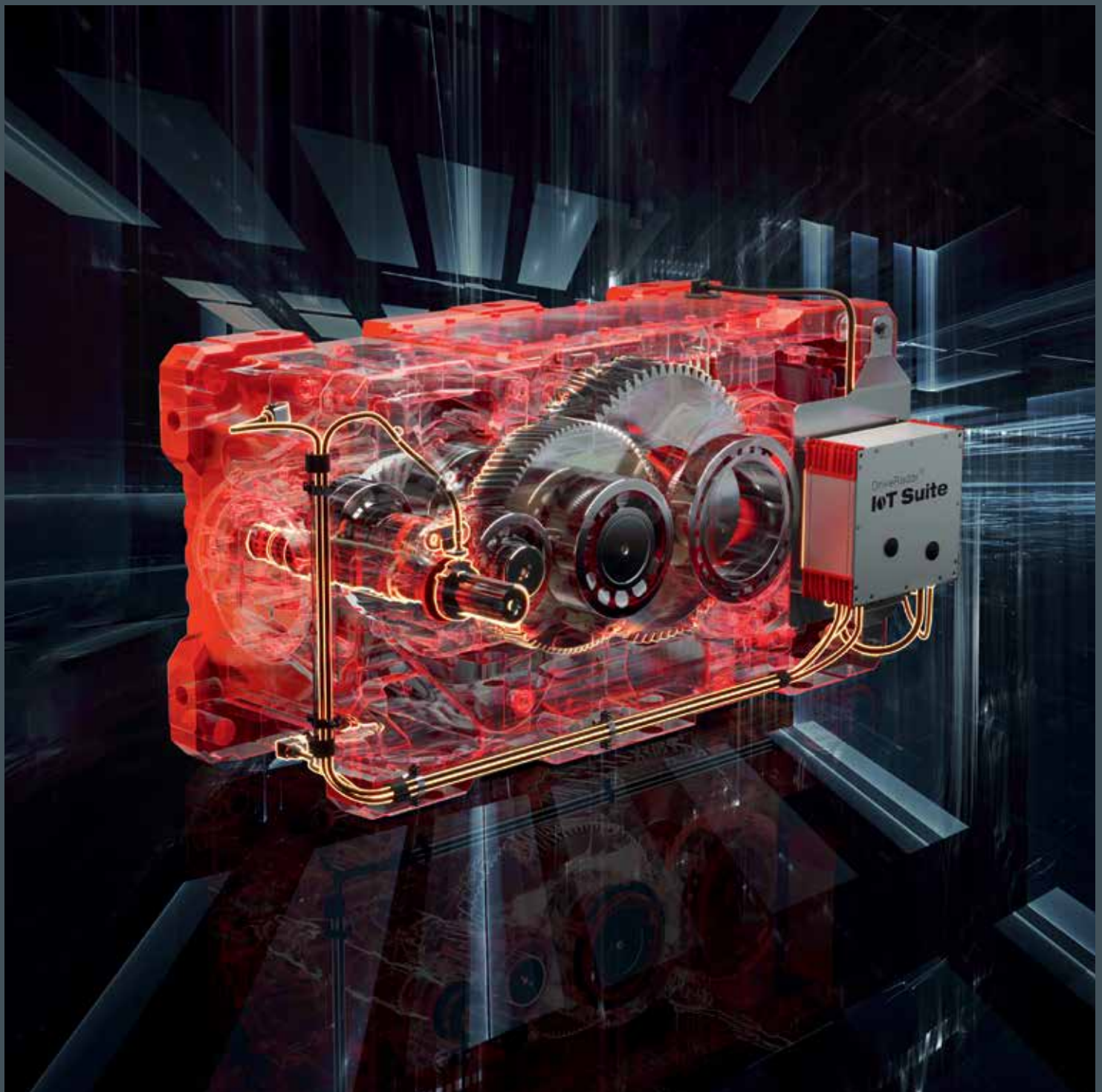


DriveRadar® IoT Suite for industrial gear units

Condition-based component monitoring and
maintenance forecasts for new and existing gear units



A clear view ahead

Ask a machine or system operator, and you'll always get the same answer:

When it comes to preserving or even increasing a system's value, the top priorities are excellent system availability and improved productivity. Digitalization can help reduce manual work and optimize the use of resources.

This means less strain on maintenance budgets, better worker safety and greater machine reliability.

Wouldn't you like to stop flying blind? Time to clear your view of the way ahead.



Take a proactive approach with DriveRadar® IoT Suite

Our DriveRadar® IoT Suite keeps working for you 24/7. The digitalized condition monitoring system automatically monitors your industrial gear unit, so you have reliable, detailed information about the state of your components at your fingertips at all times.

If there are any relevant changes in condition, the system will notify you and provide you with initial recommendations for action, so you can take steps at an early stage and prevent downtime.

→ Early warning

Thanks to automated condition monitoring, you receive prompt notification of any critical changes to the condition of your industrial gear unit and any abnormal operating behavior.

