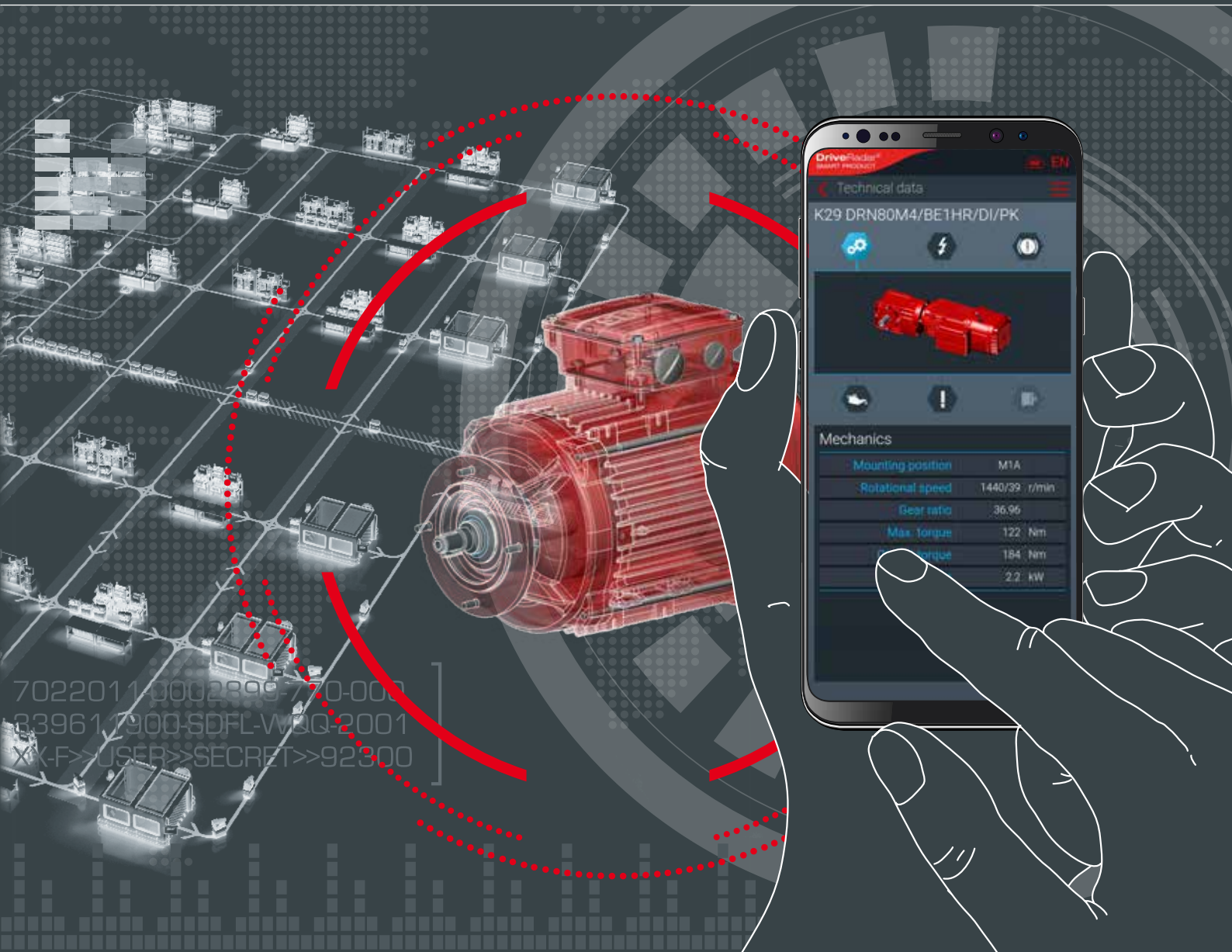


## DriveRadar® – Condition Monitoring and Predictive Maintenance

Understanding the today and knowing what will happen tomorrow



7022011 0002899-770-000  
33961 1900-SDFL-W3Q-2001  
XX-F>>USER>>SECRET>>92300

DriveRadar®  
BEST PRODUCT

Technical data  
K29 DRN80M4/BE1HR/DI/PK

Mechanics

Mounting position	M1A
Rotational speed	1440/39 r/min
Gear ratio	36.96
Max. torque	122 Nm
Power	184 Nm 2.2 kW

# DriveRadar®

## Condition Monitoring and Predictive Maintenance

### DriveRadar®

- Maintenance redefined **4**

### Smart Product

- Data Collector –  
Infrastructure and services for Smart Product and Smart System **6**
- Intelligent, networked products for the factory of the future **8**
- Condition-based component monitoring and forecasting  
for industrial gear units **14**

### Smart System

- Process monitoring and condition-based maintenance forecast  
for complex machinery and systems **20**
- Condition-based maintenance forecast for track-guided,  
mobile MAXOLUTION® automation solutions **30**

### Smart Process

- Keeping an eye on the entire system with process monitoring **38**

### Smart Support

- Infrastructure and services for Smart Product and Smart System **42**

## DriveRadar®

### Maintenance redefined

Under the umbrella of DriveRadar®, SEW-EURODRIVE offers intelligent, scalable services for the smart factory along the entire life cycle of individual products and complex systems with the aim of significantly increasing their availability.

With the functional levels Smart Product (drive components), Smart System (system solutions) and Smart Process (plant processes), DriveRadar® offers integrated digital service offerings / products with the added value of in-depth analysis and monitoring of drive components, system solutions and processes.

DriveRadar® is based on Smart Support, which forms the technical infrastructure between local aggregated drive or system data, e.g. from an edge computing system and the higher-level IT systems (SEW cloud, customer cloud, open platform).

### Your benefits

- Online recording of operating parameters
- Displaying the condition and operation to provide transparency
- Possibilities for process optimization
- Preventing malfunctions and unplanned outages / idling times thanks to early warnings of critical system states or abnormal operations
- Making maximum use of component and system lifecycles
- Improving the ability to plan maintenance and repairs
- Ensuring/increasing the availability of components, machinery and systems



DriveRadar® aims to determine the status of products, machinery and systems by using data that is recorded during the operation of drive systems. The data is evaluated using cutting-edge predictive analytics procedures, converted with expert knowledge to instructions for action

and interpreted and made available in a database corresponding to the level. This means, DriveRadar® can prevent unforeseen failures and interferences in operation, detect wear, and minimize downtimes.

The services in SEW-EURODRIVE's DriveRadar® portfolio give operators the tools they need to draw conclusions about statuses, wear and tear, and capacity utilization based on real data, so they can then derive recommended courses of action.





## Smart Product

Data Collector – Infrastructure and services for Smart Product and Smart System

### “Connect the unconnected!”

SEW-EURODRIVE IoT soft gateway for connecting existing SEW-EURODRIVE systems, focused on the optimization of existing systems in the phases:

- Startup
- Operation
- Maintenance
- Failure



### DriveRadar® Data Collector, the IoT connection of SEW-EURODRIVE drive systems for collecting data

To implement the Smart Factory, it is necessary to obtain data from the drives. This data, in particular, which often represents physical variables directly or indirectly, can provide valuable insights into the condition and diagnostics of machines and systems.

From this level, there are several IoT uplink options. The drives are connected to the DriveRadar® Data Collector via existing fieldbus and network channels (PROFINET, Ethernet,...) without hardware retrofitting – the physics can be radio or cable-based.

The DriveRadar® Data Collector IoT soft gateway provides convenient access to data from all electronic SEW drive systems (control cabinet/ decentralized) of generation B. The software is multi-platform-capable and can be set up on customer IT systems close to the process, on edge units or SEW controllers.

The data collection itself can be process-related or self-sufficient.

