SCHAEFFLER

OPTIME

User manual

Foreword

OPTIME provides a complete condition monitoring solution

The OPTIME system from Schaeffler is a complete solution for simple condition monitoring of a large number of machines. This concept allows cost-effective condition-based maintenance even for subsystems, as unscheduled downtimes can be avoided.

When developing the system particular attention was paid to ensuring very simple start-up, easy scalability and a diverse range of potential uses. Every single process step was designed to be as user-friendly as possible.

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 the information they need.

Current version

You will find the latest electronic version (PDF) of this user manual at: https://www.schaeffler.de/std/1F40

Contents

About the user manual

This user manual covers the OPTIME condition monitoring system.

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 structure may occur. ◁

Availability

The latest electronic version (PDF) of this user manual is available from: 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

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General safety guidelines

This chapter brings together all the important safety regulations.

Anyone tasked with working on the system must read this chapter and follow the instructions given.

Principles

The OPTIME condition monitoring system complies with the state-of-the-art and the recognised safety rules. 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 gateway of the OPTIME condition monitoring system is marked with a serial number. The gateway nameplate contains the serial number, manufacturer's details and 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 76. Unauthorised 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 06/2021).

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 qualifications of personnel

The OPTIME condition monitoring system may only be installed, commissioned and operated by suitably qualified personnel. The accountabilities, area of responsibility and supervision of personnel have to 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 you corresponding product training on request.

Work on electrical devices

Work on electrical devices and components 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.

Warning notices

Please read this document before commissioning the system. Make sure that the product is suitable without restrictions for the relevant applications.

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

Schaeffler Monitoring Services GmbH herewith declares that the OPTIME gateway and OPTIME sensor wireless systems comply with Directive 2014/53/EU.

The device may only be installed by a trained electrician.

Carry out the installation in accordance with the national and international regulations covering the installation of electrical equipment.

Before mounting 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.

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 condition.

The use of the OPTIME condition monitoring system is only admissible within the boundaries of the conditions stated and illustrated in the user manual.

The system may only be operated within the limits described in the data sheet. If the system is operated outside these limits system components may be destroyed.

Do not repair any damaged components of the OPTIME condition monitoring system but instead please arrange to have any necessary repairs carried out by Schaeffler Monitoring Services GmbH.

Only dismantle the OPTIME gateway with the power switched off and in a voltage-free condition.

Safety regulations

All important safety specifications are described in the following sections.

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. 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.

If the sensors are handled incorrectly there can be a risk of leaks or the emission of evaporated electrolyte that can cause fire or 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

The scope of supply comprises, *Figure 1*:

- OPTIME Gateway
- Quick guide manual BA 68-02.

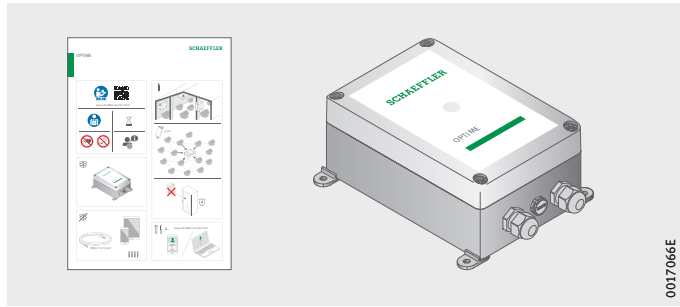


Figure 1
Scope of supply
Gateway

Sensor kits

Depending on the sensor kit ordered, the scope of supply comprises, *Figure 2*:

- 10×OPTIME 3 sensors or
  10×OPTIME 5 sensors
- 10×mounting plates
- Quick guide manual BA 68-01.

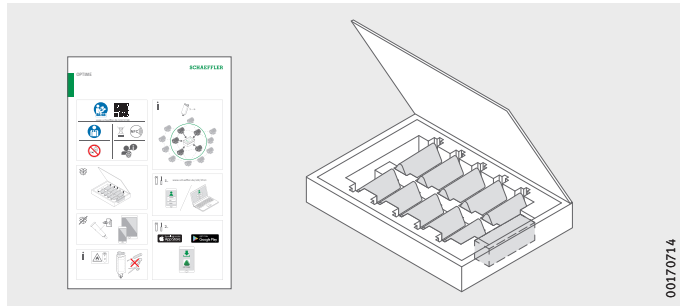


Figure 2
Scope of supply
Sensor kit

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 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.

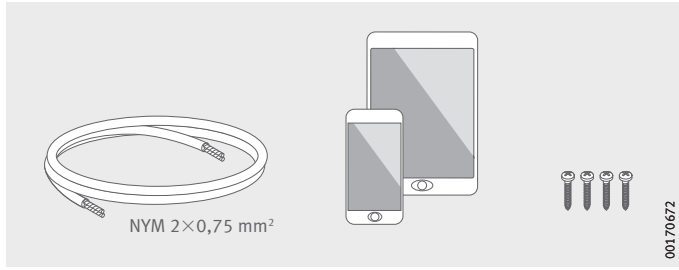


Figure 3
Required accessories for the gateway

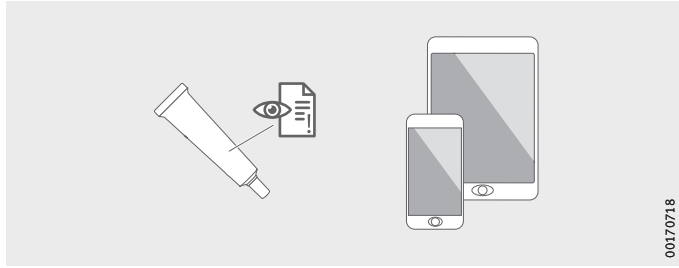


Figure 4
Required accessories for the sensors

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
OPTIME condition monitoring system

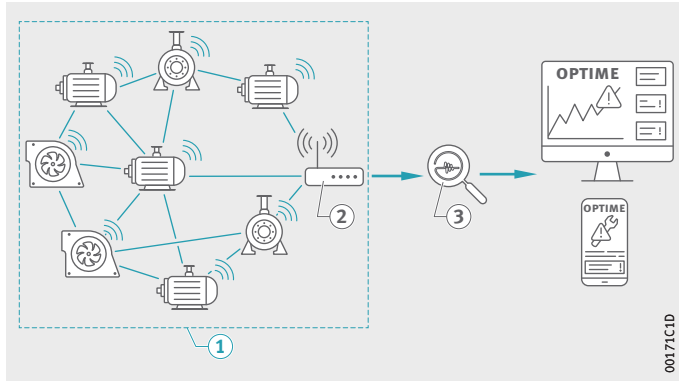
The sensors automatically form a mesh network that transfers data directly or via other sensors to the gateway. In the network, the sensors transfer raw data on vibrations as well as KPIs via the gateway to the Schaeffler IoT Hub, where the data are analysed and the results sent to the OPTIME app. All 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 this starts the learning mode, 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 you only need to select the corresponding sensor during 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 will get an administration user account when the OPTIME system has been purchased. This user is able to create additional users. All created users will get their login data via email. 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.

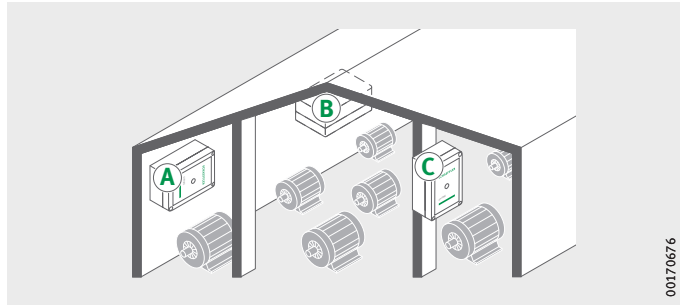


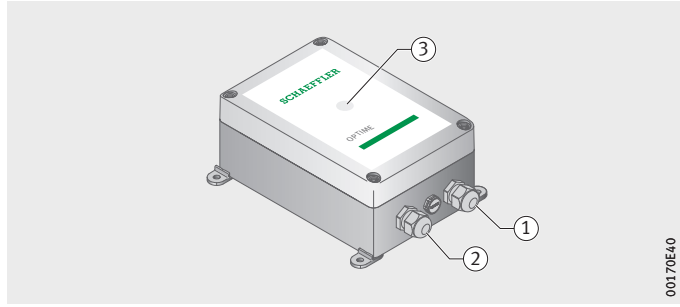
Figure 7
Gateway in the system, suitable installation positions

When choosing the mounting location, please remember that reinforced concrete or larger metal 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*.



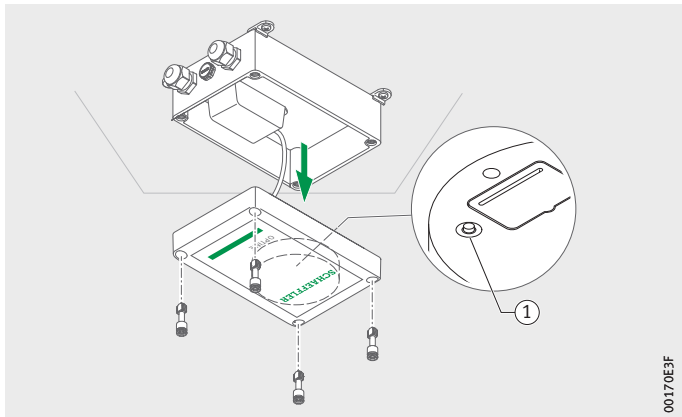
① Input power supply
② Input network connection
③ LED for indicating operating status

Figure 8
Gateway connections and indicators

The gateway is equipped with an LED indicator that shows various operating statuses, see *table*, page 16.

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 10 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 10 Hz to 5 kHz and can therefore also be considered for monitoring the following applications:

- pumps
- geared motors
- gear box
- compressors.

The OPTIME system is suitable for machines that run continually or partly continually. Machines that are only operated for short phases during the day are less suitable for monitoring by OPTIME. In addition, the machine should normally run in a stable operating condition (speed and performance) for a period of around one hour. With OPTIME 3 sensors, machine speeds of 100 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 considered, see *table*.

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	☐ Bearing of saw blade
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 19.

