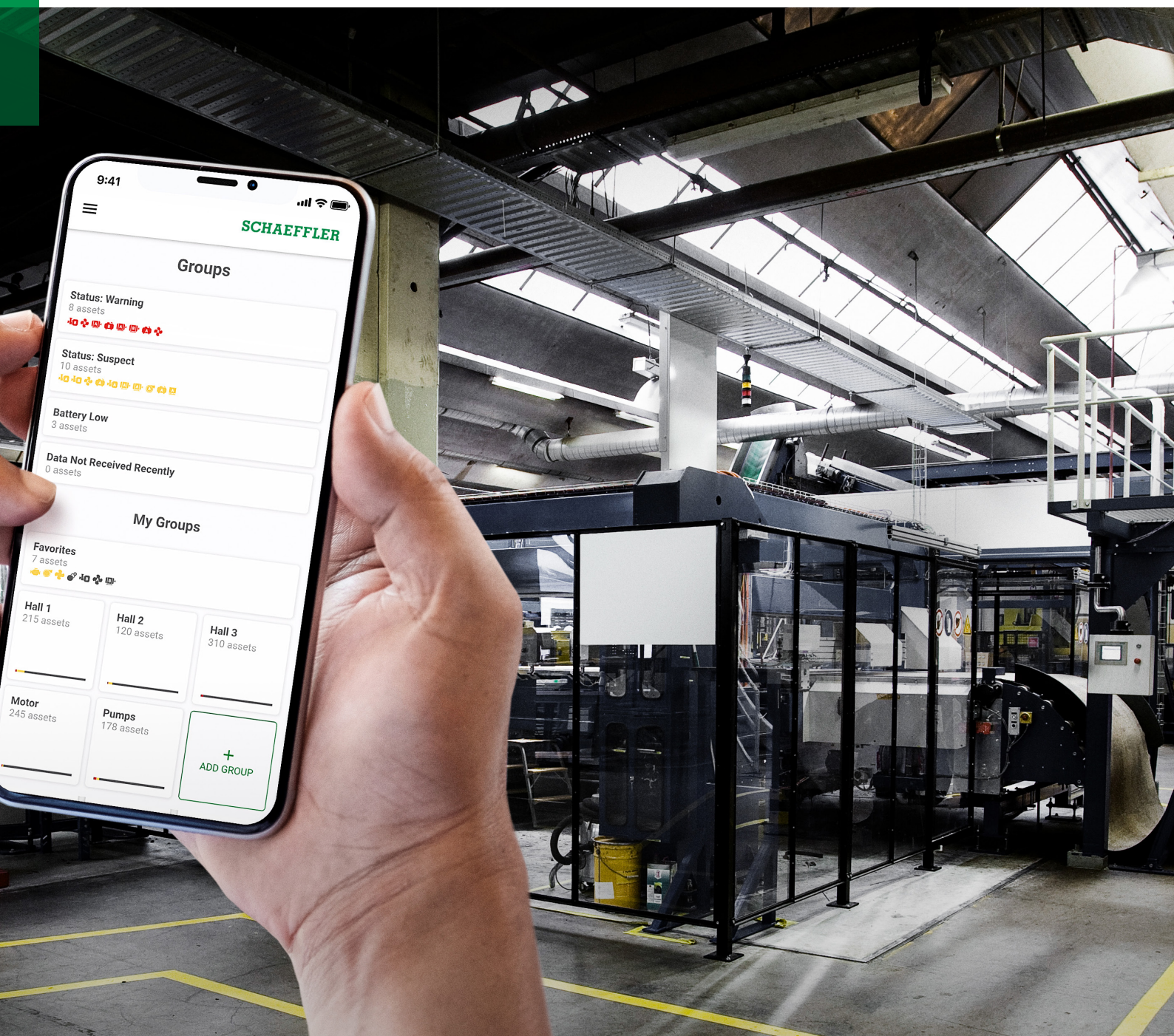
SCHAEFFLER

Schaeffler OPTIME

What is OPTIME and how does it work?



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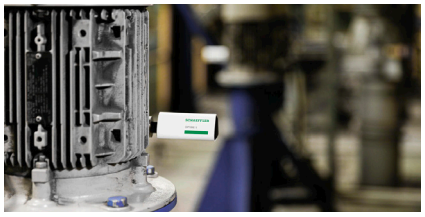
Condition Monitoring Solution

Success across the board...

