



RAILWAY
SYSTEMS
by voestalpine

zentrak ROLLING STOCK MONITORING

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.



We believe that the future of efficient, safe, and modern railway systems can be found at the crossroads of cutting-edge technology and the limitless capabilities of the human mind. Our solutions are based on vast amounts of data, technologies, and the holistic digitalization of critical assets to make data a relevant and intelligent management tool for creating sustainable, profitable, safe and flexible railway ecosystems.

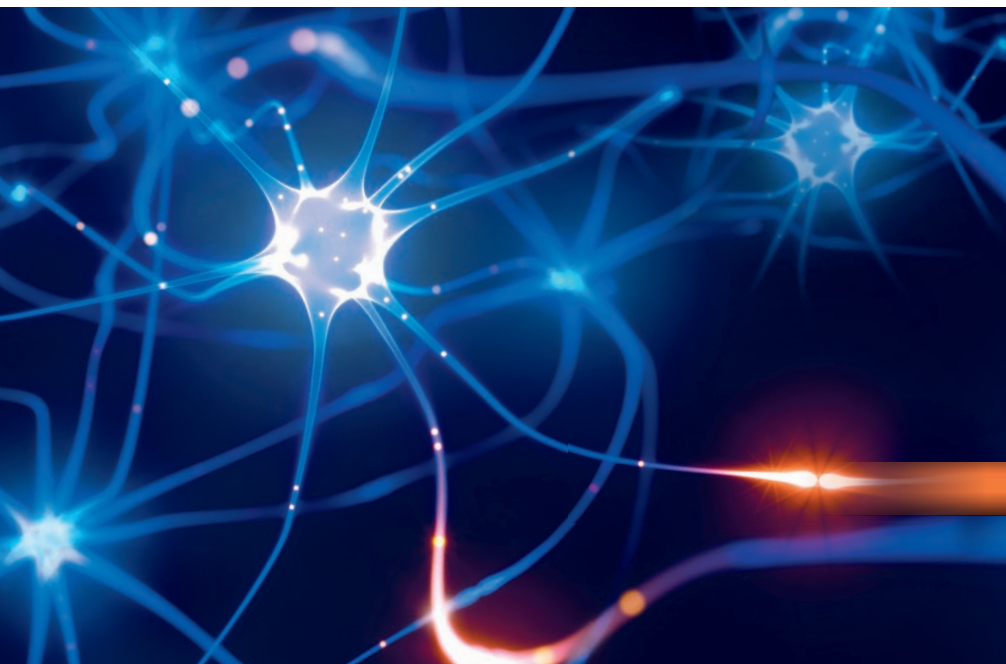
With zentrak, we have developed an intelligent, conscious, and living railway ecosystem, that enables you to create and manage the most efficient, reliable, and high-performing railway track assets in the world. In the smartest way possible.

For rolling stock monitoring, zentrak offers 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 hardware and software is that it provides the customer with a monitoring solution that addresses their individual business needs. This concept allows customers to install additional sensor functionality at existing monitoring sites in a cost-efficient way.

zentrak

zentrak CENTRAL MANAGEMENT SOFTWARE



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

zentrak's software solutions for rolling stock monitoring offer a variety of applications for analyzing, interpreting and presenting diagnostic results in real time.

Presenting only relevant data to your teams, zentrak's rolling stock monitoring applications have 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

zentrak System Supervision

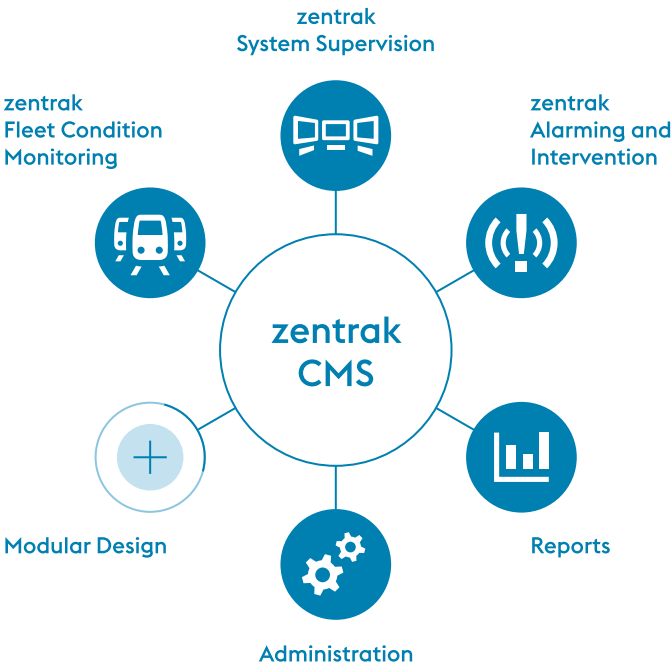
The System Supervision app offers infrastructure operators a convenient overview of your rolling stock monitoring installations. It displays the real-time status and online information of the installed sensor systems. The processed data supports intelligent solution finding and remote trouble-shooting processes in the event of a problem to reduce maintenance visits on-site.

