.

To protect the engine and operating personnel, safety systems such as oil mist detectors are commonly used. While these systems help prevent catastrophic damage, but cannot prevent costly repairs or unscheduled outages because they do not provide early detection of developing bearing issues.

Unexpected bearing failures within the defined lifetime pose significant technical and financial challenges for operators of power plants, industrial facilities, and marine vessels. Traditional monitoring systems, such as bearing temperature measurement, can detect spontaneous bearing damage but require extensive installation work and often react only when the damage is already advanced.

To improve the controllability of bearing failures, Schaller Automation offers BEAROMOS, combined with the COB-

With BEAROMOS, you gain:

- valuable insights into the operating condition of your machinery,
- reduced downtime and increased overall availability,
- lower failure and repair costs thanks to early intervention.

MOS MODULE, a sensor system for plain bearings that can be installed with low effort. Compared to temperature-based monitoring systems, BEAROMOS provides a significant speed advantage, enabling the early detection of emerging bearing damage.

Depending on the root cause, bearing failures may announce themselves minutes, hours, or even days before an actual breakdown. These changes within the crankshaft system can be reliably detected by BEAROMOS. With just a single sensor, BEAROMOS can identify damage simultaneously in:

- main bearings
- connecting rod bearings
- and even the cylinder liner

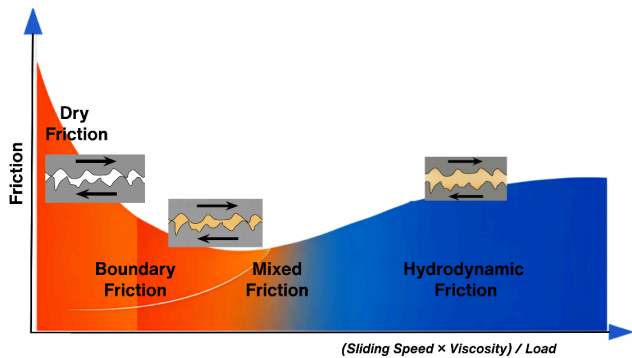
The evaluation of BEAROMOS measurement data is performed by the COBMOS MODULE, which provides the operator with real-time bearing condition information via industrial interfaces. Relay outputs can also deliver warning signals related to the crankshaft condition. Additionally, when an internet connection is available, the COBMOS MODULE can transmit measurement data via MQTT to the COBMOS HUB.

Technical Background

Oil-lubricated plain bearings are designed to operate within the hydrodynamic lubrication regime. This regime is only left briefly — for example during machine start-up or shutdown — when mixed friction occurs.

If additional mixed-friction events arise during engine operation, they lead to increased wear on the bearing surfaces and may ultimately result in bearing failure.





Areas of friction according to the Stribeck-curve



Example of a worn-out plain bearing

BEAROMOS reliably detects the onset of mixed friction within seconds during engine operation. The system is based on the physical principle of the Seebeck effect. When mixed friction occurs between two metals, it generates a localized temperature increase. If the two metals are made of different materials — which is typical for plain bearings — this temperature gradient produces an

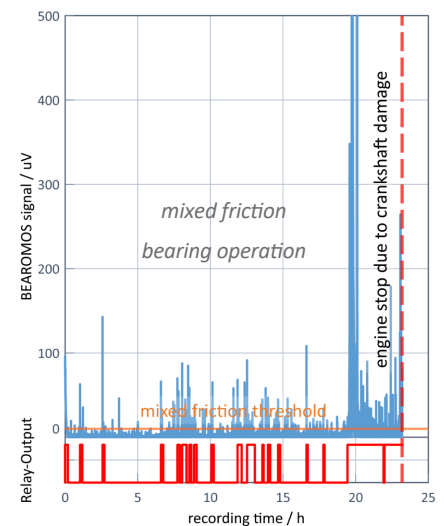
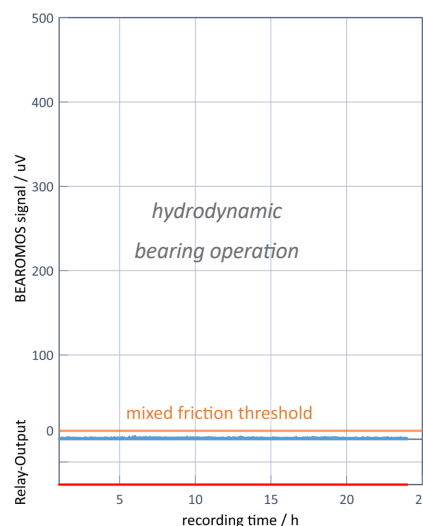
electrical thermoelectric voltage. Due to the high sensitivity of BEAROMOS, even the smallest thermoelectric voltages can be measured. In combination with the COBMOS MODULE, this enables the detection of even minimal mixed-friction events during engine operation.

Features of BEAROMOS & the COBMOS MODULE

Through advanced measurement data analysis, the COBMOS MODULE provides the following information:

- Sensor Information
 - Assessment of bearing condition
 - Continuous evaluation of the bearing condition using proprietary algorithms.
 - Warning for temporary mixed friction
 - If persistent mixed friction is detected during operation, this may indicate an impending spontaneous bearing failure.
- Detection and filtering of typical mixed-friction events
 - Warning for recurring mixed friction
 - If recurring mixed-friction events are identified over time, this may point to increased bearing wear.
- The system automatically identifies and filters out mixed-friction events caused by normal operating conditions such as start/stop cycles, load changes, and similar transient effects.