→ Recognize trends

Continuous monitoring and a clear, intelligent display mean you can proactively plan ahead, knowing how long your gear unit will continue working without faults.

→ Prevent downtimes

Thanks to greater transparency regarding the condition and operating behavior of your industrial gear units, you can vastly increase your level of protection against unplanned downtimes.

→ Operate efficiently

The forecasts calculated by the system mean you can plan service and maintenance activities preventively. What's more, you can control the length of your maintenance cycles as needed.

→ Save resources

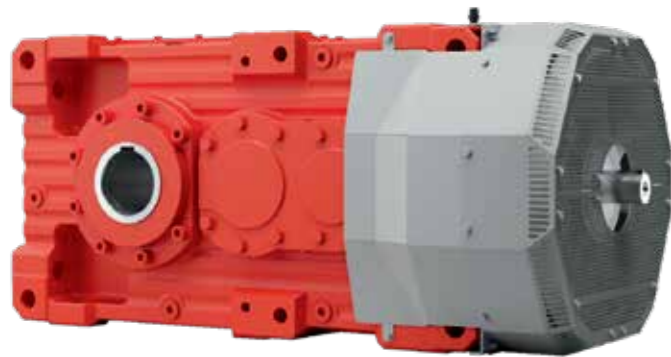
You can make full and optimum use of your drive components' service life, thanks to the condition-based recommendations for action.

→ Use directly

The hardware is pre-assembled, fully parameterized and ready to use ex works, so you can simply connect and start up your DriveRadar® system straight away

Our package at a glance

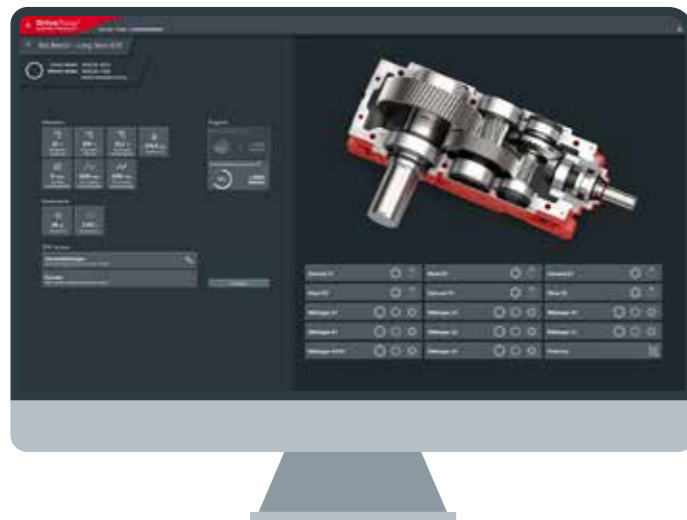
The DriveRadar® IoT Suite is available for all helical and bevel-helical gear units – regardless of whether these are new or already in use.



Hardware

Components

- 2 × acceleration sensors
- 1 × oil temperature sensor
- 1 × ultrasound sensor
- 1 × speed sensor
- 1 × DriveRadar® EdgeProcessingUnit



Access to the web application

Elements

- Access to the DriveRadar® IoT Suite web application
- App for mobile devices included
- Data tariff for mobile service included
- Automatic notification of errors and warnings



Your optional warranty package

- **Enjoy peace of mind**
Protect your industrial gear unit with a warranty lasting up to 48 months
- **Plan maintenance**
Avoid unanticipated repair costs
- **Enjoy the benefits of quality**
GearOil by SEW-EURODRIVE lasts up to 50% longer
- **Protect your investment**
Preserve the value of your system

Your +24 smart package

If your gear unit doesn't begin operations until after the statutory warranty has expired or if, for example, you want to pass on your customer's warranty claim to the supplier, our new +24 warranty packages give you a further 24 months of warranty for the industrial gear unit. This provides you with a complete, hassle-free service.

The +24 smart extended warranty combines our tried-and-tested Generation X.e industrial gear units with the premium lubricant GearOil by SEW-EURODRIVE and the DriveRadar® IoT Suite – our innovative gear unit condition monitoring solution.

With this package, you benefit from an extra 24 months of warranty for your industrial gear unit free of charge – and that's not all. You will also save yourself the need for the first oil change after 500 operating hours and benefit from attractive discounts for both the oil fill ex works and the DriveRadar® hardware¹⁾.

Once correct installation has been verified, the DriveRadar® IoT Suite will continuously monitor the condition of the gear unit.

