RAILWAY SYSTEMS

DIAGNOSTIC AND MONITORING TECHNOLOGIES FOR ROLLING STOCK

voestalpine Signaling
www.voestalpine.com/railway-systems

voestalpine
ONE STEP AHEAD.

FOCUS ON SAFETY AND AVAILABILITY

With over 20 years of rolling stock diagnostic and monitoring experience, the voestalpine Signaling group provides fleet managers with decision support and condition based maintenance data where and when they need it. Our devices and apps are designed to work with controllers, maintenance crews and signallers so that at every level your railway gets access to the information needed to keep your performance on track.

Our business unit “Diagnostic and Monitoring Technologies” (DMT) has its core competence in monitoring fixed infrastructure assets and rolling stock. We have developed a world leading range of monitoring solutions which provide our customers with the tools to implement smarter maintenance practices and prevent asset failures.

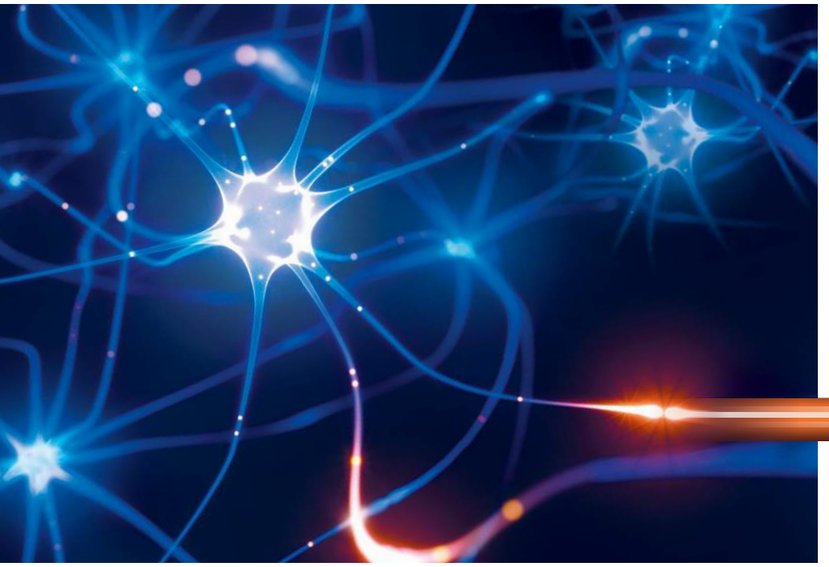
We can deliver turnkey supply and implementation of our products to our customers around the world. A variety of service contracts can be arranged, depending on the very needs of our customers, securing the desired level of availability of the systems and operation.

PHOENIX is composed of modular wayside diagnostic and monitoring functions and intuitive software applications for the immediate diagnosis and management of assets which at the same time provide information for long term business improvements. This facilitates users to perform specific tasks such as maintenance planning and train control more effectively.

The advantage of the interconnected structure of our PHOENIX hardware and software is that it provides the customer with a monitoring solution that addresses their individual business needs. The PHOENIX concept allows customers to install additional sensor functionality at existing monitoring sites in a cost-efficient way.

PHOENIX

PHOENIX CMS – CENTRAL MANAGEMENT SOFTWARE



Nervous system [noun]: The **seamless** transmission and immediate interpretation of **sensory** impulses that result in physical **responses**.

Presenting only relevant data to your teams, every app of PHOENIX CMS has been specifically designed to support efficient decision making within your railway organization. The acquired information is displayed in a user friendly format to the customer.

The flexible and high capacity software architecture can also handle various 3rd party equipment, protocols and data in real time and is also able to provide data feeds to management information systems.

Decision Support Applications

Asset Management

The asset management application enables access to predefined dashboards and reports that give insight into the performance of railway assets. This allows you to prioritize and validate potential technical improvements and process enhancements.

Alarming and Intervention

With the alarming and intervention application, key personnel such as traffic controllers, track managers and infrastructure maintainers are actively informed about deviating and adverse situations before an impact on safety or availability occurs.

