SCHAEFFLER

OPTIME

User manual

Foreword

OPTIME provides a complete condition monitoring solution

The OPTIME system from Schaeffler is a complete solution for the straightforward condition monitoring of a large number of machines. The concept also renders condition-based maintenance economical for ancillary equipment, as unplanned downtime can be avoided.

During the development of the system, particular attention was paid to the very simple commissioning process, smooth expandability and wide range of possible uses. The outlay on the part of the user was kept as low as possible for each individual process step.

OPTIME gateway and OPTIME sensors

The concept features special wireless OPTIME sensors, which combine with the OPTIME gateway to form a mesh network. Another key element is the service components, which run centrally on the Schaeffler IoT Hub, which is also where the data are analysed and the results can be viewed in greater detail. At the same time, the results are also transferred directly to the OPTIME app.

OPTIME app

The OPTIME app shows the machine status directly on site according to criticality and thus allows optimum planning of maintenance activities. Each user can adapt the selection of machines to their own remit and therefore has direct access to all of the necessary information.

Current version

A current electronic version (PDF) of this user manual can be found at https://www.schaeffler.de/std/1F40

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About the user manual

This user manual applies to the condition monitoring system OPTIME.

Symbols

The warning and hazard symbols are defined in accordance with ANSI Z535.6-2011.

WARNING In case of non-compliance, death or serious injury may occur.◁

CAUTION In case of non-compliance, minor or moderate injury may occur.◁

NOTICE In case of non-compliance, damage or malfunctions in the product or the adjacent construction may occur.◁

Availability

A current electronic version (PDF) of this user manual can be found at https://www.schaeffler.de/std/1F40.

Legal guidelines

The information in this manual corresponded to the most recent status at the close of editing. The illustrations and descriptions cannot be used as grounds for any claims relating to devices that have already been delivered. Schaeffler Monitoring Services GmbH accepts no liability for any damage or malfunctions if the device or accessories have been modified or used in an incorrect manner.

Apps and functions may not be available in all countries and regions. The availability of apps and functions may change.

Advice on third party products and services

All names of products and services cited in this manual are brand names of the respective companies. The details provided in the text are merely indicative and provided for information purposes only.

- Apple, App Store, Safari and their logos are registered trademarks of Apple Inc.
- Google, Android, Google Play, Google Chrome and their logos are registered trademarks of Google LLC
- Microsoft, Windows, Edge, Internet Explorer, Excel and their logos are registered trademarks of the Microsoft Corporation
- Mozilla, Mozilla Firefox and their logos are registered trademarks of the Mozilla Foundation
- Wirepas, Wirepas Mesh and their logos are registered trademarks of Wirepas Ltd.
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Other products and manufacturers' names cited in this publication may be the trademarks of their respective owners.

Licences

The OPTIME sensor software uses the following open source components:

The original language of the licence texts is English. All other foreign languages have been translated from the original English text.

General safety guidelines

This chapter brings together all the important safety regulations.

Any person charged with working on the system must read this chapter and observe the guidelines.

Principles

The OPTIME condition monitoring system corresponds to the current level of technology and the recognised rules of safety practice.
If the safety guidelines are not observed, risks to life and limb for the user or third parties and extensive damage to other material assets may nevertheless arise during use.

Marking

Every sensor and every gateway of the OPTIME condition monitoring system is marked with a serial number. The gateway nameplate contains the serial number, information on the manufacturer and the CE symbol. This information is printed on the sensor.

Usage for the intended purpose

The OPTIME condition monitoring system is approved for use in indoor and outdoor industrial environments. The system may only be used in accordance with the technical data, see page 83. Unauthorized structural modifications to the system are not permissible. We assume no liability for any damage to machinery or injury to persons arising from such actions.

Usage for the intended purpose also includes the following:

- all guidelines in the user manual are observed
- compliance with all relevant specifications on occupational safety and accident prevention during all life cycles of the system
- the necessary specialist training and authorisation of your company for carrying out the necessary work on the system.

Usage not for the intended purpose

The OPTIME condition monitoring system does not provide machine protection. It must not be used as a component of safety systems. For use in environments with an explosion risk, please note the markings on the sensors (expected to be available from 2022).

The OPTIME condition monitoring system is not classified as a safety component in accordance with the Machine Directive 2006/42/EC.

Warranty

The manufacturer shall assume liability for warranties in relation to operational security, reliability and performance only under the following conditions:

- Installation and connection must be carried out only by authorised and skilled personnel.
- The system must be used in accordance with the information in the technical data sheets. The limit values indicated in the technical data must not be exceeded under any circumstances.
- Conversion and repair work on the system may only be carried out by the manufacturer.

Selection and qualification of personnel

The OPTIME condition monitoring system may only be mounted, commissioned and operated by qualified personnel. The scope of competence, area of responsibility and monitoring of personnel must be precisely regulated by the site operator.

Designated qualified personnel:

- are authorised to install the system
- have all the necessary knowledge
- are familiar with the safety guidelines
- have read and understood this manual.

If personnel do not possess the necessary knowledge, they must be given the necessary training and instruction. Schaeffler can offer appropriate training courses on request.

Work on electrical devices

Work on electrical devices may only be carried out by a trained electrician.

On the basis of their technical training, knowledge and experience as well as their knowledge of the appropriate regulations, a trained electrician is in a position to assess the work assigned to them and recognise possible hazards.

Do not repair any damaged system components. Please arrange for any necessary repairs to be carried out by Schaeffler Monitoring Services GmbH.

Any work on wiring, opening or closing of electrical connections may only be performed while disconnected from the power supply and in a voltage-free state.

Safety regulations

All safety specifications are described in the following sections.

Safety during installation

Read this user manual before installing the system. Make sure you are certain that the product is suitable without restrictions for the relevant applications.

Before installing the components, check for any external damage. If damage or some other defect is found, the system must not be commissioned.

Any interventions in and modifications to the system, or the addition or removal of components not designed to be added or removed, are impermissible, can endanger occupational safety and may render any warranty claim null and void.

The device may only be installed by a trained electrician who observes the national and international regulations covering the installation of electro-technical equipment.

Handling the lithium batteries in the sensors

The sensors contain non-replaceable lithium thionyl chloride batteries, which are not dangerous provided they remain in the sensor housing. Never expose the batteries to excessive mechanical, thermal or electrical loads, as this would activate the safety valves and the battery container could rupture. Do not open the sensor. Avoid temperatures of more than +100 °C. Dispose of the sensor in accordance with the statutory provisions.

The incorrect handling of sensors may result in leaks or the emission of evaporated electrolyte that can cause a fire or an explosion and lead to serious injuries or death.

Sensors must be deactivated during transport and storage.

Keep away from children

Gateway and sensors are not toys and must be kept out of the reach of children. The system contains small parts. Children must not be allowed to play with system components.

Danger of burns due to hot surfaces

The outer surface of a machine can reach high temperatures that can cause injuries in the event of direct contact. Before performing installation work switch off the machine and allow it to cool down. If these instructions are not followed serious injuries may result.

Safe handling of information interfaces

This product has the following information interfaces:

- 2G, LTE CAT M1
- Wirepas Mesh network
- WiFi (WLAN)
- Ethernet.

The product can be connected with other devices, components or internal or external networks (e.g. internet) via each of these interfaces. Devices (like data carriers) connected via information interfaces may contain malware or execute malicious functions undetected. This product, or potentially your company infrastructure (e.g. IT infrastructure) can be damaged due to the use of these kinds of information interfaces. In addition, your company's data security may be compromised.

Before using our product and its information interfaces, please familiarise yourself with the following:

- the security features offered by the product and its information interfaces
- the security provisions of your company (e.g. on IT security).

Before commissioning please clarify with your relevant points of contact whether and which security measures are to be taken when using the product and its associated information interfaces.

Protection against unauthorised use

Data encryption and secure login with individual login data are the tools used to protect against unauthorised use of the OPTIME app and OPTIME dashboard. Software users (users) must log in with their user name and password. The password has to be changed at regular intervals. A secure password must be used.

The user is responsible for keeping their login data secure.

Scope of delivery

The OPTIME condition monitoring system is available in various combinations.

Gateway

Scope of delivery of the OPTIME gateway:

- 1 OPTIME gateway
- 1 built-in LTE stick (depending on the region)
- 1 gateway quick guide manual BA 68-02.

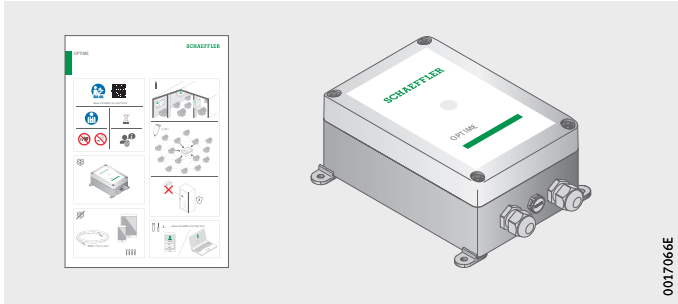


Figure 1
Scope of delivery
Gateway

Sensor kits

Scope of delivery of OPTIME 3:

- 10 OPTIME 3 sensors
- 10 mounting plates M6
- 1 quick guide manual for sensors BA 68-01.

Scope of delivery of OPTIME 5:

- 10 OPTIME 5 sensors
- 10 mounting plates M6
- 1 quick guide manual for sensors BA 68-01.

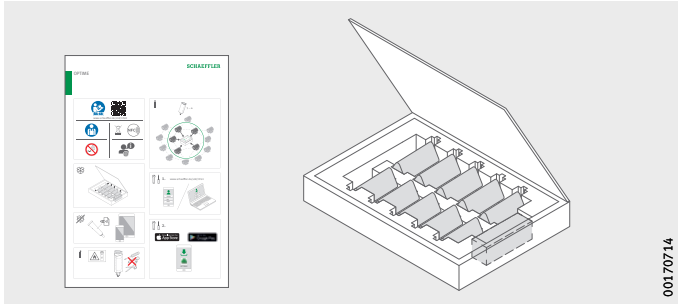


Figure 2
Scope of delivery
Sensor kit

The enclosed quick guide manuals contain the following link to this user manual BA 68, which always provides the latest version:
https://www.schaeffler.de/std/1F40

Required accessories

To ensure the system is complete and ready-to-use, the following devices and accessories need to be provided by the user in addition to the gateway and sensors, *Figure 3* and *Figure 4*:

- mobile phone or tablet (each with LTE and NFC technology) with installed OPTIME app
- connection cable to supply power to the gateway
- depending on type of installation, a suitable adhesive for fixing the mounting plates.

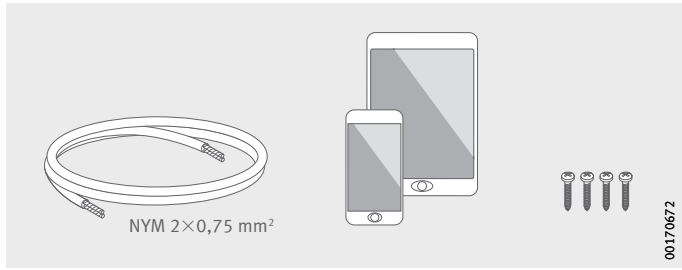


Figure 3
Required accessories for the gateway

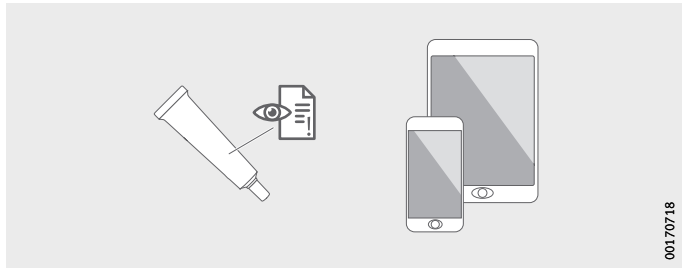


Figure 4
Required accessories for the sensors

A suitable adhesive for fixing the mounting plates for the sensors is LOCTITE AA 330 with activator, LOCTITE SF 7388 or a product with comparable properties.

- Please follow the instructions and observe the safety data sheet for the adhesive.
- In particular, follow the instructions on preparing the substrate and curing times.

Damage during transit

Any damage during transit must be reported as a complaint to the carrier:

- Check the delivery immediately upon arrival for any damage during transit.
- Report any damage during transit promptly as a complaint to the carrier.

Defects

Any defects must be reported promptly as a complaint:

- Check the product immediately upon delivery for visible defects.
- Report any defects promptly as a complaint to Schaeffler.

Description
Structure

The overall system consists of several components designed for condition monitoring and predictive maintenance:

- OPTIME gateway
- OPTIME sensors
- OPTIME app
- OPTIME dashboards in the Schaeffler IoT Hub.

Figure 5
Condition monitoring system OPTIME

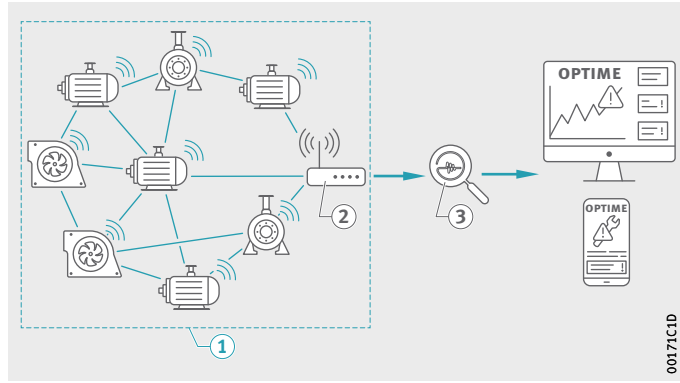
The sensors automatically form a mesh network that transfers data directly or via other sensors to the gateway. In the network, the sensors transfer raw data on vibrations as well as key performance indicators (KPI) via the gateway to the Schaeffler IoT Hub, where the data are analysed and the results sent to the OPTIME app. All analyses are also available in the OPTIME dashboard. Directly after activation the sensor automatically starts to measure and transfer data at pre-set intervals. At the same time, learning mode is initiated, which defines the alarm thresholds for the respective machine.

The mesh network organises itself automatically, when sensors or gateways are added or removed. The use of several gateways in the same network is also possible. Depending on the circumstances, existing OPTIME installations can also be expanded subsequently
to 50 to 70 sensors per gateway.

Since an independent network is used to transfer the measured data to the Schaeffler IoT Hub and wireless technology is used for other communication (pre-set, optionally also WiFi or Ethernet), there is no need for a connection to the local IT infrastructure.

Communication interfaces and data transfer of OPTIME system

Mesh technology was selected because when monitoring the condition of machines in large industrial plants large distances also have to be covered and difficult to access machines need to be reached. The actively managed mesh network can establish contact to sensors in a line of sight of up to 100 m, ensures reliable communication and at the same time optimises the battery service life of the sensors.



① Mesh network
② OPTIME gateway
③ Schaeffler IoT Hub

Figure 6
Communication between OPTIME system components

The standard version of the gateway already has an integrated SIM card for use exclusively in conjunction with the OPTIME system. If the proposed mobile phone connection is not to be used, there are other options for connecting to the Schaeffler IoT Hub, i.e. using a separate SIM card, a WiFi connection or connection via network cable.

