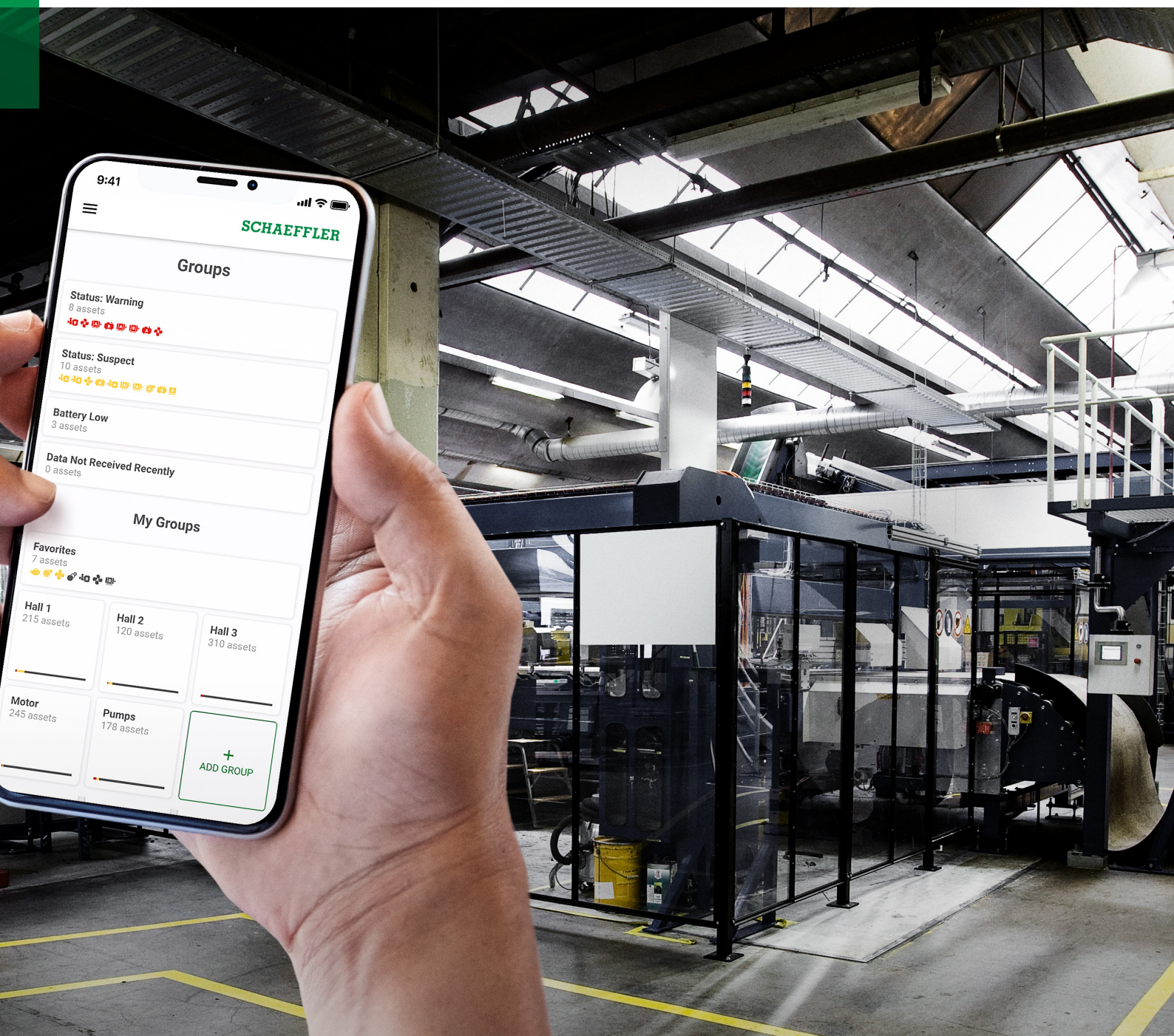
SCHAEFFLER

We pioneer motion

Schaeffler OPTIME Condition Monitoring

What is OPTIME Condition Monitoring and how does it work?



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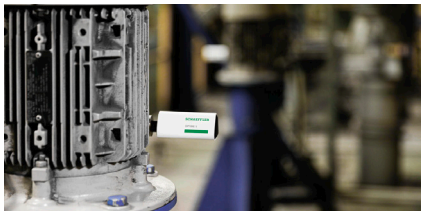
Success all along the line ...