### Your benefits

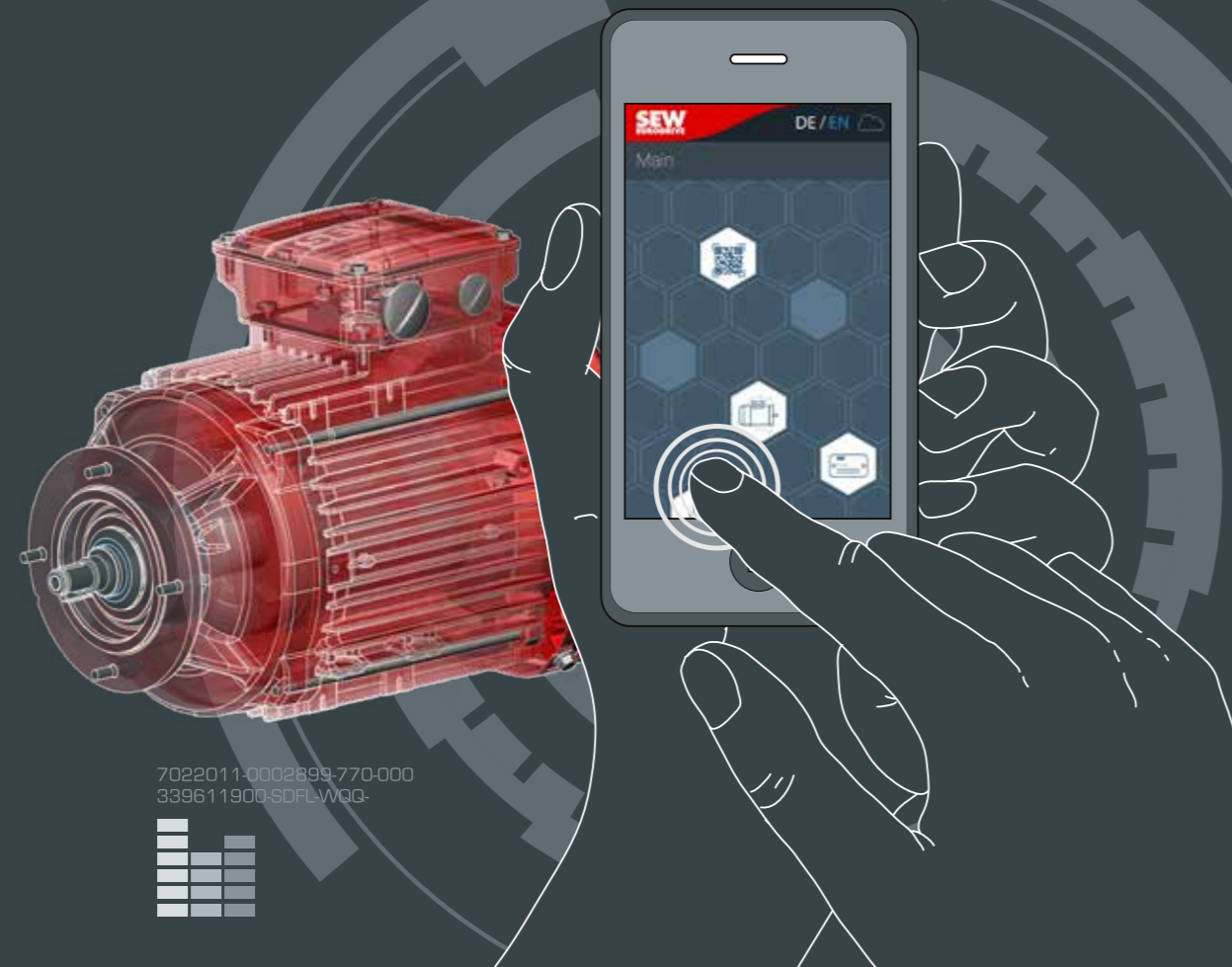
- Ideal for IoT connection and optimization of existing systems
- No hardware retrofitting necessary
- Without interfering with the process sequence
- Different communication and IoT uplink options
- Parameter and scope data can be gathered
- Compatible with existing SEW drive systems

## Smart Product

Intelligent, networked products for the factory of the future

One of the basic tenets of Industry 4.0 is that all of the participants are to be networked. Our smart products are capable of collecting data and communicating with one another to produce networks. This opens up entirely new possibilities. The digital twin of the product is already created in the development phase and is then complemented with valuable information during the entire product life cycle.

Our Smart App allows the user to benefit from these order – and product-related data in many ways – for example to identify an integrated drive, with simplified installation and startup instructions or regarding condition monitoring.



### Your benefits

- Secure and automatic identification of the product by scanning the QR code with the Smart App
- Automatic connection to the digital twin
- Provision of product data:
  - Configuration-related technical data
  - Smart installation: Brief instructions for installation and startup
  - Smart operations: Current operating data (for Smart Connect and Smart Control)
  - Smart maintenance: Configuration-related brief instructions for maintenance
- Smart spare parts management: Convenient one-click ordering of spare parts as necessary
- Documentation of actions and information in the product history in the digital twin



# Smart Functions overview



### Smart Basic

- Drive without sensor technology and electronics
- Access to the digital twin by scanning the QR code with the Smart App



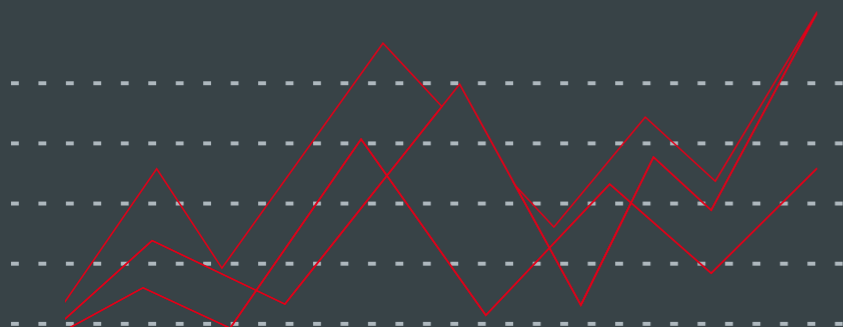
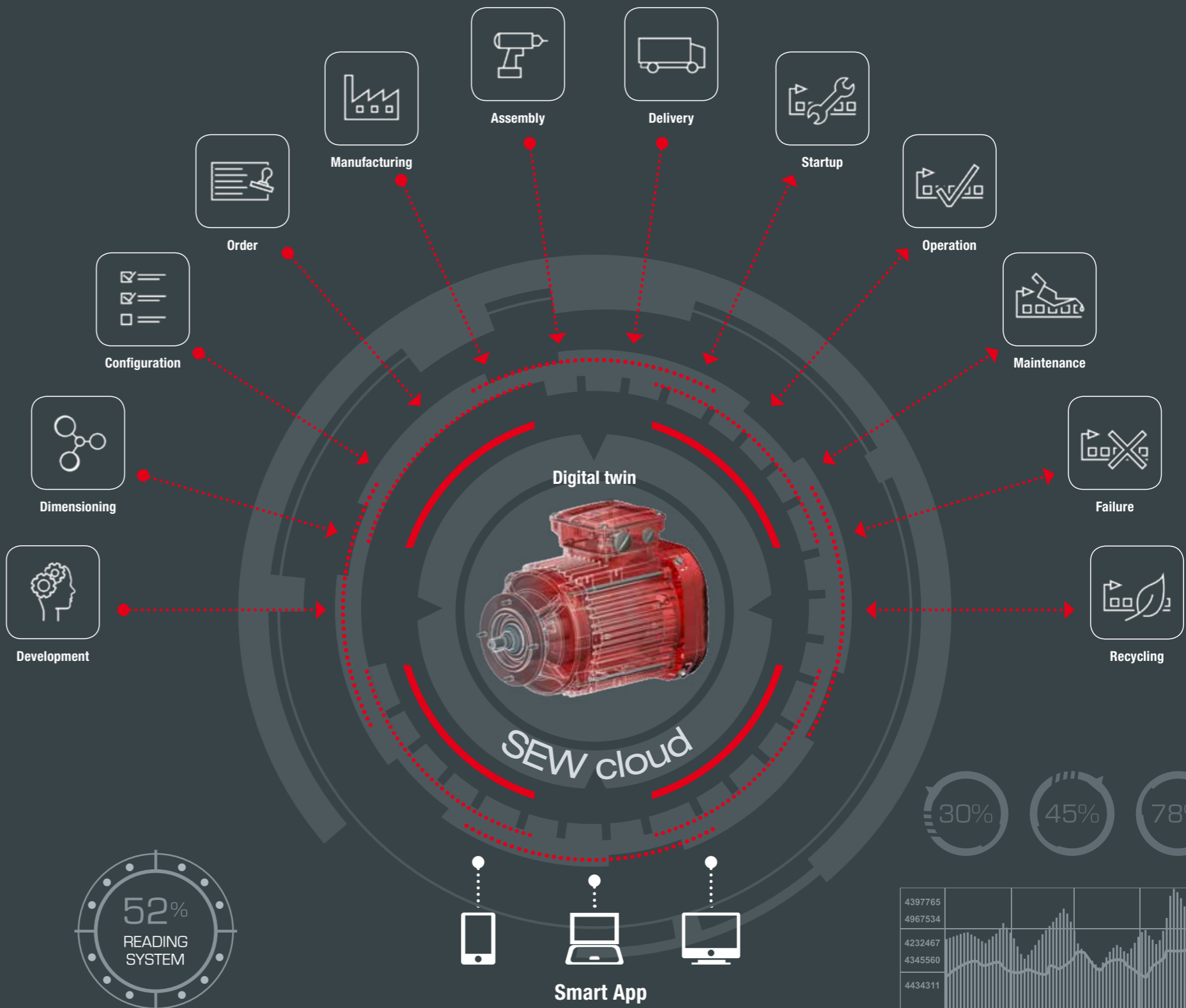
### Smart Connect