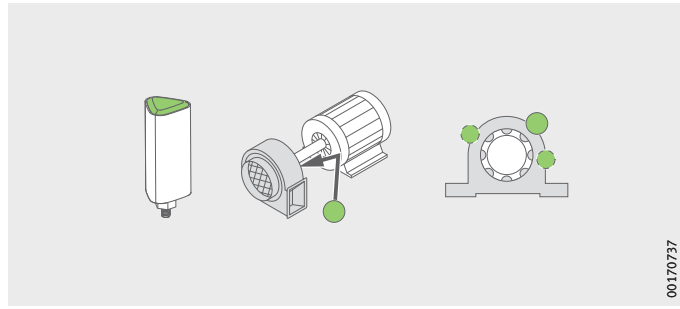


Figure 10
Examples of mounting positions with OPTIME 3 sensor

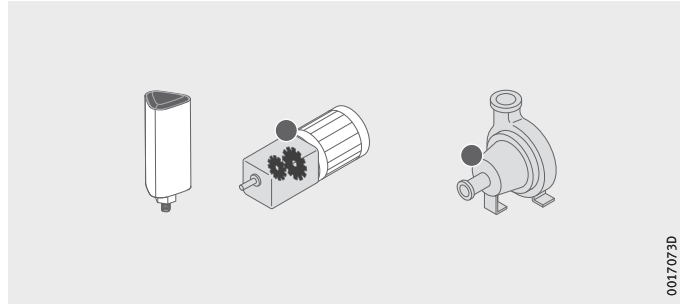


Figure 11
Examples of mounting positions with OPTIME 5 sensor

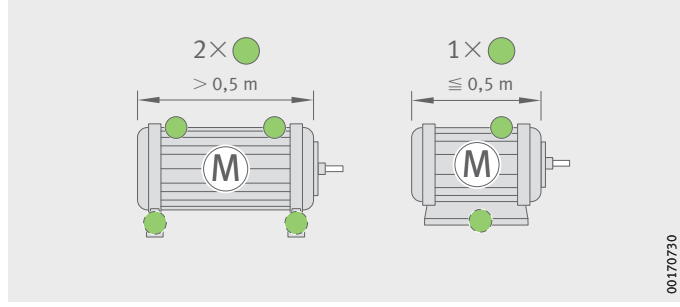


Figure 12
Examples of mounting positions for large and small motors

In the case of machines that are significantly larger than 0,5 m, it is recommended to use at least two sensors to be able to readily identify potential damage. 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.

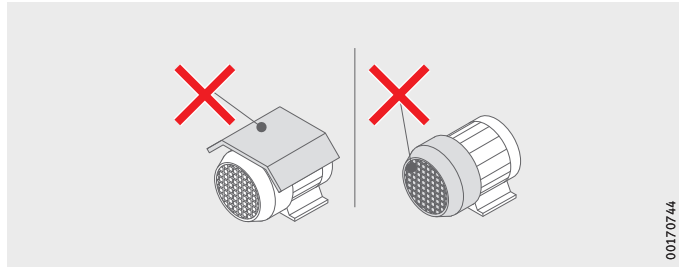


Figure 13
Examples of unsuitable mounting positions

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 10 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.

Temperatures below –10 °C or above +60 °C can lead to a shorter service life. Battery service life is also reduced by other factors, like the quality of the connection to the gateway or if a sensor functions as a repeater for other sensors.

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.

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

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 of the machine it is extremely important to start the learning period again from the OPTIME app, so that new alarm thresholds can be learned.

Transport and storage

The packaging of sensor and gateway do 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 resulting in 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

Because they contain non-replaceable lithium thionyl chloride batteries, the sensors are classified as dangerous goods during transport. 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 27. ◁

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 57. You can configure the components of your system, i. e. gateway and sensors, for your system layout. This can be done following completion of registration either in the OPTIME dashboard or OPTIME app.

Install OPTIME app

Before installing the components of the OPTIME condition monitoring system, you 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 onto the OPTIME app, see page 35.

Install gateway

For a first-time installation 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 and tap on the [**Add Gateway**] button.

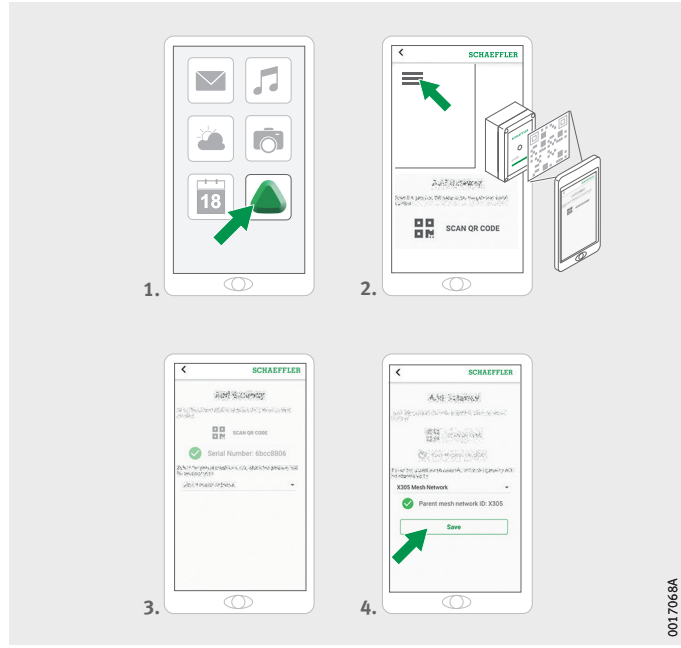


Figure 14
Register gateway

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

For further information on configuring the gateway, see page 32.

For further information on the gateway in the OPTIME app, see page 55.

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 metal 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.

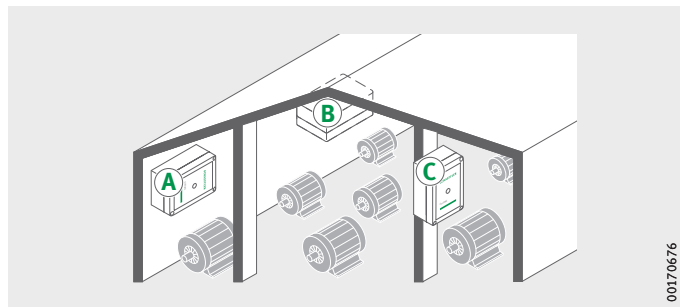


Figure 15
Mounting location for gateway

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 mains voltage is to be connected by a qualified electrician.

▶ Fix the gateway to the selected location.

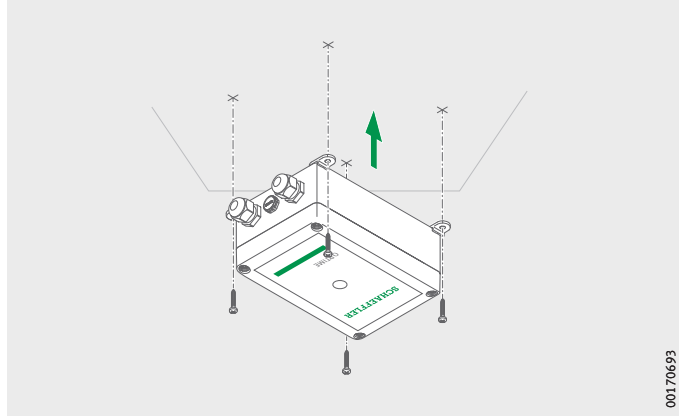


Figure 16
Mount the gateway

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 adhere to the safety regulations can cause a life-threatening electric shock. Make sure that all electrical connections are carried out only by skilled personnel who observe the safety regulations. ◁

WARNING

A defective connection cable can cause a life-threatening electric shock, so you must change any defective connection cables immediately. ◁

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

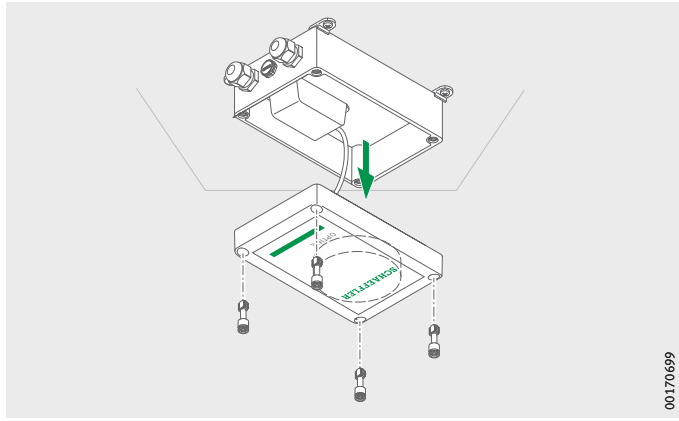


Figure 17
Open cover

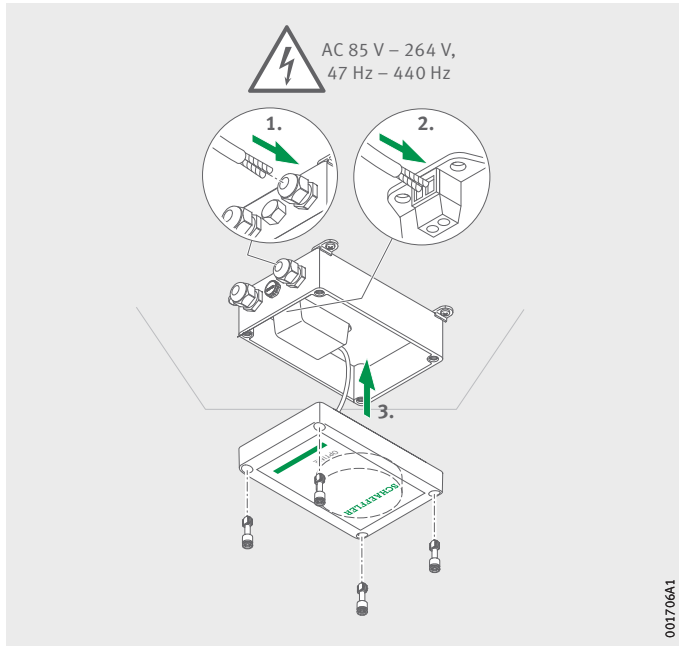


Figure 18
Complete the electrical connections to the gateway

▷ 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 32:

- 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, like the natural oscillation from 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.
- ▶ Using the menu, tap on the [**Add sensor**] button.