Red Dot Design Award 2021
With its innovative OPTIME condition monitoring solution, Schaeffler joins the list of renowned companies that are winners of the coveted "Red Dot Award." The jury honored OPTIME in the "Smart Product" and "Industrial Equipment" categories - a resounding endorsement of this digital service solution's outstanding product design, functional composition and innovative power.

Industry 4.0 Innovation Award 2020
The perfect implementation of Schaeffler‘s innovative OPTIME condition monitoring solution was confirmed with the "Industry 4.0 Innovation Award."
The award was presented for the fifth time by VDE-Verlag in cooperation with the German Electrical and Electronic Manufacturers' Association (ZVEI) and the Standardization Council Industry 4.0.

Success stories from satisfied customers



Reliable monitoring around the clock
Schaeffler OPTIME prevented unplanned downtimes in supply systems at a German manufacturing plant, delivering five-digit cost savings.

Read the Success Story

Cost savings with OPTIME
In a Romanian factory, our customer saves 49,152 euros with a motor monitoring system in milling machines; in Slovakia, a pump-monitoring system saves our customer 18,161 euros.

Read the Success Story

OPTIME finds the defects
Immediately after installation, OPTIME automatically detects failures and sends an alarm message. Through a variety of customer applications, we show you real-life examples of how OPTIME finds defects.
Read the Success Story

Customer testimonials

With its digital visualization features, OPTIME gives our maintenance staff the ability to always able to keep track of the machine's condition - without having to be on site all the time.
Tony Virtanen
Maintenance Engineer, Finnsementti Oy

Good price, top performance.
The system is also able to take readings in hard-to-reach places and can operate in warm and cramped environments. I like that.

Juha Knihtilä
Reliability Engineer in the Sunila plant

Since we've been using OPTIME, we've had no unplanned downtime in the supply plants.
This is a good thing.

Detlev Jacobi
Maintenance Manager, Schaeffler Schweinfurt

Schaeffler OPTIME
Seamless Monitoring at the Lowest Cost

What is Schaeffler OPTIME?

Schaeffler OPTIME is an easily scalable condition monitoring solution that was developed for a variety of industrial applications. It is recommended for use on rotating machines operating at speeds of 120 rpm* to 5000 rpm.

During the development of the system, special attention was paid to the very simple commissioning, problem-free expansion and versatile use of the solution. The effort for the user was kept as low as possible for each individual process step.
These features make Schaeffler OPTIME particularly suitable for condition-based monitoring of large numbers of machines.

Schaeffler OPTIME won the Red Dot Award 2021 in two categories

Benefits of Schaeffler OPTIME

- Cost-efficient monitoring.
- Monitor hundreds of rotating machines for just a few cents per day (each) – up to 50 percent cheaper than manual monitoring with handheld measurement devices.
- Quick to install.
- Installing the sensors and setting up the app takes just a few minutes – no prior knowledge needed.
- Take advantage of expert knowledge.
- Digital Service provides professional diagnoses based on expert algorithms and machine learning, available 24/7 via the OPTIME app – so you always make the right decision.
- For beginners and advanced users.
- Intuitive operation, offers critical information and extensive expansion options suitable for different users and needs.

* application-specific

Schaeffler OPTIME

Solution Components

1. Sensors
The battery-operated sensors can be mounted quickly and easily on the machines, where they record vibration and temperature data of the monitored device. The wireless mesh network enables automatic data exchange between all connected devices.

2. Gateway
The gateway receives the data sent by the sensors and transmits it to the cloud.

3. Digital Service
In the cloud, continuous, automatic analyses are carried out and early warnings are sent out in case of changes in machine condition or imminent failures. The results are based on proprietary algorithms derived from Schaeffler's extensive rolling bearing knowledge and condition monitoring expertise as well as machine learning.

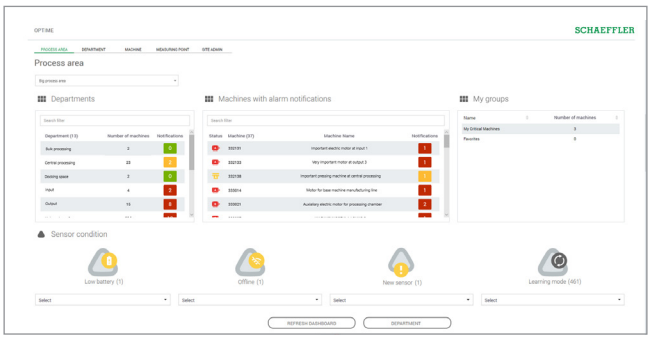
All results are available in an easy-to-use smartphone app and a web-based dashboard. The functions are tailored to the needs of the users and their individual work processes.