Red Dot Design Award 2021
With its innovative condition monitoring solution OPTIME, Schaeffler joins the list of winners of the „Red Dot Award“, which include well-known companies. The jury awarded OPTIME CM in the categories „Smart Product“ and „Industrial Equipment“, thus confirming the product design, the functional composition and the innovative power of the digital service solution.

Industry 4.0 Innovation Award 2020
The perfect implementation of Schaeffler‘s innovative condition monitoring solution OPTIME 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. Standardization Council Industrie 4.0.

Customer satisfaction - success stories



Reliable monitoring around the clock
Schaeffler OPTIME CM prevented unplanned downtimes in supply systems at a German plant. This saved costs in a five-digit range.

Success Story

Saving costs with OPTIME CM
In a Romanian factory, the customer saves 49,152 euros with a motor monitoring system in milling machines; in Slovakia, 18,161 euros are saved with a pump monitoring system.

Success Story

Defect detection with OPTIME CM
Immediately after installation, OPTIME CM automatically detects failures and sends an alarm message. In various customer applications, we show you directly from practice how OPTIME CM finds defects.

Success Story

Customer quotes

With OPTIME CM our maintenance staff has the transparency over the condition of most of our machines without the need to watch them closely all the time.

Tony Virtanen
Maintenance Engineer, Finnsementti Oy

Good price, top performance.
The system is also suitable for operation in hard to reach places to carry out measurements. It is also suitable for hot and cramped places. I like it.

Juha Knihtilä
Reliability Engineer im Werk Sunila

Since introducing OPTIME CM, we have had no unplanned downtime in the supply plant.
This is a good thing.

Detlev Jacobi
Maintenance Manager, Schaeffler Schweinfurt

Schaeffler OPTIME Condition Monitoring (CM)

Seamless Monitoring at lowest Cost

What is Schaeffler OPTIME CM?
In the OPTIME Ecosystem, which combines intelligent condition monitoring and lubrication, Schaeffler OPTIME CM is an easily scalable condition monitoring solution. It has been developed for various purposes in industry and is recommended for a range of rotating machines with a speed of 120 rpm*-5000 rpm.

Schaeffler OPTIME CM wins the Red Dot Award 2021 in two categories

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 CM particularly suitable for condition-based-monitoring of a large number of machines also for hazardous areas.

Benefits of Schaeffler OPTIME CM

- Cost-efficient monitoring
- Monitoring hundreds of rotating machines for just a few cents per day – up to 50 percent cheaper than manual monitoring with handheld measurement devices
- Solutions available for the hazardous areas
- Quick to install
- Installing the sensors and setting up the app takes just a few minutes – no previous knowledge is necessary
- Use expert knowledge
- Digital Service provides professional diagnoses based on expert algorithms and machine learning, available 24/7 via app – so you always make the right decision
- For beginners and advanced users
- Easy handling, offers decisive information and extensive extensions suitable for different users and needs

* application-specific

Schaeffler OPTIME Ecosystem

Solution Components

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

2. Gateway
The gateway receives the data sent by the sensors and transmits it to the cloud. One gateway can cover 50 sensors.

3. Digital Service
In the cloud, continuous, automatic analyses are carried out and early warnings are sent out in case of beginning and imminent failures.
The results are based on algorithms derived from Schaeffler's 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 Ecosystem

Digital Service

OPTIME Digital Service is a cloud-based solution and can be used via mobile App 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 subscription 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 mandatory and optional service components.

Description – Necessary technical Services

Digital Service Tenant

- 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 the creation of plants and machines, and corresponding groups
- Access to mobile and web applications for desktop browsers
- Note: Schaeffler requires the name and an e-mail address of at least one key user of the customer so that the tenant can be created.
- The tenant will be set up after the customer has placed the order and will be invoiced at the beginning of the following month.
- The customer will be informed by e-mail that the tenant has been set up.
- Any agreed minimum contract period starts from the first month of the first invoicing.

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.
- In the event that Schaeffler has delivered a gateway including a SIM card, the cost of data transfer is included in the monthly fees.*
- Note: Schaeffler requires at least the machine type of the monitored machine for automatic analysis and alerting. Other optional metadata for better results are criticality, ISO class of the machine and more.

Digital Lubrication Management

- Display of status information of OPTIME Smart Lubricator devices (e.g. fill level, battery status or ambient temperature)
- Generation and display of alarms (critical lubricant level, temperature limits exceeded, back pressure too high)
- Identification of the causes of malfunctions
- Support in the selection of lubricant and relubrication parameters
- Remote modification of lubrication settings
- Fees are only charged for active devices. A device is active as soon as the Schaeffler OPTIME Cloud receives data from the device.
- In the event that Schaeffler has delivered a gateway including a SIM card, the cost of data transfer is included in the monthly fees.*

Description Optional Services

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)

For information on the prices of the respective components, please contact your Schaeffler sales representative.