- Drive with integrated intelligent system for recording operation data
- Storing the operation data in the digital twin
- Access to the digital twin with the Smart App

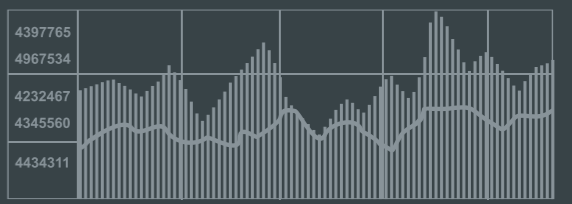
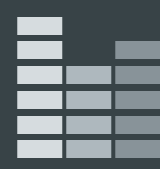


### Smart Control

- Drive with integrated intelligent system or inverter for recording operation data
- Storing the operation data in the digital twin
- Independent, system-specific optimization
- Access to the digital twin with the Smart App



7022011-0002899-770-000  
 339611900-SDFL-WQQ-2001  
 XX-F>>USER>>SECRET>>92300



# Smart App

For your smartphone, tablet and computer

Provides order- and product-related data from the cloud

Cloud

6.950	5.298	4.745
7.376	8.919	3.802
5.582	4.351	3.658
5.238	4.808	8.703
3.332	6.821	3.660
4.084	6.519	7.078
7.214	5.284	8.227
3.429	6.218	4.10
7.543	7.880	6.729
5.904	6.570	6.844



7022011-0002899-770-000  
 339611900-SDFL-WGQ-2001  
 XX-F>>USER>>SECRET>>92300

DriveRadar® – responsive design



## Smart Product

### Condition-based component monitoring and forecasting for industrial gear units

With our DriveRadar® range for industrial gear units, all operationally relevant mechanical parameters are recorded and analyzed. Continuous evaluation of the measurement data ensures that the condition of the gear unit is transparent at all times.

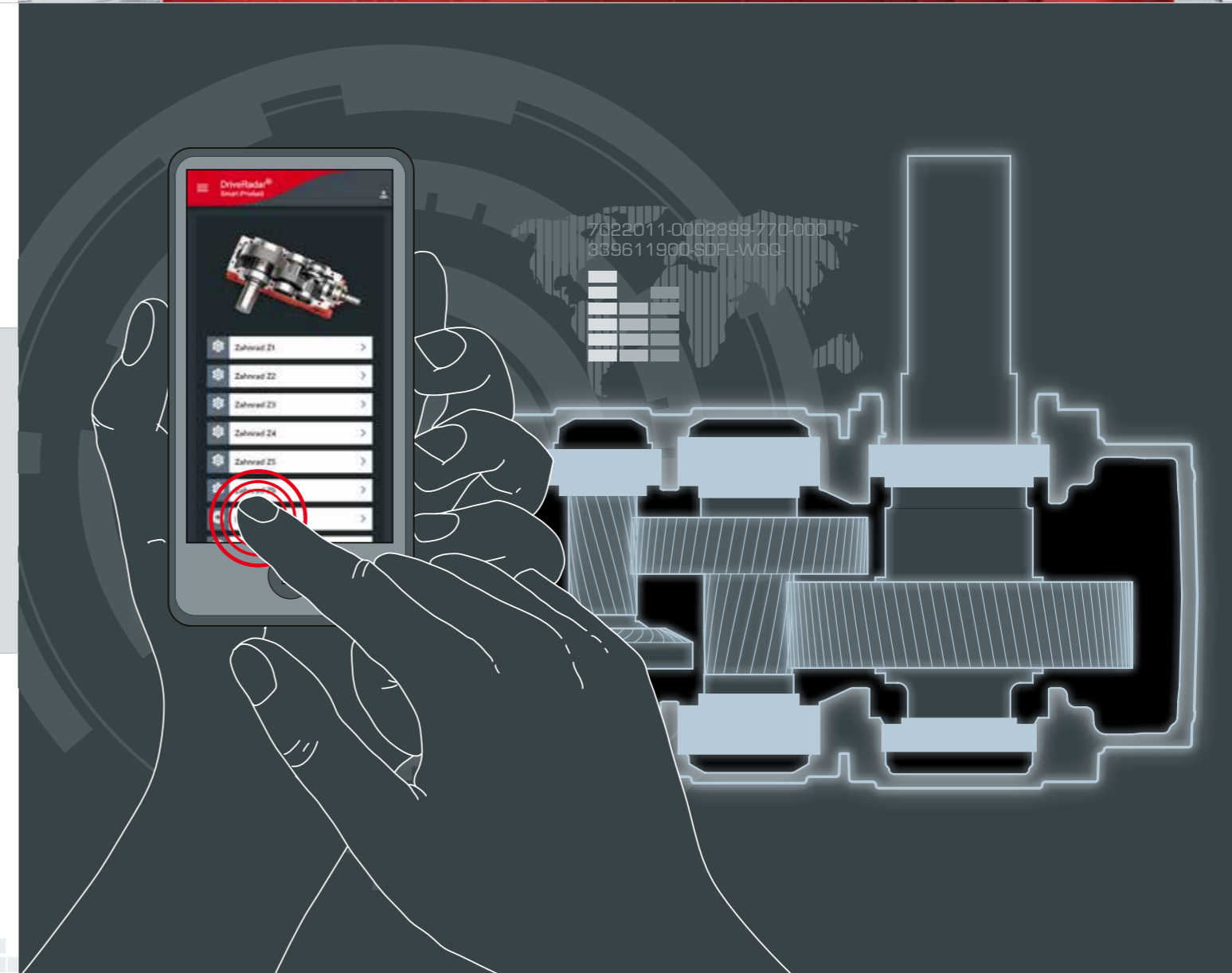
Anomalies are assigned directly to a component, which simplifies root cause analysis.

This means that precisely tailored maintenance work can be planned at an early stage and maintenance measures can be carried out in a targeted manner. This leads to a reduction in life cycle costs and an increase in productivity.



### Your benefits

- Fast and straightforward startup (plug and play)
- Continuous data acquisition of all operation-relevant parameters
- Transparency through graphical representation of operating behavior
- Early detection of system-critical operating states
- Cost reduction through condition-oriented maintenance
- Agile spare parts storage and ordering
- Predict machine and plant downtimes
- Significantly reduce unscheduled downtime
- Increase operational safety
- Investment protection and longer life cycle times
- Detailed diagnostics and decision support
- Ensuring a high level of machine and system availability





## Our measured variables

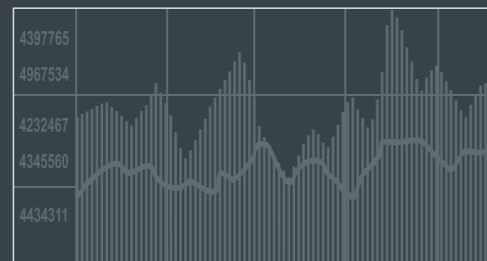
Valuable data is generated in each phase of the product life cycle.