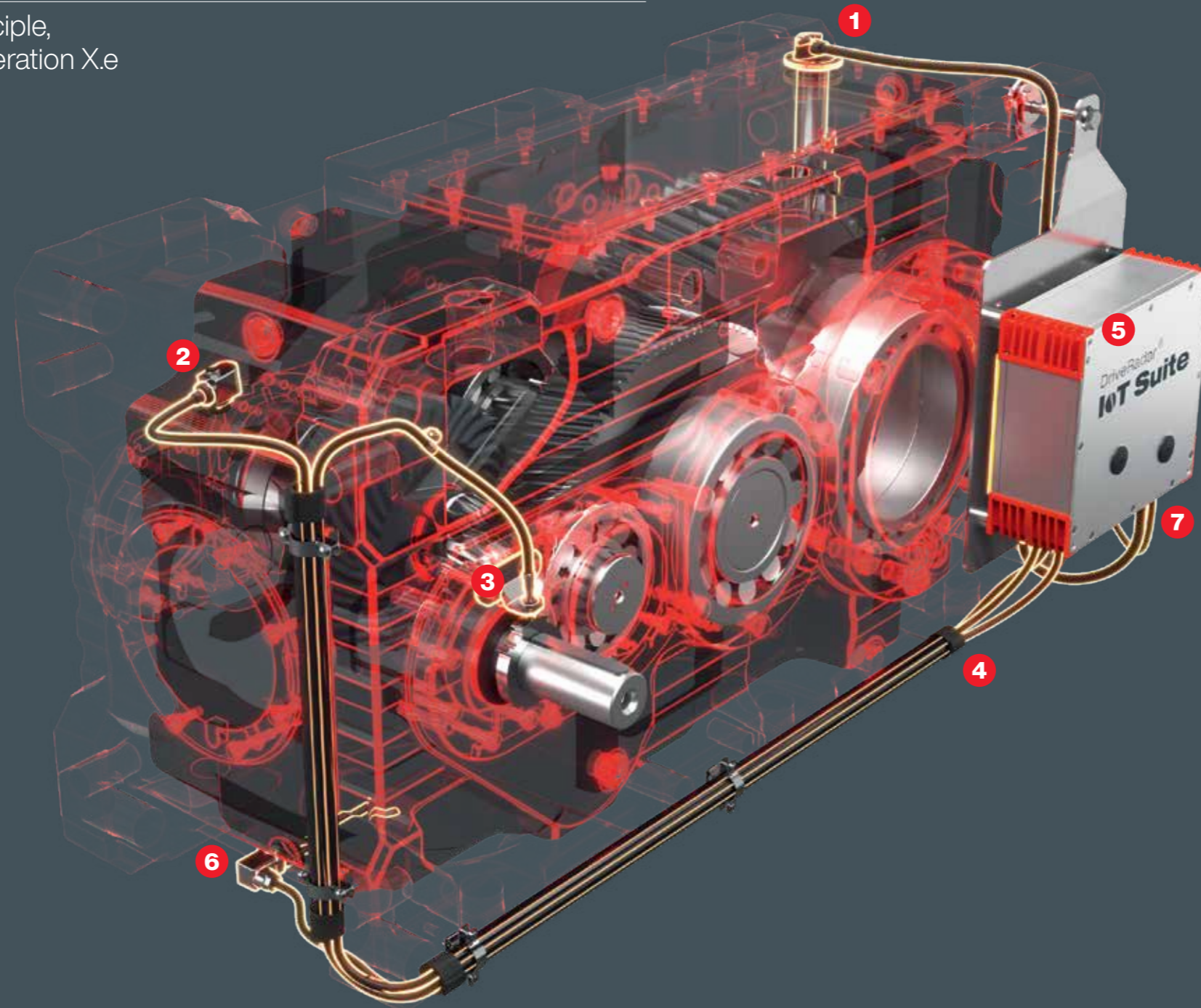
¹⁾Requirement outside Europe: A local SIM card must be supplied.



Find out more about our "extended warranty"

Technology and function blocks – an overview

The DriveRadar® operating principle, based on the example of a Generation X.e bevel-helical gear unit



Data acquisition

A uniform, specially selected and coordinated package of sensor technology records the industrial gear unit's parameters and sends them to the EdgeProcessingUnit. The measuring technology comprises the following:

- Speed sensor
- Acceleration sensors
- Oil level sensor
- Oil temperature sensor
- Ambient temperature sensor

Data connection

The EdgeProcessingUnit records all sensor data, encrypts it and transmits the collated measured values to the SEW-EURODRIVE data center.

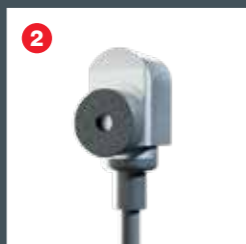
Data linking

Using an OPC UA interface as standard also means local measurement data can be incorporated directly into your customer system. If the traffic light displayed changes to amber or red ("Overall Health Status"), this lets you know you should take a look at your DriveRadar® IoT Suite.