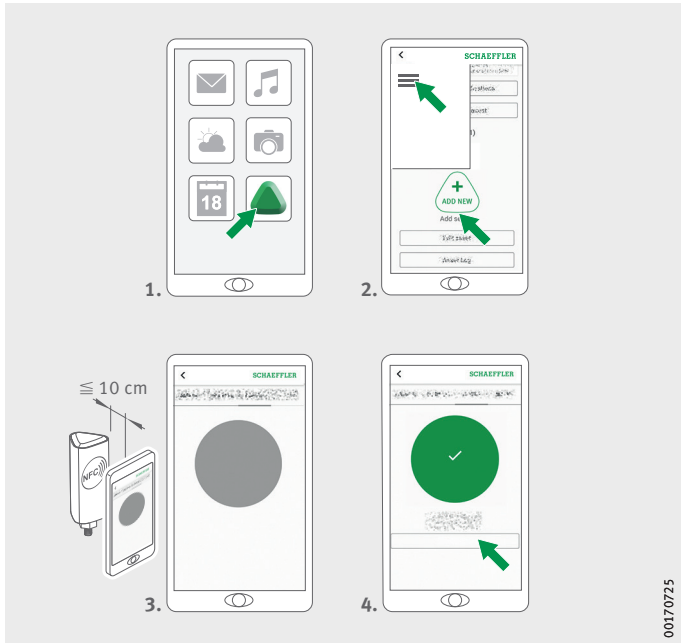


Figure 19
Activate sensor

- ▶ 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 48.
- ▶ Tap the [**Deactivate sensor**] button.
- ▶ Follow the instructions in the OPTIME app to deactivate 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 or death. Deactivate the sensor before handing it over for proper disposal. Sensors also have to 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 18.

NOTICE

Risk of damage due to incorrect installation. To ensure optimum condition monitoring you may wish to get support 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 to 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 to mount the sensors directly to 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.

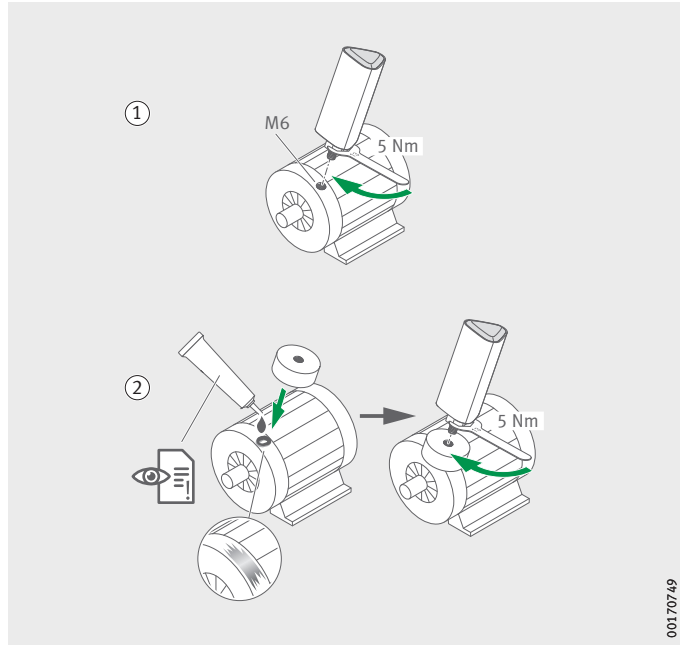
The scope of supply for the sensors includes mounting plates that can be glued on if there is no screw-in thread on the machine.

NOTICE

Screwing the sensor onto a highly curved surface can result in the sensor bolt twisting and cause permanent damage to the device. ◁

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

- 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 Installing a sensor using a mounting plate
Other option: with adapter M8 on M8 (accessory)

Figure 20
Mounting options

Mounting a sensor into a thread

To mount a sensor into an existing thread on the machine you need a flat surface and a screw-in thread with an M6 internal thread, *Figure 20*:

▶ Clean the machine surface.

▶ Insert the sensor screw into a screw-in thread with an M6 internal thread.

▶ Tighten the sensor screw with a maximum torque of 5 Nm.

NOTICE

There is a risk of damage if the specified 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 screw. ◁

Install sensor with mounting plate

The mounting plate can be used to fix the sensor to a machine with no thread, *Figure 20*, page 30. You will need a mounting plate, suitable adhesive and a surface with a diameter of 32 mm.

NOTICE

Select a suitable adhesive. Follow the adhesive instructions and safety data sheet. Direct skin contact with the adhesive can lead to injuries. Use suitable gloves.

The sensor fixing cannot be removed again after installation without damage. ◁

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

NOTICE

Observe the curing times specified in the adhesive instructions. ◁

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

NOTICE

There is a risk of damage if the specified 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 screw. ◁

Configure sensor

The sensor receives the network parameters automatically via the OPTIME app. For configuration purposes the minimum information necessary is the machine type (e.g. motor, pump, fan). All other data on the machine (like 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 52.

Gateway configuration

Various interfaces are available for communication between 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.

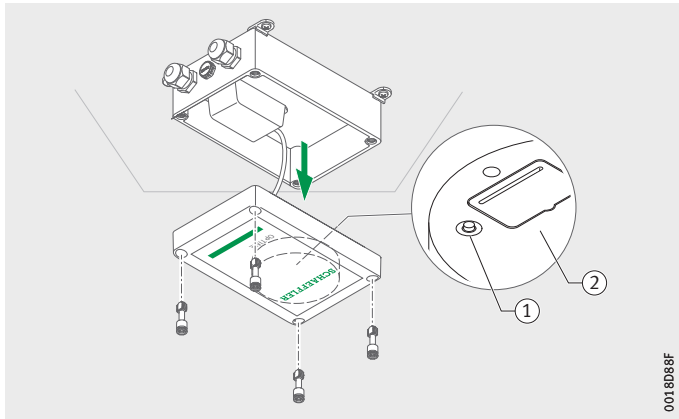
The following settings can be changed:

- 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 numbe*r" is the serial number of the gateway.

The serial number is on the label 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.

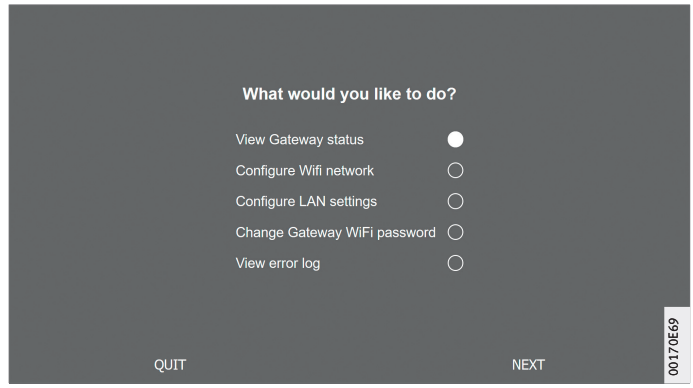


Figure 22
Drop-down menu for gateway configuration

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**].

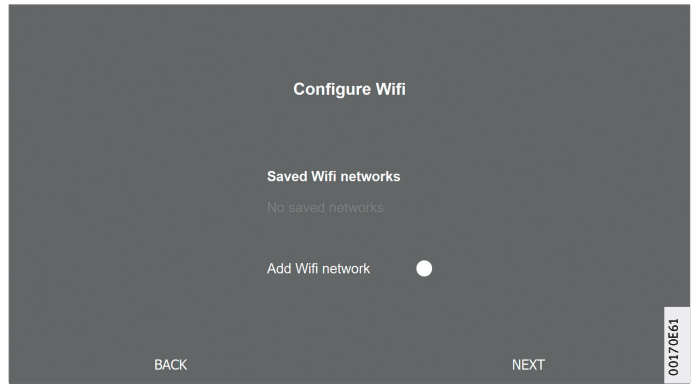


Figure 23
Settings for operation in WiFi network

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 done under the menu item [**Configure LAN settings**].

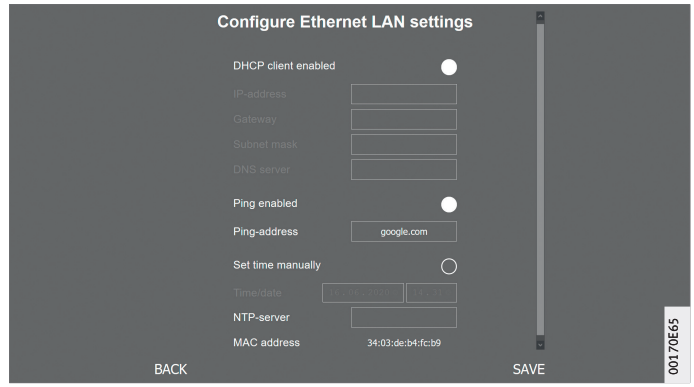


Figure 24
Settings for operation in LAN network

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 maintain the OPTIME condition monitoring environment, to receive up-to-date information on the condition data and react to changes in the condition data.

With the OPTIME app you can retrieve the sensor data locally via a wireless connection. You will get information on the status of the machine and its last operating values. In addition, the sensors are commissioned and configured with the help of the OPTIME app. The menu navigation guides the user and helps them add, configure and manage sensors.

Login and logout

To log into the OPTIME app as a user you will need login data. Every customer will get an administration user account when the OPTIME system has been purchased. This user is able to create additional users. All created users will get their login data via email.

The customer's administrator receives login data by registering on the OPTIME dashboard, see page 58. Only the administrator can set up additional user accounts.

Login

To login:

▶ Start the OPTIME app.

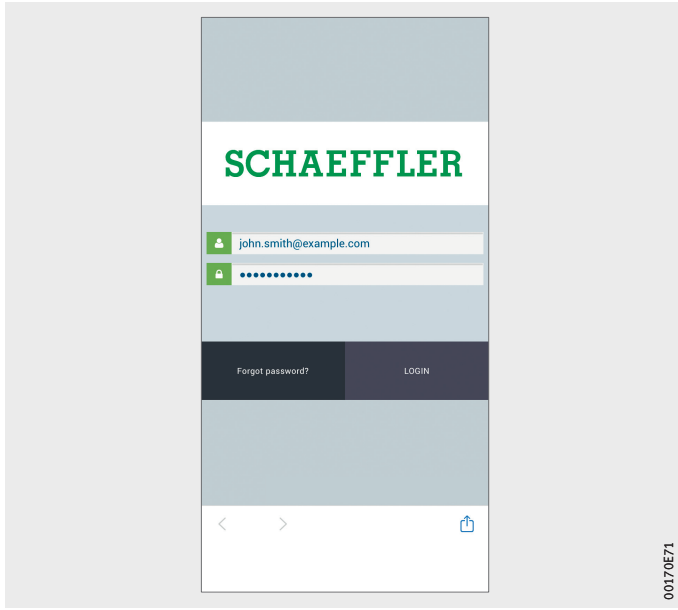


Figure 25
Log into the OPTIME app

▶ Enter your login data.

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

▶ Tap the [**Login**] button.

Logout

To log out:

▶ To log out, go to the menu and tap the [**Logout**] button, *Figure 26*, page 36.

General navigation

To run the app there are core navigation elements and settings options located in the various screens.