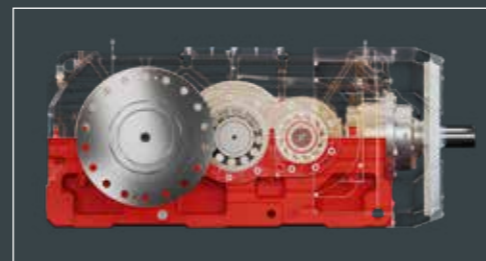
Operating hours	Rotational speed	Vibration level	Oil fill quantity	Oil bath temperature	Oil viscosity	Electronics temperature	Ambient temperature



Forecast



Vibration analysis



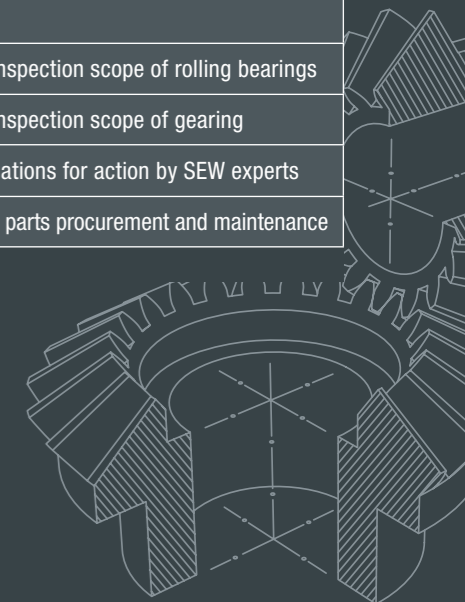
Product information



Smart Connect

	Smart Connect scope	
	Included	Additional bookable services
<b>Hardware</b>	Measuring hardware incl. LTE modem	–
	Extensive sensor package	–
	Plug-and-play startup	–
<b>Access</b>	SEW cloud connection	–
	Secure desktop and mobile access	–
<b>Web application</b>	Status overview of all monitored gear units	Comprehensive expert report on the status development of the entire inventory
	Detailed condition of the individual gear unit components	Detailed expert report on the condition of a drive and its individual components
	Graphical display of all measurement data for any time period	–
	Recording of operating time	–
	Recording of gear oil and ambient temperature	–
	Oil level detection and oil consumption forecast	Localization and elimination of leaks with subsequent leakage test
	Remaining oil life and oil change forecast	Oil sample analysis, oil procurement and oil change
	Display of the effective vibration velocity and acceleration	–
	Assessment of bearing condition	Examination with an inspection scope of rolling bearings
	Assessment of gearing condition	Examination with an inspection scope of gearing
	Notification of critical status changes	Individual recommendations for action by SEW experts
	Error and activity logbook	Drive inspection, spare parts procurement and maintenance

```
7022011-0002899-770-000
339611900-SDFL-WQQ-2001
XX-F>>USER>>SECRET>>92300
```



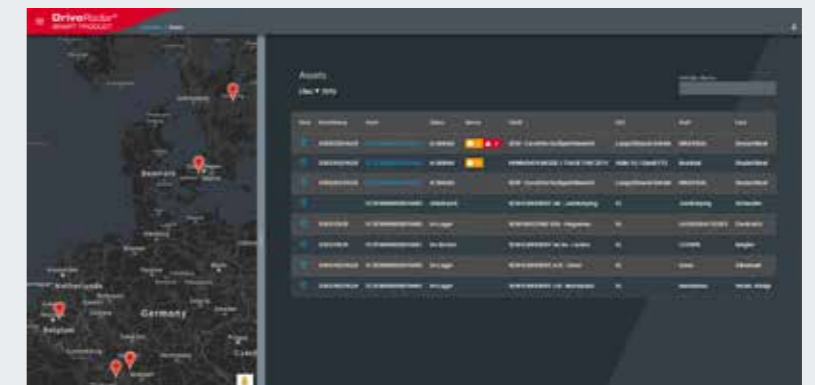
# Smart Connect for industrial gear units

- Drive with sensor technology and electronics
- Fast access to the drive data via QR code
- Web application visualizes the status of all drives at a glance: asset and factory view
- Current gear unit data in the live monitoring area: oil temperature, operating hours, speed, oil condition, ambient temperature and vibration level
- Continuous monitoring, evaluation and visualization of the bearing and gearing condition
- Permanent monitoring of the oil condition as well as display of the remaining time until the next oil change
- Precise recommended procedure and error assignment for each message
- Rapid assistance due to cloud connection and worldwide service
- Plug and play – no additional startup necessary
- Electronic log automatically documents all events and maintenance tasks
- Push notifications to app and desktop for every status change
- Expert reports of the monitored gear units



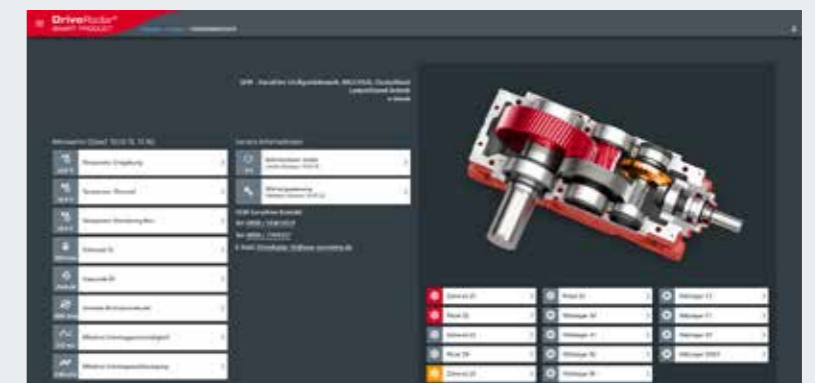
## Asset view

- Active condition monitoring of all drives
- Intuitive and clear user interface
- One-page overview of all measured variables and components



## Notifications

- Innovative notification system for system changes
- Clear recommendations for action for cause analysis and elimination



## Evaluation and visualization

- Analytics for early detection of bearing and gearing damage
- Scalable time series trends of data points
- Near real-time monitoring of the gear unit



## Smart System

Process monitoring and condition-based maintenance forecast for complex machinery and systems

The combination and encapsulation of process steps in one module as a building block of the modular, convertible factory with defined interfaces and services:

What if a drive or automation system consists of more than one product? Or if the individual drive and automation products used have complex relationships and interconnections with each other?

In these cases, the overall performance of such a system can no longer be achieved by monitoring a single product alone. Different views and levels of knowledge have to be combined. These are smart systems with multi-layered dependencies that must be taken into account when implementing a condition monitoring / predictive maintenance solution.

In the smart factory, smart systems are defined as modular process units with various electrical and mechanical components that can process one or more process steps in a coordinated manner.





**The range of services for the Smart Product segment is the functionally necessary substructure for every Smart System.**

**Necessary modules are:**

- The digital product twins with associated asset management
- The individual provision of data
- The data supply/connection (offline/online)
- The product-related diagnostic recipes and expert models for product behavior
- A simple and intuitive content delivery system with interfaces

**In the modular factory, a Smart System carries out process steps in a delimited module. The solution for condition monitoring and predictive maintenance must therefore also monitor the following parameters in addition to monitoring the individual components:**