Condition Based Maintenance

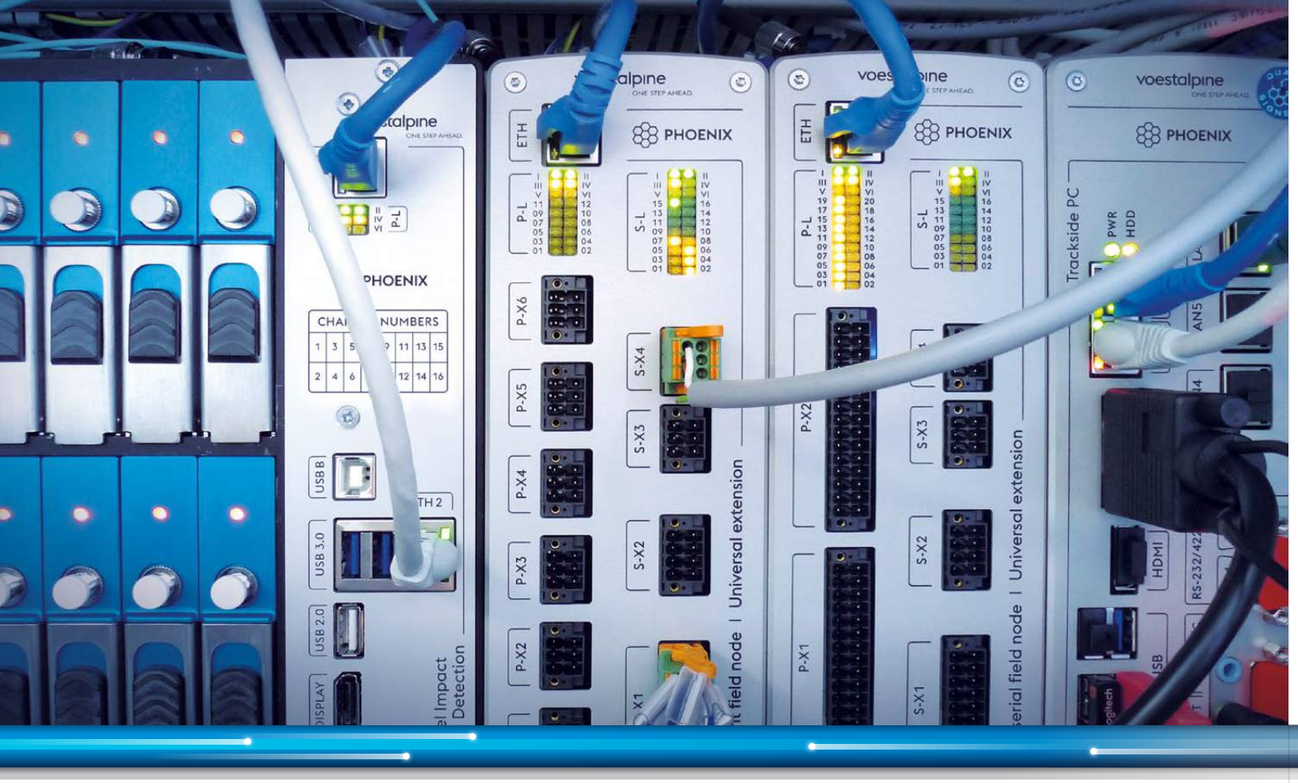
The condition based maintenance application provides maintenance personnel with real time asset performance and condition data. This gives the opportunity to pro-actively schedule maintenance before service is disrupted by failures.

System Supervision

Using the system supervision application the status of each function can be monitored and analyzed. Deviations are reported to allow for timely repair or service.

Control of Auxiliary Systems

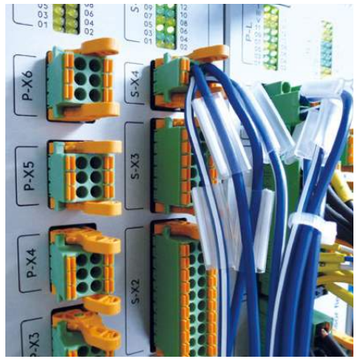
This application provides a concentrated solution for handling 3rd party wayside systems that allow the operator to review status and react accordingly.



Consciousness [noun]: The **combination** and interpretation of multiple **sensory** inputs, resulting in the ability to assess and **evaluate** what is happening around you.