*Due to telecommunications law, Schaeffler can only provide the OPTIME solution with SIM cards if the customer uses the solution in his own company. Service partners must therefore purchase SIM cards themselves.

Schaeffler OPTIME Ecosystem

Mobile Application

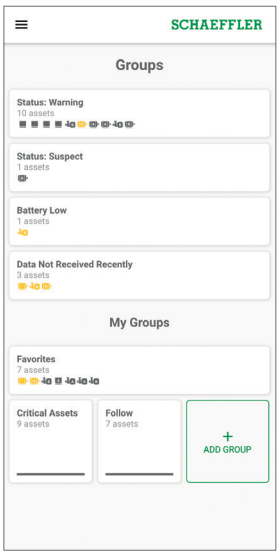
The OPTIME app can be downloaded from the Apple App Store and Google Play. The app shows the real machine status according to criticality, thus allowing optimal planning of maintenance activities. You can organize your machine park individually and easily with the help of the group, machine and sensor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

Schaeffler OPTIME

Group management

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

- Alarm status
  - *Severe: Machine shows advanced damage. These machines should be inspected and repaired if necessary.*
  - *Warning: Inspect machine and schedule repair work for the next regular maintenance interval.*
  - *Suspect: Observe; no immediate action 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

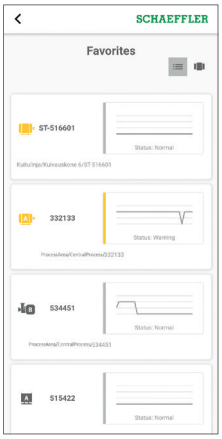
- Local conditions (location, buildings)
- Structures relevant to production (segments, product lines, production units)
- Machine types (motors, fans, pumps)

Schaeffler OPTIME Ecosystem

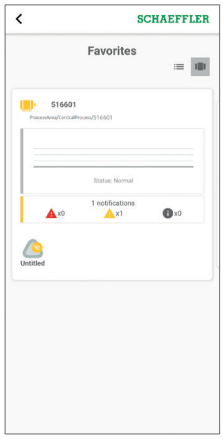
Mobile Application

Group views
Within a group all assigned machines can be found. There is the list view and the tile view.

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.

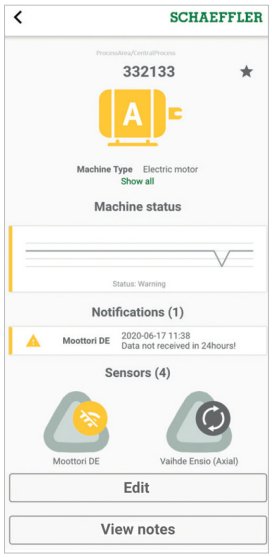


List view



Tile view

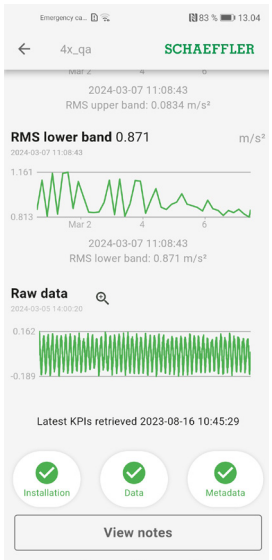
Machine management
If you select a machine within the group, you can access the machine management. The machine management shows a machine and related information such as the status, active alarm notifications and the sensors connected to the machine.



Machine management

Functions
- Tracking the machine status
- Acknowledge alarm notifications
- Edit machines
- View and add notes to machine log
- Navigation to the subordinate sensors
- Add a new sensor

Sensor management
The selection of a sensor leads to the sensor management. The sensor management shows active alarm notifications, KPIs and raw data related to the sensor.