zentrak Fleet Condition Monitoring

Displaying real time and trend data, the Fleet Condition Monitoring app provides fleet managers and maintenance engineers with a comprehensive view of a train's status and performance. It provides flexible alert thresholds, which can be configured according to each vehicle's tolerances and characteristics.

zentrak Alarming and Intervention

The Alarming & Intervention app displays within seconds the vital data and key information needed by dispatchers and traffic controllers to support immediate decision making. Clear, concise and secure messages are delivered according to their user profile ensuring that users only receive messages that are relevant to their role in the railway.

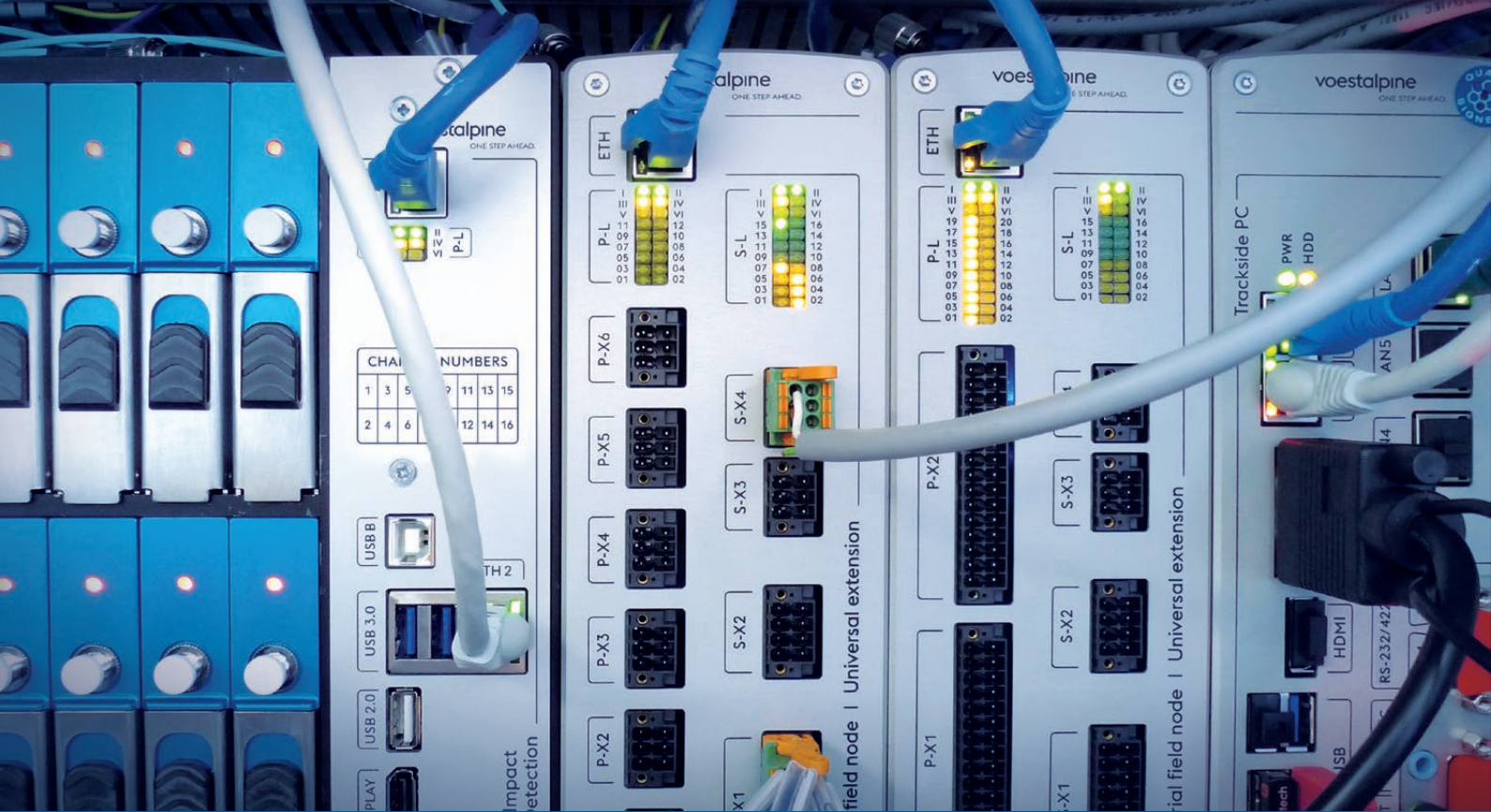


Reports

The Reports app offers users such as supervisors or management to analyze the historical data in a clear and flexible way.

Administration

The Administration app enables administrators to control access to the collected data by setting user profiles, creating user groups and applying specific roles to users.



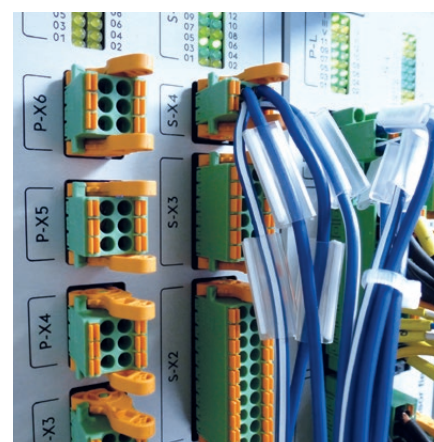
zentrak MODULAR DIAGNOSTIC SYSTEM



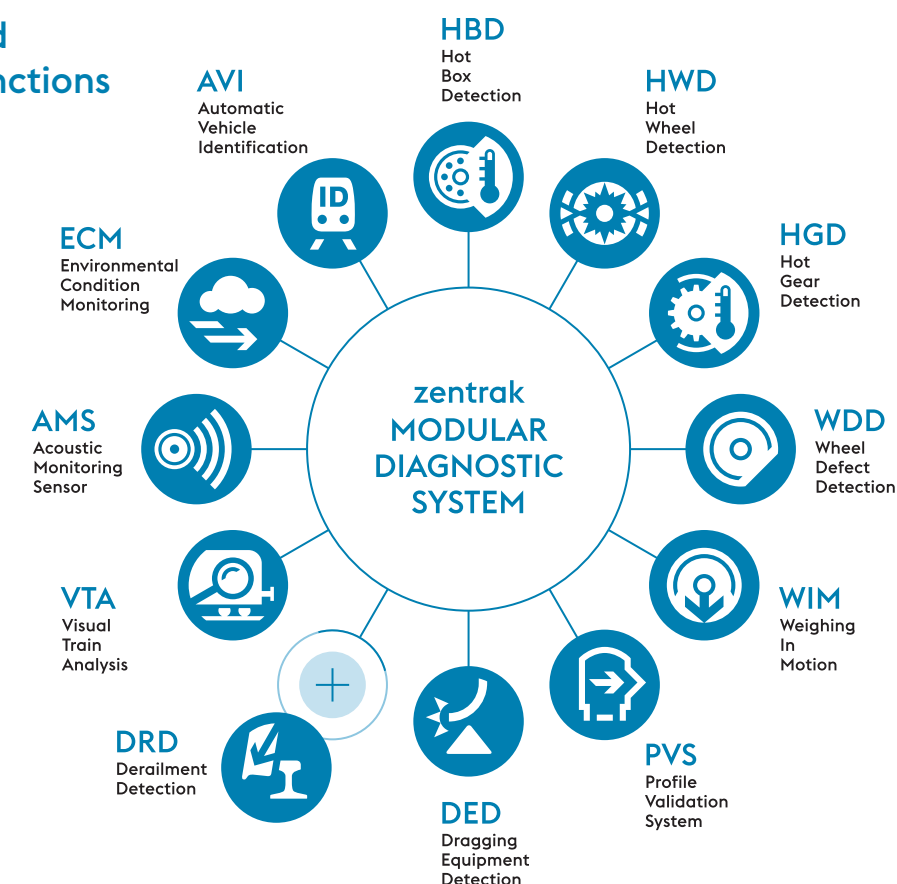
Consciousness [noun]: The **combination** and interpretation of multiple **sensory** inputs, resulting in the ability to assess and **evaluate** what is happening around you.