The following areas in the OPTIME app can be accessed to monitor the machines in the asset systematically:

- group
- machine
- sensor.

User roles

The OPTIME app has the same structure for each user. Depending on 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

Navigation is via the drop-down menu, accessible via the symbol [**Menu**], and the main buttons.

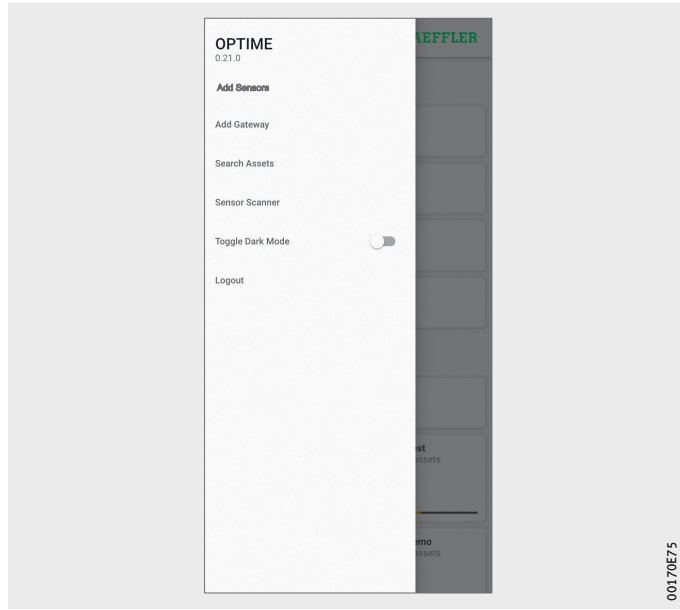


Figure 26
Direct access
via navigation elements

Menu

Button	Description
 [**Menu**]	Opens other entries.
[**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 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, e. g. at group, machine or sensor level.

Search function and filters

The search function can be used in various areas 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.

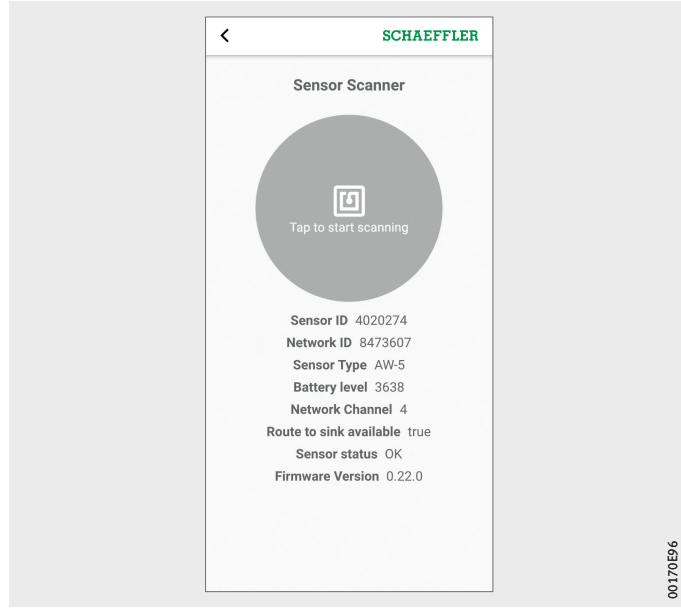


Figure 27
Sensor Scanner

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.

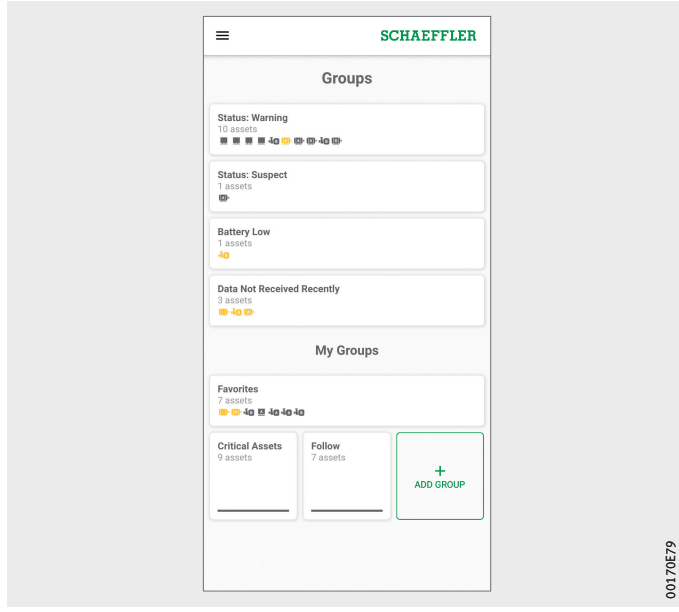


Figure 28
Start screen
for group management

Start screen for group management with group fields

Input	Group field	Description
[**Groups**] Alarm status	Status: Normal or Suspect	A grey symbol shows a normal or a suspicious status (level 1 to 2 in the state diagram), i. e. no or a 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 asset and schedule repairs 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 asset and depending on result schedule a repair as soon as possible.
[**Groups**] Battery status	[**Battery Low**]	Shows 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	E. g.: [**Learning mode**]	Shows the groups compiled on the basis of search filters.
[**My Groups**]	[**Favorites**] Other user-defined groups, e. g.: [**Pumps**]	Shows user-defined groups.

For further information on the colour coding and designation of alarms, see page 72.

Display information on groups

To get detailed information:

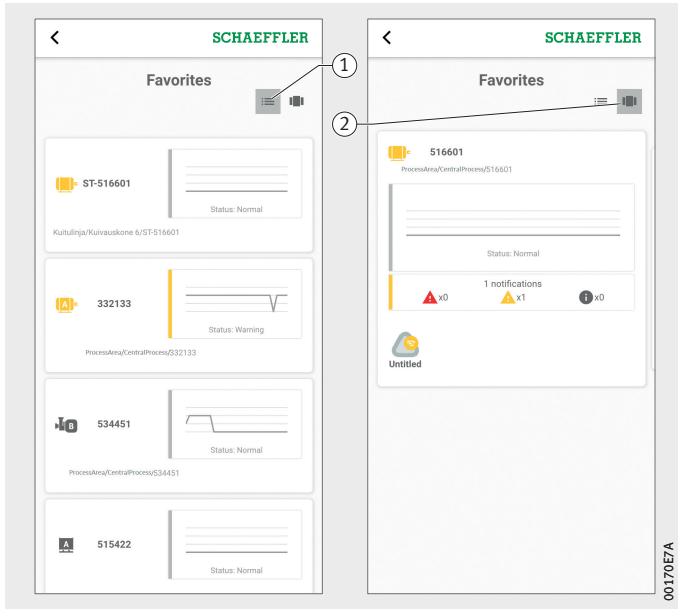
▶ Tap on a group field.

▷ 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 you to quickly scroll 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 43.

Add new group

To add a group:

▶ Tap the [**Add Group**] button.

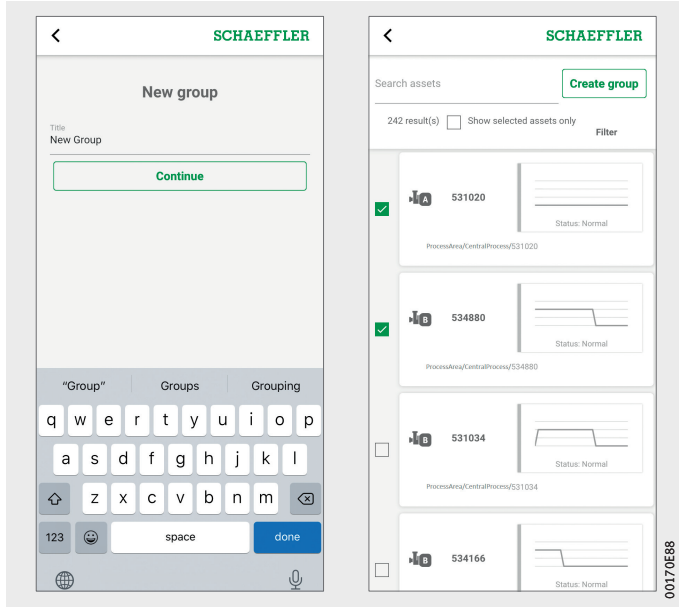


Figure 30
Add new group

▶ 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 like status, active alarm messages and the sensors connected to the machine. The machine management screen takes you to the sensor or sensors assigned to the machine.

The following functions are available to the user:

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

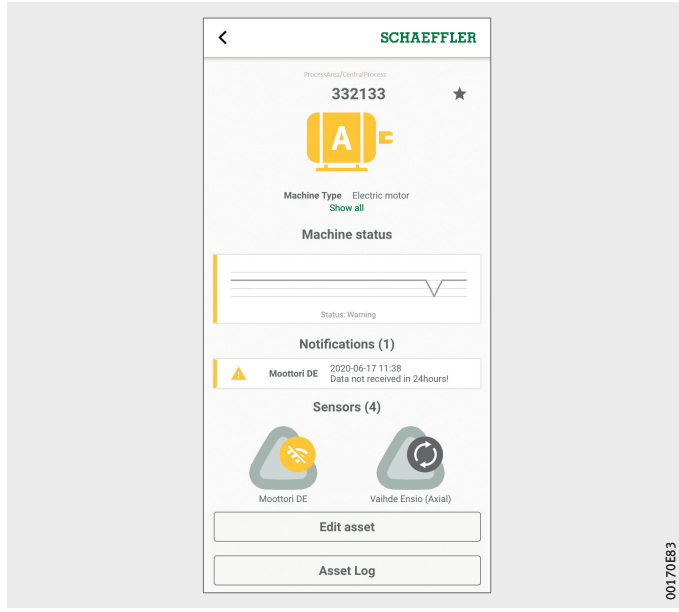


Figure 31
Machine management screen

Machine management screen

Input	Field	Description
Asset name	Text entry	Displays defined asset names.
Machine name	Text entry	Displays defined machine names.
Machine symbol	 Electric motor  Belt drive  Compressor  Fan  Gear box  Pump  Roll  Shaft  Turbine  Unknown machine	The colour of the symbol clearly indicates the alarm status of the machines: ■ A grey symbol shows a normal or a suspicious status (level 1 to 2 in the state diagram), i.e. no or a 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 asset and schedule repairs for the next regular servicing interval. ■ A red symbol shows a main alarm (level 3 to 4 in the state diagram), i.e. the highest alarm level. Inspect asset and depending on result, schedule a repair as soon as possible.
Metadata on machine	Text entries	Depending on machine type, other information can be entered as meta data to specify the machine. The meta data can be completely expanded and collapsed using the buttons [**Show all**] and [**Show less**]. Meta data is superordinate information that serves to describe the data.
[**Machine status**]	Graphical display	The machine status shows the state diagram and the alarm status.
[**Acknowledge notifications**]	Button	The button takes you to the relevant screen. The button only appears in the case of notifications that require action to be taken.
[**Send service request**] (optional)	Button	The button takes you to the relevant screen.
[**Edit asset**]	Button	The button takes you to the relevant screen.
[**Asset Log**]	Button	The button takes you to the relevant screen.