Activate and integrate the sensor using the Schaeffler OPTIME App.

Schaeffler OPTIME

Digital Service

OPTIME Digital Service is a cloud-based solution and can be used via mobile apps and web applications for desktop browsers, e.g., in control rooms or at the workplace.
OPTIME Digital Service is made available to the customer after subscribing to the service by creating a dedicated customer area within the Schaeffler Cloud. The OPTIME installation is managed via the mobile application or the OPTIME Dashboard. OPTIME Digital Service includes required and optional service components.



Dashboard

Required service components

Digital Service Tenant

The Digital Service Tenant consists of:

- Provision and access to your own customer area in the Schaeffler Cloud
- User access and management
- Commissioning and activation of sensors and gateways via the mobile app
- Hardware allocation, including setup of devices and machines as well as corresponding groups
- Access to mobile apps and web applications for desktop browsers

Digital Service Analytics

- Vibration-based automated condition assessment of monitored machines, using algorithm-based automated diagnostics
- Display of alarms and failure causes
- Fees are only charged for active sensors. A sensor is active as soon as the Schaeffler Cloud receives measurement data from the sensor.
- Gateway SIM data costs are included in the monthly fee.

Optional service components

- Digital Service REST API usage
  - *Access to REST API to retrieve data from the Schaeffler cloud into the customer system (see page 9)*
- OPTIME ExpertViewer
  - *Advanced vibration analysis tool for experts from experts (see page 9)*

Please contact your Schaeffler sales representative for information on pricing for specific components.

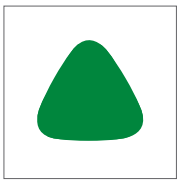
Schaeffler OPTIME

Mobile Application

The OPTIME app can be downloaded from the Apple App Store and Google Play. The app shows the real machine status according to criticality, thus allowing optimal planning of maintenance activities. You can organize your machines individually and easily with the help of the group-, machine- and sensor management functions.

Download on the App Store

GET IT ON Google Play

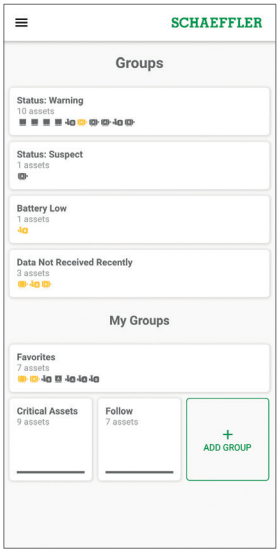


OPTIME App

Group management

Alarm-based groups are preset in the group management home screen:

- Alarm status
  - *Severe: Machine is exhibiting severe damage. Inspect and repair, if necessary.*
  - *Warning: Inspect machine and schedule repairs during the next regular maintenance interval.*
  - *Suspect: Observe; no immediate reaction required.*
- Battery status: Sensors with low battery.
- Reception status: Sensors which are offline and have not transmitted any data in the last 24 hours.



Group management

My groups

Below the alarm-based groups are the user-defined groups that can be created individually.

Examples:

- Local conditions (location, buildings)
- Structures relevant to production (segments, product lines, production units)
- Machine types (motors, fans, pumps)

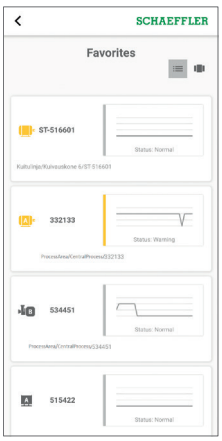
Schaeffler OPTIME

Mobile Application

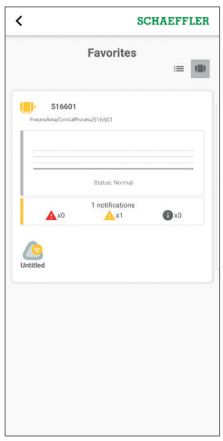
Group views

All assigned machines can be found within a group. They can be viewed in a "List view" or "Tile view" format.