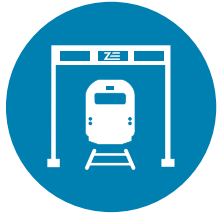
Our modular structure supports the combination of sensor functions to meet the monitoring requirements at each installation location. We offer a wide range of monitoring functions, such as Hot Box Detection, Visual Train Analysis or Wheel Defect Detection. These functions can be complemented with a variety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

Multiple zentrak Modular Diagnostic System functions installed in the track at the same site can be connected to a single cabinet. Operating at a low voltage and with interchangeable modular parts the functions provide customers with a lower total cost of ownership.



Diagnostic and Monitoring Functions





MULTI-MEASUREMENT CHECKPOINT



Example of a Checkpoint Solution

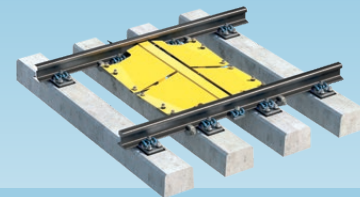


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|---|---|---|--|--------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|---|----------------------------------|---|--|
| 1
DRD
Derailment Detection | 2
AVI
Automatic Vehicle Identification | 3
DED
Dragging Equipment Detection | 4
VTA
Visual Train Analysis | 5
HBD
Hot Box Detection | HWD
Hot Wheel Detection | HMD
Hot Motor Detection | HGD
Hot Gear Detection | 6
WDD
Wheel Defect Detection | WIM
Weighing In Motion | 7
AMS
Acoustic Monitoring Sensor | 8
PVS
Profile Validation System |
|---|---|---|--|--------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|---|----------------------------------|---|--|

zentrak 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, zentrak Modular Diagnostic System Checkpoints provide interconnected self-verifying sensor data that increases the value of the output.

Our 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.

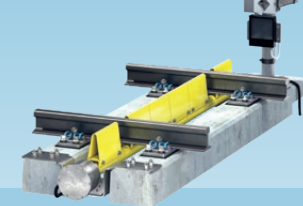
1 **DRD**



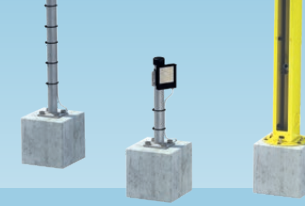
2 **AVI**



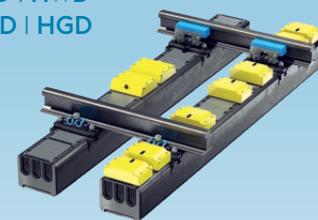
3 **DED**



4 **VTA**



5 **HBD | HWD
HMD | HGD**



6 **WDD | WIM**



7 **AMS**



8 **PVS**





ROLLING STOCK MONITORING

Our **zentrak 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

zentrak Hot Box Detection (HBD)

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

zentrak Hot Wheel Detection (HWD)

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

zentrak Cold Wheel Detection (CWD)

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.



HMD
Hot Motor Detection

zentrak Hot Motor Detection (HMD)

HMD sensors alarm customers on high temperatures on motor drives and their power cables and provide valuable trending alerts to assist in condition based maintenance. Due to a modular design we can support multiple scanner configurations inside the track, even when multiple types of rolling stock are in use.



HGD
Hot Gear Detection

zentrak Hot Gear Detection (HGD)

Modern rolling stock relies heavily on gearbox performance, and elevated temperatures can signal component failure in the running gear. Our proven HGD sensors monitor gearbox components and couplings for excess temperatures and provide temperature trending analysis for multiple train passes.



DED
Dragging Equipment Detection

zentrak Dragging Equipment Detection (DED)

Restoring DED paddles monitor the undercarriage of passing trains for dragging parts. Dragging detection alerts train and railway operators to prevent damage to track structure and elements built in it.

zentrak Wheel Defect Detection (WDD)

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.



WDD
Wheel Defect Detection

zentrak Weighing in Motion (WIM)

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.



WIM
Weighing In Motion

zentrak Acoustic Monitoring Sensor (AMS)

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

zentrak Automatic Vehicle Identification (AVI)

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

zentrak Profile Validation System (PVS)

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

zentrak Visual Train Analysis (VTA)

VTA brings machine vision to the track. Cameras are installed at different angles and distances to the tracks to record images used for multiple analysis algorithms, such as UIC number recognition, brake block detection, hazardous signs, etc. Using IR-flash lights the system delivers reliable results at day and night.