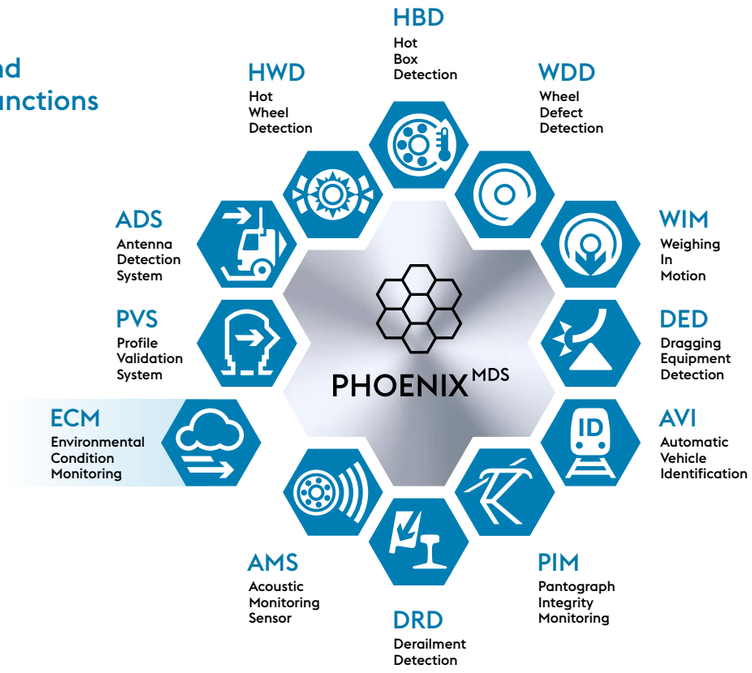
Our modular structure supports the combination of sensor functions to meet the monitoring requirements at each installation location. We offer a wide range of monitoring functions, such as Hot Box Detection, Switch Condition Monitoring or Wheel Defect Detection. These functions can be complemented with a variety of options and components to fit to specific monitoring requirements.

Multiple PHOENIX^{MDS} functions installed in the track at the same site can be connected to a single cabinet. Operating at a low voltage and with inter-changeable modular parts PHOENIX^{MDS} provides customers with a lower total cost of ownership.