List view
The color-coded alarm status of the machine, the status diagram with alarm level and possible open alarm notifications are displayed.
Tile view
In addition to the list view, an extended overview of alarm notifications and the status of the machine‘s sensors are displayed.



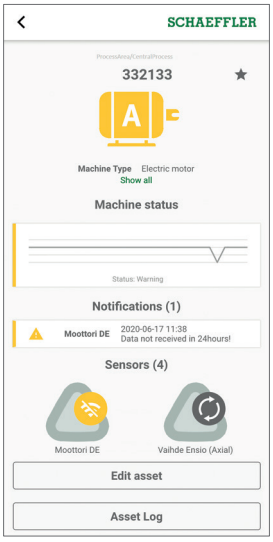
List view



Tile view

Machine management

Selecting a machine within the group gives you access to the machine management function, which displays a machine and related information such as the device's status, active alarm notifications and the sensors that are connected to the machine.

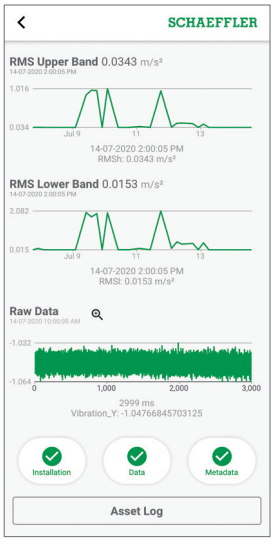


Machine management

Functions
- Track the machine's status
- Acknowledge alarm notifications
- Edit machines
- Edit and view machine log
- Navigate to the assigned sensors
- Add a new sensor

Sensor management

Selecting a sensor takes you to the sensor management function, which shows active alarm notifications, KPIs and raw data related to the sensor.

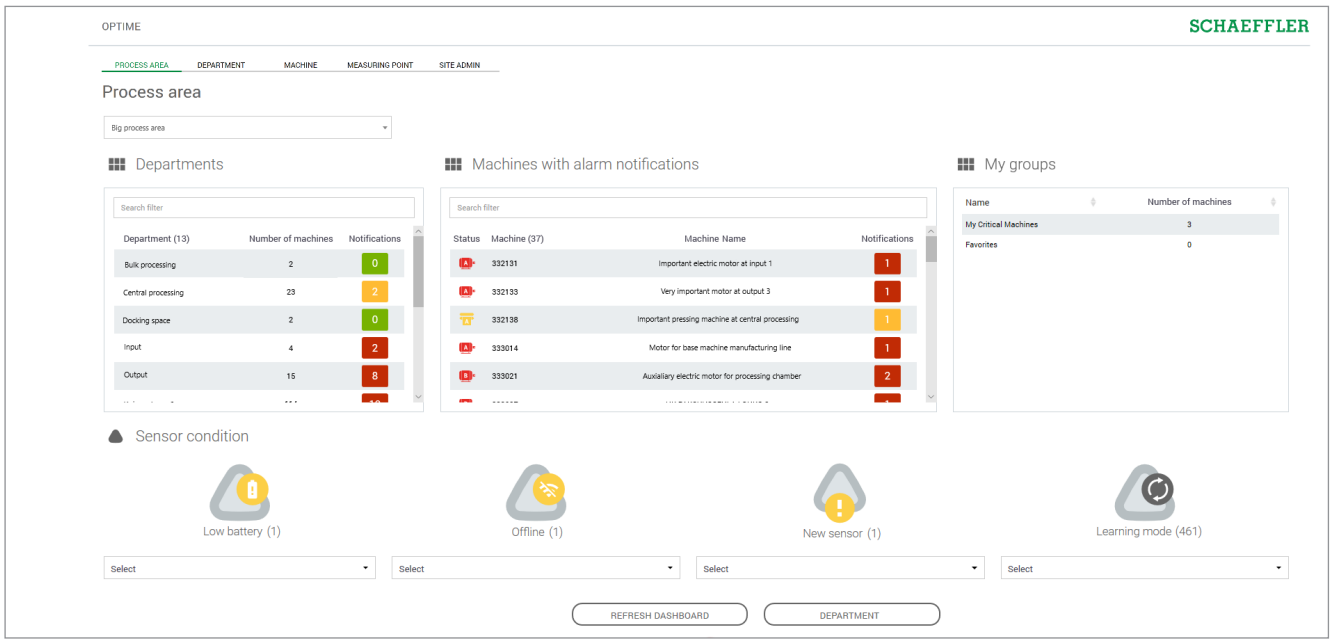


Sensor management

Functions
- Acknowledge alarm notifications
- View KPIs
- View raw data
- Edit sensor
- Request new KPIs and raw data
- Edit machine log

Schaeffler OPTIME

Web-Based Dashboard



The dashboard is the central user interface for OPTIME. It is intended for control rooms where KPIs and alarm notifications for plant condition monitoring can be tracked.