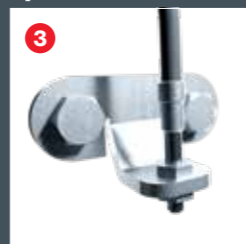
Oil level sensor



Vibration sensors



Inductive speed sensor



Cabling



EdgeProcessingUnit



Oil temperature sensor



Ambient temperature sensor



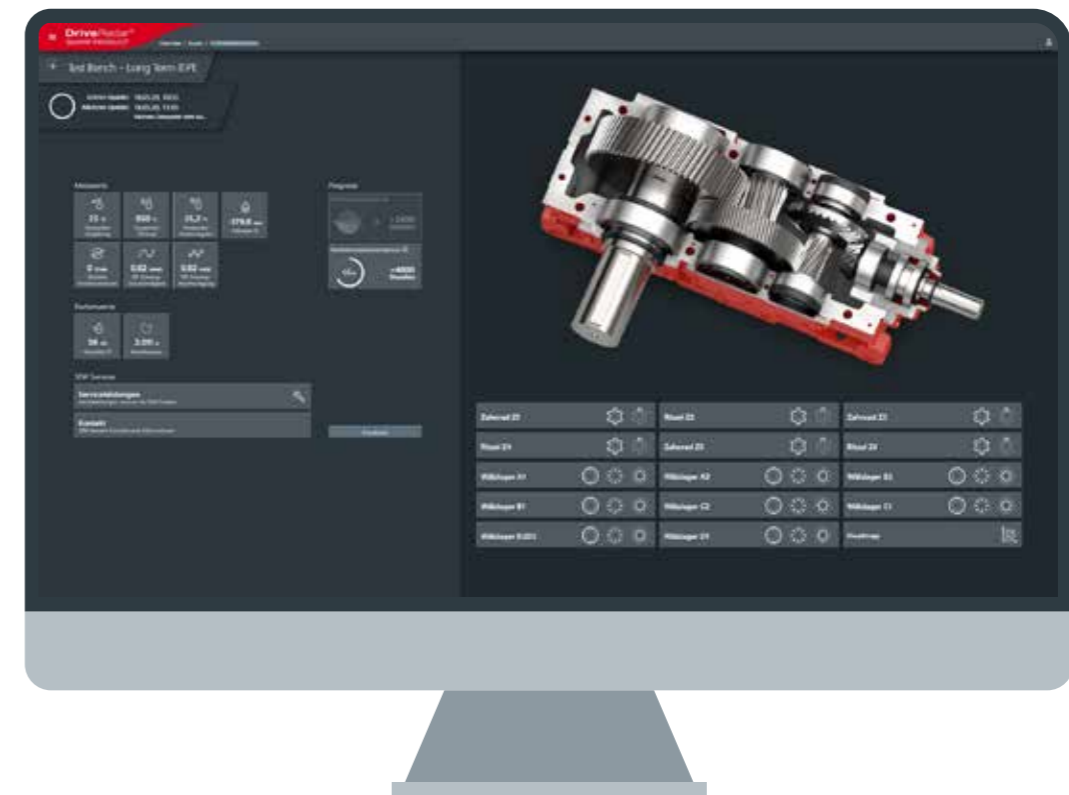
Your new repair and maintenance cockpit

The DriveRadar® IoT Suite provides you with a fast, online overview of the condition of your gear unit and all the components, enabling you to initiate maintenance and repair activities early and preventively.

It provides you with a **device overview** (image on page 9) and a rapid overview of the condition of your industrial gear unit and all associated components.

A **traffic light system** is used as a simple and easy-to-understand way of showing whether a critical operating state is approaching or has already been reached. The next level – the detailed view – shows you both the measured values recorded by the sensors and the results of calculations and forecasts. This means you can initiate maintenance and repair activities early and preventively.

The **DriveRadar® app for industrial gear units** also provides you with optimum monitoring and predictive maintenance support for your industrial gear units, and is the ideal addition to the tried-and-tested DriveRadar® IoT Suite.



Smartphone app for iOS and Android

- Immediate push notifications if the condition of a component changes
- Immediate identification of the gear unit components that require attention

Notifications and services

- Notifications by e-mail or app
- Initial recommendations for action to speed up fault elimination
- Tried-and-tested SEW-EURODRIVE services directly from the DriveRadar® IoT Suite

The web application – an overview

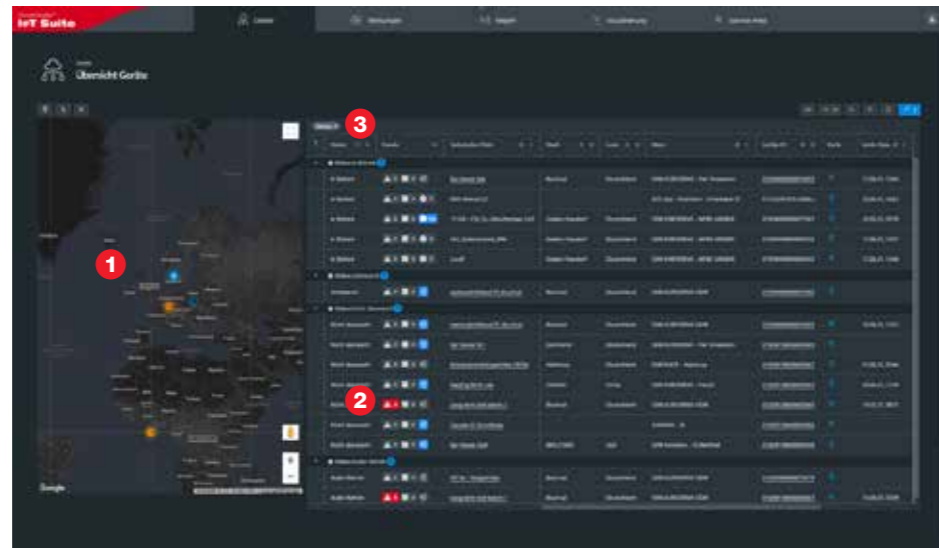
All measured values are collated and visualized in the DriveRadar® IoT Suite.