VTA
Visual Train Analysis

zentrak Derailment Detection (DRD)

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

zentrak Environmental Condition Monitoring (ECM)

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.



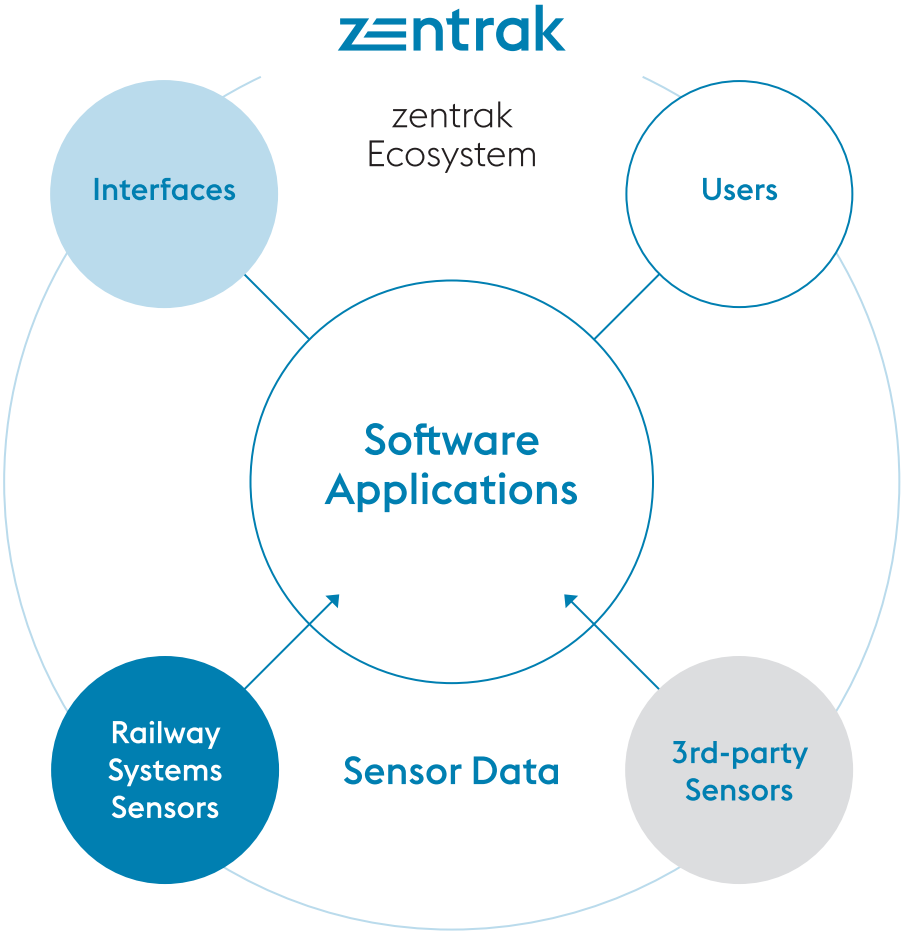
ECM
Environmental Condition Monitoring

zentrak CONNECTING EVERYTHING



The intelligent, conscious and living railway ecosystem
Your railway network keeps the world moving forward: but your infrastructure is only as strong as the technology that holds it together. That's where zentrak comes in: our intelligent, living railway ecosystem enables you to create and manage the most efficient, reliable, and high performing railway track assets in the world.

zentrak's three modules Rolling Stock Monitoring, Infrastructure Monitoring, and Asset & Maintenance Management combine as a catalyst for cost effective digitalization and sustainable, long term growth: building a future in which your railway network thrives intelligently.



BUSINESS SUPPORT

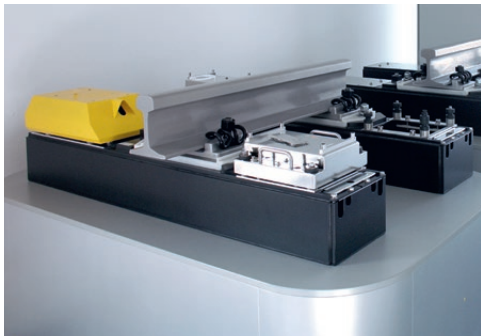
Market demand and the availability of new technology continuously drive our team to further develop our services. In co-operation with our voestalpine Railway Systems and university partners, we share our expertise and knowledge of railway processes with our customers.

