

EKE

Product Catalogue

SIL Safety Applications and Products

Smarter trains. Better future.



A Warm Welcome to EKE-Electronics

For more than four decades, EKE-Electronics has supported train builders and operators in delivering dependable, well-integrated fleets. Over this time, we have developed strong expertise in the design and manufacture of SIL safety applications, with more than 20 systems delivered up to SIL 2.

In this brochure, we aim to give a clear overview of how our solutions can support your safety objectives. Our development processes, together with thorough testing and well-structured documentation, help ensure compliance with SIL requirements.

Thank you for taking the time to learn about our work. We look forward to supporting you and your teams in your upcoming projects.

Marko Mäkinen

Chief Executive Officer, EKE-Electronics Ltd.

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The information provided in this brochure was accurate at the time of publication. However, EKE-Electronics reserves the right to make changes to products, specifications, and services without prior notice. Product illustrations are provided for reference purposes and may be representative of a product family rather than a specific product variant. We do not accept responsibility for any errors, omissions, or discrepancies that may be present in this document.

SIL Safety Applications

Proven Track Record

At EKE-Electronics, we boast a proven track record of developing systems up to SIL 2 across diverse safety functions. Leveraging our wealth of experience and a comprehensive process adhering to standards such as EN 50126, EN 50129 and EN 50716, we have established a robust framework for developing and testing safety applications.

Cybersecurity/CRA Ready

Our SIL Safety Applications are designed with cybersecurity as a core requirement, supporting a secure-by-design approach. A cryptographically verified secure-boot chain ensures that only trusted, approved software can run on the device.



The overall architecture aligns with IEC 62443-4-2 Security Level 2 and supports compliance with the EU Cyber Resilience Act, helping operators meet evolving cybersecurity requirements.

Existing Functionalities

Our existing safety applications cover a wide range of train control, monitoring, and safety functions, which can be tailored to specific project requirements.

By leveraging these pre-developed, validated solutions, we provide cost-effective and efficient integration, ensuring compliance with SIL standards while accelerating project timelines.

Testing and Documentation

EKE-Electronics ensures the reliability of SIL safety applications through extensive testing and thorough documentation. We produce detailed test reports, verification records, and safety cases, providing clear traceability and evidence of compliance.

This meticulous approach supports the safe and dependable operation of our solutions.

Can't See Your SIL Application Listed?

We have only listed a selection of some of the safety applications that we have developed for customers. If you have a specific requirement, get in touch to find out how we can help.

Automatic Selective Door Operation



Automatically assesses the train's alignment with the station and platform setup, granting activation solely to doors that can be safely opened. RIS-2747-RST.

On-Board Hot Axle Box Detection



Continually monitors the axle box and gearbox temperature and issues warnings if the measurements vary from normal. EN 15437-2.

Lateral Acceleration Monitoring



Measures lateral vibrations and sends notifications about abnormalities or automatically stops the train in immediate danger.

Vigilance Control System



Continually monitors the train driver's vigilance and automatically stops the train if the system pedal/button is not periodically pressed.

Safety Communication Management System



Centrally managed networked safety functions to ensure safe data communication throughout the train.

Supervision of Traction Enabling



Checks conditions that must be fulfilled to enable the traction, e.g. driver's cab occupied, no speed (null speed signal on), doors are closed.

Fire Detection Subsystem Monitoring



Reads fire detection signals from locomotives and coaches and displays the information to the train crew.

Supervision of Passenger Alarm Activation



Receives the activation of the passenger alarm when the train is at the platform or when leaving the platform.

Train Speed and Distance Monitoring



Analysis of several speed measurements and display of the value to the train crew.

Brake Pipe Pressure Monitoring



Informs the driver of the status of the main brake pipe pressure and if necessary, activates the protective actions.

From Idea to Implementation

A Structured Approach

Whether you are designing a new system, upgrading an existing system or introducing new SIL 2 functions, we provide support throughout the entire process, from selecting the right hardware to developing custom software applications.

Initial Consultation

1

Your journey with us begins when you share requirements for SIL Safety Applications. Our team will work closely with you to understand your project's goals and constraints, ensuring that we align with your technical needs.

System Selection

2

Appropriate modules are selected to meet safety and system requirements. Multiple systems can be integrated into a single rack to optimise space and efficiency.

Software Development

3

Once the hardware has been selected, the software application is developed in accordance with EN 50716 to deliver the required system functionality.

Project Support

4

We can provide project support services to ensure the seamless integration and implementation of our solutions.

Technical Support and Training

5

EKE-Electronics provides remote technical support via our customer portal, with on-site expert support available when needed. We also offer tiered training for partners and EKE-Trainnet® users, delivered online or in person.