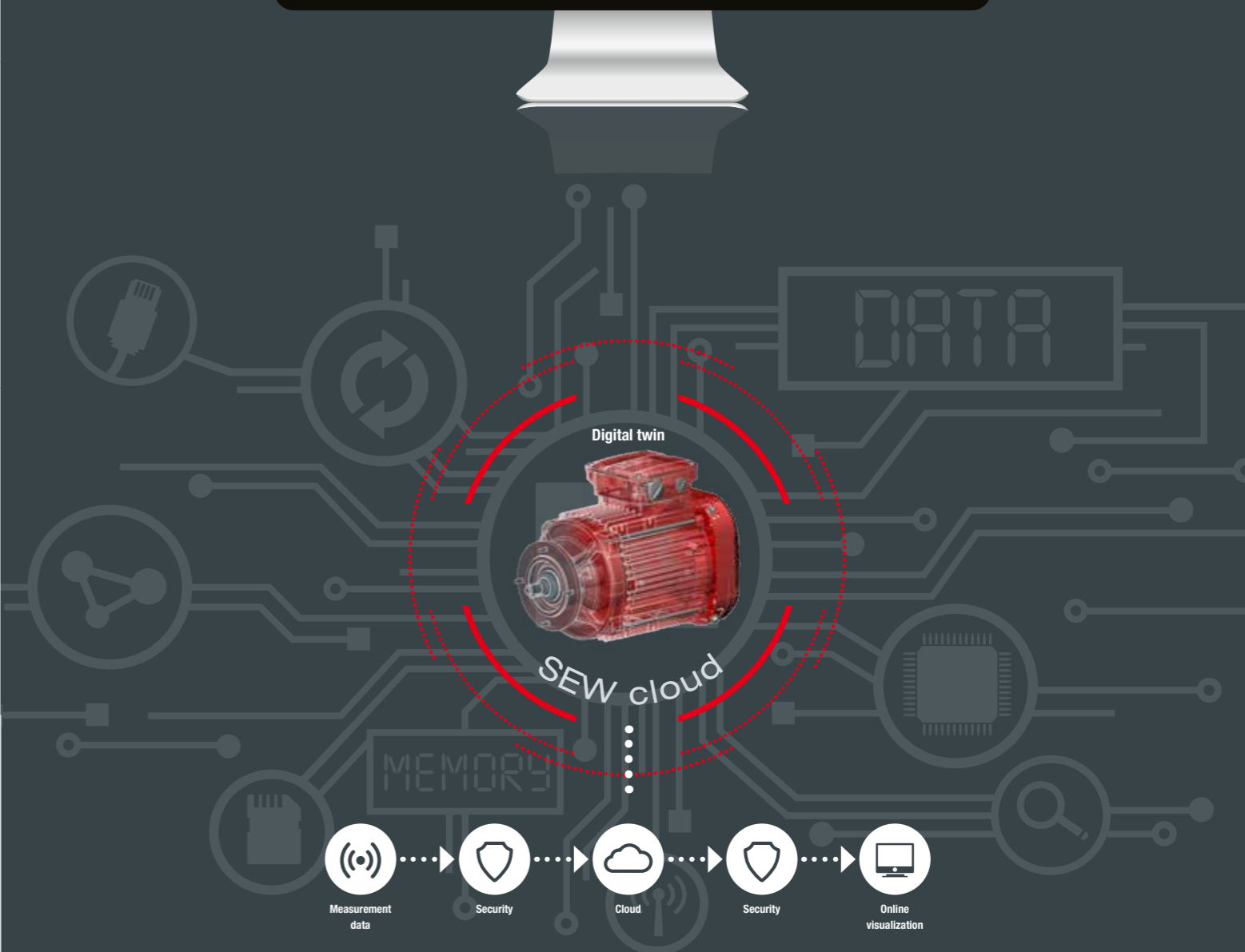
- Result: process compliance with regard to completeness and correctness
  - System performance: interaction of the system components
- This requires, among other things, the use of a digital twin for the process module, based on the correct modeling of the process and the automation system implementing the process. The digital twin of the Smart System thus also integrates the digital twins of the individual components.

**Other components are:**

- System monitoring
  - Data and information acquisition
  - Prediction models
- This can be provided by the manufacturer of a smart system for greenfield systems or, in the case of brownfield applications, can be developed as part of an engineering process.

### Your benefits

- Modularization in the physical as well as in the digital world
- Complexity reduction through functional encapsulation
- Purpose-optimized bundling of all relevant data and analyses
- Direct module diagnostics as well as integration into higher-level systems
- Use of the Smart System for pre/use/post phases



## Smart System

### Core functions

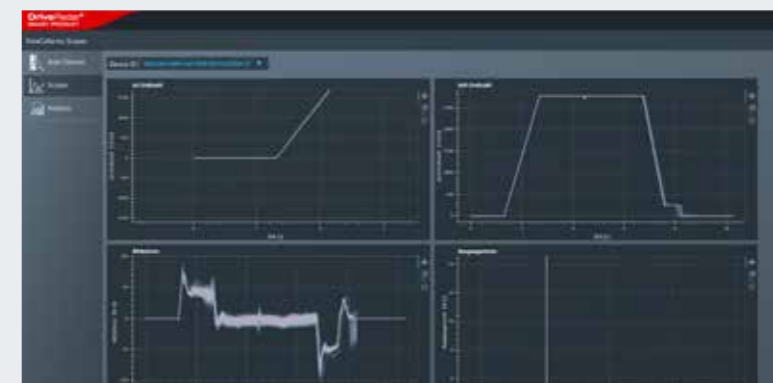
#### Digital twin for the system

The various digital contents and functions are made transparently available for the complete module (Smart System).



#### Predictive analytics

The analysis of the behavior on the basis of historical data and derived statements on the functionality and availability of the module in the future.



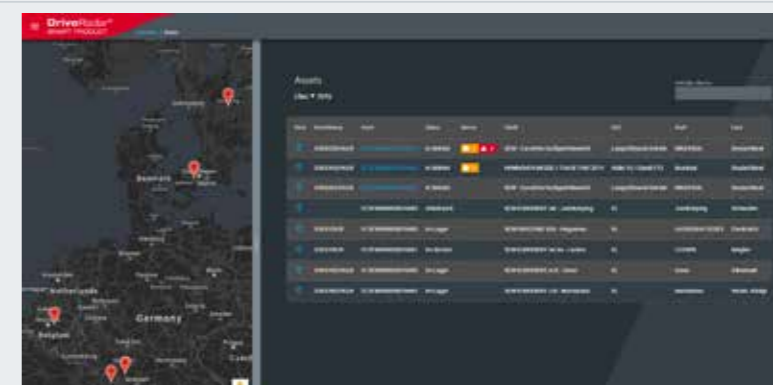
#### Process monitoring

The monitoring and optimization of the process steps carried out in the module is the level at which the user works with the module – and thus the most important user interface. Subordinate product and system analyses support the process monitoring.



#### Higher-level asset/system management

The management and up-to-date knowledge of all settings, maintenance, repairs and optimizations, as well as the products and sensors used in general, is necessary in order to be able to act quickly in the event of a problem, and it is also the basis for intelligent system monitoring.



# Smart System

Higher-level functions for condition monitoring, predictive maintenance and services

## Integration capability of sensors and drive components

A Smart System must have open interfaces for the integration of various automation components – in order to be adaptable, changeable and permanently optimizable, but also to be able to integrate all relevant parts of the system digitally.

### Data acquisition via SEW drive system

Control  
UHX85A

#### X axis



#### Y axis



#### Z axis



#### Rotational axis



- 1 Filtering data
- 2 Saving data
- 3 Networked data analysis
- 4 Prediction



### Data management, interface to application programming and higher-level system integration

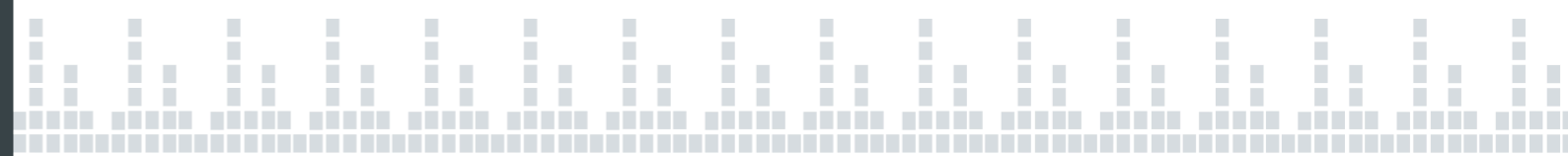
The data and information in a Smart System must be controlled by the operator. Furthermore, data from partner systems or system products must be made available in a controlled manner by the manufacturers.

### User-optimized module monitoring

The provision of the status and availability of smart systems can also be provided “on site” to the operator in a suitable key performance indicator cockpit.

### Services

In addition to the functions described as primary, further services such as data security, analysis services, operational analyses and much more are possible with Smart Systems and are appropriate and necessary for the infrastructure and operating environment.





## Smart System portfolio

### Basic condition monitoring and analysis options



#### Track-guided, mobile materials handling technology

This Smart System monitors both communication and physical parameters according to the track position and the carrier of the electrified monorail system. Follow-up analyses and limit value considerations are possible to increase system availability. Optionally, the condition of the line can also be completely diagnosed (conductor rails, mounting rails, encoder quality and much more).



#### Stationary materials handling technology

The automation of complex, stationary conveyor systems with networked decentralized systems is also a Smart System. Here, in addition to monitoring the units themselves, fleet management is offered as a central administration system. Furthermore, cyclic data from the drives can be used for higher-level analysis.



#### Process modules in the Smart Factory

Within the scope of monitoring these Smart System process modules, the monitoring of drives, sensors, mechanics and process fulfillment is solved.