Planning

A system tree, i.e. showing the allocation of sensors to machines and assets, does not necessarily have to be set up beforehand. However, in the case of an entire plant this considerably simplifies the installation process, as it is only necessary to select the corresponding machine for sensor installation. A system tree may take the form of an Excel table imported via the dashboard menu.

Log into the OPTIME app and OPTIME dashboard

Every customer receives an administration user account when purchasing the OPTIME system. This user is able to create additional users. All created users will receive their login data by e-mail.
To log into the OPTIME customer portal, please visit the following website:
https://schaeffler-optime.com/dashboard

Gateway

The gateway is located in a rugged protective housing suitable for wall or ceiling mounting. It can also be used outdoors thanks to its protection type and UV resistance.

Positioning of gateway

If possible the gateway should be positioned in a central location in the area of the installed sensors. Ideally there should be a line of sight to five or six sensors. These can then be used as repeaters for the remaining sensors. For optimum coverage it can be helpful to install the gateway above the sensor level.

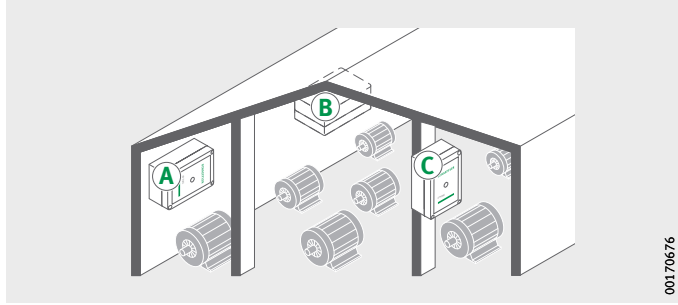


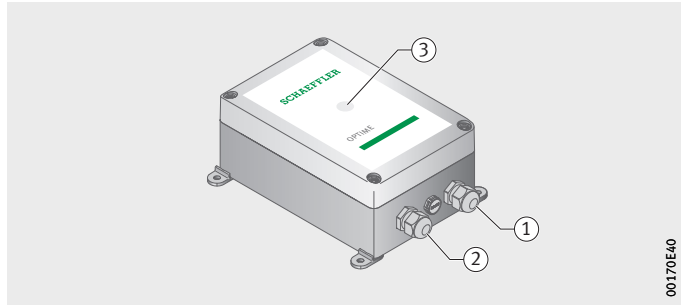
Figure 7
Gateway in the system, suitable installation positions

When choosing the mounting location, it should be noted that reinforced concrete or larger metallic objects can block signal transmission in this area. This also means that a gateway may on no account be installed in a metal switch cabinet.

If a mobile phone connection is used for data transfer we recommend checking the LTE reception at the installation location beforehand with a mobile phone.

Gateway connections and indicators

The gateway has two cable glands for routing the cable to the power supply and, optionally, feeding through the network cable, *Figure 8*.



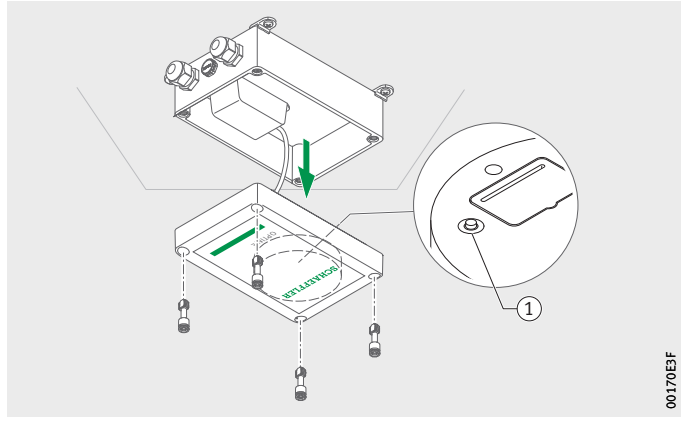
① Input power supply
② Input network connection
③ LED for indicating operating status

Figure 8
Gateway connections and indicators

The gateway is equipped with an LED indicator, which displays the various operating states, see *table*.

LED displays

LED	Function
Green light	The gateway is connected to the internet.
Blue light	The gateway is trying to connect to the internet. Please remember that if conditions are unfavourable it can take 15 minutes to establish a connection to the internet.
Flashing blue	The gateway is in configuration mode.
Red light	An error has occurred. More information is provided in the web interface on configuring the gateway.



① [**Configuration**] button

Figure 9
Button for gateway configuration

Put the gateway into configuration mode by pressing the [**Configuration**] button.

Sensors

The OPTIME sensors are fixed to the machines and activated using near-field communication (NFC) via the OPTIME app. The sensors are also suitable for use outdoors.

Two different types of sensor are available.

The OPTIME 3 sensor has a bandwidth of 2 Hz to 3 kHz and is therefore suitable for the following applications:

- motors
- generators
- fans
- plummer block bearings.

The OPTIME 5 sensor has a bandwidth of 2 Hz to 5 kHz and is therefore suitable for monitoring the following applications:

- pumps
- geared motors
- gear box
- compressors.

The OPTIME system is suitable for machines that run continually or run continually to some extent. Machines that are only operated for short phases during the day are less suitable for monitoring with the OPTIME system. In addition, the machine should normally run in a stable operating state (speed and performance) for a period of around one hour. With OPTIME 3 sensors, machine speeds of 120 min^{-1} to 3 000 min^{-1} can be monitored, and with OPTIME 5 sensors up to 5 000 min^{-1}. When choosing the suitable combination of machines and sensor, there are certain factors that need to be considered, see *table*, page 20.

Combination of machines and sensors

Application[1)]	Other characteristic	Sensor type	Quantity	Mounting location
Electric motor	<0,5 m	OPTIME 3	1	☐ Bearing position on motor drive side ☐ Centrally on the motor ☐ In the centre at the base of the motor
	>0,5 m	OPTIME 3	2	☐ Drive side and non-driven side of motor ☐ Base of drive side and non-driven side of motor
Fans	Overhang	OPTIME 3	1	☐ Plummer block housing
	Between bearings	OPTIME 3	2	☐ Plummer block housing
	Directly coupled	OPTIME 3	1	☐ Drive side of motor
Compressor	–	OPTIME 5	2	☐ Bearing position
Plummer block bearings	–	OPTIME 3	1	☐ Bearing position
Pump	–	OPTIME 5	2	☐ Bearing position
Geared motor	<0,5 m	OPTIME 5	1	☐ Gearbox
	>0,5 m	OPTIME 3 OPTIME 5	1 1	☐ Motor ☐ Gearbox
Extruder	–	OPTIME 3	2	☐ Bearing position
Calenders	–	OPTIME 3	2	☐ Bearing position
Belt drive	–	OPTIME 3	2	☐ Bearing position
Saws	–	OPTIME 5	1	☐ Saw blade bearing arrangement
Shaft	–	OPTIME 3	1	☐ Bearing housing
Gearbox	–	OPTIME 5	2	☐ Input and output

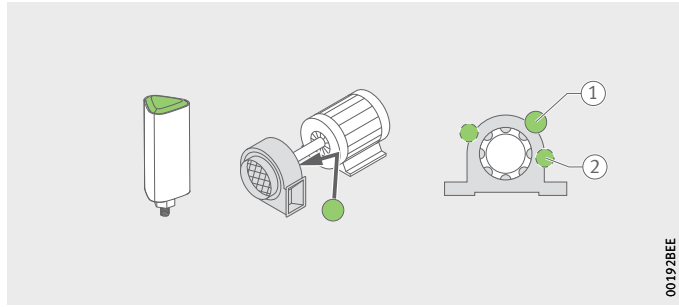
1) Please consult Schaeffler if your machine is not listed.

Mounting position on machine

Ideally the sensors should be mounted in the vicinity of the bearing arrangements of the machine, if possible in a radial layout (in the load zone). The precise mounting location is not too critical; a sensor can still be located effectively at some distance from the ideal position. If, for example, the bearing area of a motor is not accessible, the sensor can alternatively be fixed to a suitable flat area on the motor housing or even at the base of the motor. If possible the sensor should not be shielded on several sides by metal parts.

The vibration monitoring process measures the structure-borne sound of machines, which is why there needs to be a fixed connection to the bearing arrangements. This means that machine cladding components are not suitable as a mounting location.

When attaching sensors to the machine it helps to use the overviews, *Figure 10* to *Figure 13*, page 22.



① Mounting position
② Alternative mounting position

Figure 10
Examples of mounting positions with sensor OPTIME 3

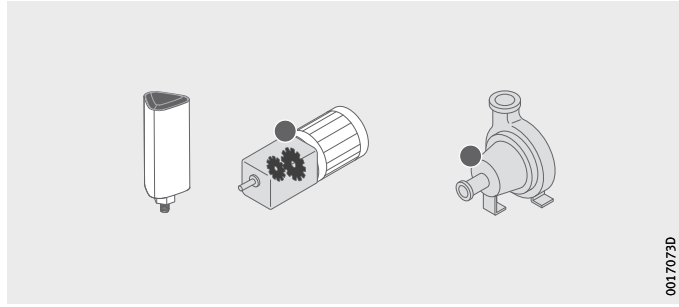
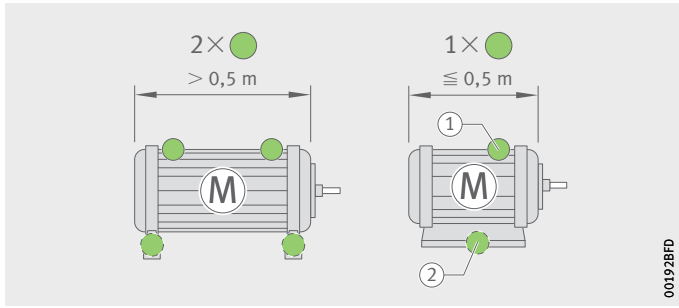


Figure 11
Examples of mounting positions with sensor OPTIME 5



① Mounting position
② Alternative mounting position

Figure 12
Examples of mounting positions for small and large motors

In the case of machines that are significantly larger than 0,5 m, it is recommended that at least two sensors be used so that potential damage can be readily identified. The same applies if two machine components are separated by a coupling, as in this case the vibrations cannot be transmitted adequately via the coupling.

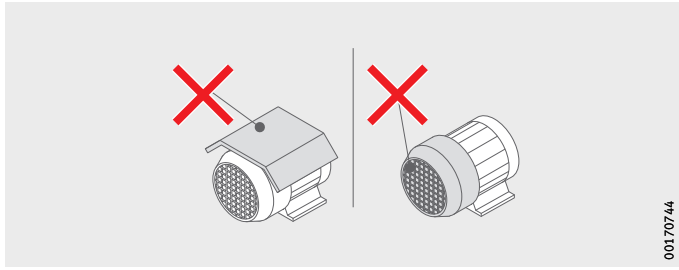


Figure 13
Examples of unsuitable mounting positions

Technical characteristics of the sensors

Apart from vibrations, both sensors also always measure temperature as a characteristic value.

Sensor KPIs measured

The following characteristic values (KPIs) are determined:

- RMS_{low}
  RMS value of acceleration $<$750 Hz
- RMS_{high}
  RMS value of acceleration $>$750 Hz
- $Kurtosis_{low}$
  Kurtosis of acceleration $<$750 Hz
- $Kurtosis_{high}$
  Kurtosis of acceleration $>$750 Hz
- $ISO_{velocity}$
  RMS value of velocity 2 Hz to 1 000 Hz
- DeMod
  RMS value of demodulation curve, HP 750 Hz
- Temperature.

Sensor battery service life

The battery service life depends on various parameters and operating conditions:

- ambient temperature
- quality of wireless connection
- number of wireless connections to downstream sensors
- frequency of measuring intervals
- manual activation of individual measurements.

The calculated sensor service life for both types of sensor at the pre-set measuring intervals is 5 years.

Sensors in learning mode

The system has to learn the normal machine condition using the vibration and temperature KPIs recorded by the sensor, before the threshold values for alarm notifications are defined.

During the first phase of learning mode, 90 KPI data samples are retrieved from a running machine. As the system takes six KPI data samples within 24 hours, the first phase lasts at least 15 days. After the first phase, the alarm notifications are determined provisionally. For safety purposes, very high alarm thresholds are already activated during the learning phase.

Subsequently, the learning mode is continued in a second phase during which the alarm thresholds are continually adjusted. This phase lasts another 15 days.

In learning mode the system uses absolute alarms. An absolute alarm is triggered if a pre-set standard ISO value (for various machine types) or the pre-set admissible temperature range, is exceeded at a sensor.

Note

Please note that the data are only recorded if the machine is recognized as being in operation. If the machine is not running in between, the learning mode will take longer.

After each technical change, service or repair carried out on the machine, it is extremely important to restart the learning period from the OPTIME app, so that new alarm thresholds can be learned.

Transport and storage

The sensor and gateway packaging does not protect the items against damage during transport.

WARNING

If the sensors are handled incorrectly there can be a risk of leaks or the emission of evaporated electrolyte that can cause a fire or explosion and lead to serious injuries or death.

The sensors contain non-replaceable lithium thionyl chloride batteries, which are not dangerous provided they remain in the sensor housing. Avoid temperatures of more than +100 °C! Never open the sensor housing. Make sure that the sensors are not damaged during transport and storage. Store the sensors in the original packaging until use. ◁

WARNING

The sensors are classified as dangerous goods during transport due to the non-replaceable lithium thionyl chloride batteries they contain. They must be transported in accordance with the statutory provisions. Defective sensors must not be sent by air freight. Sensors must be deactivated during transport and storage, see page 31. ◁

NOTICE

The electronics and plastic components of the gateway and sensors can be damaged or destroyed by strong vibrations, so avoid dropping them and severe impacts. ◁

The storage life of the battery-powered sensors is 10 years. Store the sensors at a temperature of +0 °C to +30 °C, to protect the non-replaceable batteries they contain.

Mounting

Registering in the OPTIME dashboard

To configure the gateway and sensors it is necessary to register in the Schaeffler IoT Hub, so that sensors and gateways are automatically associated with your company, see page 62. You can configure the components of your system, i.e. gateway and sensors, for your system tree. This can be done following completion of registration either in the OPTIME dashboard or in the OPTIME app.

OPTIMEapp installation

Before installing the components of the OPTIME system, you will need to install the OPTIME app on your mobile phone or tablet. The OPTIME app can be downloaded free of charge from the App Store or Google Play. You will need login data to be able to log on to the OPTIME app, see page 41.

Install gateway

When installed for the first time, the gateway is the core of the mesh network. First of all, the gateway is added to the mesh network. It is then mounted at the desired location and the electrical installation is completed.

Add gateway

The OPTIME app will guide you step by step through the process of adding the gateway to the mesh network.

- ▶ Open the OPTIME app.
- ▶ Tap the [**Login**] button.
- ▶ Enter your login data.
- ▶ Go to the [**Menu**] symbol and tap on the [**Add Gateway**] button.

Figure 14
Register gateway

▶ Follow the instructions in the OPTIME app to scan the QR code of the gateway.

For further information on configuring the gateway, see page 37.

For further information on the gateway in the OPTIME app, see page 60.