Railway Systems Academy – Campus Siershahn
Our customers value the exchange of best practice in the area of railway asset management. The Campus Siershahn 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.

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 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
Support

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.

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 our **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.

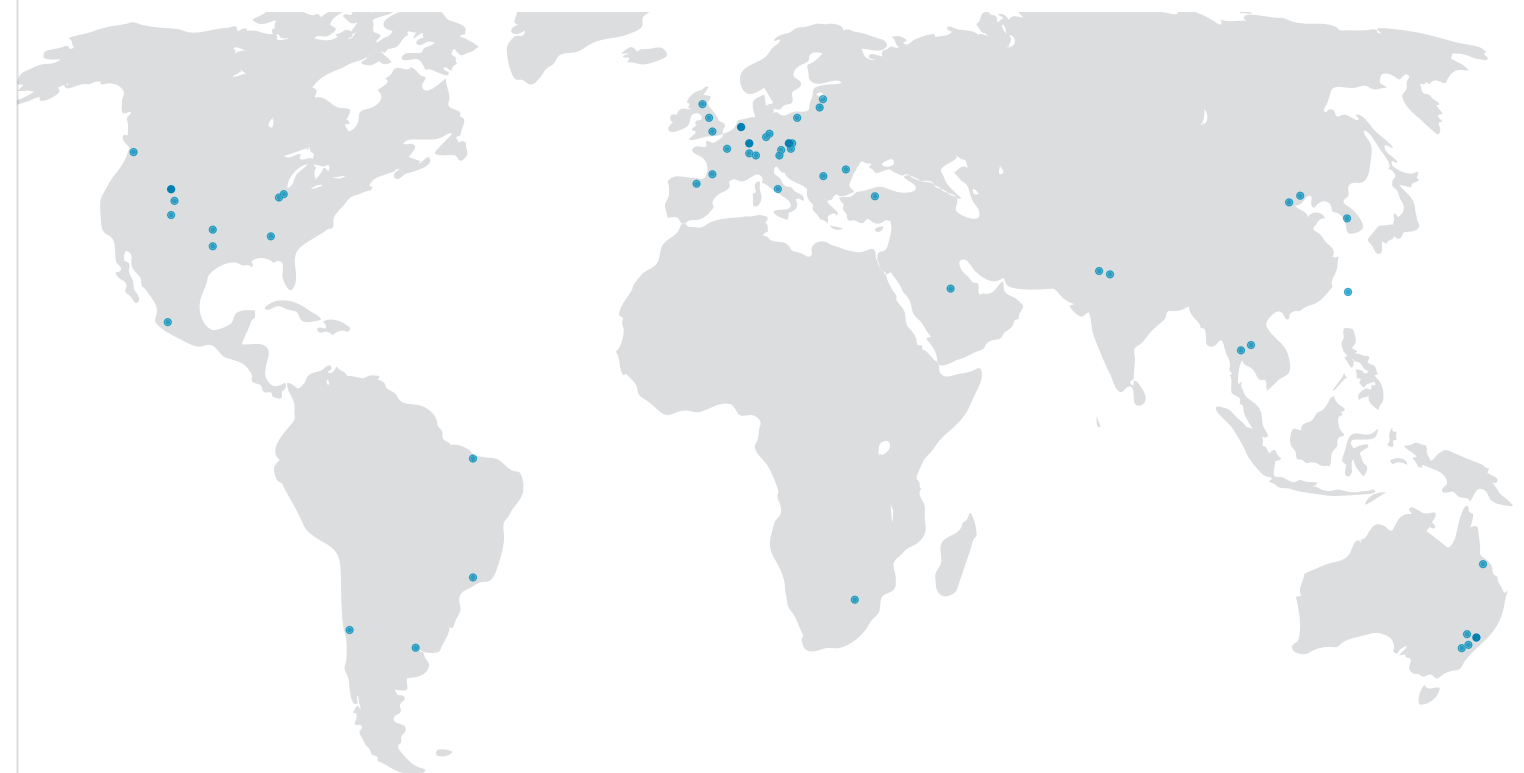
Service Centers

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

- Companies and Branch Offices of voestalpine Signaling Siershahn
- Companies of voestalpine Railway Systems



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