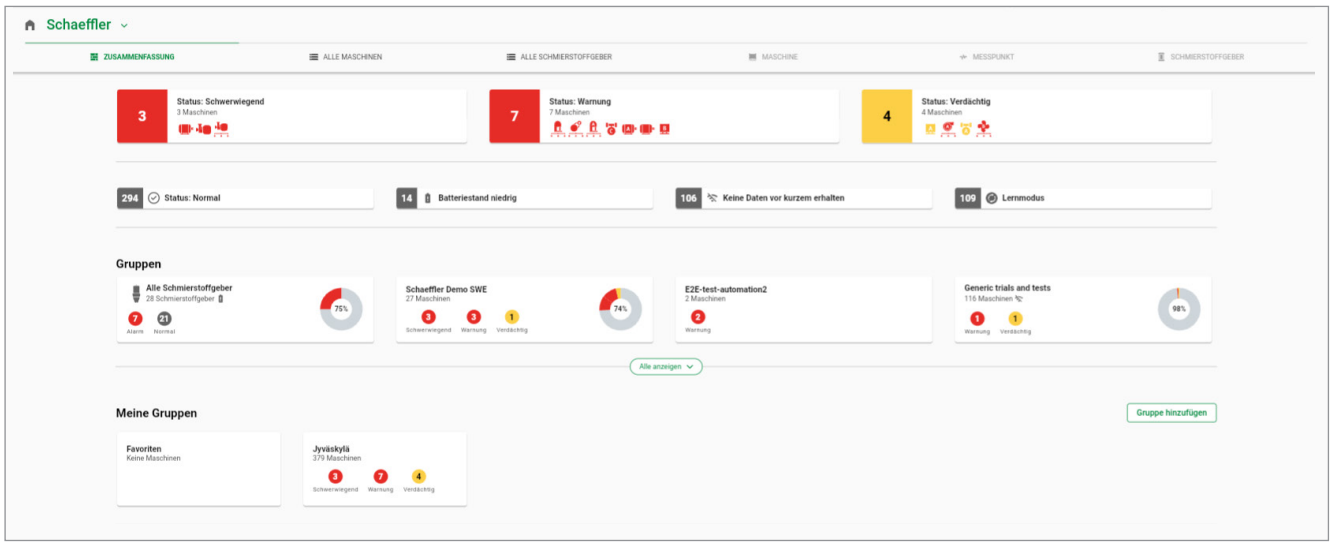


Sensor management

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

Schaeffler OPTIME Ecosystem

Web-based Dashboard



The OPTIME dashboard is the central user interface for use in control rooms where KPIs and alarm notifications for plant condition monitoring can be controlled.

Functions

- Track machine status
- Active monitoring of 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*
- Management of the installations
  - *Add, move and delete gateways and sensors*

Browser

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

Schaeffler OPTIME Ecosystem

Optional Services

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 State, open alarms, history of alarms

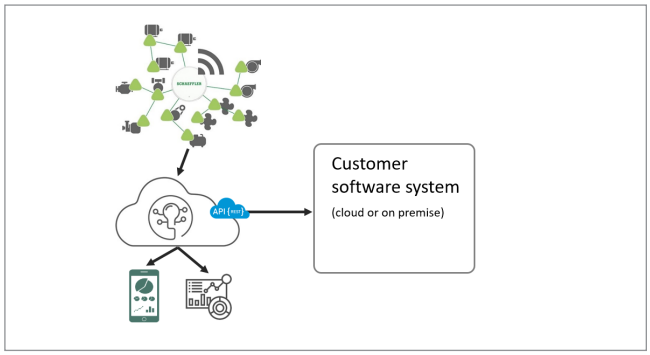
Notes: Data access rates are limited by the API proxy. The rate limits ensure that the OPTIME system is protected against misuse via the API, whether intentional or accidental.
Schaeffler requires at least one lead developer from the customer as a contact person who is granted access to the Schaeffler API Developer Portal. The lead developer will be provided with access and introduction information.

Monthly fees are charged for this service.
The access to the service is granted via the Schaeffler Developer Portal to ensure state of the art security and system protection.

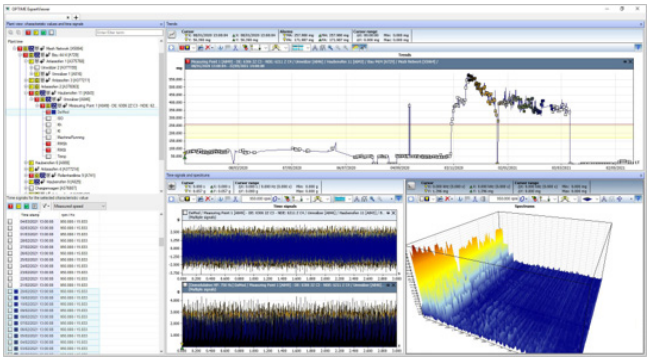
OPTIME ExpertViewer

The OPTIME ExpertViewer digital service offers a comprehensive collection of analysis tools for manual in-depth and root cause analysis of vibration data.
The service is compatible with OPTIME and „OPTIME-ready“ data (Schaeffler SmartCheck and Schaeffler ProLink).
ExpertViewer is optimized for the responsive analysis of large amounts of vibration data. It is also easy to use.
Users log in with the OPTIME user data.
Good to know: the number of users on the customer side for the digital service Expert-Viewer is not limited.