Mounting location for gateway

The gateway should be installed at a central location in the overall system, *Figure 15*. Please take note of the following for the mounting location:

- The gateway should be placed in a central position in the area of the installed sensors. There should be a line of sight to up to five or six sensors. In most cases these sensors then serve as repeaters for the remaining sensors.
- The best coverage in the mesh network can be achieved if the gateway is mounted above several sensors distributed across an area.
- Avoid installing the gateway at the end of a row of several sensors one behind the other to prevent the last sensor in the row from having a reduced battery life.
- Reinforced concrete or larger metallic objects can strongly impede signal transmission in this area. On no account may the gateway be installed in a metal switch cabinet. Choose a mounting location that will allow stable data transmission.
- If a mobile phone connection is used for data transfer we recommend checking the LTE reception at the installation location beforehand with a mobile phone.

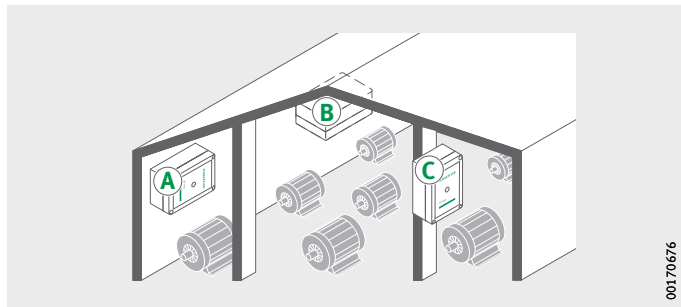


Figure 15
Mounting location for gateway

Mechanical installation of gateway

Suitable fixing material must be selected to match the surface quality of the substrate. Install the gateway using the mounting brackets supplied. Once the gateway has been fixed to the selected location, the electrical connection must be carried out by a qualified electrician.

▶ Fix the gateway to the selected location.

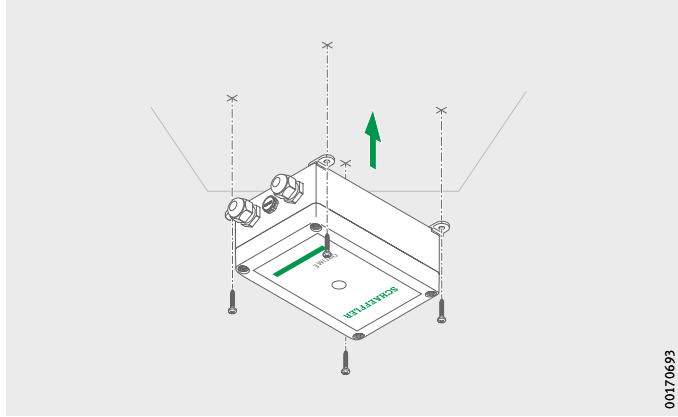


Figure 16
Mount the gateway

Electrical connection of gateway

For the electrical connection the customer has to provide a sufficiently long connection cable with the appropriate specifications.

WARNING

Failure to observe the safety regulations may result in a life-threatening electric shock. Make sure that all electrical connections are carried out only by a qualified electrician. ◁

WARNING

A defective connection cable can cause a life-threatening electric shock. Make sure that any defective connection cables are replaced immediately by a qualified electrician. ◁

▶ Proceed as shown, *Figure 17* and *Figure 18*.

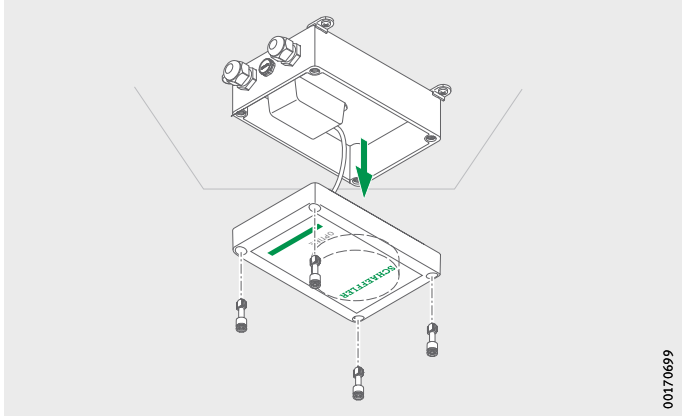


Figure 17
Open cover

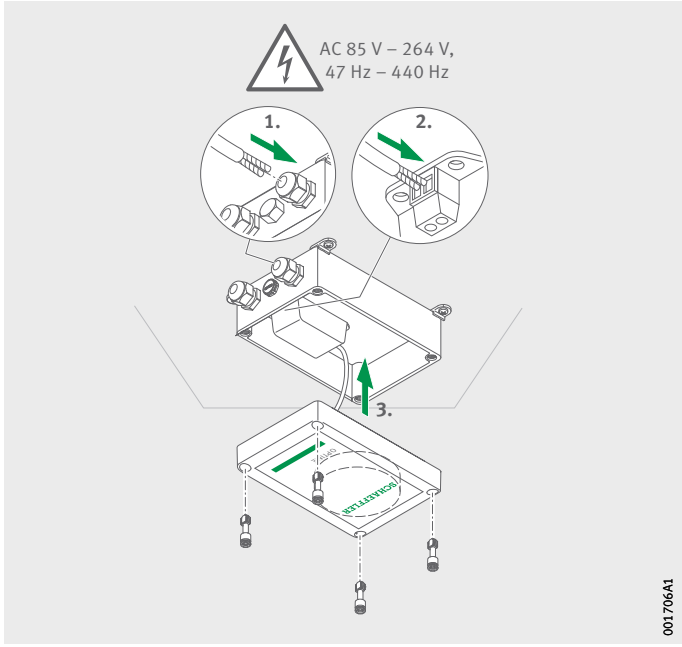


Figure 18
Complete the electrical connections to the gateway

▷ The gateway is now connected.

▷ If the mobile phone gateway connection is used (factory setting), the gateway connects automatically with the Schaeffler IoT Hub. Please remember that it can take several minutes to establish the connection.

▶ If the gateway is to be connected via the LAN, you can alternatively establish communication with the gateway by plugging the network cable connector into the router socket.

▷ When the LED on the gateway flashes green then the connection to the internet has been established successfully. The gateway appears in the customer section in the Schaeffler IoT Hub.

If the mobile phone connection via the installed SIM card is not to be used, there are other options available, see page 37:

- SIM card provided by the customer
- connection via WiFi
- connection via network cable.

Install sensor

CAUTION

Danger of burns due to hot surfaces. The surface of a machine can reach a temperature that can cause burns in the event of contact with the hot surface. Switch the machine off and let it cool down before you start installing the sensor. The surface temperature of the machine has to be measured using suitable measuring devices. ◁

Please take note of the following for the mounting location:

- Do not cover up the sensors to ensure that data transmission is not impeded.
- When choosing the mounting location, take care to avoid areas exposed to stronger vibrations, such as the natural oscillation of thin-walled housing covers or cooling fins.

Activate sensor before mounting

To activate the sensor you need an NFC-capable mobile phone or tablet. The OPTIME app has to be installed on your mobile phone or tablet.

Activate sensor

You should activate the sensor before mounting to rule out any possible defect in advance, *Figure 19*.

- ▶ Open the OPTIME app.
- ▶ Tap the [**Login**] button.
- ▶ Enter your login data.
- ▶ Go to the [**Menu**] symbol and tap on the [**Add sensor**] button.

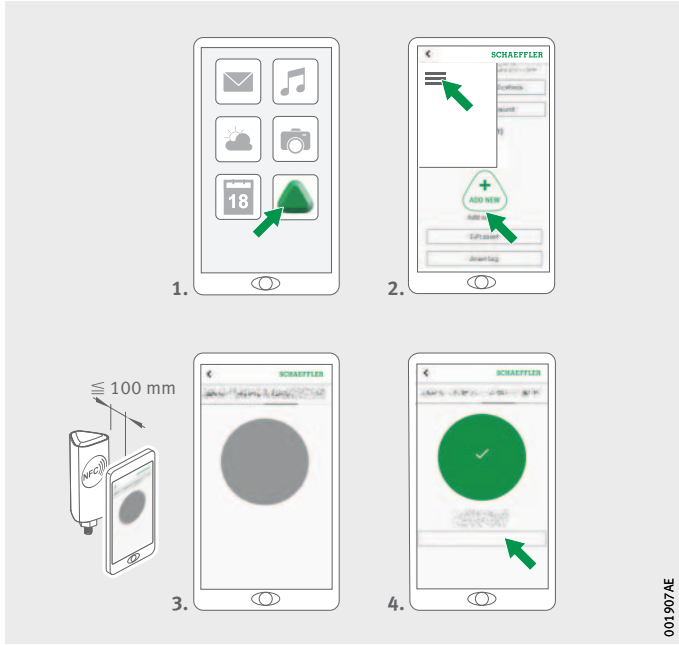


Figure 19
Activate sensor

- ▶ Follow the instructions in the OPTIME app to activate the sensor via NFC.

  The activation is done in two steps. Firstly, the sensor is switched on. Then the network parameters are transferred. For final confirmation the user is requested to save the settings. Depending on the mobile device used, each separate NFC contact is acknowledged, e. g. through vibration.

- ▷ The sensor is activated.

Deactivate sensor

The sensor can also be deactivated again:

- ▶ In the OPTIME app, navigate to sensor management, see page 53.
- ▶ Tap the [**Deactivate sensor**] button.
- ▶ Follow the instructions in the OPTIME app to activate the sensor via NFC. Depending on the mobile device used, each separate NFC contact is acknowledged, e.g. through vibration.
- ▶ The sensor is deactivated.

⚠WARNING

If the sensors are handled incorrectly there can be a risk of leaks or the emission of evaporated electrolyte that can cause a fire or explosion and lead to serious injuries. Deactivate the sensor before handing it over for proper disposal. Sensors must also be deactivated during transport and storage. Defective sensors must not be sent by air freight. ◁

Sensor mounting location

When installing the sensor at a monitored machine it is important to take the position of the sensor and the contact between sensor and machine into consideration, see page 21.

NOTICE

Risk of damage due to incorrect mounting. To ensure optimum condition monitoring, you may wish to seek assistance from a vibration expert for this step. ◁

Schaeffler Monitoring Services GmbH can offer you a service ideally tailored to your needs.

Contact surface for sensors on the machine

The sensor is mounted on the base using the M6 threaded bolt. To ensure optimum measuring quality, the contact surface on the machine should be completely flat, smooth and larger than the base of the sensor. It is recommended that the sensors be mounted directly on the machine housing using an existing M6 threaded hole. Adapters for other thread sizes are available as accessories.

In addition, it is possible to make a threaded hole in the machine which the sensor can then be screwed into. In cases where the surface of the machine is slightly curved or uneven, a suitable adhesive with gap-filling properties has to be used between the machine surface and the sensor. If possible the surface can also be straightened using a suitable tool.

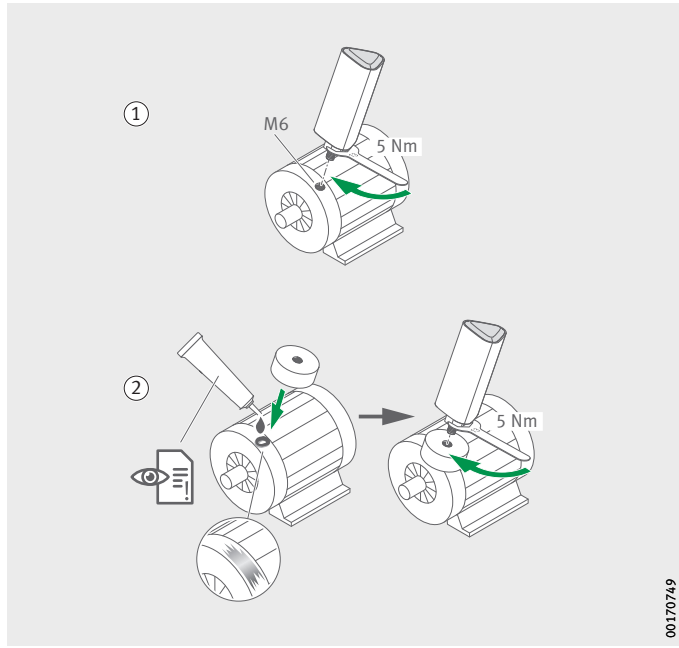
Mounting plates, which can be glued on if no screw-in thread is available on the machine, are also included in the scope of delivery of the sensors.

NOTICE

Risk of damage due to incorrect mounting. Screwing the sensor onto a highly curved surface can result in the threaded bolt twisting and cause permanent damage to the device. ◁

Furthermore, please note the following, *Figure 20*, page 35:

- The sensor has to be attached perpendicular to the mounting surface.
- The mounting surface must not be excessively curved or uneven.
- The surface should be free of contamination.
- The sensor can be operated at ambient temperatures of –40 °C to +85 °C.



① Mounting a sensor into a thread
② Mounting a sensor using the mounting plate
Further option: with adapter M6 on M8 (accessory)

Figure 20
Mounting variants

Mounting a sensor into a thread

Mounting a sensor into an existing thread on the machine requires a flat surface and an M6 screw-in thread, *Figure 20*:

- ▶ Clean the machine surface.
- ▶ Insert the threaded bolt into an M6 screw-in thread.
- ▶ Tighten the threaded bolt with a maximum torque of 5 Nm.

NOTICE

There is a risk of damage if the specified tightening torque is not adhered to. Too low a torque can lead to a weak connection between sensor and machine, while too high a torque can damage the sensor and the threaded bolt. ◁

Install sensor with mounting plate

The mounting plate can be used to fix the sensor to a machine with no thread, *Figure 20*, page 35. This requires a mounting plate, suitable adhesive and a surface with a diameter of 32 mm.

⚠ CAUTION

Incorrect handling of the adhesive may cause injury. Follow the adhesive instructions and the safety data sheet. Direct skin contact with the adhesive can lead to injuries. Use suitable gloves. ◁

NOTICE

There is a risk of damage if the adhesive is used incorrectly. Select a suitable lubricant and observe the adhesive instructions.

The sensor fixing cannot be removed by non-destructive means following installation. ◁

- ▶ Clean the machine surface.
- ▶ Stick the mounting plate to the machine.

NOTICE

There is a risk of damage if the adhesive is used incorrectly. Observe the curing times specified in the adhesive instructions. ◁

- ▶ Insert the threaded bolt into the screw-in thread of the mounting plate.
- ▶ Tighten the threaded bolt with a maximum torque of 5 Nm.

NOTICE

There is a risk of damage if the specified tightening torque is not adhered to. Too low a torque can lead to a weak connection between sensor and machine, while too high a torque can damage the sensor and the threaded bolt. ◁

Configure sensor

The sensor receives the network parameters automatically via the OPTIME app. For configuration purposes, the minimum information required is the machine type (for example: motor, pumps, fans). All other data on the machine (such as the speed, power, bearing types) are optional and primarily improve the result of the analysis.

These data can also be configured retrospectively via the OPTIME app or in the Schaeffler IoT Hub.

For further information on the sensor in the OPTIME app, see page 57.

Gateway configuration

Various interfaces are available for communication between the gateway and Schaeffler IoT Hub.

Note

Normally there is no need to change the standard gateway settings, but for certain installations it may be necessary to adapt or change some of the standard settings. These settings should be undertaken only by skilled personnel.