For further information on the colour coding and designation of alarms, see page 72.

Acknowledge alarm notification

To acknowledge an alarm notification, the action taken has to be selected, *Figure 32*. In addition, you have to select a comment from the drop-down menu that describes which measures were taken or why the notification is no longer valid. The alarm acknowledgement will be stored in the [**Asset Log**] with timestamp and details on the user.

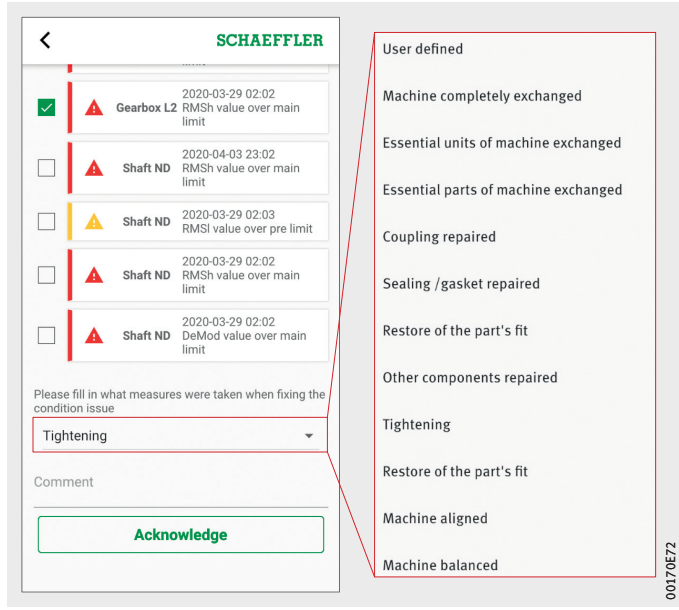


Figure 32
Acknowledge alarm notification, drop-down menu with machine type-specific entries

Manage machine sensors

The machine management screen shows which sensors are assigned to the machine. To edit the sensors, tap on the sensor. This takes you to sensor management.

Add a new sensor for the machine using the [**Add sensors**] button.

For further information on sensor management, see page 48.

For further information on adding a sensor, see page 52.

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.

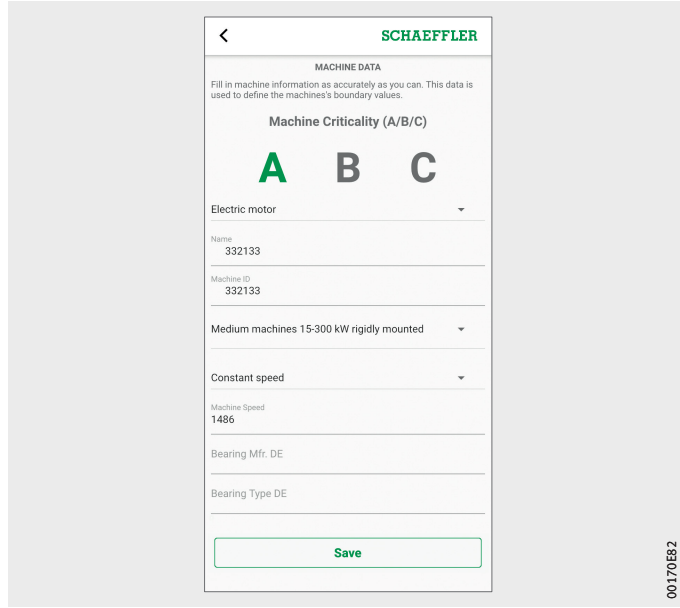


Figure 33
Edit machine

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 asset in which notifications and log entries are archived in chronological order. You can use the [**Add log entry**] button to create your own log entries. Every activity such as the acknowledgement of alarm notification is stored in the log.

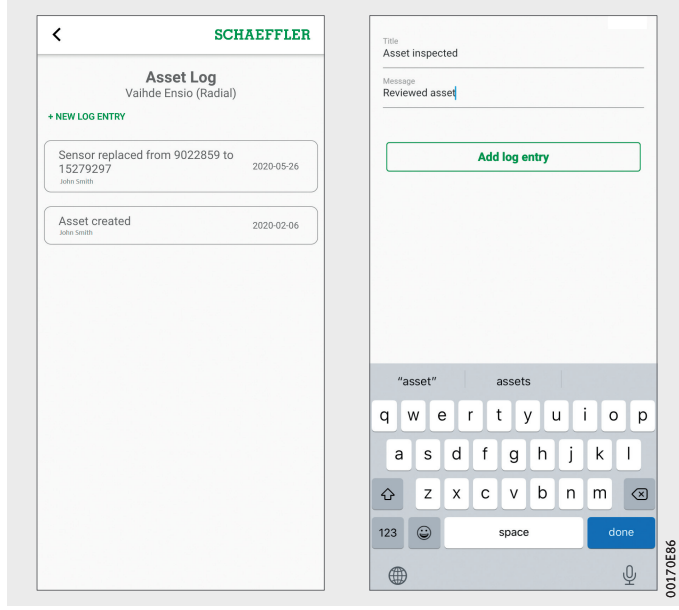


Figure 34
Asset log

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.

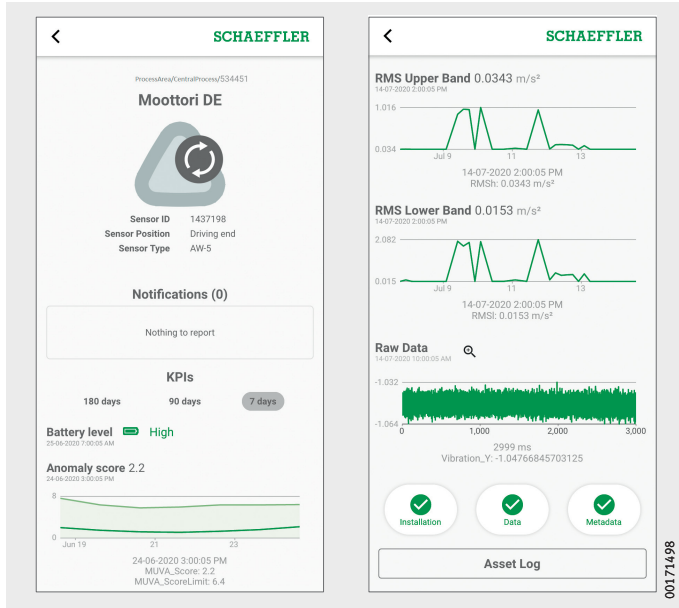


Figure 35
Sensor management screen

Sensor management screen

Input	Field	Description
Machine name	Text entry	Displays defined machine names.
Sensor name	Text entry	Displays defined sensor names.
Sensor symbol		Normal status.
		Displays an alarm notification.
		Displays battery status.
		Shows that sensor is offline and has not transmitted any data in the last 24 hours.
		Shows learning mode.
Meta data on sensor	Text entries	Depending on sensor type, further information can be entered. Meta data is superordinate information that serves to describe the data.
[**Acknowledge notifications**]	Button	The button takes you to the relevant screen. The button only appears in the case of notifications that require action to be taken.
Battery level	Graphical display	Displays battery status.
KPIs	Graphical display	Presents the KPIs over time as a graph.
Raw data	Graphical display	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 okay. Yellow signals a high alarm level, for example if necessary metadata are missing. Red indicates the highest alarm level, for example if no data has been transmitted for a longer period of time.
[**Asset Log**]	Button	The button takes you to the relevant screen.

Tapping in one of the graphs displayed will show you under the x-axis the values belonging to the position you tapped. The time signal and frequency range of the raw data can also be displayed in a separate magnified view using the [**Magnifier**] button, see page 50.

View raw data

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 go back to the sensor management screen.

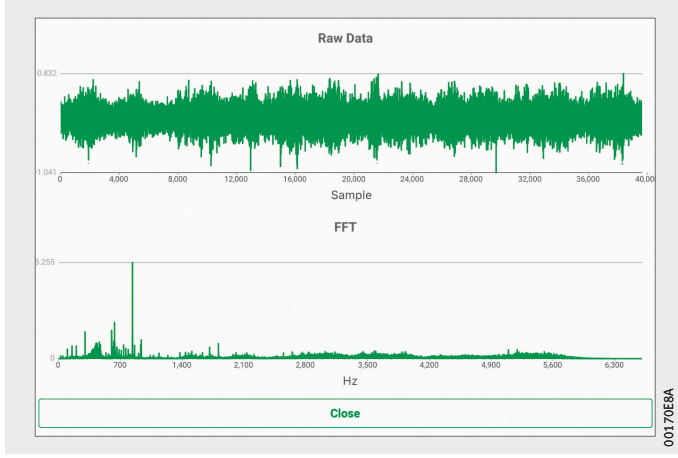


Figure 36
View raw data

Edit sensor with [Installation] buttons

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. This data is 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

Adding sensors can be initiated from various sections of the OPTIME app.

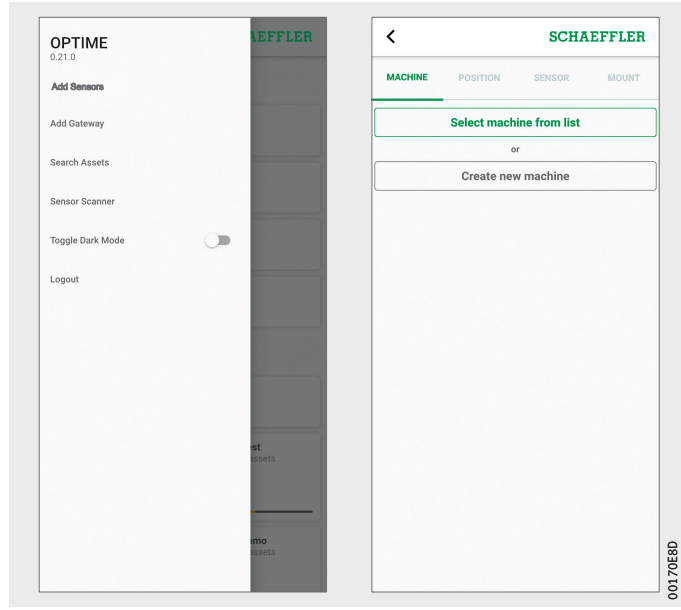


Figure 37
Add sensor

To add a sensor:

▶ Tap the [**Add sensor**] button.