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 works.



Insights in the ExpertViewer

Schaeffler OPTIME CM

Applications

The OPTIME solution allows you to adapt to the machine‘s operating cycle by using different modes (standard, dynamic). With this feature also those machines can be monitored, which are operated randomly or running only for a very short time per cycle (more than30 s), see also the following page.

With OPTIME 3 sensors, machine speeds from 120 rpm* to 3000 rpm, with OPTIME 5 sensors, up to 5000 rpm are recommended; the sensor variant OPTIME 5 Ex allows to extend this use case to machines in hazardous areas. When selecting the suitable combination of machine and sensor, some factors must be considered, see table.

Typical combinations of machines and sensors

Application	Characteristic	Sensor		Mounting location
Electric motor	‹ 0,5 m	OPTIME 3	1	• Bearing position on the drive side of the motor • Central on the engine • 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 from drive side and non-drive side of the motor
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
Gear motor	‹ 0,5 m	OPTIME 5	1	• Bearing location
Gear motor	› 0,5 m	OPTIME 3	1	• Motor
Gear motor	› 0,5 m	OPTIME 5	1	• Gearbox
Extruder	–	OPTIME 3	2	• Bearing location
Calander	–	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

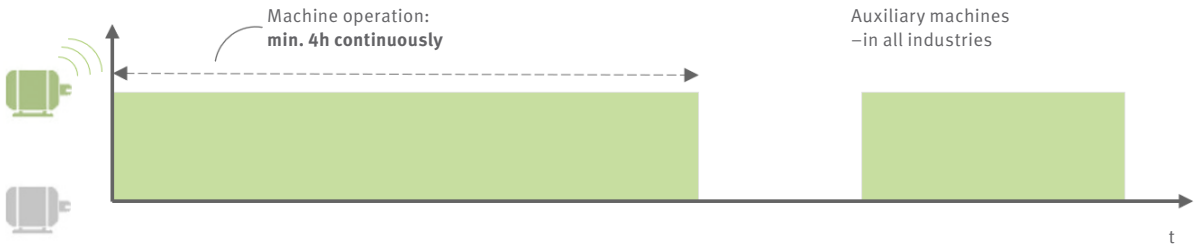
* application-specific

Schaeffler OPTIME CM

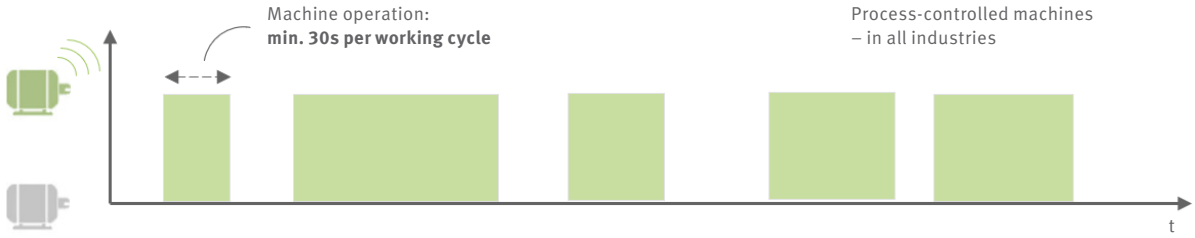
Adaptive modes

To guarantee reliable machine monitoring for all types of machines, OPTIME CM can be set in different modes. In the Dynamic mode (DM) OPTIME sensor will then learn to identify when the machine is running, and take measurements only in that state. There are two modes available, one further is currently in planning.

Standard mode (STM)
Sensors measure at fixed time intervals.
For machines which run continuously for a minimum of 4 hours.



Dynamic mode (DM)
Dynamic measurements for machines which are only occasionally operated but run for more than 30 seconds at a time.