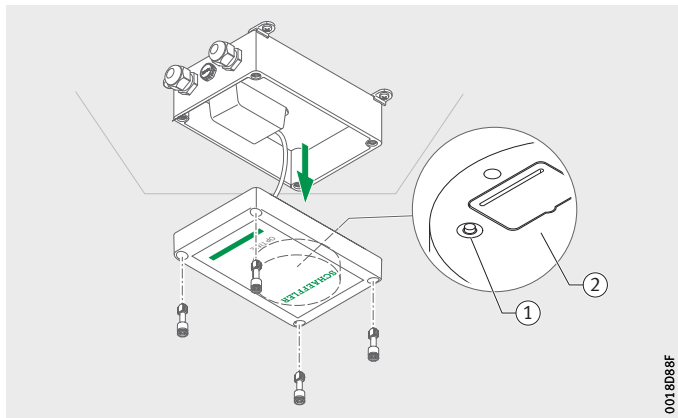
The following settings can be changed:

- WiFi
- LAN.

Initial login to gateway configurator

To reach the user interface of the gateway configurator using a browser, proceed as follows:

▶ Press the [**Configuration**] button on the gateway until the status LED flashes blue.



① Button [**Configuration**]
② Nameplate with WiFi password

Figure 21
Button on gateway

▷ The gateway is in configuration mode.

▶ The gateway becomes a WiFi access point.
The name of the WiFi access point is "OPTIME *serial number*", whereby "*serial number*" is the serial number of the gateway.

The serial number is on the sticker on the side of the gateway.

▶ Establish a WiFi connection between your computer or mobile device and the WiFi access point. The WiFi password is on the nameplate.

▶ Open your browser and enter the IP address 192.168.0.1:3001.

If necessary, determine the TCP/IP values of the gateway if the pre-set IP address does not work. This can happen if the device was already connected to another network.

▷ The drop-down menu opens and displays the setting options.

Settings

The menu items [**View Gateway status**] and [**View error log**] are not relevant for normal operation of the gateway. The information retrievable under these menu items can be used by specialist personnel if the gateway is not working properly.

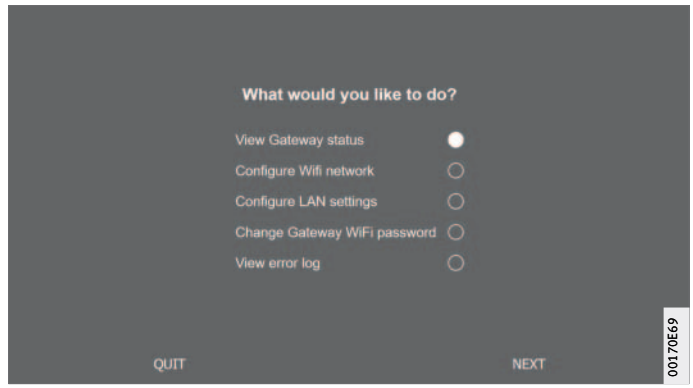


Figure 22
Drop-down menu
for gateway configuration

Configure WiFi

Under the menu item [**Configure WiFi network**] the WiFi settings of the gateway can be modified. A known network can be selected or a new network added. If necessary the password for the WiFi can be changed under another menu item [**Change Gateway WiFi password**].

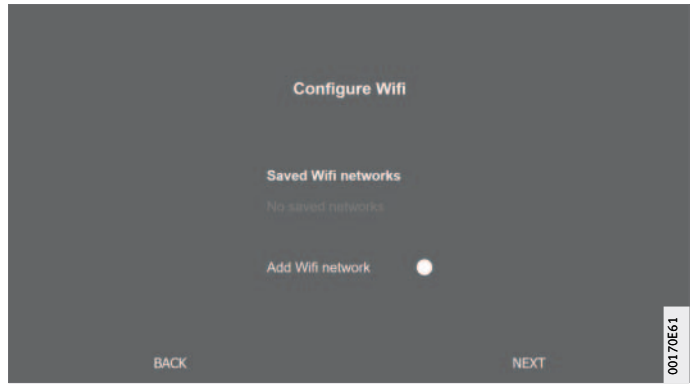


Figure 23
Settings for operation
in WiFi network

Configure LAN

If the gateway is to be connected with a local network via the RJ45 port provided in the device, the necessary settings can be performed under the menu item [**Configure Ethernet LAN settings**].

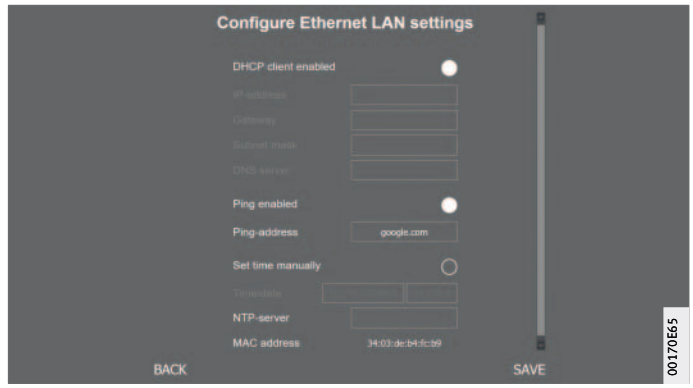


Figure 24
Settings for operation in LAN network

Using the OPTIME app

The OPTIME app is an integral part of the OPTIME solution, providing easy access to the condition monitoring data. The app is used to create and manage the OPTIME condition monitoring environment, receive up-to-date information on the condition data and react to changes in the condition data.

The OPTIME app allows sensor data to be retrieved locally via a wireless connection and provides information on the state of the machine and its latest operating values. In addition, the sensors are commissioned and configured with the aid of the OPTIME app. The menu navigation guides the user in adding, configuring and managing new sensors.

Login and logout

To log into the OPTIME app as a user, you will need login data. Every customer receives an administration user account when purchasing the OPTIME system. This user is able to create additional users. All created users will receive their login data by e-mail.

The customer's administrator receives login data by registering on the OPTIME dashboard, see page 64.

Login

To log in:

▶ Start the OPTIME app.

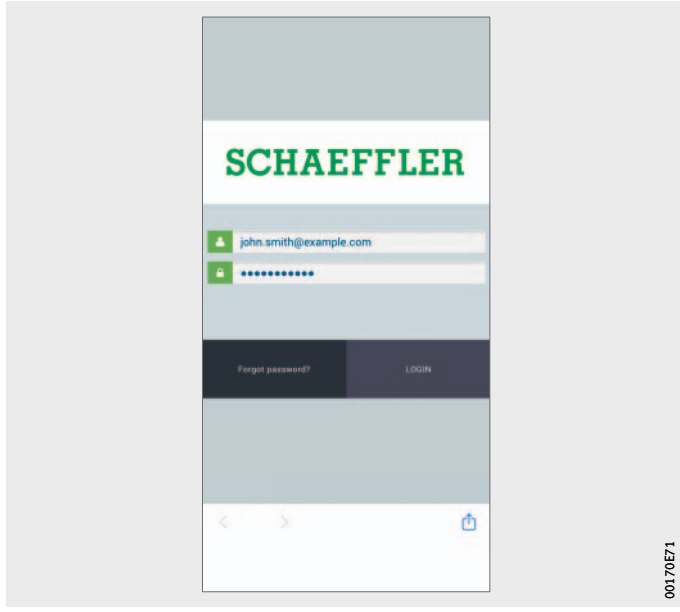


Figure 25
Log into the OPTIME app

▶ Enter your login data.

▷ After you have logged in successfully the start screen appears.

▶ Tap the [**Login**] button.

Logout

To log out:

▶ Go to the [**Menu**] symbol and tap on the [**Logout**] button, *Figure 26*, page 42.

General navigation

There are central navigation elements and setting options for running the OPTIME app, which can be found in the various screens.

The following areas can be accessed in the OPTIME app, to enable targeted monitoring of the machines in the asset.

- group
- machine
- sensor.

User roles

The OPTIME app has the same structure for each user. Depending on the user role, different permissions may apply.

Languages

The language of the app depends on the language of the operating system. At the moment German and English are supported.

Buttons

The drop-down menu, which can be accessed via the [**Menu**] symbol, and the main buttons are used for navigation.

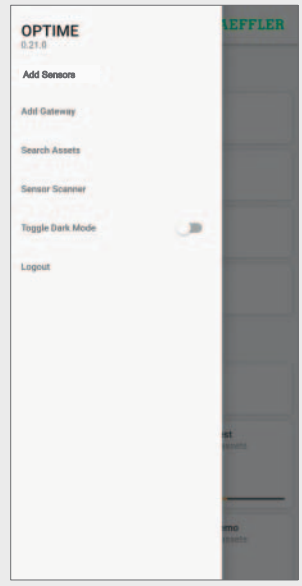


Figure 26
Direct access via navigation elements

Symbol [Menu]

Button, symbol	Description
[**Add Sensor**]	Direct access for installing and configuring a sensor.
[**Add Gateway**]	Direct access for installing and configuring a gateway.
[**Search Machines**]	Direct access to the search function for machines with various filtering options.
[**Scan Sensor**]	Direct access to the scan function for reading sensor settings.
[**Toggle Dark Mode**]	Toggles dark mode, in which the OPTIME app is displayed in a darkened layout.
[**Logout**]	Logs the user out.

Navigation elements

Button, symbol	Description
	Goes back to previous screen.
	Closes screen.
	Adds selection to favourites.
	Confirms the update after the screen was swiped down, for example at group, machine or sensor level.

Search function and filters

The search function can be used in various sections of the OPTIME app and helps refine search results for assets, machines or sensors according to specific criteria.

Filters can be set based on an inputtable search string, the criticality of the machine and the machine type. The filters can be reset using the [**Clear Filters**] button.

Scan sensor

The sensor settings can be read using the [**Scan Sensor**] button.

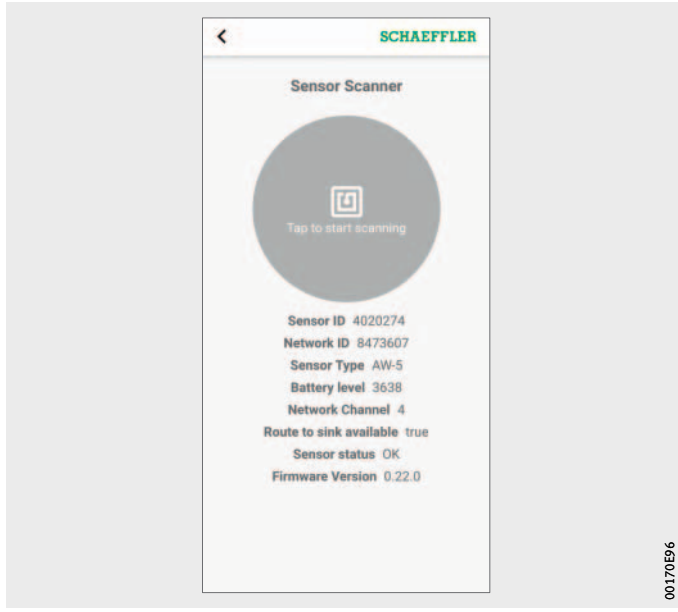


Figure 27
Sensor Scanner

Manage groups

The start screen for group management is displayed immediately after logging in.

Alarm-based groups are pre-set:

- alarm status depending on the alarm level
- battery status
- receiving status.

The fields for alarm-based groups take up the whole width of the screen, while the fields for user-defined groups are square.

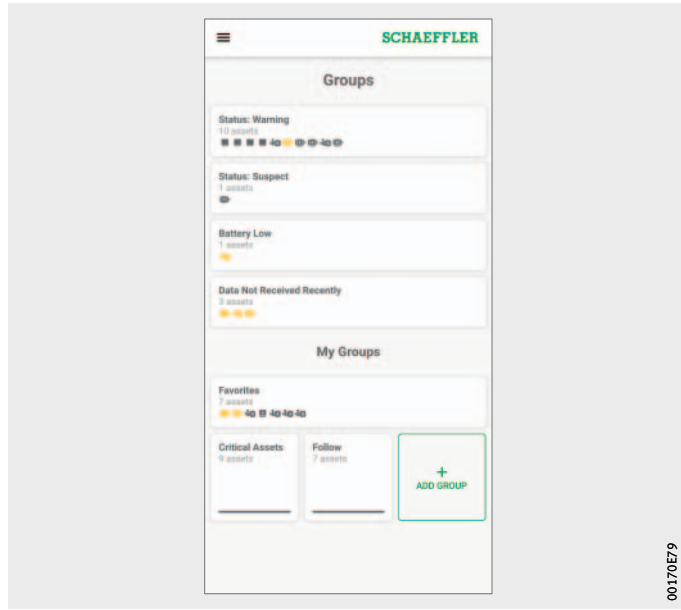


Figure 28
Start screen
for group management

Start screen for group management with group fields

Input	Group field	Description
[**Groups**] Alarm status	Status: Normal or suspect	A grey symbol indicates a normal or suspect status (level 1 to 2 in the state diagram), i.e. no or low alarm level. No immediate response necessary.
	Status: Warning	A yellow symbol indicates a pre-alarm (level 2 to 3 in the state diagram), i.e. a high alarm level. Inspect the asset and schedule repair measures for the next regular servicing interval.
	Status: Severe	A red symbol indicates a main alarm (level 3 to 4 in the state diagram), i.e. the highest alarm level. Inspect the asset and, depending on the result, schedule a repair as soon as possible.
[**Groups**] Battery status	[**Battery Low**]	Displays the battery status.
[**Groups**] Receiving status	[**Data Not Received Recently**]	Shows that the sensor is offline and has not transmitted any data in the last 24 hours.
[**Groups**] Filtered groups	For example: [**Learning mode**]	Displays the groups compiled on the basis of search filters.
[**My Groups**]	[**Favorites**] Other dedicated groups, e.g.: [**Pumps**]	Displays user-defined groups.

For further information on the colour coding and designation of alarms, see page 79.

Display information on groups

To obtain detailed information:

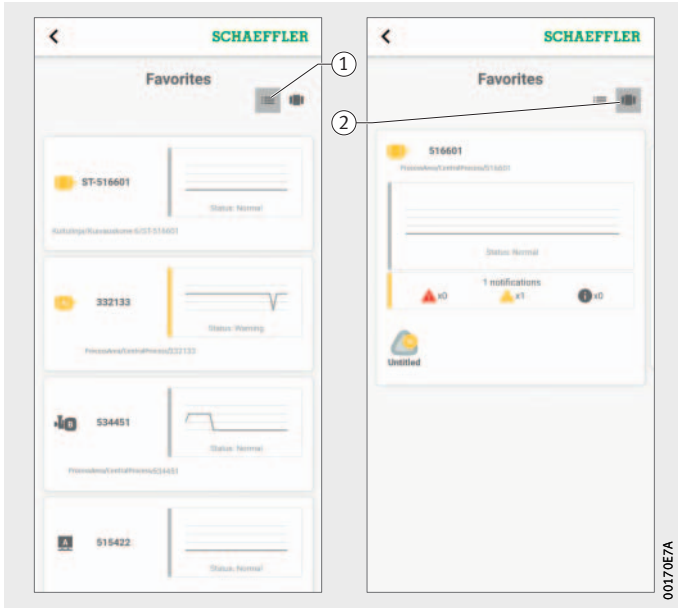
▶ Tap on a group field.