Functions

- Track machine status
- Actively monitor machines and their KPIs
- Display of alarm notifications based on learned KPI limits as an indication of possible machine defects
- Confirmation of alarm notifications
- Display and generation of log entries for machines
- Display of KPI data and raw sensor data

Functions exclusively for administrators

- User administration
  - *Add, edit and delete users and profiles*
  - *Send notifications to users*
- Device management
  - *Add, move and delete gateways and sensors*

Supported browsers

- Google Chrome
- Microsoft Edge
- Mozilla Firefox
- Safari
- Microsoft Internet Explorer

Schaeffler OPTIME

Optional Service Components

Digital Service REST API

Thanks to this service, OPTIME data can be accessed via a software interface. You have access to the following data:

- Per sensor: raw vibration and raw KPI values
- Per machine: CM status, open alarms, history of alarms

Monthly fees are charged for this service.

To ensure state-of-the-art security and system protection, this service is accessed via the Schaeffler Developer Portal.

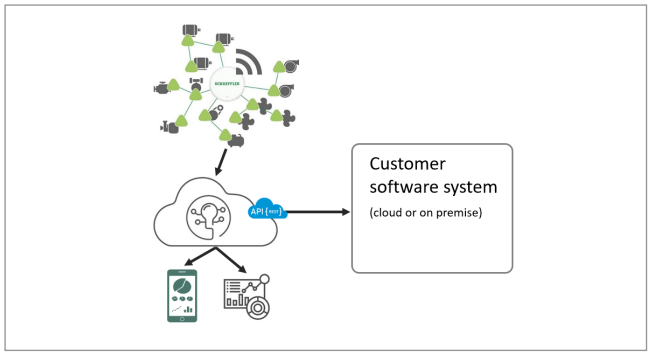
OPTIME ExpertViewer

The OPTIME ExpertViewer digital service offers a comprehensive collection of analysis tools for manual in-depth and root cause analysis of vibration data.

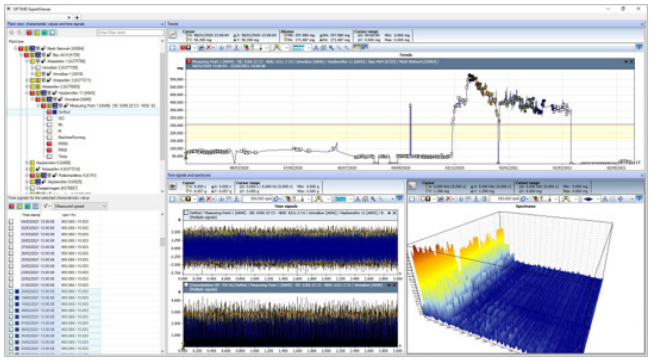
- Works with OPTIME and "OPTIME-ready" data-monitoring systems (Schaeffler SmartCheck and Schaeffler ProLink)
- Optimized for the responsive analysis of large amounts of vibration data

Monthly fees are charged for this service.

OPTIME ExpertViewer is provided as a download and requires an active Digital Service Tenant.



Schematic representation of how REST API functions



ExpertViewer's analysis tools

Schaeffler OPTIME

Applications

The OPTIME system is suitable for machines that are operated continuously or intermittently. Furthermore, the machine should normally run in a stable operating state (i.e., speed and power) for a period of about one hour. Schaeffler recommends OPTIME-AW3 sensors be used for machine speeds between 120 rpm* and 3000 rpm, while OPTIME-AW5 sensors are recommended for speeds up to 5000 rpm. Certain factors must be considered when selecting the right combination of machine and sensor (please see the below table).