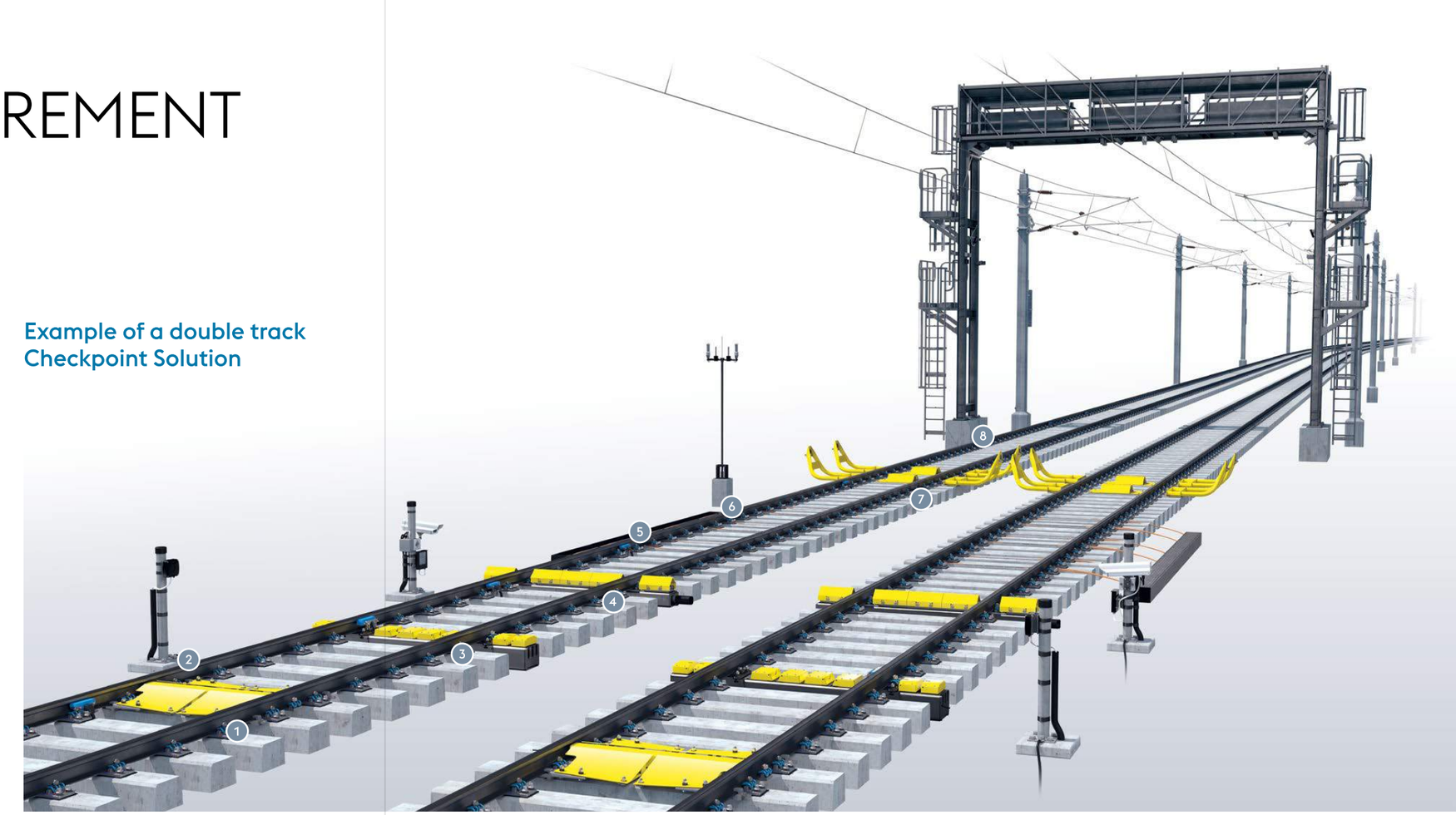
PHOENIX^{MDS} – MODULAR DIAGNOSTIC SYSTEM

Diagnostic and Monitoring Functions



MULTI-MEASUREMENT CHECKPOINT

Example of a double track Checkpoint Solution



1 **DRD**
Derailment Detection

2 **AVI**
Automatic Vehicle Identification

3 **HBD**
Hot Box Detection

HWD
Hot Wheel Detection

4 **DED**
Dragging Equipment Detection

5 **WDD**
Wheel Defect Detection

WIM
Weighing In Motion

6 **ECM**
Environmental Condition Monitoring

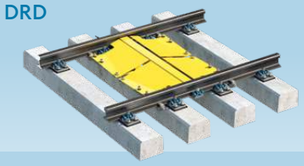
7 **AMS**
Acoustic Monitoring Sensor

8 **PVS**
Profile Validation System

PHOENIX enables the combination of individual wayside diagnostic and monitoring functions into a single site. This gives the advantage of allowing customers to configure each site according to their monitoring strategy. In contrast to stand-alone multi-supplier sites, PHOENIX[MDS] Checkpoints provide interconnected self-verifying sensor data that increases the value of the output.

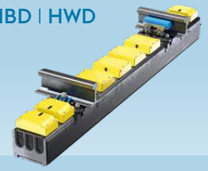
Our PHOENIX[MDS] based Checkpoint solutions further allow customers the ability to change or add monitoring functions at any site after the initial installation without the need to install fresh power or IT infrastructure. The use of interchangeable hardware components across different monitoring functions reduces the number of installed parts and cuts maintenance costs over the Checkpoint's lifetime.

1 **DRD**



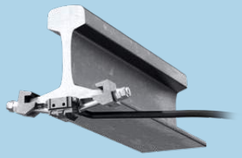
2 **AVI**

3 **HBD | HWD**



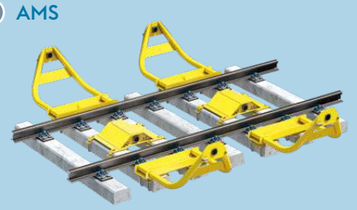
4 **DED**

5 **WDD | WIM**



6 **ECM**

7 **AMS**



8 **PVS**

ROLLING STOCK MONITORING

Our PHOENIX[MDS] rolling stock diagnostic and monitoring solutions are based on a variety of measurement technologies: infrared, fibre optic, acoustic and optical sensors can be applied to optimize the measurement location. The sensors are designed to withstand any environmental conditions and enable a continuous monitoring of rolling stock assets.