▷ The machines assigned to the group are displayed.

Two different views

Two different views are available

- List view:
  - Displays the colour-coded alarm status of the machine, the state diagram with alarm level and any outstanding alarm messages.
- Tiled view:
  - As well as the information in the list view, an extended overview of alarm messages and the status of the machine sensors is displayed. The tiled view allows rapid scrolling through the machines.



① List view
② Tiled view

Figure 29
Access to information about groups in various views

Manage favourites

You can add any machine to your [**Favorites**] group, using machine management, see page 48.

Add new group

To add a dedicated group:

▶ Tap the [**Add Group**] button.

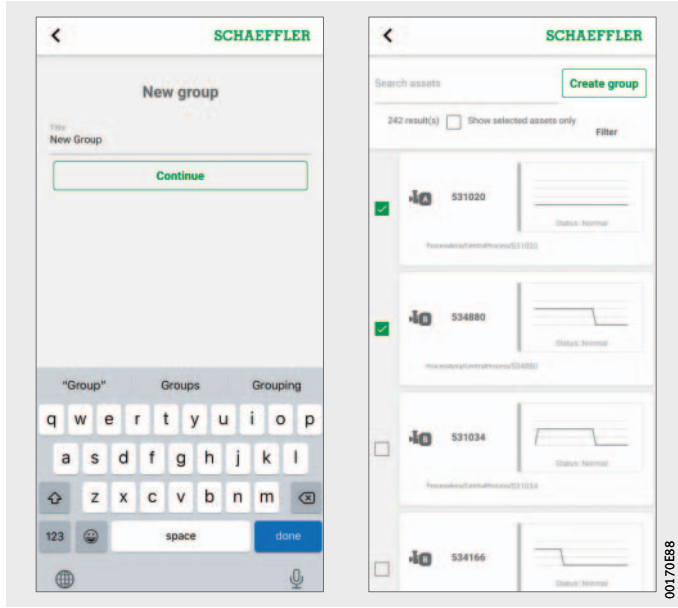


Figure 30
Add new group

▶ Enter the name of the group.

▶ Tap the [**Continue**] button.

▷ A list of all machines is displayed.

▶ Use the search function and filters to refine the choice of machines.

▶ Place a check mark against the machines that you want to add to the group.

▶ Tap the [**Create group**] button.

▷ Your group will be displayed under [**My groups**].

Manage machines

The machine management screen displays a machine with associated information such as the status, active alarm notifications and the sensors connected to the machine. The sensor or sensors assigned to the machine can be accessed from the machine management system.

The following functions are available to the user:

- acknowledge alarm notifications
- edit machines
- view machine log
- navigate to machine sensors.

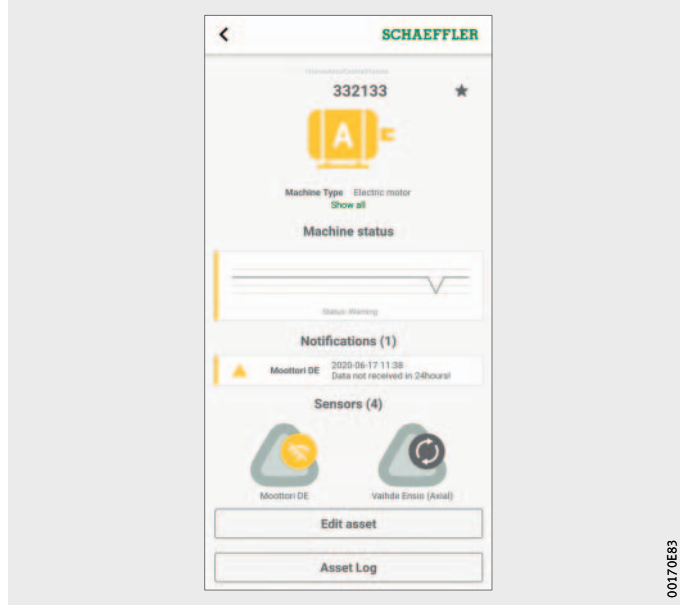


Figure 31
Machine management screen

Machine management screen

Input	Field	Description
Asset name	Text entry	Displays the defined asset names.
Machine name	Text entry	Displays the defined machine names.
Machine symbol	 Electric motor  Belt drive  Compressor  Fans  Gearbox  Pump  Roll  Shaft  Turbine  Unknown machine	The colour of the symbol clearly indicates the alarm status of the machines: ■ A grey symbol indicates a normal or suspect status (level 1 to 2 in the state diagram), i.e. no or low alarm level. No immediate response necessary. ■ A yellow symbol indicates a pre-alarm (level 2 to 3 in the state diagram), i.e. a high alarm level. Inspect the asset and schedule repair measures for the next regular servicing interval. ■ A red symbol indicates a main alarm (level 3 to 4 in the state diagram), i.e. a high alarm level. Inspect the asset and, depending on the result, schedule a repair as soon as possible.
Metadata on the machine	Text entries	Depending on machine type, other information can be entered as metadata to specify the machine. The metadata can be completely expanded and collapsed using the [**Show all**] and [**Show less**] buttons. Metadata are superordinate information that serve to describe the information.
[**Machine status**]	Graphic representation	The machine status shows the state diagram and the alarm status.
[**Acknowledge notifications**]	Button	Button takes the user to the relevant screen. The button only appears in the case of notifications that require action to be taken.
[**Send service request**] (optional)	Button	Button takes the user to the relevant screen.
[**Edit asset**]	Button	Button takes the user to the relevant screen.
[**Asset Log**]	Button	Button takes the user to the relevant screen.

For further information on the colour coding and designation of alarms, see page 79.

Acknowledge alarm notification

The [**Acknowledge notifications**] button takes the user to the relevant screen.

To acknowledge an alarm notification, it is necessary to select the action taken, *Figure 32*. In addition, a comment describing which actions were taken or why the notification is no longer valid must be selected from the drop-down menu. The alarm notification is stored in the [**Asset Log**] with a time stamp and details on the user.

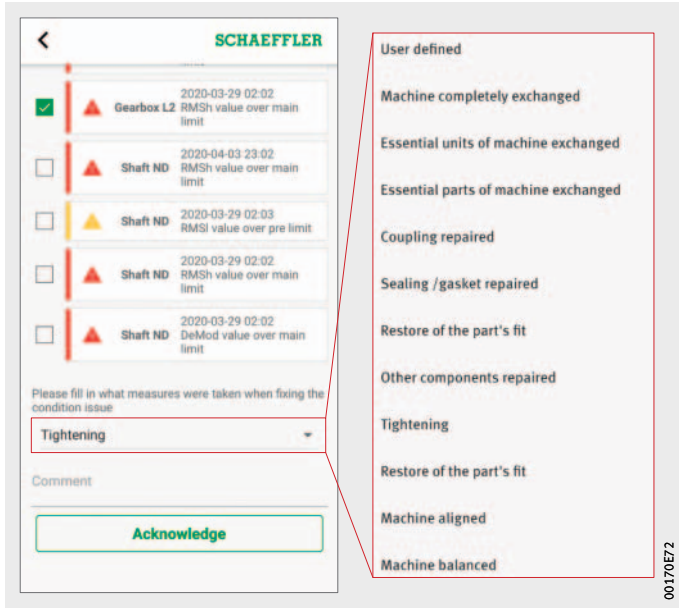


Figure 32
Acknowledge alarm notification, drop-down menu with entries specific to machine type

Manage machine sensors

The machine management screen shows which sensors are assigned to the machine. The sensors can be edited in the sensor management screen by tapping on the sensors.

To add a new sensor for the machine, use the [**Add sensors**] button.

For further information on sensor management, see page 53.

For further information on adding a sensor, see page 57.

Edit machine

All machine properties can be edited. You should enter machine information as accurately as you can. This data is used to define the threshold values for the machine and to improve the results of the analysis.

The criticality of the machine is indicated by a letter: “A” for critical machines, “B” for fairly non-critical and “C” for non-critical.
The criticality is defined by the user.

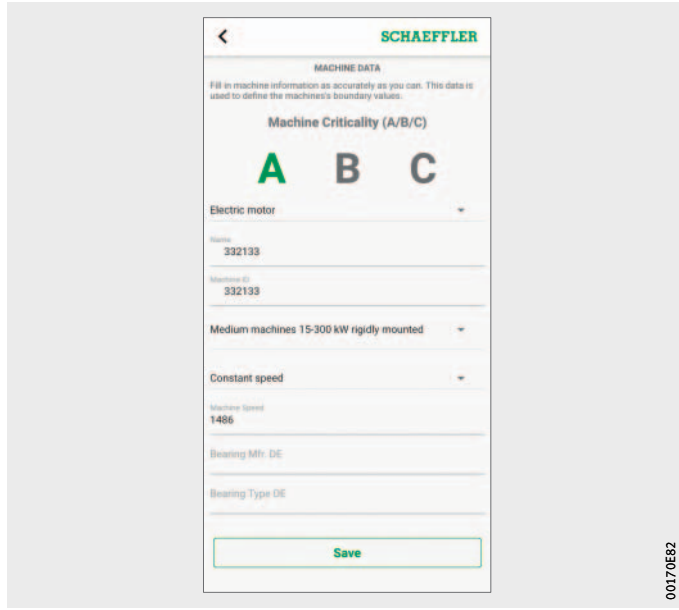


Figure 33
Edit machine

Asset log

The asset log records events during the service life of the asset. Events to be logged include asset creation, sensor activation and replacement and alarm notifications.

You can display the log for each machine, in which notifications and log entries by personnel are archived in chronological order. Dedicated log entries can be created using the [**Add log entry**] button. Every activity, such as the acknowledgement of alarm notifications, is stored in the machine log.

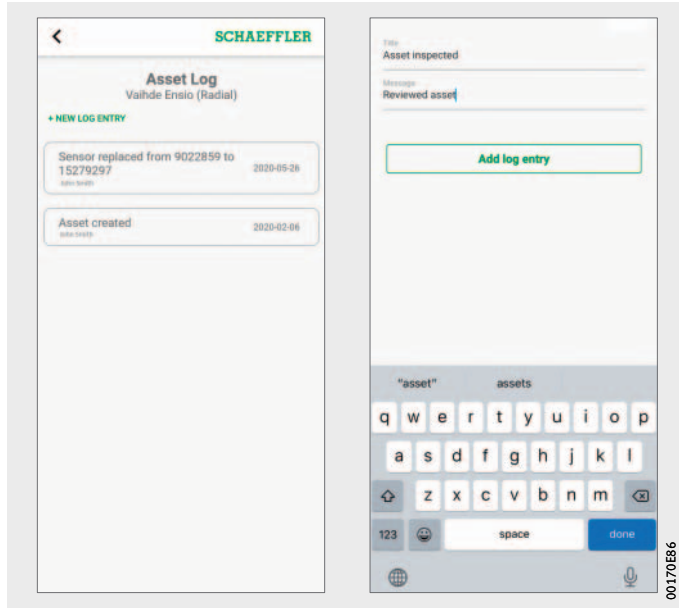


Figure 34
Asset log

Manage sensors

Sensor management displays active alarm notifications, KPIs and raw data relating to the specific sensor.

The following functions are available to the user:

- acknowledge alarm notifications
- view KPIs
- view raw data
- edit sensor
- request new KPIs and new raw data
- view asset log.

Figure 35
Sensor management screen

Sensor management screen

Input	Field	Description
Machine name	Text entry	Displays the defined machine names.
Sensor name	Text entry	Displays the defined sensor names.
Sensor symbol		Normal status.
		Displays an alarm notification.
		Displays the battery status.
		Shows that the sensor is offline and has not transmitted any data in the last 24 hours hours.
		Displays learning mode.
Metadata on the sensor	Text entries	Depending on the sensor type, further information can be entered. Metadata are superordinate information that serves to describe the information.
[**Acknowledge notifications**]	Button	Button takes the user to the relevant screen. The button only appears in the case of notifications that require action to be taken.
Battery level	Graphic representation	Displays the battery status.
KPI	Graphic representation	Presents the KPIs over time as a graph.
Raw data	Graphic representation	Presents the raw data over time as a graph.
[**Installation**] [**Data**] [**Metadata**]	Button	Additional buttons open. The colour of the button indicates whether there is a problem with the installation, the data reception or the metadata. Green indicates that the condition is in order. Yellow indicates a high alarm level, for example if necessary metadata are missing. Red indicates the highest alarm level, for example if no data have been transmitted for a longer period of time.
[**Asset Log**]	Button	Button takes the user to the relevant screen.

For further information on the colour coding and designation of alarms, see page 79.

Acknowledge alarm notification

The [**Acknowledge notifications**] button takes the user to the relevant screen. For further information on acknowleding alarms, see page 50.

View KPIs and raw data

Tapping in one of the graphs displayed will show the values corresponding to the tapped position under the x-axis. The time signal and frequency spectrum of the raw data can also be displayed in a separate magnified view using the [**Magnifier**] button, *Figure 36*.

The magnified view of the raw data displays the time signal and frequency range. Tap within the time signal to centre the point you tapped in the view. You can also zoom into the time signal by placing two fingers on the time signal and then spreading them apart. Move one finger on the time signal to the left or right to move the zoomed area. To zoom out place two fingers on the time signal and then pinch close.

Do exactly the same to navigate the frequency range.

Use the [**Close**] button to return to the sensor management screen.

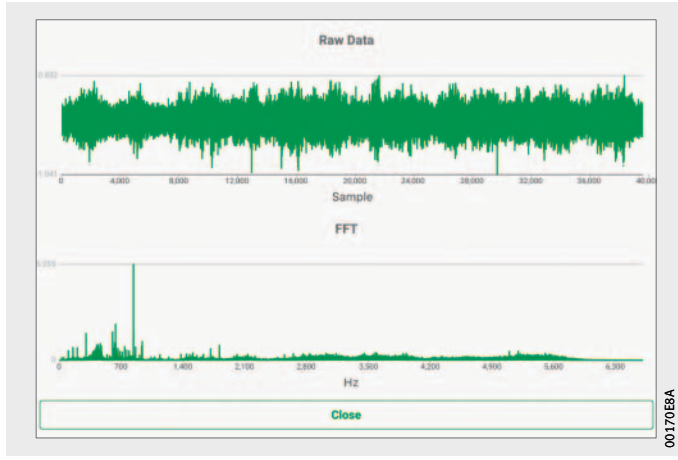


Figure 36
View raw data

Edit sensor with [Installation] button

The [**Installation**] button opens the buttons [**Replace sensor**], [**Trigger learning mode**] and [**Deactivate sensor**].

Use the [**Replace sensor**] button to replace a defective sensor or a sensor with a dead battery at the same measuring point.
Use the [**Trigger learning mode**] button to put the sensor back into learning mode. Use the [**Deactivate sensor**] button to switch off the sensor.

Edit sensor metadata with [Metadata] button

The [**Metadata**] button opens the [**Edit asset**] button. This is where you can edit the sensor metadata and enter name, position on machine and sensor type. These data are used to define the sensor threshold values and improve the results of the analysis.

Use [Data] button to request fresh KPIs and raw data for sensor

KPIs and raw data can be requested for the sensor.