#### Mobile systems

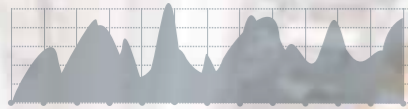
Mobile systems allow the monitoring and diagnostics of the processing along the routes of the transport vehicles and assistance systems, or the events occurring during the performance of tasks. This makes bottlenecks, anomalies and optimization potential transparent over the routes.



## Smart System

Condition-based maintenance forecast for track-guided, mobile MAXOLUTION® automation solutions

7022011-0002899-770-000  
339611900-SDFL-WQQ-



### Smart System portfolio

Thanks to integrated systems, our smart systems are capable of collecting data along the product life cycle, communicating and networking. Special condition monitoring solutions tailored precisely to the needs of customers in the automotive industry determine the condition of our smart systems at regular intervals and generate

the data base for condition-based maintenance. The data is evaluated and interpreted using cutting-edge predictive analytics procedures. This makes it possible to create an accurate maintenance forecast.

**Already used by automakers as part of our MAXOLUTION® system solutions!**

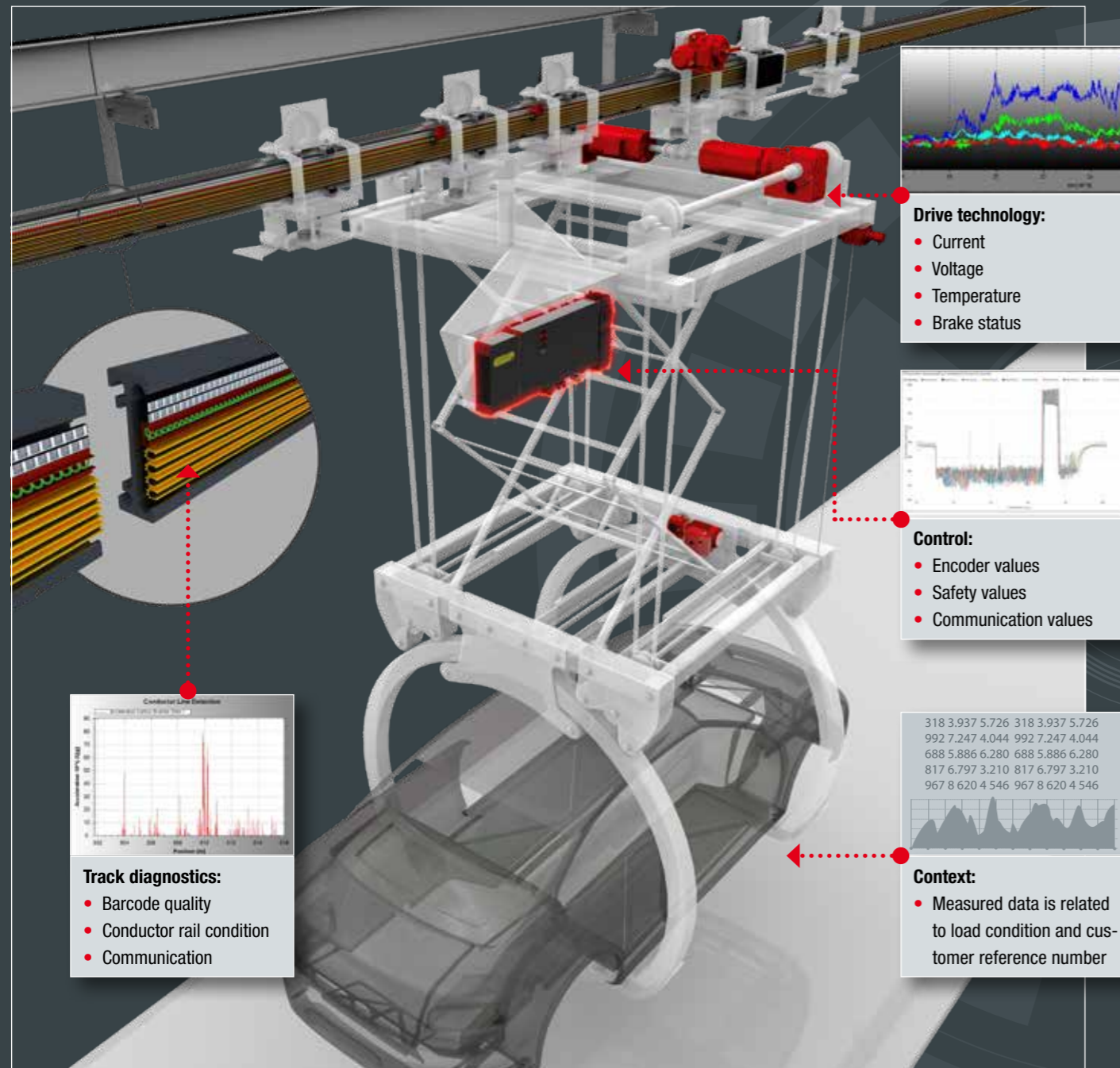
### Your benefits

- Early warning in case of critical system conditions or abnormal operating characteristics
- Prevents malfunctions and unplanned downtimes
- Displays the condition and operating characteristics of the system, thus providing transparency
- Improved ability to plan maintenance and repairs
- Makes maximum use of component and system lifecycles

# Diverse range – diverse benefits

Availability of system component performance data

The DriveRadar® portfolio for track-guided, mobile materials handling technology



Service	Description	Added value	Example
DriveRadar® Standard	Collect and display errors and states of the SEW system solution (mobile system): <ul style="list-style-type: none"> <li>• Heat map</li> <li>• Error lists</li> <li>• Filter functions</li> </ul>	Error information is already available during startup. Early integration of maintenance is possible. Graphical representation of the main points of error speeds up optimization.	Easy detection of error clusters on specific vehicles or track sections.
DriveRadar® Advanced	Various measured values (key performance indicators) are collected, processed and displayed.	Status and trend display of the SEW system solution.	Comparison reveals an increase in the current consumption of a vehicle.
Addition: Track diagnostics	Sensor recording of the track quality. Data is continuously transmitted to the vehicle controller. Includes connection to DriveRadar® Advanced.	Early warning in case of deterioration of the measured values of the track: <ul style="list-style-type: none"> <li>• Barcode quality</li> <li>• Conductor rail condition</li> <li>• Accelerations</li> <li>• Voltages</li> <li>• ...</li> </ul>	Comparison reveals an increased shock load on the conductor rails at a junction. Comparison reveals barcode contamination.
Addition: Network diagnostics	Setting up a network diagnostics incl. connection to DriveRadar® Advanced.	Information about the network can be evaluated together with measured values of the WLAN communication.	A new external WLAN subscriber is automatically detected.
DriveRadar® On-site support	<ul style="list-style-type: none"> <li>• Consulting/engineering during implementation</li> <li>• Training</li> <li>• Interpretation and optimization</li> <li>• Startup</li> </ul>	<ul style="list-style-type: none"> <li>• Fast implementation</li> <li>• Build up of expertise</li> <li>• Transfer of expertise to own employees</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance workshop</li> <li>• Qualification of own employees</li> <li>• Optimized warning thresholds</li> </ul>
DriveRadar® Back-end support	MAXOLUTION® expert evaluation with recommendations for action <ul style="list-style-type: none"> <li>• Regular DriveRadar® status report</li> <li>• Customizing/update</li> </ul>	<ul style="list-style-type: none"> <li>• Direct actions can be derived</li> <li>• Relieving own resources</li> <li>• High user-friendliness</li> </ul>	<ul style="list-style-type: none"> <li>• Targeted device replacement</li> <li>• Regular status report about the overall system</li> <li>• Integration into existing systems</li> <li>• Design of surfaces according to requirements</li> </ul>



# DriveRadar® for applications in automotive plants



**Mobile materials handling technology**  
 MAXOLUTION® system solution  
 Electrified monorail system EMS



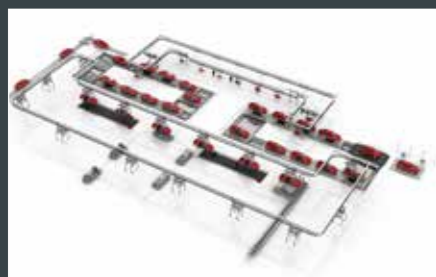
**Mobile materials handling technology**  
 MAXOLUTION® system solution  
 Skillit



**Mobile materials handling technology**  
 MAXOLUTION® system solution  
 Automated guided vehicle system



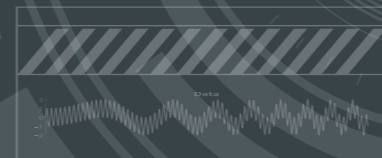
**Stationary materials handling technology**  
 Rotary table, roller conveyor, etc.