Typical combinations of machines and sensors

Application	Characteristic	Sensor	Quantity	Mounting location
Electric motor	‹ 0.5 m	OPTIME 3	1	• Bearing position on the drive side of the motor • Central location on the motor • In the middle at the foot of the motor
Electric motor	› 0.5 m	OPTIME 3	2	• Drive side and non-drive side of the motor • Foot of the motor's drive side and non-drive side
Fan	overhang	OPTIME 3	1	• Plummer block housing
Fan	between the bearing	OPTIME 3	2	• Plummer block housing
Fan	directly coupled	OPTIME 3	1	• Drive side of the motor
Compressor	–	OPTIME 5	2	• Bearing location
Pillow block	–	OPTIME 3	1	• Bearing location
Pump	–	OPTIME 5	2	• Bearing location
Gearbox motor	‹ 0.5 m	OPTIME 5	1	• Bearing location
Gearbox moto	› 0.5 m	OPTIME 3	1	• Motor
Gearbox motor	› 0.5 m	OPTIME 5	1	• Gearbox
Extruder	–	OPTIME 3	2	• Bearing location
Calender	–	OPTIME 3	2	• Bearing location
Belt drive	–	OPTIME 3	2	• Bearing location
Saw	–	OPTIME 5	1	• Bearing position of the saw blade
Shaft	–	OPTIME 3	1	• Bearing housing
Gearbox	–	OPTIME 5	2	• Input and output

* application-specific

Schaeffler OPTIME

Product Specifications

OPTIME sensors	**OPTIME-3** 	**OPTIME-5** 
Vibration bandwidth	2 Hz – 3 kHz	2 Hz – 5 kHz
Amplitude range	±2/±4/±8/±16 g	±2/±4/±8/±16 g
Temperature trend measurement	–40°C to +85°C	–40°C to +85°C
Calculated KPIs	$RMS_{Low,}$ $Kurtosis_{Low,}$ $ISO_{VELOCITY,}$ $RMS_{High,}$ $Kurtosis_{High,}$ DeMod, Temperature	$RMS_{Low,}$ $Kurtosis_{Low,}$ $ISO_{VELOCITY,}$ $RMS_{High,}$ $Kurtosis_{High,}$ DeMod, Temperature
Measurement cycle	KPIs: every 4 h Time waveform: every 24 h	KPIs: every 4 h Time waveform: every 24 h
Typical target applications	Motors, generators, fans, pillow block bearings, up to 3.000 rpm	Pumps, geared motors and small gearboxes, compressors, HVACs etc., up to 5.000 rpm
Sensor commissioning	NFC (Near Field Communication)	NFC (Near Field Communication)
Communication	Wirepas Mesh (2.4GHz ISM Band)	Wirepas Mesh (2.4GHz ISM Band)
Sensor transmission range (line of sight)	up to 100 m	up to 100 m
Power supply	Non-replaceable Li-$SOCl_2$ battery	Non-replaceable Li-$SOCl_2$ battery
Typical battery life	up to 5 years (depending on configuration)	up to 5 years (depending on configuration)
Operating temperature range	-40° to +85°C	-40° to +85°C
Recommended storage temperature (for optimum battery life)	0° to 30°C	0° to 30°C
Ingress protection	IP 69K	IP 69K
Materials	Mounting base: steel AISI 316 Housing: polycarbonate	Mounting base: steel AISI 316 Housing: polycarbonate
Mounting	Single Bolt Mounting (M6) (Adapters available)	Single Bolt Mounting (M6) (Adapters available)
Dimensions	Please see drawings	
Certifications	CE, FCC, IC, RCM, Anatel, NTC, NBTC, SIRIM, WPC, SRRC; more country certifications to follow	
Hazardous Area Classification	Zone 1 (in preparation)	Zone 1 (in preparation)

OPTIME Gateway	
Sensor communication	Wirepas Mesh (2.4GHz ISM Band)
Communication to Schaeffler IoT Hub	2G, LTE CAT M1 (default) LTE-Stick: GSM, UMTS, LTE Wi-Fi 2.4GHz, Ethernet RJ45
SIM card format	Micro-SIM (3FF)
Ingress protection	IP 66/67
Temperature range	-20°C to 50°C (operation), -40°C to 85°C (storage)
Power supply	Voltage Range 85-264VAC, 47-440Hz, Power Consumption 30VA max.
Dimensions	Please see drawings
Certifications	Europe: CE (Radio Equipment Directive 2014/53/EU); see above for additional certifications

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