HBD
Hot Box Detection

PHOENIX[MDS] HBD – Hot Box Detection
HBD sensors are used to monitor the temperature of axle bearings. Bearing defects are indicated by hot axle boxes which might lead to axle fractures or premature failure.

HWD
Hot Wheel Detection

PHOENIX[MDS] HWD – Hot Wheel Detection
HWD sensors are used to monitor the temperature of wheels and disc brakes. Locked brakes indicated by an increase of temperature might lead to loosened wheel rims, broken brake discs or even fire.

CWD
Cold Wheel Detection

PHOENIX[MDS] CWD – Cold Wheel Detection
CWD sensors are used to monitor the temperature of wheels and disc brakes. Underperforming brakes are indicated by comparatively low temperature resulting in unevenly distributed or reduced braking force.

WDD
Wheel Defect Detection

PHOENIX[MDS] WDD – Wheel Defect Detection
WDD sensors measure increased wheel-rail interaction forces coming from running surface defects of passing wheels. These defects create higher wear and tear of both vehicles and infrastructure leading to higher derailment risks. In addition they reduce travel comfort and create an increase in noise and vibration.

WIM
Weighing In Motion

PHOENIX[MDS] WIM – Weighing in Motion
WIM sensors automatically measure the vertical wheel forces of passing vehicles. In addition derived quantities such as axle load, asymmetric loading, overloading, vehicle weight and train weight are determined.

DED
Dragging Equipment Detection

PHOENIX[MDS] DED – Dragging Equipment Detection
DED sensors monitor the undercarriage of passing trains for dragged parts by using accelerometers. Dragging detection alerts train and railway operators to prevent damage to track structure and elements built in it.

PHOENIX[MDS] AVI – Automatic Vehicle Identification
AVI sensors ensure the allocation of measurement data to the correct carriage and wheelset. This RFID based system allows users to quickly match the defect to the specific asset and location.

AVI
Automatic Vehicle Identification

PHOENIX[MDS] ECM – Environmental Condition Monitoring
ECM sensors constantly measure environmental conditions. Strong wind, rain fall, sand storms, flooding or considerable changes in rail temperature can seriously impact schedules. ECM delivers timely warnings about the weather which mitigates its impact on your railway.

ECM
Environmental Condition Monitoring

PHOENIX[MDS] DRD – Derailment Detection
As a serious danger for rail vehicles derailed wheels cause considerable damage to railway infrastructure. DRD sensors are designed to detect derailed wheels and to inform the dispatcher instantly.

DRD
Derailment Detection

PHOENIX[MDS] AMS – Acoustic Monitoring Sensor
AMS identifies bearing defects at an early stage through acoustic measurements on freight and passenger wagons. AMS sensors predict different kinds of bearing defects (cone and cup defects, loose cones, etc.), supporting efficient wheelset management.

AMS
Acoustic Monitoring Sensor

PHOENIX[MDS] PVS – Profile Validation System
PVS sensors provide precise train profile surveillance by using optical scanners and cameras. PVS sends alarms to train controllers to prevent damage to tunnels, bridges, infrastructure and even accidents.

PVS
Profile Validation System

PHOENIX[MDS] ADS – Antenna Detection System
ADS sensors detect antennas protruding from road vehicles loaded onto cargo trains, warning of the risk of an antenna contact with the track's overhead power supply.

ADS
Antenna Detection System

PHOENIX[MDS] PIM – Pantograph Integrity Monitoring
Using cameras and laser technology PIM offers a complete pantograph monitoring solution that prevents overhead wire tear down and alerts customers to carbon strip wear.

PIM
Pantograph Integrity Monitoring

PHOENIX[MDS] WPM – Wheel Profile Monitoring
WPM sensors monitor wheel wear and wheel profile of every train axle by using optical technology. WPM measures automatically the wheel profile and wheelset parameters like flange height and width, flange slope (qR), wheel width and diameter, etc., supporting efficient wheelset management.