The [**Data**] button opens the two buttons [**Request fresh KPI values**] and [**Request fresh raw data**], which initiates a new measurement.

Add sensor

The addition of sensors can be initiated in various sections of the OPTIME app.

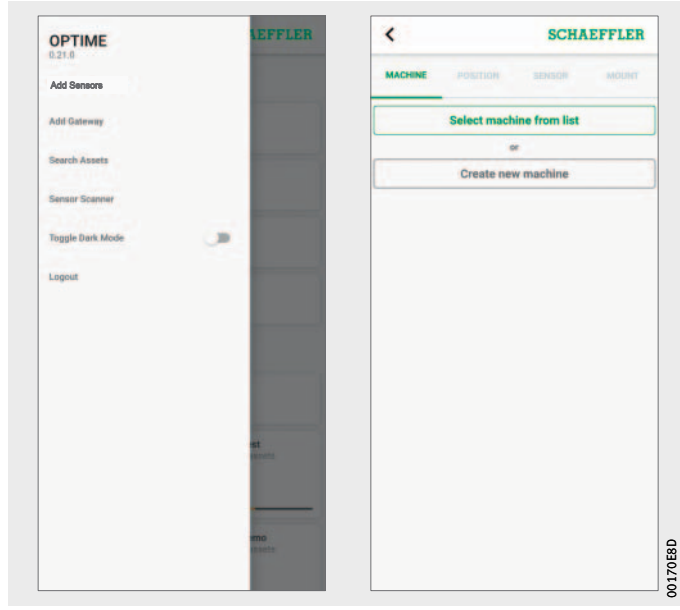


Figure 37
Add sensor

To add a sensor:

▶ Tap the [**Add sensor**] button.

▷ The [**MACHINE**] tab is displayed.

▶ Choose whether to select a machine from the list or create a new machine.

▷ The [**POSITION**] tab is displayed.

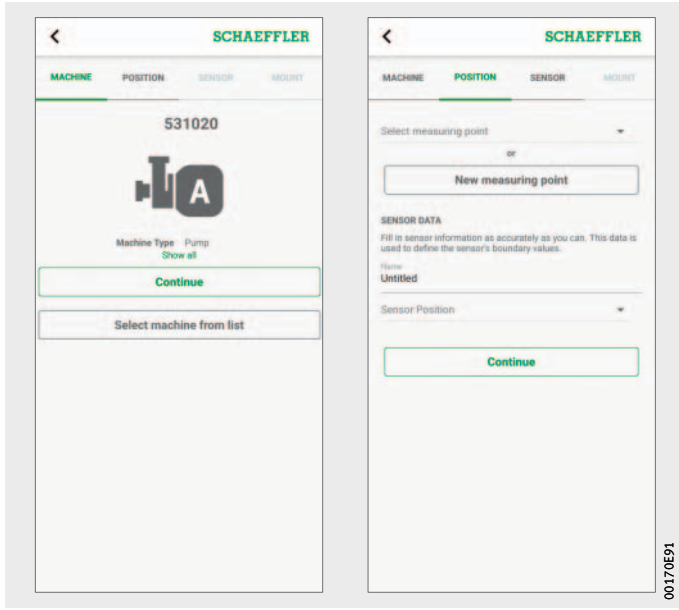


Figure 38
Settings for machine and position

▶ Specify the settings for the position.

▷ The [**SENSOR**] tab is displayed.

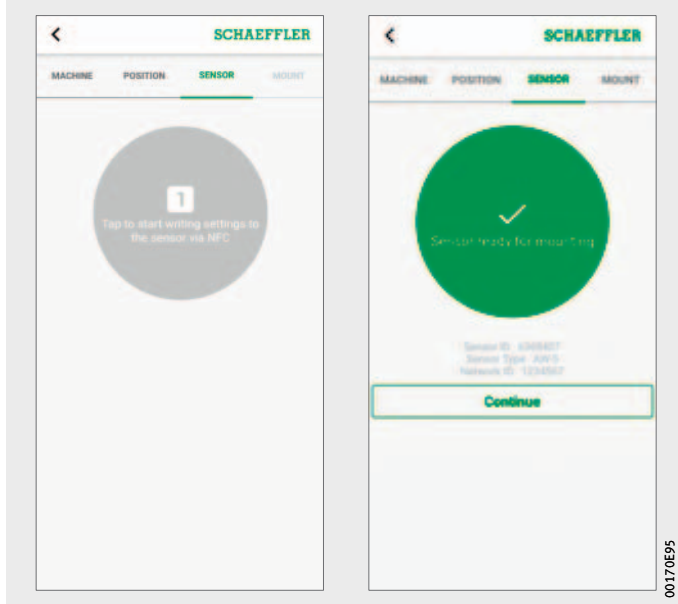


Figure 39
Activate sensor

▶ Hold your mobile device to the sensor when prompted to do so by the OPTIME app, to activate the sensor by NFC.

Activation takes place in two steps; the sensor is switched on first, then the network parameters are transferred. As final confirmation, the user is requested to save the settings. Depending on the mobile end device used, each separate NFC contact is acknowledged, e.g. through vibration.

▶ The sensor is activated.

▷ The [**MOUNT**] tab is displayed.

▷ The sensor can be fixed to the machine.

Add gateway

The option of adding a gateway is offered in various sections of the OPTIME app.

To add a gateway:

▶ Tap the [**Add gateway**] button.

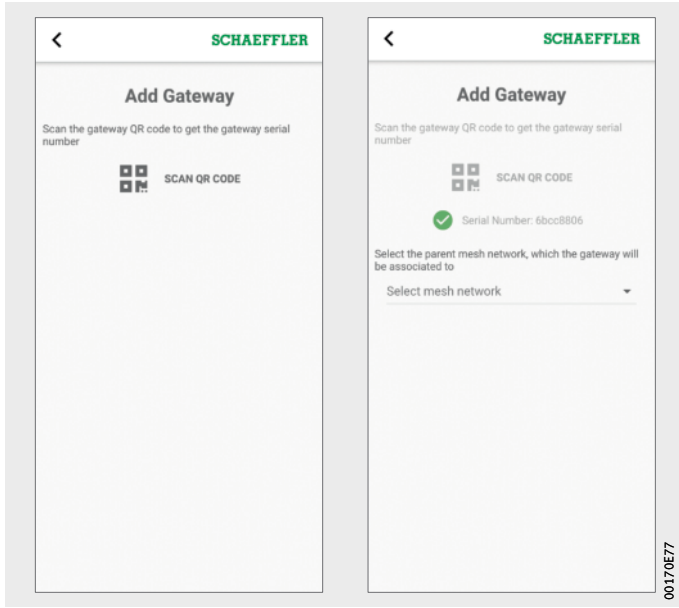


Figure 40
Add gateway

▶ Scan the gateway's QR code to read the QR code printed to the gateway.

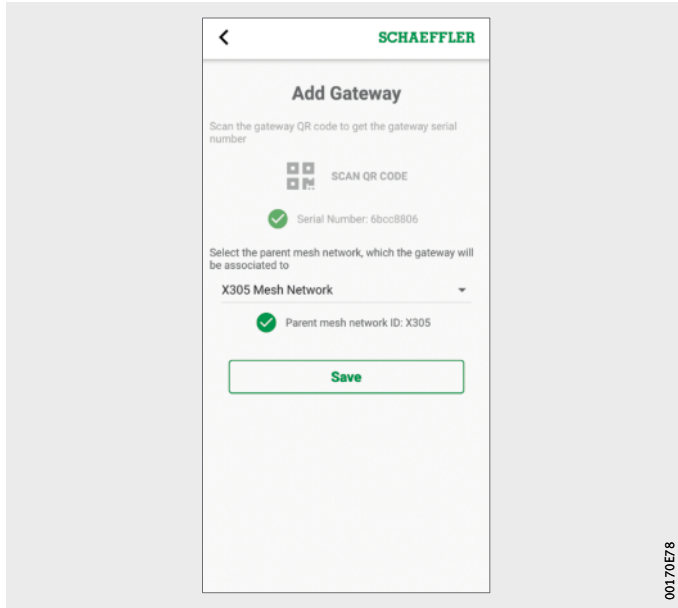


Figure 41
Save gateway

- ▶ As necessary, select the parent mesh network that the gateway should be associated with.
- ▶ Tap the [**Save**] button.

Using the OPTIME dashboard

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

The OPTIME dashboard helps users and administrators to actively monitor the machine status and to display alarm messages based on learned KPI limit values and indications of potential defects affecting the machines in a control room type of environment. The users are able to view and create asset log entries for machines and acknowledge alarms. It is also possible to analyse OPTIME sensor KPI data and raw data.

The administrators are authorised to view the network topology in order to evaluate the sensor states in more detail. In management mode, the administrators can add, edit and delete users and profiles as well as send notifications to users. At corporate and mesh network level, the administrators can also manage the process area, department and machine structure (assets) and mesh networks (devices).

The OPTIME dashboard permits the following functions:

- active monitoring of machines and their KPIs
- display of alarm notifications based on learned KPI thresholds as indicators of potential defects on the machines
- acknowledgement of alarm notifications
- display and generation of log entries for machines
- display of sensor KPI data and raw data
- communication with experts to analyse possible defects on machines.

Other functions are only available to administrators:

- user management:
  - add, edit and delete users and profiles
  - send notifications to users
- manage assets:
  add, move and delete gateways and sensors.

Note

Reliable alarm notifications are only displayed after completion of the learning phase during which each sensor is “trained” to establish and respond to threshold values.

System requirements

The following minimum requirements must be met in order to be able to use the OPTIME dashboard:

- System requirements:
  - Windows 10, current macOS or current Linux operating system
  - high-resolution screen
  - rapid internet connection
- Browser:
  - Google Chrome
  - Microsoft Edge
  - Mozilla Firefox
  - Safari
  - Microsoft Internet Explorer
    (limited support for Microsoft Internet Explorer 11 and older).

Registration, login and logout

The Administrator account is created automatically as part of the order process. Other users are managed by the administrator. All new users created by the administrator receive their login details by e-mail.

Login

To log in:

▶ Go to the OPTIME customer portal at: https://schaeffler-optime.com/dashboard

Figure 42
Login

▶ Enter your user name and click on [**Continue**].

▶ Enter your password and click on [**LOGIN**].

▶ If you have forgotten your password click on “Forgot password?” to reset your password.

▷ Your new login details will be sent to you by e-mail.

NOTICE

Any unauthorised use of the OPTIME system can result in substantial damage to other material assets. A new, secure password must be created for the initial login. Make a note of your user name and password, as you will need these to log onto both the OPTIME app and the OPTIME dashboard. ◁

Logout

To finish a session you need to log out again.

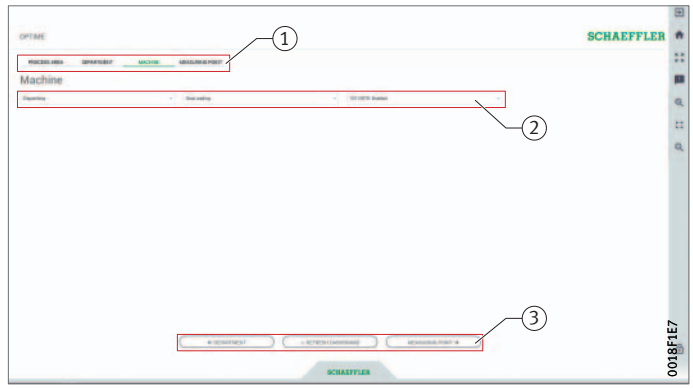
- ▶ Click on the [**SETTINGS**] button, *Figure 44*, page 66.
- ▶ Click on the [**LOG OUT**] button.

General navigation

For operation of the app the various pages contain navigation elements and settings options.

Navigation elements

The app pages contain the hierarchy path, drop-down menus and navigation buttons that provide several options for reaching navigation targets.

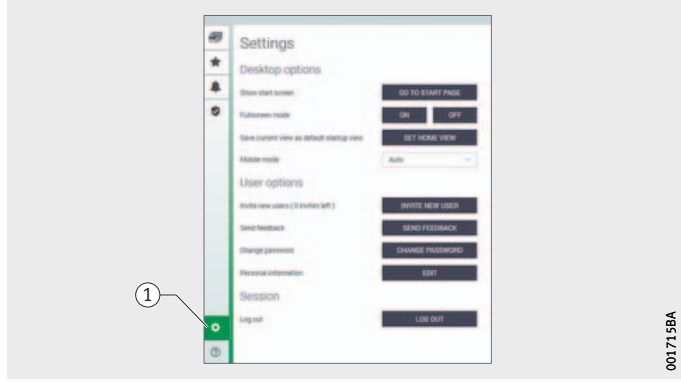


① Hierarchy path
② Drop-down menus
③ Navigation buttons

Figure 43
Navigation elements

Settings

The left-hand menu bar is expanded using the [**Settings**] button. In addition to logout, other settings are available for adjusting the [**Desktop Options**] and [**User Options**].



① [**Settings**]

Figure 44
Other settings

Explanations

Designation	Description
[**GO TO START PAGE**]	Switches to the start page.
[**FULLSCREEN MODE**]	Toggles full screen mode on and off.
[**SET HOME VIEW**]	Sets the current page as the home view.
[**MOBILE MODE**]	Enables mobile device mode.
[**INVITE NEW USERS**]	Button takes the user to the “invite new user” page (for administrators only).
[**SEND FEEDBACK**]	Button takes the user to the “send feedback” page.
[**CHANGE PASSWORD**]	Button takes the user to the “change password” page.
[**EDIT PERSONAL INFORMATION**]	Adjust user profile.

Search function and filters

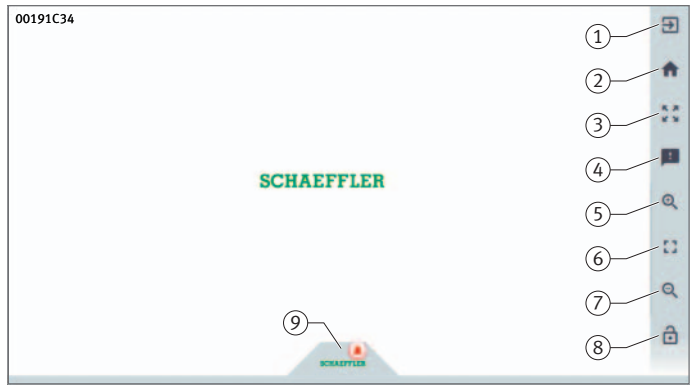
The search function can be used in various sections of the OPTIME dashboard and helps refine search results for assets, machines or sensors according to specific criteria.

Filters can be set based on an input-capable search string, the criticality of the machine and the machine type. The filters can be reset using the [**Clear Filters**] button.

Description of dashboard

Start page

After logging in, the user is taken to the start page or a user-defined dashboard, depending on the user's settings. The pages contain standardised navigation elements.



① [Logout]
② [Go to start page]
③ [Toggle fullscreen]
④ [Give feeback]
⑤ [Zoom in]
⑥ [Reset Zoom to 1:1]
⑦ [Zoom out]
⑧ [Auto-hide the menu]
⑨ [Schaeffler-Tab]

Figure 45
Start page

Explanations

Designation	Description
[Logout]	Logs the user out.
[Go to start page]	Switches to the start page.
[Toggle fullscreen]	Switches to full screen mode.
[Give feeback]	Opens the feedback page.
[Zoom in]	Magnifies the view.
[Reset Zoom to 1:1]	Returns to the default view.
[Zoom out]	Reduces the view.
[Auto-hide the menu]	Hides the menu. The same button can be used to show the menu again.
[Schaeffler-Tab]	Provides access to other functions, see page 77.