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

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

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

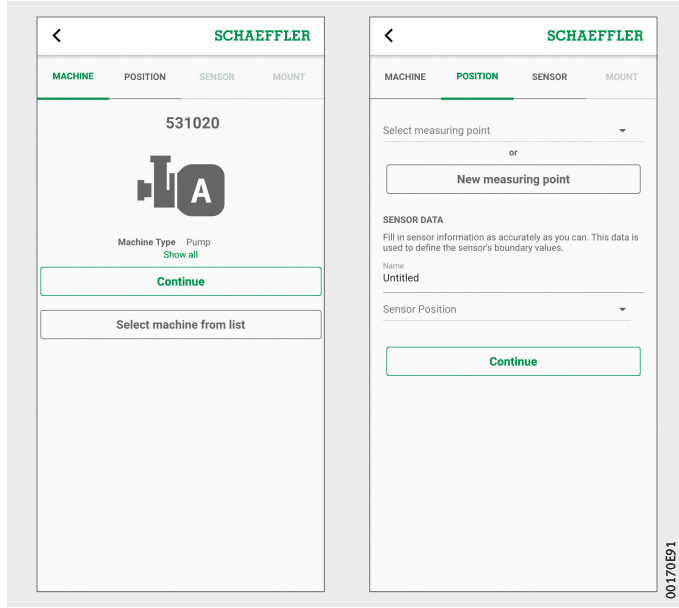


Figure 38
Settings for machine and position

▶ Specify the settings for the position.

▷ The [**SENSOR**] tab is displayed.

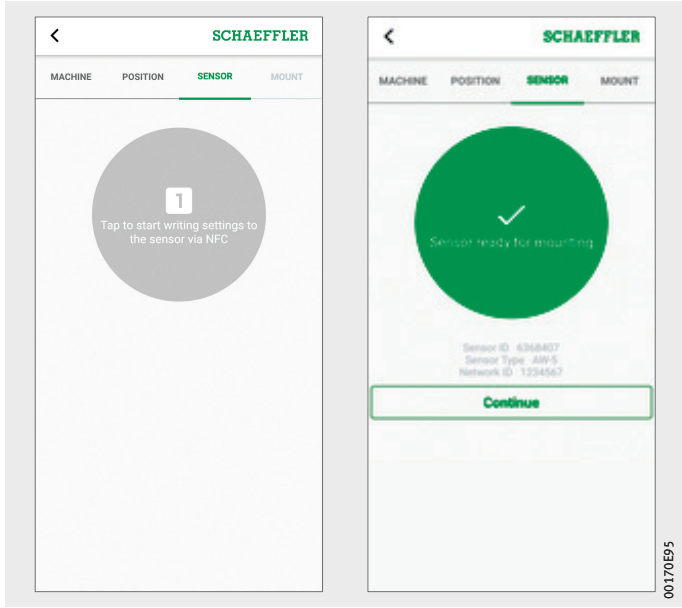


Figure 39
Activate sensor

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

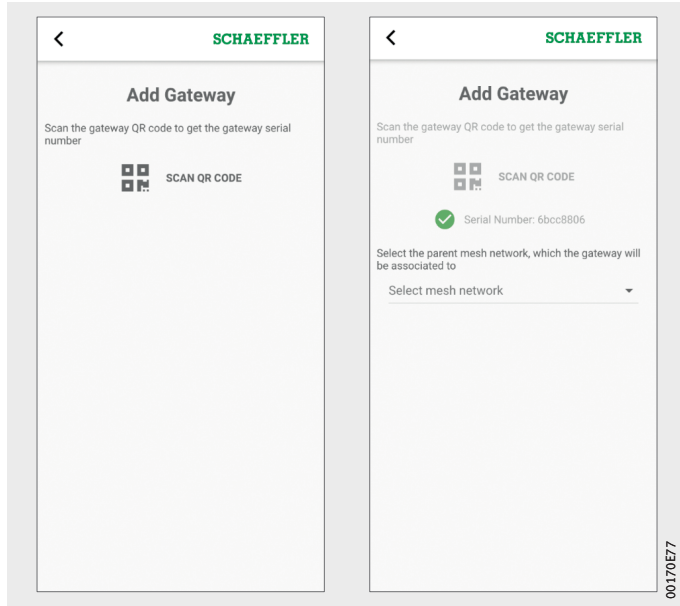


Figure 40
Add gateway

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

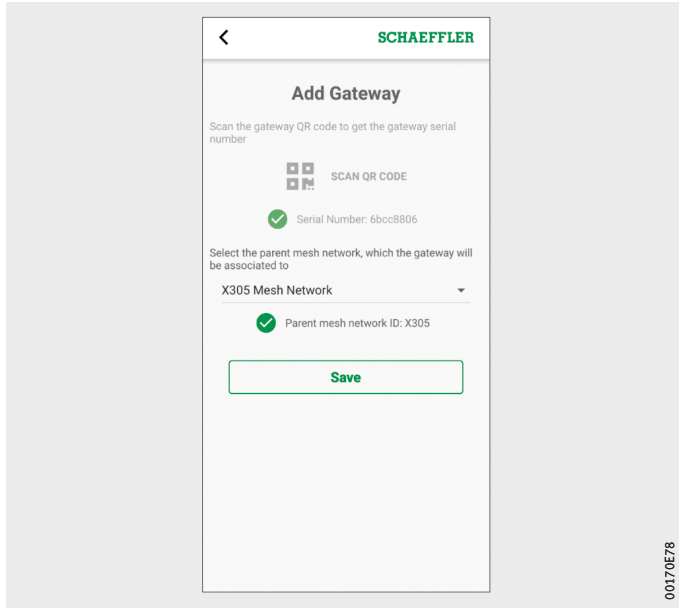


Figure 41
Save gateway

- ▶ 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 main user interface for use in control rooms where KPIs and alarm notifications for the condition monitoring of the asset can be monitored.

The OPTIME dashboard helps users and administrators to actively monitor machine status and to see alarm notifications based on learned KPI limits and indications of potential defects with 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 to evaluate the sensor statuses in more detail. In management mode the administrators may add, edit and delete users and profiles and send to send notices to users. In the corporation and mesh network level, the administrators may also handle the process area, department and machines structure (assets) and mesh networks (devices).

The OPTIME dashboard enables the following functions to be performed:

- 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 creation 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 system requirements have to be met to be able to use the OPTIME dashboard:

- 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 administrator will get login details via email.

Login

To login:

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

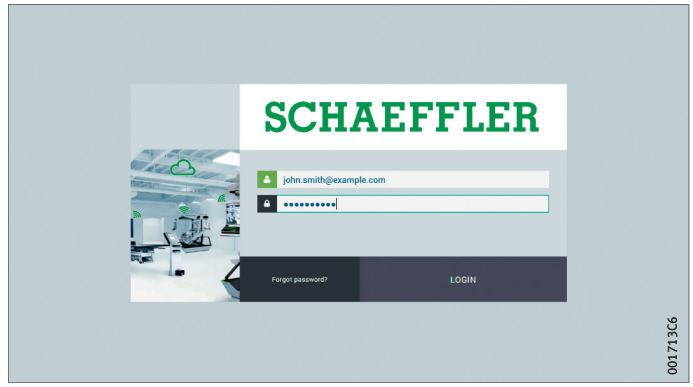


Figure 42
Login

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

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

If you have forgotten your password click on “Forgot password?” to reset your password. Your new login details will be sent to you by email.

NOTICE

You need to create a new, secure password for the initial login. Make a note of your user name and password, because you will need them to log onto the OPTIME app and OPTIME dashboard.◁

Logout

To finish a session you need to log out again.

▶ Click on the [**SETTINGS**] button, *Figure 44*.

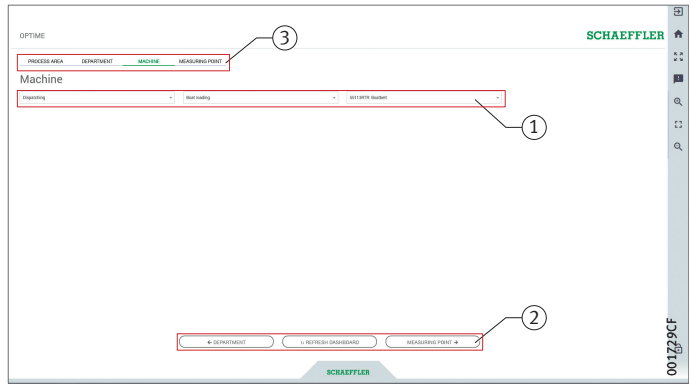
▶ Click on the [**LOG OUT**] button.

General navigation

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

Navigation elements

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

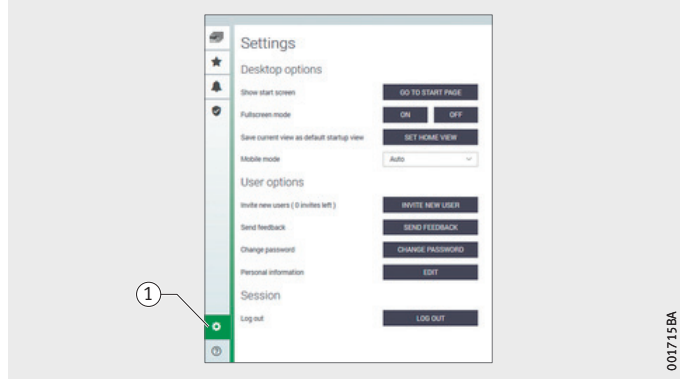


① Drop-down menus
② Navigation buttons
③ Hierarchy path

Figure 43
Navigation elements

Settings

The left-hand menu drops down using the [**SETTINGS**] button. Apart from logout, other settings are available for modifying the [**Desktop Options**] and [**User Options**].



① [**Drop-down menu**]

Figure 44
Drop-down menu for additional settings

Explanations of settings

Designation	Description
[**GO TO START PAGE**]	Switches to 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 you to the “invite new user” page (for administrators only).
[**SEND FEEDBACK**]	Button takes you to the “send feedback” page.
[**CHANGE PASSWORD**]	Button takes you to the “change password” page.
[**EDIT PERSONAL INFORMATION**]	Edit user profile.