The DriveRadar® IoT Suite provides you with a fast, online overview of the condition of your gear unit and all components, enabling you to initiate maintenance and repair activities early and preventively.

Device list

The device list provides you with an overview of your industrial gear units. You can use the filter and grouping functions to change the view to suit your needs at any time and these functions are saved. A traffic light system simplifies continuous monitoring and ensures the user has the necessary gear unit condition transparency at all times and in an easy-to-understand way.

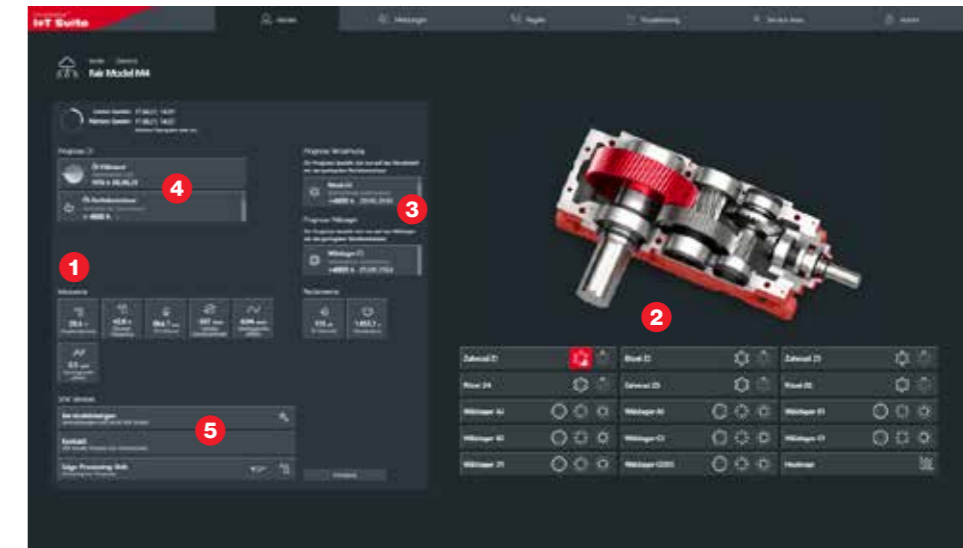
- 1 Gear unit location shown on the map
- 2 Overview of the overall condition of all monitored gear units
- 3 Filter and grouping functions



Overview of measured values and forecasts

- 1 Compact overview of all relevant measured variables
- 2 Monitoring and localization of the bearing and gearing
- 3 Failure probability forecast for rolling bearings and gearing
- 4 Oil level and oil change forecast
- 5 Rapid access to contact and services

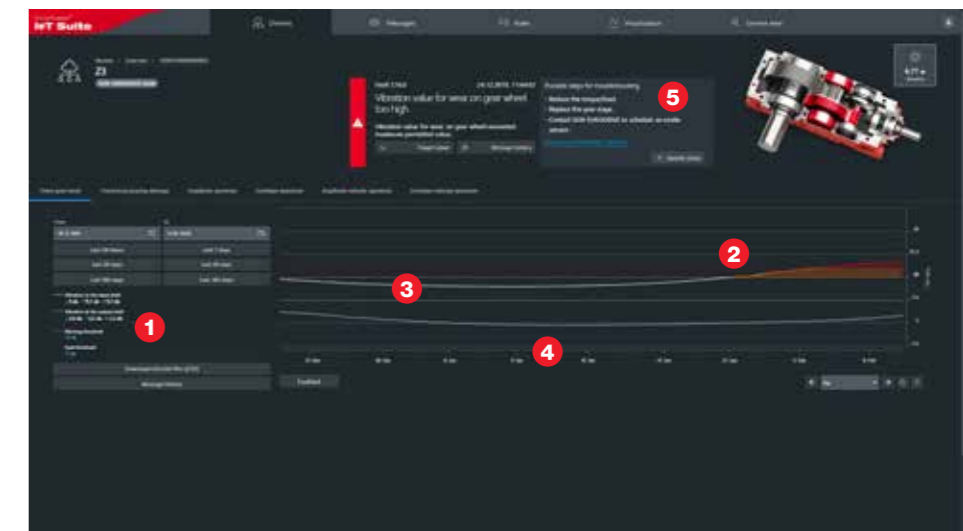
Thanks to the visualization of the condition and forecast values in the device overview, you can see all the current values at a glance and find out which measured values are OK and whether there are any faults.