Using the dashboard levels

Various dashboard levels are accessible via the structure tree on the [**Resource Browser**] page:

- level [**Process Area**]
- level [**Department**]
- level [**Group**]
- level [**Machine**]
- level [**Sensor**].

Alternatively, the individual dashboard levels can also be accessed via the tab of the same name.

Level [Process Area]

The process area assigned to the user is visible in the [**Process Area**] level. The page is subdivided into departments, alarm notifications and user-defined groups. An overview of the sensor conditions is provided at the bottom of the page.

① [**Departments**]
② [**Machines with alarm notifications**]
③ [**My groups**]
④ [**Sensor condition**]

Figure 46
Level [**Process Area**]

Explanations

Designation	Description
[**Departments**]	Displays a list of alarm notifications for departments with the number of alarms and colour-coded representation of the warning level.
[**Machines with alarm notifications**]	Displays a list of alarm notifications for machines with the number of alarms and colour-coded representation of the warning level.
[**My groups**]	Displays user-defined groups.
[**Sensor condition**]	Displays lists of the sensors that have one of the following conditions: - low battery level - no connection - new sensor - learning mode.

Clicking on a department name in the list will take you to the [**Department**] level.

Clicking on a machine name in the list will take you to the [**Machine**] level.

Clicking on an alarm counter in the list will take you to the [**Alarms & Events**] view.

You can use filters on the lists [**Departments**] and [**Machines with alarm notifications**], see page 66.

The list under [**My groups**] shows the user-defined groups set up in the OPTIME app.

The colours used to display the warning level in the lists under [**Departments**] and [**Machines with alarm notifications**] are determined from the highest alarm level for an individual characteristic value that applies to the department or machine.

The sensors in the expanded menus under [**Sensor condition**] are sorted according to alarm level. Clicking on a sensor in the drop-down menus under [**Sensor condition**] will take you to the [**Sensor**] level.

Level [Department]

The [**Department**] level shows the user the machines from a selected department.

① [**Department name**]
② [**DEPARTMENTS**]
③ [**GROUPS**]

Figure 47
Level [**Department**]

Explanations

Designation	Description
[**Department name**]	Displays the name of the department.
[**DEPARTMENTS**]	Displays the machines from a department.
[**GROUPS**]	Displays the machines in a user-defined group.

You can use filters in the displayed list of machines, see page 66.

The machines are ordered so that the machine with the most critical alarm status is at the top.

For further information on the colour coding and designation of alarms, see page 79.

The [**Status**] column displays the symbol for the machine in the colour of the alarm level. The machines can be identified from the [**Machine-ID**] and [**Machine Name**] columns. Clicking on the ID will take you to the [**Machine**] level.

The [**Machine Status**] and [**Notifications**] columns display the alarm status. Clicking on an alarm counter in the list will take you to the [**Alarms and Notifications**] view on the [**Resource Browser**] page.

The [**Warnings**] column displays sensor-specific alarm notifications about the battery level and errors in the transmission of data in the last 24 hours.

The [**Probable Cause**] column shows what the cause of the alarm notification might be based on the KPIs. The suggested cause can assist with error diagnosis.

The diagram under [**Machine Status Trend**] shows the trend in machine status over time.

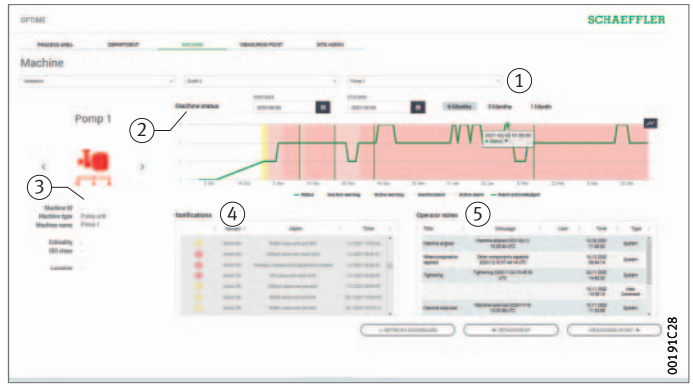
Level [Group]

The [**Group**] level shows machine groups compiled according to special criteria. The user can also create dedicated groups.

The [**Group**] level has the same functions as the [**Department**] level.

Level [Machine]

The [**Machine**] level shows the status of the machine.



① Filter for period of analysis
② [**Machine status**]
③ Machine symbol and machine metadata
④ [**Notifications**]
⑤ [**Operator notes**]

Figure 48
Level [**Machine**]

Explanations

Designation	Description
Filter for period of analysis	Start and end dates can be entered. Alternatively, the corresponding period up to the current date can be selected using the buttons [**1 Month**], [**3 Months**] or [**6 Months**].
[**Machine status**]	The machine status shows the state diagram and the alarm status.
Machine symbol and machine metadata	Depending on machine type, information can be entered to specify the machine in more detail.
[**Notifications**]	Displays the alarm notifications for the machine.
[**Operator notes**]	Displays the history of alarm notifications and log entries for the machine.

The machine name and symbol are used to identify the machine.

The metadata are listed below the symbol; depending on machine type this information could be:

- ID
- machine name
- description
- location
- speed
- machine type
- criticality
- department.

This information is specified when installing the sensor and can be edited via the OPTIME app.

The [**Machine status**] is updated once a day and is based on the KPI values determined for the sensor or sensors.

State diagrams

In the state diagrams the phases in which an alarm status is present are represented in different colours according to their alarm level.

Figure 49
Detailed state diagram

Active pre-alarms or main alarms are shown in the table with a yellow or red background. The acknowledgement of an alarm notification by the user is indicated by vertical green stripes. An active alarm occurs when the data last transmitted still justify the alarm but the alarm has not yet been acknowledged. An inactive alarm occurs if the data last transmitted no longer justify the alarm. From the machine status diagram, the user can also see the active and inactive alarms.
The inactive alarms are pale in colour and the active alarms are a darker colour.

Moving the mouse cursor over the diagram reveals the tooltip, which can be used for more precise determination of time and machine status.

Alarm notifications for the machine

The pre-alarms, main alarms and possible causes are listed as alarm notifications.

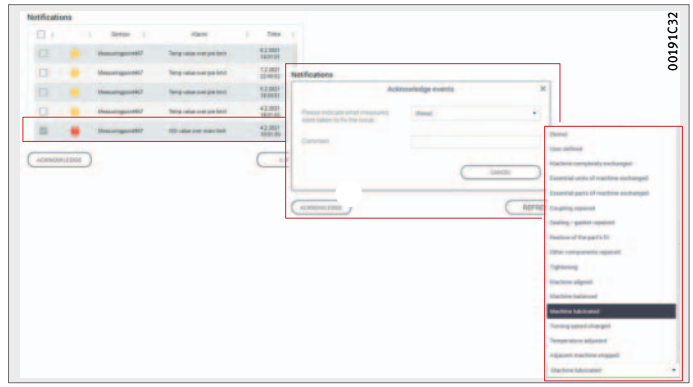


Figure 50
Examples of alarm notifications

An alarm notification can be acknowledged directly by inserting a tick in the line to be confirmed. The [**ACKNOWLEDGE**] button opens an input field. The action taken is then selected from the drop-down menu. Further information can be entered in the Comments field. The acknowledgement is completed by clicking on the [**CONFIRM**] button. The alarm notification is saved in the history with a time stamp and details on the user. Clicking on the lines in the list will also take the user to the [**Alarms & Events**] view, which provides more detailed information about the alarm notification.

History

Alarm notifications and log entries by personnel are archived chronologically in the history for each machine. Log entries performed by the operator in the OPTIME app are also visible in the history.

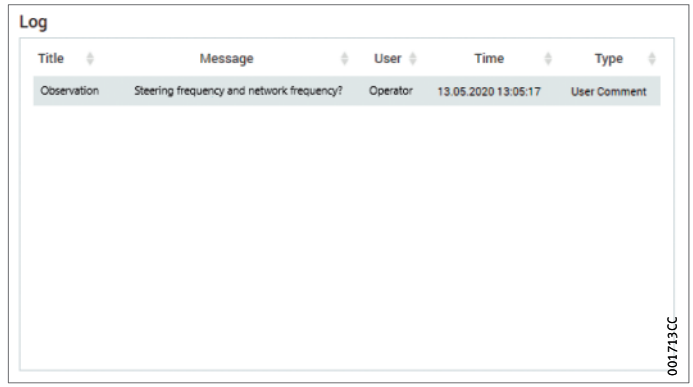


Figure 51
Examples of entries in the history

Level [Sensor]

The [Sensor] level displays details of the analysed data on vibrations and temperature that have been provided by the selected OPTIME sensor. The raw data of the sensor can also be displayed.

① Filter for period of analysis
② [RAW DATA]
③ [KPIS]
④ KPI diagrams
⑤ Sensor symbol and sensor metadata

Figure 52
Level [Sensor]

Explanations

Designation	Description
Filter for period of analysis	Start and end dates can be entered. Alternatively, the corresponding period up to the current date can be selected using the buttons [1 Month], [3 Months] or [6 Months].
[KPIS]	Displays the KPIs.
[RAW DATA]	Displays the raw data.
Tabs for KPI diagrams	The following KPIs are shown as state diagrams in the form of a graph: - [ISO] (mm/s) - [DeMod] (m/s^2) - [Temp] (°C) - [Kurtosis High] - [Kurtosis Low] - [RMS High] (m/s^2) - [RMS Low] (m/s^2) - [Anomaly Score].
Sensor symbol and sensor metadata	Information can be entered to specify the sensor in more detail.

The name and symbol are used to identify the sensor.

The metadata are listed below the symbol:

- ID
- machine type
- sensor type
- installation date
- date of last KPIs received
- date of last raw data received.

The sensors transmit the KPIs every four hours, which means that six KPI data samples are transmitted per day. If a dataset is not transmitted, the system interpolates the diagram on the basis of earlier and later values. Using the [**Toggle Markers**] button, the graph can be switched to show the points in time when the KPIs were received by the sensor.

Optionally, requests for KPIs and raw data can be initiated directly via the OPTIME app and OPTIME dashboard.

KPIs

The [**ISO/DeMod/Temp**] tab shows graphs for the basic data on condition monitoring, the ISO value (standardised vibration intensity to ISO 10816), the DeMod value (demodulation) and the temperature.

The [**Excess Kurtosis High/Low**] tab shows graphs for the excess kurtosis value in two different frequency ranges.

The [**RMS Upper Band/RMS Lower Band**] tab shows the RMS value of the vibration data, also for two different frequency ranges.

The [**Anomaly Score**] tab contains graphs based on an algorithm developed specially by Schaeffler. This parameter shows a significantly lower dependency on operating parameters such as speed and power.

Raw data

Using the [**RAW DATA**] button, the user can access the raw data of the sensor instead of the calculated KPIs.

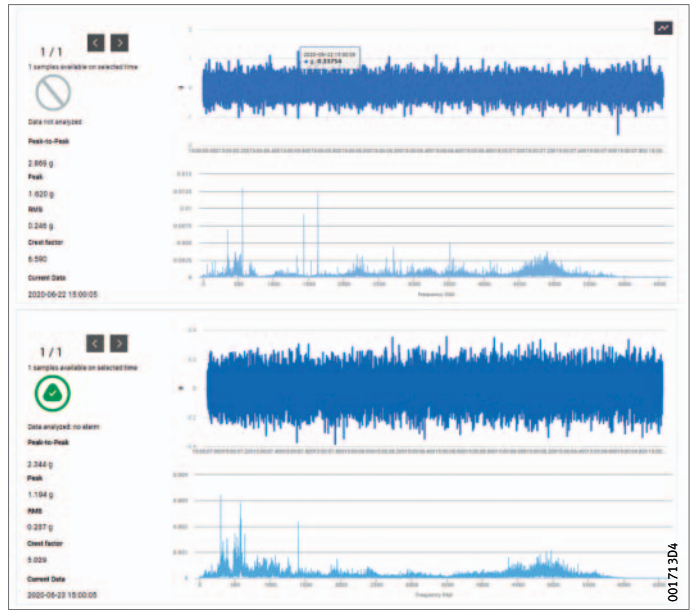


Figure 53
Display of raw data

[Schaeffler-Tab]

Use the [Schaeffler-Tab] button to access the various views.

① [Schaeffler-Tab]
② [Dashboard Browser]
③ [Favorites]
④ [Alarms & Events]
⑤ [Management Mode]
⑥ [Settings]
⑦ [Help]
⑧ [Resource Browser]
⑨ [Tab]
⑩ [Dashboard with vertical ellipsis menu (more options menu)]

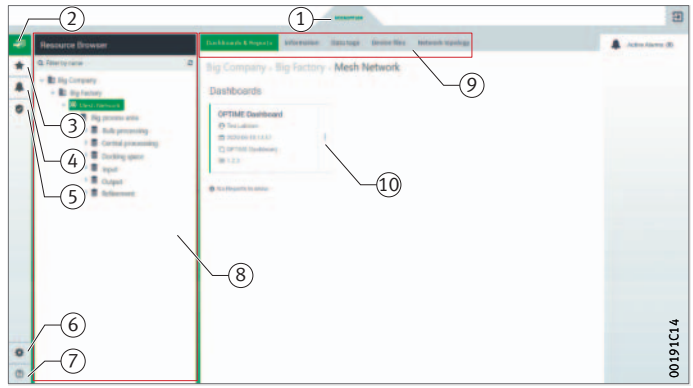


Figure 54
[Schaeffler-Tab]

Explanations

Designation	Description
[Dashboard Browser]	Switches to the view in which the [Resource Browser] and the [Dashboards & Reports] tab are displayed. Other tabs are only displayed for users with administrator rights.
[Favorites]	Switches to the view in which favourites are displayed.
[Alarms & Events]	Switches to the view in which the notifications are displayed.
[Management Mode]	Switches to the view in which the OPTIME dashboard is managed by users with administrator rights.
[Settings]	Switches to the view in which settings are carried out.
[Help]	Contains IoT ticket documentation about various views and settings. This support function has only limited validity for the use of OPTIME.
[Resource Browser]	Tree structure showing the hierarchical structure of your asset.
[Vertical ellipsis menu (more options menu)]	Provides access to other options.

For users with administrator rights, the [Schaeffler-Tab] offers extra functions if accessed via the [Management Mode] view.

[**Schaeffler-Tab**] The [**Schaeffler-Tab**] provides access to further functions, if you click on the button at the bottom of the page. Click on the button at the top of the page to close the view that was opened by the [**Schaeffler-Tab**].

[**Resource Browser**] The [**Resource Browser**] view shows the hierarchical structure tree which depicts the asset.

Various tabs are available:

- [**Dashboard & Reports**] (all users)
- [**Information**] (administrators only)
- [**Data tags**] (administrators only)
- [**Device files**] (administrators only)
- [**Network topology**] (administrators only).