WPM
Wheel Profile Monitoring

ROADMASTER® APPLICATIONS

FIXED ASSET MONITORING

Our ROADMASTER® applications capture and analyze performance related data in the most challenging environments to identify deteriorating infrastructure asset condition. Automated alerts are then issued so that maintenance can be proactively scheduled, avoiding service disruption and maximizing track availability.

SCM
Switch Condition Monitoring

SCM – Switch Condition Monitoring

SCM monitors the performance of switch machines and turnouts at every movement. Specialist algorithms are used to warn when normal operating characteristics are exceeded, allowing maintenance work to be scheduled to restore performance before train services are disrupted.

TCM
Track Circuit Monitoring

TCM – Track Circuit Monitoring

TCM reliably identifies deteriorations in track circuit performance and issues alerts to allow maintenance before any failure. TCM provides early stage detection of rail head or wheel contamination, ballast or insulation problems and track circuit equipment faults.

SPM
Signaling Power Monitoring

SPM – Signaling Power Monitoring

SPM monitors the availability and quality of power supply to vital systems such as signaling, rail crossings and switches. Correlation of power information data with other infrastructure monitoring data assists in the diagnosis of complex faults.

RXM
Rail Crossing Monitoring

RXM – Rail Crossing Monitoring

RXM systems range from event recording for test and investigation to condition monitoring for smart maintenance. Through logical analysis of the monitored inputs, the RXM system determines key performance indicators, such as warning time, barrier rise/fall time, road closure time and train speed.

BUSINESS SUPPORT

Market demand and the availability of new technology continuously drive our team to further develop our services. In co-operation with our voestalpine Railway Systems and university partners, we share our expertise and knowledge of railway processes with our customers.

PHOENIX ACADEMY

Our customers value the exchange of best practice in the area of railway asset management. The PHOENIX ACADEMY facilitates this by organizing user group meetings, conferences and seminars on the application of railway diagnostic monitoring technologies.

You can benefit from a full portfolio of product training, ranging from an introduction level for on-site maintenance engineers to a workshop on how data can be applied in operational processes. We offer trials for evaluation of our asset management technologies, supported by a structured trial management process. Our consultants assist in implementing the provided solutions and in reaching the projected targets.

Furthermore we are proud of our relationships with the academic world. We actively co-operate with the Competence Center for the Assessment of Railway Diagnostic and Monitoring Technologies for applied research in railways.

Certified Training

For all products we offer a wide range of training courses for various target groups. Participants are trained to make use of the full potential of each installed sensor and to maximize the return of the investment in the PHOENIX installation. In addition to training courses we also offer workshops for the exchange of best practice of technical personnel.

The installation of our diagnostic and monitoring functions can also be done by our customers or their service partners. We offer a training course for your technical engineers and can assist in overseeing the installation process itself. This way we can ensure a high quality service from start to finish.

GLOBAL SERVICE AND SUPPORT

Our after sales and service team, consisting of qualified service engineers, offers a wide range of services. We secure global presence using local service partners and support centers of the voestalpine group and support. We support high performance organizations in a demanding railway environment.

Global Support

On Demand Support

On demand support offers help to resolve critical issues quickly and effectively. On-site servicing, routine maintenance and spare parts can all be ordered through the myPHOENIX customer app.

Module Replacement Service

Module replacement service provides maintenance budget certainty and good value for money. Our customers can keep just the critical on-site spares required, knowing that a replacement for any spare you consume is immediately on its way. This service model comprises the replacement of failed components with new or refurbished factory assemblies, on time delivery of spare parts and spare stock management, even on the basis of an annual service agreement.

Service Level Agreement

We offer a wide choice of service level agreements for optimized operation, availability and reduced cost of ownership. Based on the required response times and availability level we assure customized service by provision of software upgrades, guaranteed access to our 24/7 helpdesk, and remote assistance. We can further provide preventive maintenance and efficient corrective support.

Service Centers

As a globally present group of companies voestalpine Railway Systems will provide a local point of contact to our customers wherever they are. Our regional service centers can be contacted around the clock with requests for advice and support.

voestalpine – Locations Worldwide

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