Trend information about various damage patterns

- 1 Limit values calculated automatically from teach-in mode
- 2 Example of incipient gearing damage
- 3 Range of run-in phase and good condition
- 4 Direct localization in the timeline
- 5 Recommended services and option for making a direct inquiry

Example of error identified by vibration analysis at variable speed: The diagram visualizes all historical measured values over adjustable time ranges and the future trend of the values.



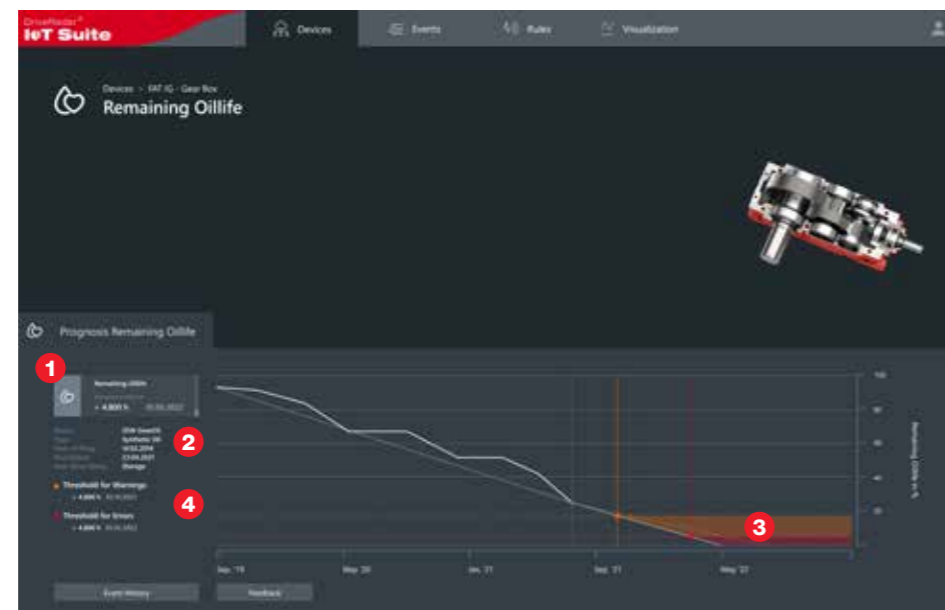
Forecasts

Reliable predictions in uncertain times

SEW-EURODRIVE is the only gear unit manufacturer in the world that provides forecasts to enable you to react early to events, by planning maintenance or ordering spare parts, for example. In this way, you can significantly boost the availability and reliability of your system.

Example: Remaining oil life and oil change forecast

- Display and monitoring of the remaining oil life, expressed both in hours and as a percentage
- Gear oil information taken into account
- Maximum oil storage period calculation
- Operationally relevant factors taken into account

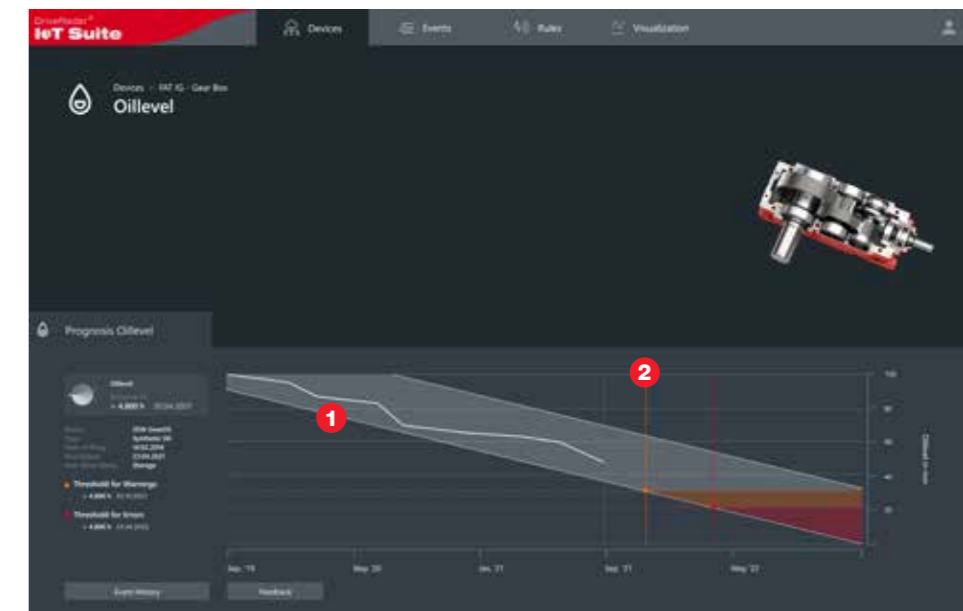


- 1 Remaining oil life display
- 2 Information about the gear oil and storage period
- 3 Calculated oil life end date area of the diagram
- 4 Display of the limit values stored in the system