[**Favorites**] The [**Favorites**] view shows the dashboards that you have selected using the [**Add to Favorites**] button.

[**Alarms & Events**] The [**Alarms & Events**] view is used to manage alarm notifications, see page 79.

[**Dashboard**] The designated dashboards are displayed on the page. The number of dashboards displayed depends on how the system tree has been set up.

Alarms

In the [**Alarms & Events**] view, alarms for departments, machines and sensors are displayed in one place. The user can reach the [**Alarms & Events**] view from several access points on the OPTIME dashboard.

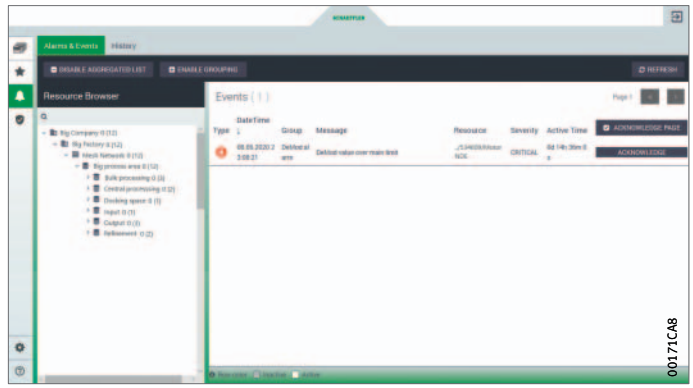


Figure 55
Display of alarm notifications [**Alarms & Events**]

The [**Schaeffler-Tab**] provides access to further functions, if you click on the button at the bottom of the page. Click on the button at the top of the page to close the view that was opened by the [**Schaeffler-Tab**]. Alternatively, the [**Alarms & Events**] view can be accessed from the Department level by clicking on the buttons under [**Notifications**], the colour of which indicates the status and additionally the number of alarm notifications.

Note

Reliable alarm notifications are only displayed after completion of the learning phase during which each sensor is “trained” to establish and respond to threshold values. The same applies for the alarm counter with the number of alarm notifications. The exception to this is the absolute alarms that are already triggered during the learning phase, see page 24.

Key information about the status of the monitored machines and assets is provided by the alarm status. Schaeffler has developed a dedicated logic for this value, for use in summarizing and evaluating all of the measured data. The alarm status is clearly indicated by the colour coding and defined designations. The diagrams showing the alarm status over time as a graph are to be interpreted in a similar way.

Colour coding and designations for alarms

Level in state diagram	Alarm level	Alarm status	Colour coding	Alarm notification
1	No alarm	Normal	Grey symbol	–
1 to 2	Low alarm level	Suspect		
2 to 3	High alarm level	Warning	Yellow symbol	Pre-alarm
3 to 4	Highest alarm level	Severe	Red symbol	Main alarm

Figure 56
State diagram with levels 1 to 4

Acknowledge alarm notifications in [Alarms & Events]

Alarm notifications can be acknowledged in the [**Alarms & Events**] view following validation and selection of remedial measures.

- ▶ Click on the [**ACKNOWLEDGE**] button.
- ▶ To acknowledge all visible alarms on a page following validation and selection of remedial measures, click on the [**ACKNOWLEDGE PAGE**] button.
- ▶ Click on the [**Schaeffler-Tab**] button to return to the previous dashboard.

An acknowledgement via the [**Alarms & Events**] view is not saved in the history and can be used to eliminate false alarms.

Note

Using the browser's [**Back**] button is not recommended, as it resets the dashboard view and the user must then navigate to the correct dashboard again.

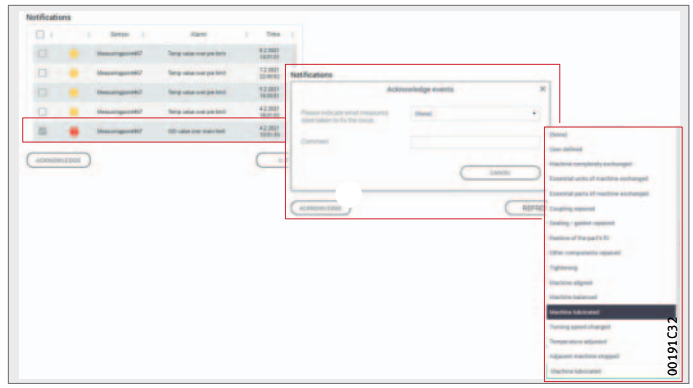


Figure 57
Acknowledge alarm notifications at [**Machine**] level

Another available option is to acknowledge alarms at [**Machine**] level.

- ▶ Click on the checkbox to select the alarm notification.
- ▶ Click on the [**ACKNOWLEDGE**] button.
- ▶ Select the action from the drop-down menu.
- ▶ Enter further information in the Comments field.
- ▷ The alarm notification is saved with a time stamp and details on the user.

Other dashboard options

Using the vertical ellipsis (more options) menu, further settings can be performed depending on the user's role and permissions.

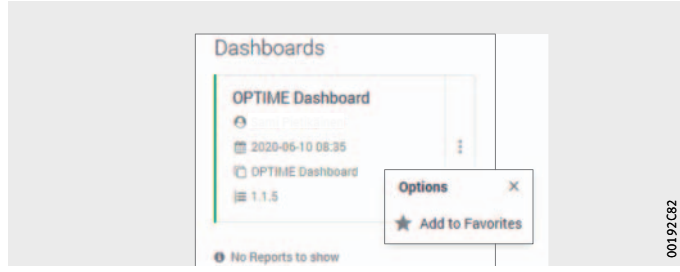


Figure 58
Vertical ellipsis menu (more options menu)

Troubleshooting and rectification

The Frequently Asked Questions (FAQ) on the OPTIME customer portal can assist with troubleshooting.

WARNING

The incorrect handling of sensors may result in leaks or the emission of evaporated electrolyte that can cause a fire or an explosion and lead to serious injuries or death. The sensors may only be returned following consultation with Schaeffler. It is imperative that sensors are deactivated for return shipment. If there is a battery fault, shipping of the device is not permitted in accordance with the hazardous goods regulation. The sensor must be properly disposed of on site in accordance with the national disposal regulations. ◁

Decommissioning

The gateway and sensors are maintenance-free. They cannot be repaired.

The sensors need to be deactivated for decommissioning, see page 33.

Disposal

After use, dispose of gateway and sensors in an environmentally compatible manner in accordance with the respective national regulations at your location.

If possible, dispose of the packaging material in the appropriate recycling waste.

When you finally decommission the product, find out more about the applicable disposal regulations from the recycling centre or from your specialist supplier.

Nameplate

The nameplate with the serial number (S/N) is located on the side of the housing. Beneath this is a QR code, in which the serial number is embedded.

Technical data, gateway

Designation		Value	Unit
Communication			
Wirepas Mesh (ISM band)		2,4	GHz
2G, LTE CAT M1 (other options available with installed local LTE stick: GSM, UMTS, LTE)		●	–
WiFi		2,4	GHz
Ethernet RJ45		●	–
SIM card format		Micro-SIM (3FF)	–
Electrical characteristics			
Power consumption		30	VA
Power supply AC		85 to 264	V
Frequency		47 to 440	Hz
Ambient conditions			
Protection class		IP66	–
Operating temperature		–20 to +50	°C
Storage	Temperature	–40 to +85	°C
	Humidity	20 to 90	%
Dimensions, mass			
Length		180	mm
Width		130	mm
Height		81	mm
Mass		≈ 1,2	kg
Certificates			
CE (EU directive 2014/53/EU), FCC, SRRC, IC, RCM, Anatel, NTC, NBTC, SIRIM, WPC		Current certifications https://www.schaeffler.de/std/1F8A	

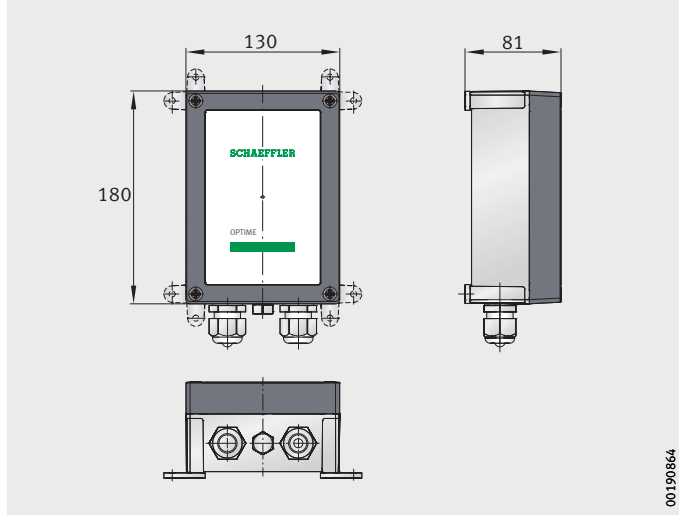


Figure 59
Gateway dimensions

Technical data, sensors

Nameplate

The serial number is printed on the sensor.

Technical data, OPTIME 3

Designation	Value	Unit
Measurement functions		
Temperature	–40 to +85	°C
Vibrations, calculated KPIs	▫ RMS_{low} ▫ RMS_{high} ▫ DeMod	m/s^2
	▫ $ISO_{velocity}$	mm/s
	▫ $Kurtosis_{low}$ ▫ $Kurtosis_{high}$	–
Measured values		
Bandwidth	2 to 3 000	Hz
Amplitude	±2, ±4, ±8, ±16	g
Measuring interval KPIs	4	h
Measuring interval time signal	24	h
Communication		
Sensor activation NFC (Near Field Communication)	●	–
Wirepas Mesh (ISM Band)	2,4	GHz
Line of sight range	100	m
Electricity supply		
Non-replaceable Li-$SOCl_2$ battery	●	–
Typical battery life (depending on the configuration)	5	years
Ambient conditions		
Protection class	IP69K	–
Operating temperature	–40 to +85	°C
Storage temperature (recommended)	0 to +30	°C
Dimensions		
Length	86	mm
Width	32,6	mm
Height	30,6	mm
Fixing method		
Threaded bolt (adapter available)	M6	–
Materials		
Mounting base	Steel AISI 316	–
Housings	Polycarbonate	–
Certificates		
CE (EU Directive 2014/53/EU), FCC, SRRC, IC, RCM, Anatel, NTC, NBTC, SIRIM, WPC	Current certifications https://www.schaeffler.de/std/1F8A	
ATEX/IECEx (from 2022)	Zone 1	–

Technical data, OPTIME 5

Designation	Value	Unit
Measurement functions		
Temperature	–40 to +85	°C
Vibrations, calculated KPIs	▫ RMS_{low} ▫ RMS_{high} ▫ DeMod	m/s^2
	▫ $ISO_{velocity}$	mm/s
	▫ $Kurtosis_{low}$ ▫ $Kurtosis_{high}$	–
Measured values		
Bandwidth	2 to 5 000	Hz
Amplitude	±2, ±4, ±8, ±16	g
Measuring interval KPIs	4	h
Measuring interval time signal	24	h
Communication		
Sensor activation NFC (Near Field Communication)	●	–
Wirepas Mesh (ISM Band)	2,4	GHz
Line of sight range	100	m
Electricity supply		
Non-replaceable Li-$SOCl_2$ battery	●	–
Typical battery life (depending on the configuration)	5	years
Ambient conditions		
Protection class	IP69K	–
Operating temperature	–40 to +85	°C
Storage temperature (recommended)	0 to +30	°C
Dimensions		
Length	86	mm
Width	32,6	mm
Height	30,6	mm
Fixing method		
Threaded bolt (adapter available)	M6	–
Materials		
Mounting base	Steel AISI 316	–
Housings	Polycarbonate	–
Certificates		
CE (EU Directive 2014/53/EU), FCC, SRRC, IC, RCM, Anatel, NTC, NBTC, SIRIM, WPC	Current certifications https://www.schaeffler.de/std/1F8A	
ATEX/IECEx (from 2022)	Zone 1	–

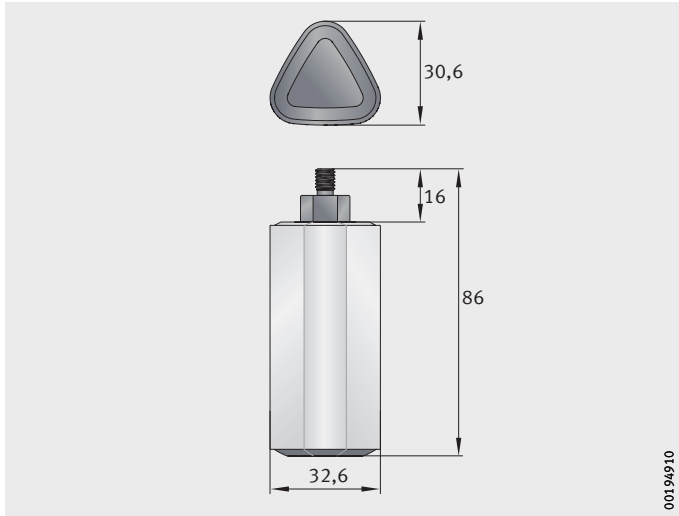


Figure 60
Sensor dimensions

Appendix
EU Declaration of Conformity

SCHAEFFLER

CE

EU Declaration of Conformity

in accordance with the *Radio Equipment and repealing Directive 2014/53/EU*

We hereby declare that the product described below, complies with the relevant fundamental health and safety requirements of the EU directives mentioned below, due to its design and construction as well as in the version we have placed on the market.
This declaration is issued under the sole responsibility of the manufacturer.

Product: Wireless Vibration and Temperature Sensor

Optime AW3 & AW5

The product complies with following directives and standards:

- Radio Equipment and repealing Directive (2014/53/EU)
- Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) (2011/65/EU)
- Low Voltage Directive (2014/35/EU)
- Directive relating to Electromagnetic Compatibility 2014/30/EU

The conformity assessment procedure referenced to article 10 and detailed in Annex III of the Radio Equipment Directive 2014/53/EU has been followed and preformed with the involvement of the following notified body - Name and Number: SGS Fimko Ltd / 0598

Applied harmonized norms, which are published in the Official Journal of the EU:

- EN62368-1:2014+A11:2017
- EN60950-22:2017
- EN62479:2010
- EN301489-1 v2.1.1
- EN301489-3 v2.1.1
- EN301489-17 v3.1.1
- EN300328 v2.2.1
- EN300330 V2.1.1

Date:01/07/2020

Signature:

Dr. Ing. Hans-Willi Keßler
Managing Director

Schaeffler Monitoring Services GmbH
Kaiserstrasse 100,
52134 Herzogenrath

Signature:

p.p. Dipl. Ing Götz Langer
Leiter Entwicklung (CE-Representative)

Schaeffler Monitoring Services GmbH
Kaiserstrasse 100,
52134 Herzogenrath

This declaration certifies the compliance with the directives mentioned, but it does not include any assurance of properties.
The product needs to be installed correctly in accordance with the commissioning instructions in the user manual.
The safety instructions in the operating instructions must be observed.

Schaeffler Monitoring Services GmbH • Kaiserstrasse 100 • D-52134 Herzogenrath

0017239A

Figure 61
EU Declaration of Conformity

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52134 Herzogenrath
Germany
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BA 68 / 02 / en-GB / DE / 2022-01