BEAROMOS signals and relay output from catastrophic real engine damage; left: engine in normal condition; right: engine before damage; as BEAROMOS measures mixed-friction the relay output indicates a warning



Who Is BEAROMOS Designed For?

Installing BEAROMOS requires a free crankshaft end without direct electrical grounding (e.g., plant-specific discharge systems or direct coupling to a ship's propeller). This makes BEAROMOS particularly suitable for bearing monitoring in four-stroke engines of all sizes.

Installation & Retrofit

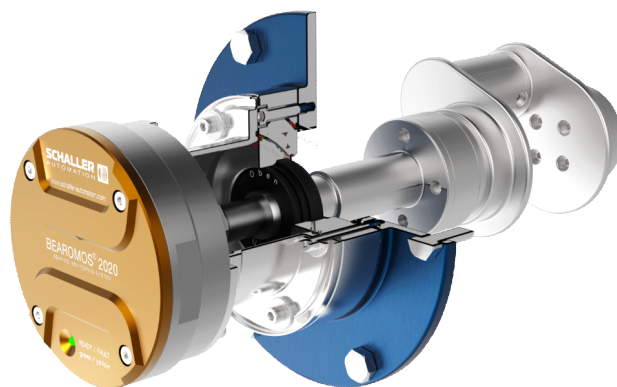
BEAROMOS is mounted onto the rotating shaft using an application-specific crankshaft adapter. Axial and radial shaft movements can be compensated during operation. If required, a sealing system can be integrated to protect the sensor from engine oil ingress.

BEAROMOS is slid onto the crankshaft adapter and connected via a slip ring. The sensor assembly is then fixed to the engine's front cover.

The COBMOS MODULE is installed on a DIN rail inside an electrical cabinet and connected to BEAROMOS. When integrated into an existing network (LAN), the module's built-in web server can be accessed, and—if internet connectivity is available—the COBMOS HUB can also be used.

Engine-Specific Adaptation

BEAROMOS and the COBMOS MODULE are delivered with a predefined standard parameter set. This allows operators to use BEAROMOS on any suitable engine right out of the box. To tailor mixed-friction warnings to specific engine characteristics, the parameters can be adjusted individually by the user.

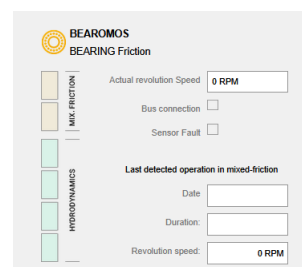


Installation example of BEAROMOS with sealing

COBMOS MODULE – Integrated Web Server & COBMOS HUB

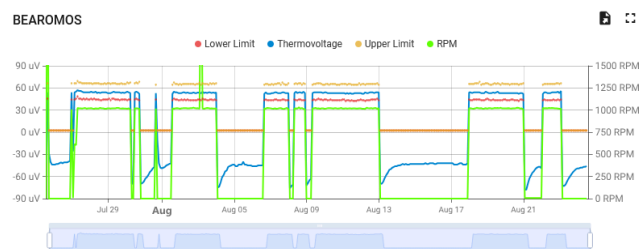
On the dashboard of the COBMOS MODULE'S integrated web server, the following information is displayed:

- Sensor signal as a bar-graph indicator (green ↔ yellow)
- Documentation of the latest transition from hydrodynamic to mixed friction, including date, time, duration, and engine speed
- Continuous monitoring of communication between the software and the sensor via LED status indicators



Dashboard example from internal webserver of COBMOS MODULE

Through the COBMOS HUB, the measurement data collected by the COBMOS MODULE can be visualized. Users can create custom dashboards, enabling personalized views tailored to specific operational needs.



Dashboard example from COBMOS HUB

Technical Data

Mechanical Data	
Dimensions (Ø)	Ø140 mm
Total Length to flange connection	125 mm
Connection to crankshaft	Customized Adaption
Connection to engine housing	6x M6 Screw
Sealing to crankcase	Optional
Weight	4 kg (Short Adaptation) / 4,5 kg (Long Adaptation)
Speed range	0...3000 rpm (Short Adaption) 0...1500 rpm (Long Adaption)
Permissible axial misalignment	<1 mm
Electrical Data	
Power supply	9...32 V DC
Nominal voltage	24 V DC
Current consumption	max. 0,4 A
RPM Sensor - Measurement range	0...3000 rpm
RPM Sensor - Repeatability	10 rpm
EMC immunity	EN 61000-6-3
EMC emission	EN 60945
Interfaces & Communication	
Communication interface	2-wire RS485 (galvanically isolated)
Recommended communication cable	M12 female connector, 4-pin, A-coded, shielded cable
Environmental Conditions	
Operating Temperature	0...70 °C
Storage Temperature	-20...70 °C
Maximum vibration for the device in compliance with approvals	5...13,2 Hz 1,6 mm Peak 13,2...100 Hz 40 m/s² Peak
Relative humidity	0...95 % rF
Protection class	IP 56





Safety for you and your engine: Worldwide!

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