Search function and filters

The search function can be used in various sections of the OPTIME dashboard to help 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.

Description of dashboard

Start page

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

① [Log out]
② [Start page]
③ [Full screen]
④ [Feedback]
⑤ [Magnify view]
⑥ [Default view]
⑦ [Reduce view]
⑧ [Hide and show menu]
⑨ [Schaeffler-Tab]
⑩ [Favorites-Tab]

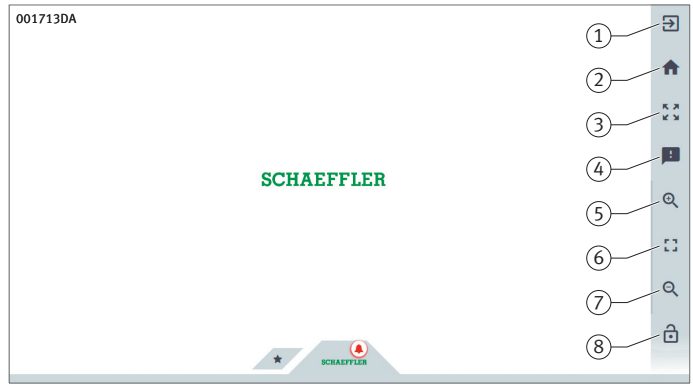


Figure 45
Start page

Explanations

Designation	Description
[Log out]	Logs user out.
[Start page]	Switches to start page.
[Full screen]	Switches to full screen mode.
[Feedback]	Opens feedback page.
[Magnify view]	Magnifies view.
[Default view]	Returns to default view.
[Reduce view]	Reduces view.
[Hide and show menu]	Hides menu. The same button can be used to show the menu again.
[Schaeffler-Tab]	Exits the [Alarms & Events] view.
[Favorites-Tab]	Exits the [Favorites] view.

Using the dashboard levels

Various dashboard levels are available via the page [**Resource Browser**]:

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

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

Level [Process Area]

In the [**Process Area**] level the user will see their assigned process area. The page is subdivided into departments, alarm notifications and user-defined groups. At the bottom of the page there is an overview of the sensor conditions.

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

Figure 46
Level [**Process Area**]

Explanations

Designation	Description
[**Departments**]	Shows the assigned departments.
[**Machines with alarm notifications**]	Shows a list of alarm notifications with number of alarms and colour-coded representation of warning level.
[**My groups**]	Shows user-defined groups.
[**Sensor condition**]	Shows lists of the sensors that have one of the following conditions: - Low battery level - No connection - New sensor - Learning mode.

If you click on a department name in the list you will get to the [**Department**] level.

If you click on an alarm counter in the list, you will get to the [**Alarms & Events**] view on the [**Resource Browser**] page.

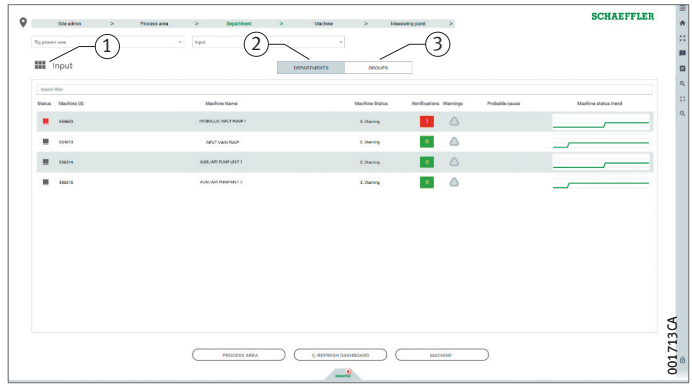
You can use filters on the lists [**Departments**] and [**Machines with alarm notifications**], see page 60.

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

The highest alarm level determines the colours of the sensor symbols. In the drop-down menu the sensors are sorted according to alarm level. If you click on a sensor in the drop-down menu you will get 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**]	Shows the name of the department.
[**DEPARTMENTS**]	Shows the machines from a department.
[**GROUPS**]	Shows the machines in a user-defined group.

You can use filters in the displayed list of machines, see page 60.

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

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

The columns **Machine Status** and **Notifications** show the alarm status. If you click on an alarm counter in the list you will get to the [**Alarms and Notifications**] view on the [**Resource Browser**] page.

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

The column **Probable Cause** shows what the cause of the alarm notification might be based on the KPIs. The suggested cause can help with fault diagnosis.

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

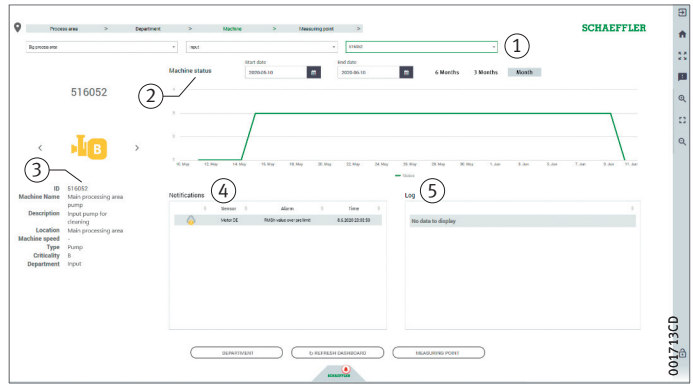
Level [Group]

The [**Group**] level shows machine groups compiled according to special criteria. The user can also put together their own 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 Symbol of the machine and machine metadata
④ [**Notifications**]
⑤ [**Log**]

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 [**Month**], [**3 Months**] or [**6 Months**].
[**Machine status**]	The machine status shows the state diagram and alarm status.
Machine symbol and machine metadata	Depending on machine type, information can be entered to specify the machine in more detail.
[**Notifications**]	Shows the alarm notifications for the machine.
[**Log**]	Shows the log trend 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 KPIs 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.

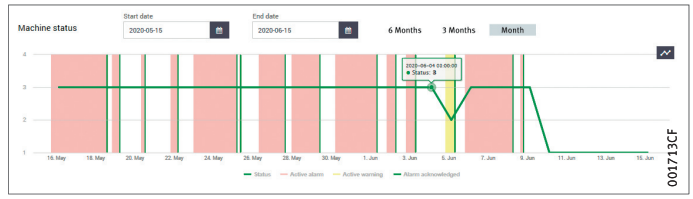


Figure 49
Detailed state diagram

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 justifies the alarm but the alarm has not yet been acknowledged. An inactive alarm occurs when 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 have a pale colour and the active alarms 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.

Notifications

The pre-alarms, main alarms and probable causes are listed as notifications. If you click on a line in the list you will get to the [**Alarms & Events**] view on the [**Resource Browser**] page, where you can obtain and acknowledge more precise information about the notification.

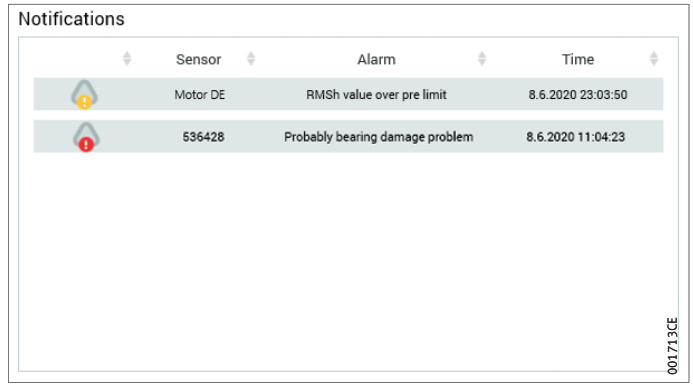


Figure 50
Examples of notifications

Log For each machine the log archives alarm notifications and log entries by personnel in chronological order. The log entries made by the operator in the OPTIME app are visible in the log.

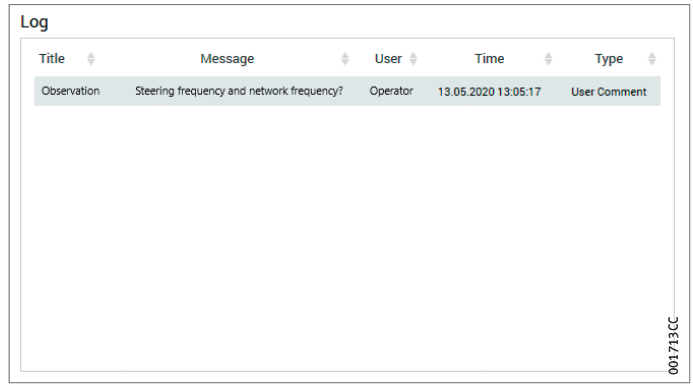


Figure 51
Examples of log entries

Level [Sensor]

The [Sensor] level shows 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 [KPIs]
③ [RAW DATA]
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 [Month], [3 Months] or [6 Months].
[KPIs]	Shows the KPIs.
[RAW DATA]	Shows the raw data.
Tabs for KPI diagrams	The following KPIs are shown as state diagrams: - [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 six hours, which means that four 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 peaks in vibration data.

The [**RMS Upper Band/RMS Lower Band**] tab shows graph for the RMS vibration data in which an increase is observed in the phase leading to an error.

The [**Anomaly Score**] tab contains early warning graphs, based on an algorithm developed by Schaeffler.