Schaeffler OPTIME CM

Product Specification

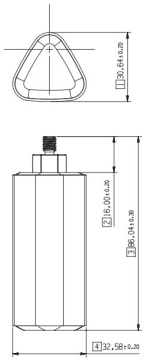
OPTIME CM sensors	OPTIME-3	OPTIME-5	OPTIME 5 Ex
Vibration bandwidth	2 Hz – 3 kHz	2 Hz – 5 kHz	
Amplitude range	±2/±4/±8/±16 g	±2/±4/±8/±16 g	
Temperature trend measurement	–40°C to +85°C	–40°C to +85°C	
Calculated KPIs	RMS_{Low}, $Kurtosis_{Low}$, $ISO_{VELOCITY}$, RMS_{High}, $Kurtosis_{High}$, DeMod, Temperature	RMS_{Low}, $Kurtosis_{Low}$, $ISO_{VELOCITY}$, RMS_{High}, $Kurtosis_{High}$, DeMod, Temperature	
Measurement cycle	KPIs: 6x per day, mode-dependant Time waveform: every 24 h	KPIs: 6x per day, mode-dependant 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, ANATEL, ANRT, COC, CRC, FCC, IC, ICASA, IFETEL, IMDA, KC, MIC, MOC, NBTC, NCC, NTC, RCM, SDPPI, SIRIM, SRRC, SUBTEL, TDRA, UKCA, UL/cUL, WPC		
Hazardous areas (OPTIME 5 Ex only)		ATEX/IECEx Zone 1/21 For details please see sensor markings.	

Schaeffler OPTIME CM

Product Specification

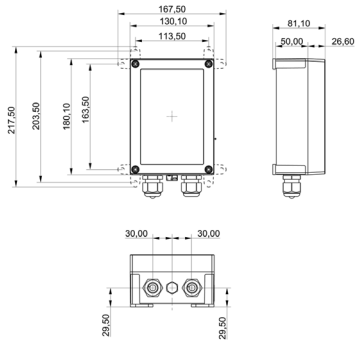
OPTIME Gateway

Sensor communication	Wirepas Mesh (2.4GHz ISM Band), maximum number of sensors: 50
Communication to Schaeffler IoT Hub	2G, LTE CAT M1 LTE-Stick: GSM, UMTS, LTE (default) Wi-Fi 2.4GHz, Ethernet RJ45
SIM card format	Micro-SIM (3FF), depending on LTE stick
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), further certificates -> see sensor above
Hazardous areas (special versions)	ATEX/IECEx Zone 2/21 (OPTIME Ex Gateway only!) Ex II 3G Ex nR IIC T6 Gc (-20°C to 50°C) Ex II 2D Ex tb IIIC T80°C Db (-20°C to 50°C) CCC, ECAS Ex, INMETRO, KCs, MASC, QPS, PESO

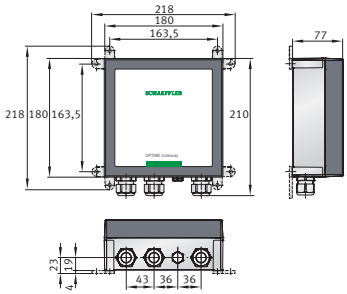


Dimensions of all Condition Monitoring OPTIME sensors (3, 5, 5 Ex)

OPTIME in Aktion



Dimensions of the OPTIME Gateway 1



Dimensions of the OPTIME Gateway 2

EASY IN EVERY WAY

Based on Schaeffler's long-standing expertise in the fields of bearing engineering, vibration analysis, and lubrication: the OPTIME Ecosystem enables a high level of "smartness" that makes eliminating downtime easy.

Easy to start
Plug and play functionality makes it easy to install, setup and integrate hundreds of machines in a very short time.

Easy to use
Intuitive mobile app with award-winning interface makes it easy to use – whether you are a beginner or an experienced user.

Easy to scale
Ease-of-use and affordability makes it easy to scale up and expand the scope of what you need at any time – in just a few steps.

Easy to decide
Complete overview of all machines and lubrication points, easy-to-understand alarms and automated analytics make it easy to know what to do next.

Easy to profit
Immediate reduction in downtime results in a quick ROI. Cost-efficiency also makes comprehensive, large-scale smart lubrication and condition monitoring affordable.

SCHAEFFLER LIFETIME SOLUTIONS

Keep your machines rolling

Schaeffler Lifetime Solutions is a full suite of industrial maintenance products, services and solutions for the entire machine lifetime. Designed with maintenance teams and plant managers in mind, the portfolio offers you everything you need to ensure that uninterrupted rhythm in your workshops and plants.

Regardless of whether you are working in food and beverage, pulp and paper, cement and mining – or any other industry. So that you can roll through the everyday knowing your machines are running smoothly.

Ready to roll?

www.schaeffler.de/en/lifetime-solutions

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