Example: Oil level forecast

- 1 Operating points through clustering processes
- 2 Calculation that predicts when the permitted oil level lower limit will be reached

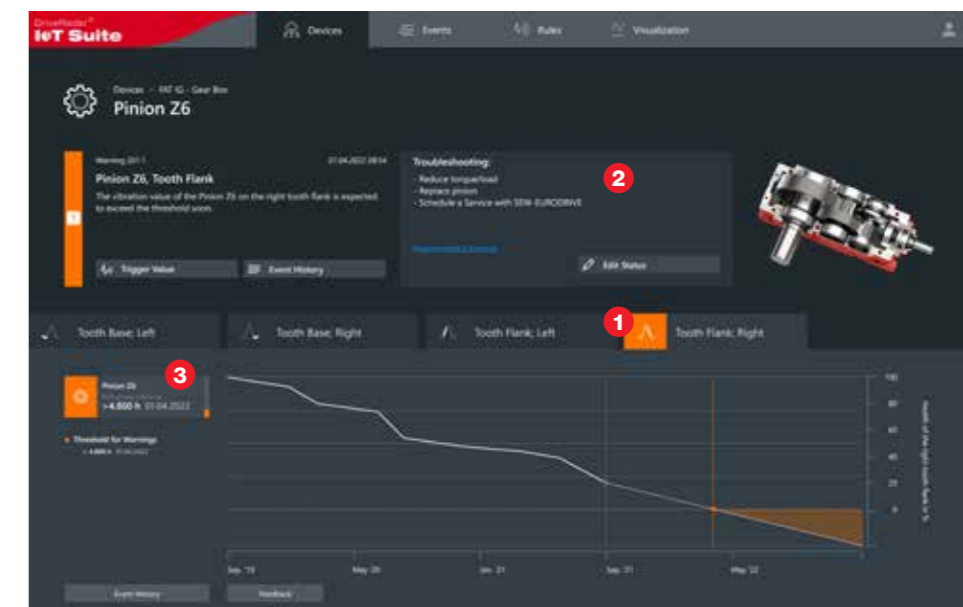
- Cutting-edge clustering algorithms for recognizing similarity structures and corresponding operating state analysis
- Additional influential factors such as input speed and oil temperature taken into account
- Self-learning system that gets better and better at recording the operating state as the database grows
- Precise calculation of the forecast through linear regression and extrapolation of the oil level



Example: Forecast for rolling bearings and gearing components

- 1 Distinction by foot or left or right edge using the example of gearing components. In the case of bearings, distinction is made by inner ring, outer ring and rolling elements.
- 2 Error message with recommendation for action
- 3 Display of remaining service life

- Service life is compared against the existing operating conditions during operation
- Analytical calculation model enables long-term forecasts for the respective components
- Optimum utilization of the component's service life through simultaneous monitoring by means of vibration analysis



Cybersecurity

Maximum protection with DriveRadar®

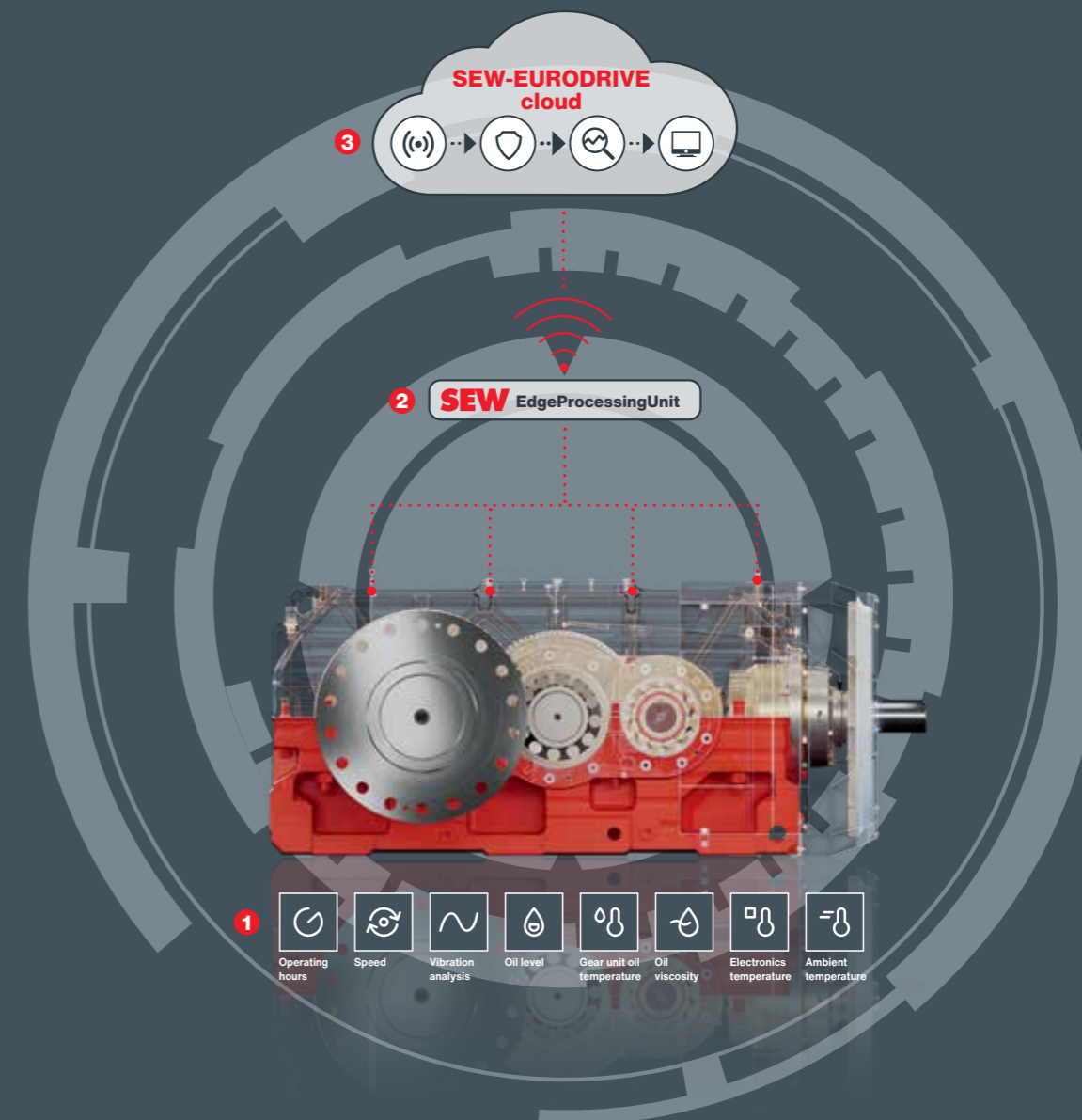
It simply isn't possible to use continuously measured drive data without cloud-based data analysis. However, DriveRadar® from SEW-EURODRIVE always keeps you on the safe side:

- Your data is transmitted directly from your industrial gear unit into the SEW-EURODRIVE cloud.
- There is no intervention in the customer network.
- Only raw data is transmitted; this is processed and interpreted at SEW-EURODRIVE in our in-house data center, which is certified to ISO/IEC 27001.
- Your data is transmitted between the gear unit and the cloud via a secure HTTPS connection.
- Alongside the measurement data, the file contains a certificate for the secure authentication and authorization of the hardware in the cloud. The channel is therefore secure and identification of the hardware is also ensured.

Protecting your data is important to us

SEW-EURODRIVE is certified to information security standard ISO 27001 (scope: "Information technology services – developing, implementing, operating and providing support for IT services"). This certificate is also of vital importance for compliance with the new European General Data Protection Regulation (GDPR).

- 24/7 operations in IT with non-stop on-call service, certification to ISO/IEC 20000
- Regular security checks performed with external assistance as part of the startup and operation of DriveRadar® with the EdgeProcessingUnits to ensure confidentiality, availability and integrity
- TISAX (Trusted Information Security Assessment Exchange) certification in place (also an automotive industry standard)
- Certification to IEC 62443 in place, voluntary "cyber-security certification" as part of Industry 4.0



1 Secure communication between the EdgeProcessingUnit and the cloud

SEW-EURODRIVE operates dedicated IoT certificate infrastructure in its in-house data centers.

- Encrypted communication between the EdgeProcessing Unit and the SEW-EURODRIVE cloud as per TLS version 1.2
- Identification of the edge devices via certificate-based SSL client authentication:
 - The identity certificate, as a "lifelong device certificate" is designed for a long service life and uses 384-bit ECC keys with an SHA-384 signature.
 - The temporary operational certificates (for authentication during data transmission) use 2048-bit RSA keys with SHA-256 signatures.
 - The operational certificates are renewed regularly and automatically with the help of the EST protocol via an M2M mobile network.

2 Encrypted communication between the cloud and the front end

Communication from the SEW-EURODRIVE cloud to the front-end device (browser) – in other words, to the DriveRadar® IoT Suite – is encrypted.

3 Highly available SEW-EURODRIVE cloud

The SEW-EURODRIVE cloud systems used by DriveRadar® have been implemented such that they are highly available and disaster-tolerant. For example, we have distributed the base active/active infrastructure components across two separate data centers in Baden-Württemberg.

- The data centers are wholly owned by SEW-EURODRIVE GmbH & Co KG.
- Both data centers are built on the basis of Tier 3+ architecture. In terms of power supply and climate control, one of the two data centers is in the top category of availability – Tier 4.
- Single points of failure are consistently avoided at all levels.
- Availability and performance monitoring is implemented at several levels through network, infrastructure, application and end-to-end monitoring.

Other topics that might be of interest to you

Industrial gear units

Extended warranty for industrial gear units

Delivery time program – industrial gear units to go

GearOil and Grease by SEW-EURODRIVE

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