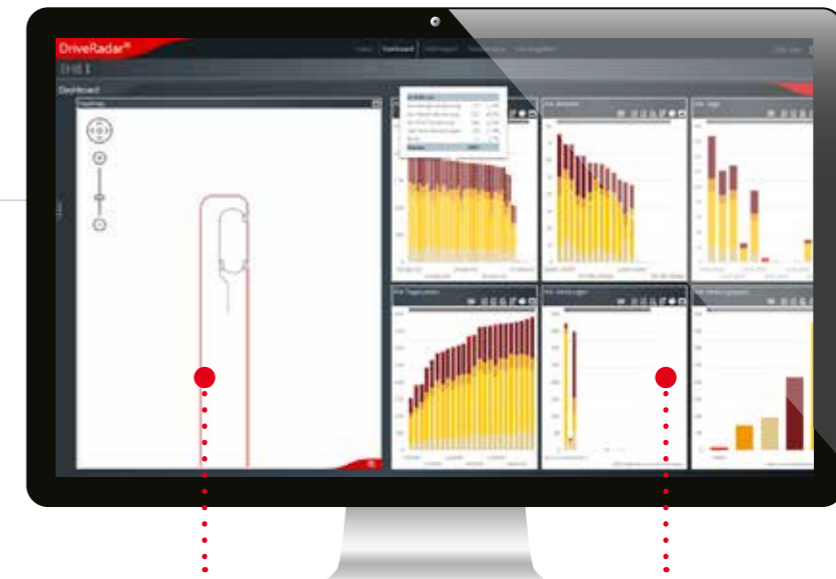
**Universal**  
 Industrial communication:  
 EtherNet and WLAN



531	3.060	8.937	531	3.060	8.937
264	7.817	3.798	264	7.817	3.798
754	8.261	3.766	754	8.261	3.766
194	6.593	6.419	194	6.593	6.419
534	8.445	3.741	534	8.445	3.741
318	3.937	5.726	318	3.937	5.726
992	7.247	4.044	992	7.247	4.044
688	5.886	6.280	688	5.886	6.280
817	6.797	3.210	817	6.797	3.210
967	8.620	4.546	967	8.620	4.546

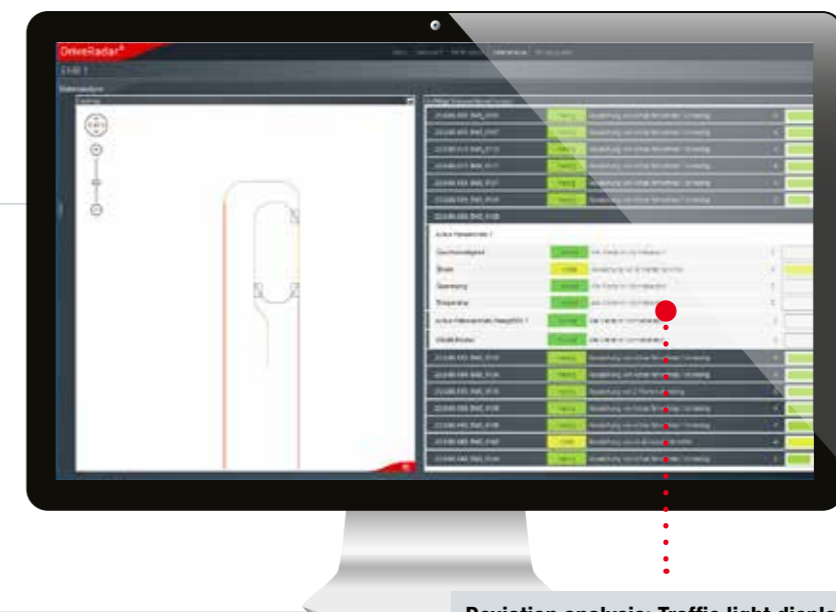


**Keeping ahead of the error:  
 Is your system running smoothly?**



**Heat map:**  
 Graphical localization of errors and peculiarities

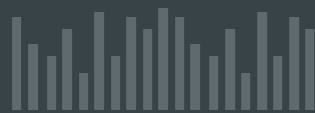
**Interactive dashboard:**  
 Quick overview with many filter and sorting functions



**Deviation analysis: Traffic light display**  
 for individual measured values / key performance indicators

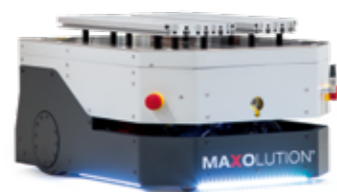
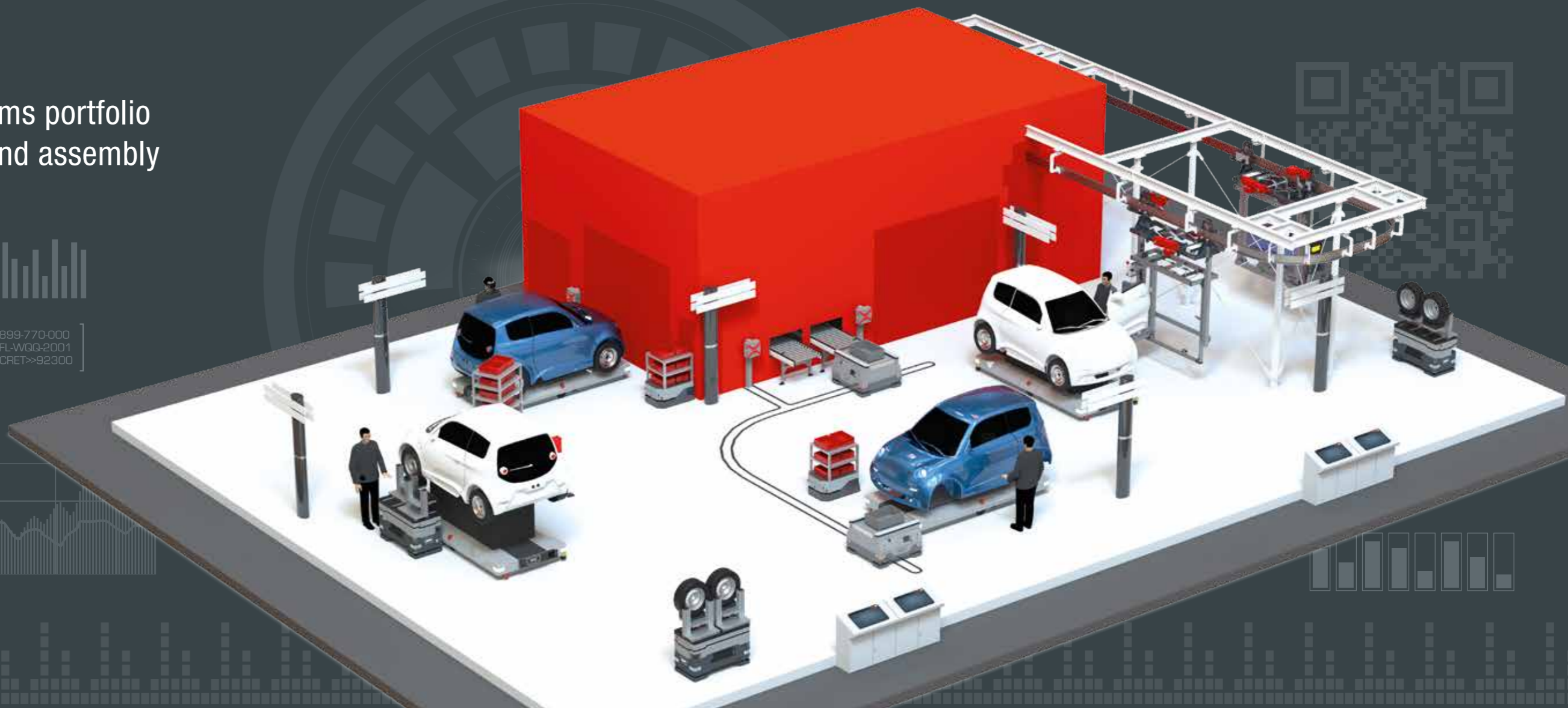
**More information on DriveRadar® – condition-based maintenance forecasting for the automotive industry:**  
[Maxolution.Automotive@sew-eurodrive.de](mailto:Maxolution.Automotive@sew-eurodrive.de)

# Mobile systems portfolio in logistics and assembly



7022011-0002899-770-000  
339611900-SDFL-WQG-2001  
XX-F>>USER>>SECRET>>92300

4397765  
4967534  
4232467  
4345560  
4434311



**Transportation vehicle**  
MAXO-MS-TV005 up to 500 kg



**Transportation vehicle**  
MAXO-MS-TV015 up to 1200 kg



**Logistics assistant**  
MAXO-MS-LA005 up to 500 kg



**Logistics assistant**  
MAXO-MS-LA003 up to 200 kg



**Transportation vehicle**  
MAXO-MS-TV030 up to 3000 kg



**Logistics assistant**  
MAXO-MS-LA015 up to 1500 kg



**Assembly assistant**  
MAXO-MS-AA005 up to 350 kg



**Assembly assistant**  
MAXO-MS-AA015 up to 1400 kg



## Smart Process

Keeping an eye on the entire system  
with process monitoring

Comprehensive process monitoring for plants and mobile systems, which collects, evaluates and graphically displays data.