Raw data

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

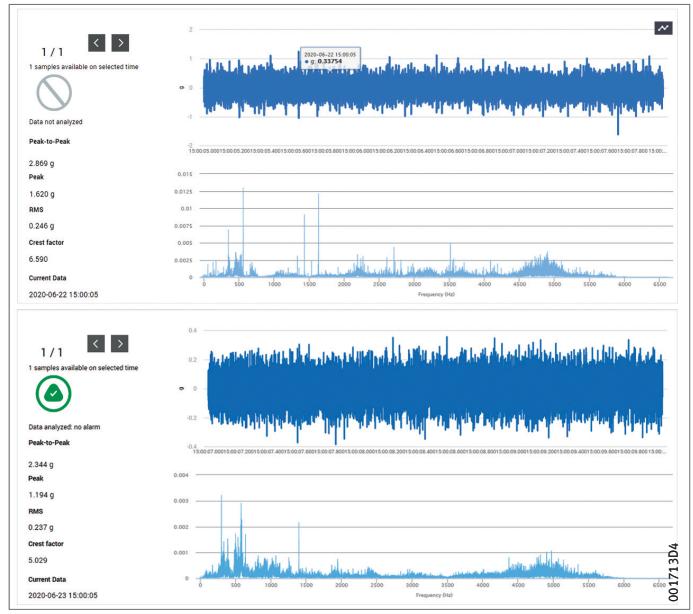
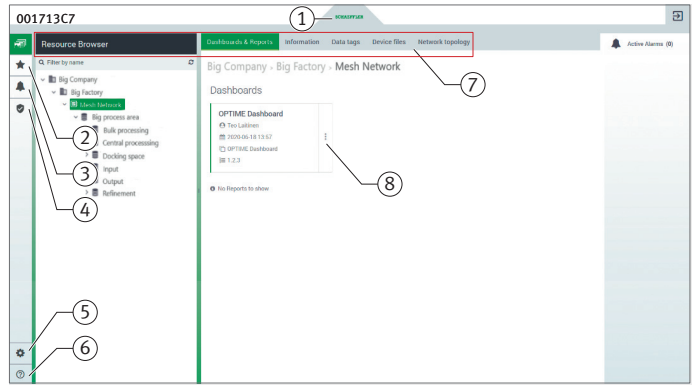


Figure 53
Display of raw data

[Schaeffler-Tab]

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



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

Figure 54
[**Schaeffler-Tab**]

Explanations

Designation	Description
[**Resource Browser**]	Tree structure showing the hierarchical structure of your asset.
[**Favorites**]	Switches to “Favorites” view.
[**Alarms & Events**]	Switches to “Alarms and Events” view.
[**Management Mode**]	Switches to OPTIME dashboard management display (for administrators only).
[**Settings**]	Switches to “Settings” view.
[**Help**]	IoT ticket documentation about various views and settings. This support has only limited validity for the use of OPTIME.
[**Vertical ellipsis menu (more options menu)**]	Takes you to further options.

For administrators the [**Schaeffler-Tab**] offers extra functions if accessed via the [**Management Mode**] view.

[Schaeffler-Tab]

You can exit the [**Schaeffler-Tab**] by clicking on the button at the bottom of the page. To return to the [**Schaeffler-Tab**], click the button at the top of the page.

[**Resource Browser**] The [**Resource Browser**]view shows the hierarchical structure of 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 72.

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

Alarms

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

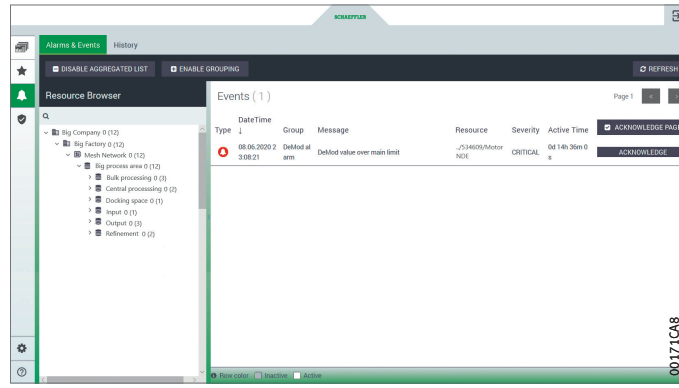


Figure 55
Display of alarm notifications [**Alarms & Events**]

You can exit the [**Schaeffler-Tab**] by clicking on the button at the bottom of the page. To return to the [**Schaeffler-Tab**], click the button at the top of the page. Alternatively, you can access [**Alarms & Events**] from the Department level by clicking on the [**Notification**] button, the colour of which shows the alarm status. It also shows the number of 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 20.

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 level alarm	Suspect		
2 to 3	High level alarm	Warning	Yellow symbol	Pre-alarm
3 to 4	Highest alarm level	Severe	Red symbol	Main alarm

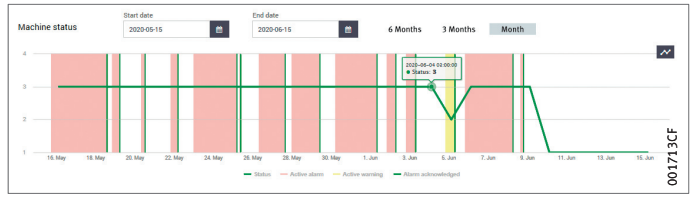


Figure 56
State diagram
with levels 1 to 4

Acknowledge alarm notifications

To acknowledge alarm notifications:

- ▶ To acknowledge the alarm after checking it and taking remedial action, click on the [**ACKNOWLEGDE**] button.
- ▶ To acknowledge all visible alarms on a page after checking them and taking remedial measures, click on the [**ACKNOWLEGDE PAGE**] button.
- ▶ Click on the [**Schaeffler-Tab**] button to return to the previous dashboard.

Note

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

Other dashboard options

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

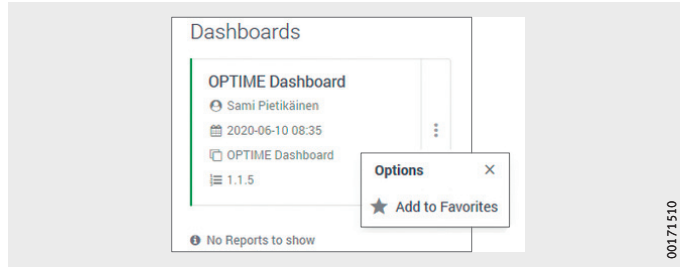


Figure 57
Vertical ellipsis menu (more options menu)

Troubleshooting and rectification

On the OPTIME customer portal you can get help with rectifying malfunctions in the Frequently Asked Questions (FAQ) section.

WARNING

The sensors may only be sent back following consultation with Schaeffler. It is absolutely imperative for any sensors being returned to be deactivated first. If there is a battery fault, the device is not allowed to be shipped because of the hazardous goods regulations. The sensor needs to be disposed of properly locally in accordance with the national disposal regulations in the respective country. ◁

Decommissioning

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

The sensors need to be deactivated for decommissioning, see page 29.

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 as recycling waste.

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

Technical data

Technical data gateway

Nameplate

The nameplate with the serial number (S/N) is located on the side of the housing. Underneath this you will find a QR code into which the serial number is embedded.

Technical data

Designation	Value	Unit
Communication		
Wirepas Mesh (ISM Band)	2,4	GHz
2G LTE CAT M1, NB-IOT (factory setting)	–	–
WiFi	2,4	GHz
Ethernet RJ45	–	–
Electrical characteristics		
Power consumption	30	VA
Power supply DC	85 to 264	V
Frequency	47 to 440	Hz
Ambient conditions		
Protection class	IP66, IP67	–
Operating temperature	–20 to +50	°C
Storage temperature	–40 to +85	°C
Humidity	20 to 90	%
Dimensions		
Length	180	mm
Width	130	mm
Height	81	mm

Technical data sensors

Nameplate

The serial number is printed on the sensor.

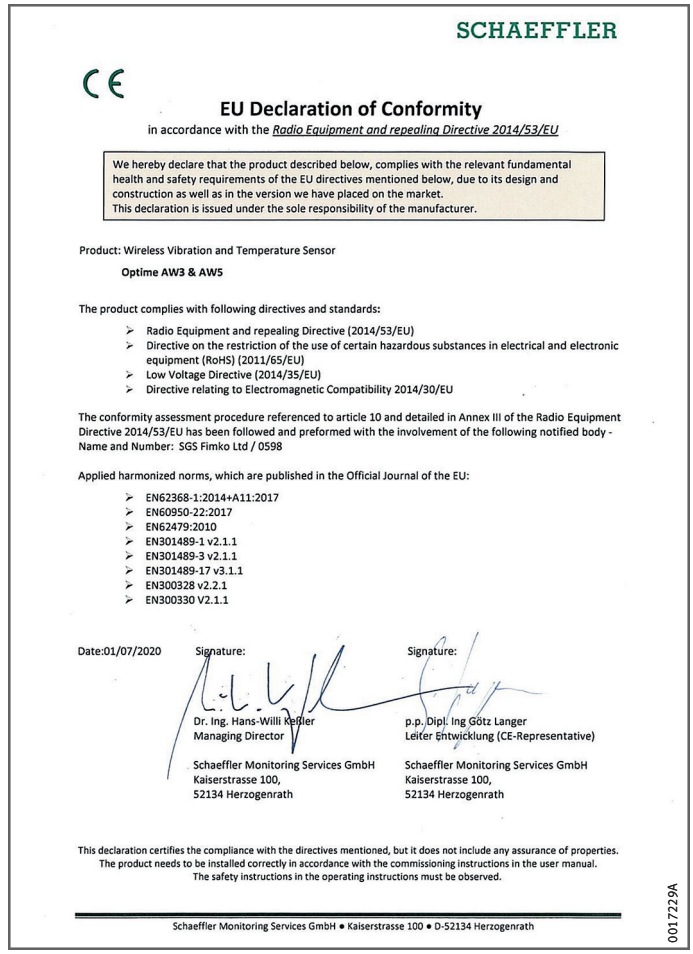
OPTIME 3

Designation	Value	Unit
Measuring functions		
Temperature Vibrations, calculated KPIs - RMS_{LOW} - $Kurtosis_{LOW}$ - $ISO_{VELOCITY}$ - RMS_{HIGH} - $Kurtosis_{HIGH}$ - DeMod	–	–
Measured values		
Bandwidth	0,01 to 3	kHz
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-$SOCl_2$ batteries	–	–
Typical battery life (depending on the configuration)	5	years
Ambient conditions		
Protection class	IP69K	–
Operating temperature	–40 to +85	°C
Storage temperature	+0 to +30	°C
Dimensions		
Length	86	mm
Width	32,6	mm
Height	30,6	mm
Certificates		
CE Directive 2014/53/EU	–	–
ATEX/IECEx (from 06/2021)	Zone 1	–

OPTIME 5

Designation	Value	Unit
Measuring functions		
Temperature Vibrations, calculated KPIs ▫ RMS_{LOW} ▫ $Kurtosis_{LOW}$ ▫ $ISO_{VELOCITY}$ ▫ RMS_{HIGH} ▫ $Kurtosis_{HIGH}$ ▫ DeMod	–	–
Measured values		
Bandwidth	0,01 to 5	kHz
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-$SOCl_2$ batteries	–	–
Typical battery life (depending on the configuration)	5	years
Ambient conditions		
Protection class	IP69K	–
Operating temperature	–40 to +85	°C
Storage temperature	+0 to +30	°C
Dimensions		
Length	86	mm
Width	32,6	mm
Height	30,6	mm
Certificates		
CE Directive 2014/53/EU	–	–
ATEX/IECEx (from 06/2021)	Zone 1	–

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: Signature:

Dr. Ing. Hans-Willi Keßler
Managing Director

Schaeffler Monitoring Services GmbH
Kaiserstrasse 100,
52134 Herzogenrath

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

0017229A

Figure 58
EU Declaration of Conformity

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