With our process monitoring tool a real-time evaluation of the system and the individual mobile systems as well as a traceability of orders and routes is made possible. This allows conclusions to be drawn about system

and vehicle availability. For example, a clear display of scan field violations in the layout shows quickly and easily which points are "jammed" and thus helps to efficiently optimize the system.

### Your benefits

- Automated and consistent online recording of operating parameters
- Easy and secure access to the data because it is stored on customer servers
- Complete connection of the system via an interface
- Real-time evaluation of the system and vehicles for condition-based maintenance forecasts
- Prevents malfunctions and unplanned downtimes
- Transparency about the status and operating behavior
- Optimization of the system:
  - Graphical / clear display of all messages in the layout
  - Traceability of orders and routes
- User-oriented representation
- Ensuring/increasing the availability of machinery and systems
- Target/actual comparison



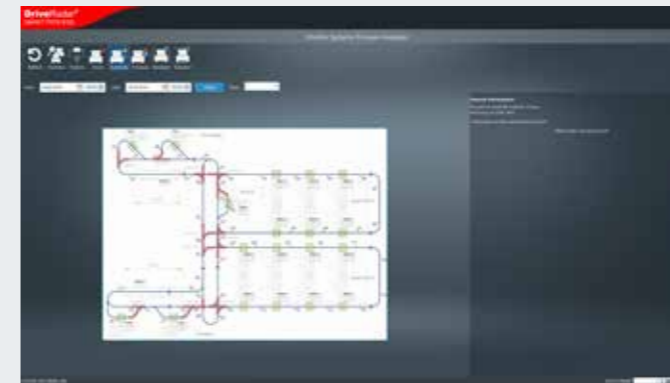




#### Time-lapse display of vehicle positions in the layout over a defined period of time

##### Benefits

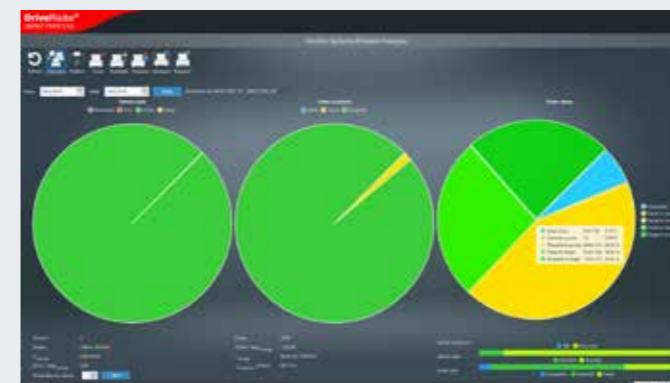
- Traceability through retrospective, time-accurate position display
- Situation analysis of past events



#### Graphical representation of the reported scan field violations

##### Benefits

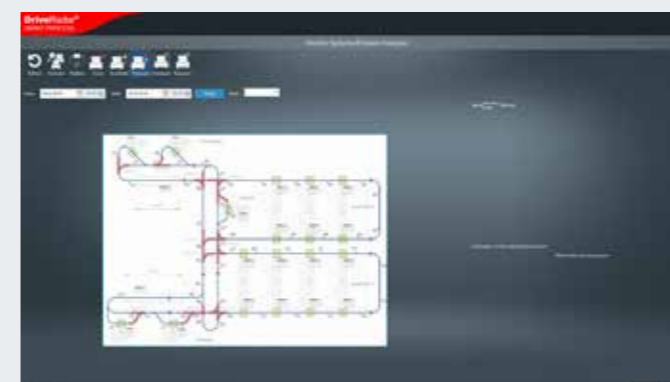
- Simple display in terms of time and vehicle
- Plant optimization through graphic representation in the layout



#### Current and retrospective overview of the overall order and vehicle status

##### Benefits

- Simple and clear representation
- System status at a glance



#### Graphical representation of communication interruptions

##### Benefits

- Detection of insufficient WLAN coverage
- Allows for early troubleshooting

# Smart Support

Infrastructure and services for Smart Product and Smart System



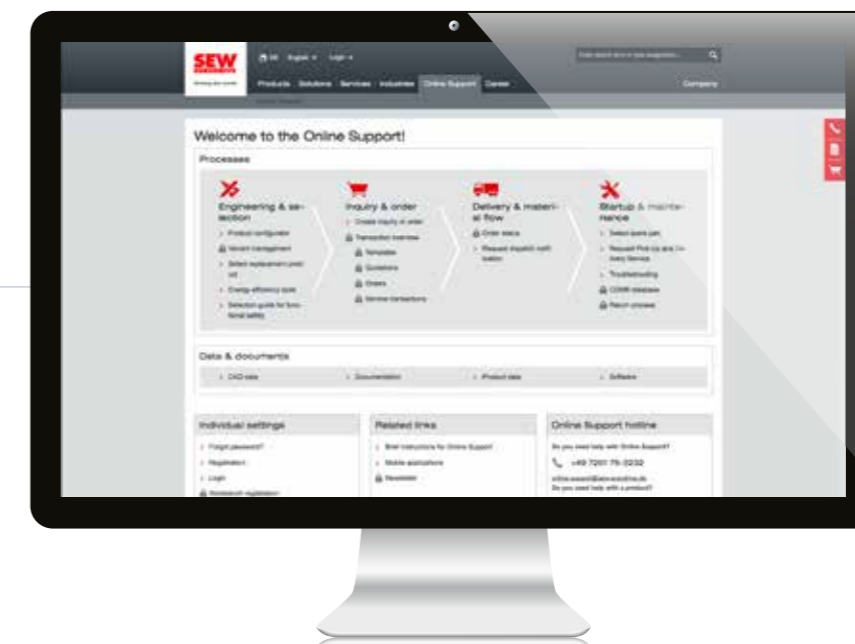
Already used by our customers today!

## The intelligent, networked product for the factory of the future

Smart Support offers infrastructure and services for the simple and secure implementation of network connectivity between edge devices and cloud solutions from SEW-EURODRIVE and 3rd party cloud systems. Depending on the application, various communication channels can be used – from encrypted communication via mobile phone network (machine2machine) to secure connections via Internet links.

For this purpose, a special connectivity service is offered for the secure setup of a remote maintenance channel. The remote maintenance user retains full control over the activation of the remote maintenance channel at all times. On request with release via key switch directly on the system.

Information and cyber security play a central role here. SEW-EURODRIVE's Information Technology Services are operated on the basis of an Information Security Management System that has been certified according to ISO27000 by TÜV SÜD Management GmbH since 2006. Maximum availability of IT solutions is also ensured by SEW-EURODRIVE's IT Service Management System, which has been ISO20000-certified since 2008.



Integration of Smart Support solutions into the Online Support customer portal



For more information on DriveRadar® and the extensive service and product portfolio, please visit [www.sew-eurodrive.com](http://www.sew-eurodrive.com)



[www.sew-eurodrive.de/en/smart-factory](http://www.sew-eurodrive.de/en/smart-factory)



**Storage technology**

- Innovative warehouse logistics implemented with SEW drive technology
- Modular structure: One-level shuttles, multi-level shuttles, vertical conveyor
- Highly dynamic shuttle systems for maximum throughput