After Sales Support

6

Our After Sales Support provides ongoing assistance throughout the product's lifecycle.

Straightforward Installation & Diagnostics

All modules in our systems have front-facing connectors, making installation and maintenance straightforward. Built-in visual diagnostics support maintainers through front-panel LEDs that show module health, application activity, connection status, and error conditions. These indicators help teams identify issues quickly without specialized tools and reduce downtime.

Space-Efficient Rack Formats

EKE-Electronics' TCMS systems are available in multiple rack formats, including front-mounted, side-mounted and flat racks for space-constrained installations such as trams and refurbishment projects. This allows installation in both standard cabinets and restricted areas without loss of functionality. All formats support standard and SIL 2 safety functions.



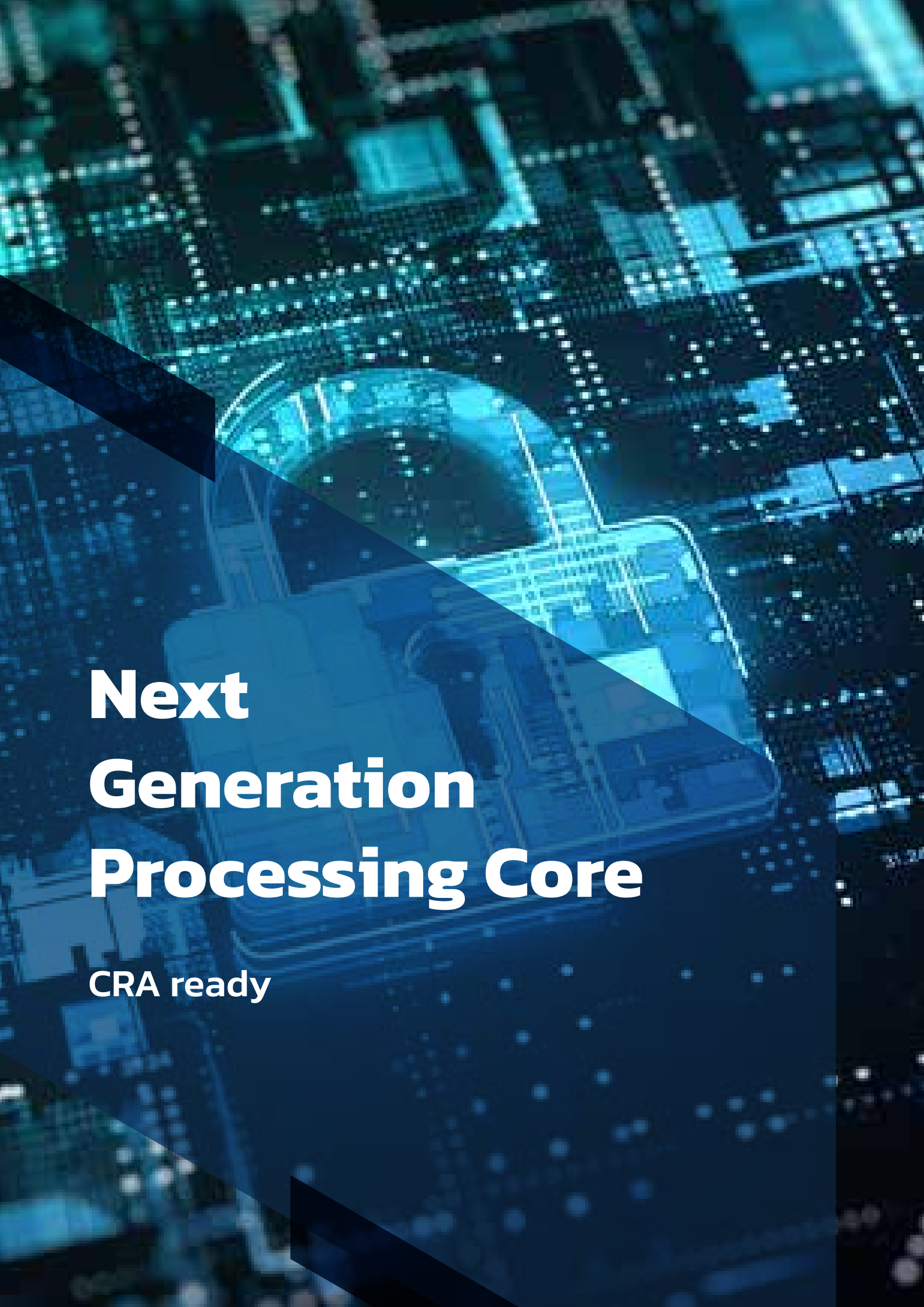
Standard Racks



Side Mounted Racks



Flat Racks

The background is a high-magnification, blue-tinted image of a microchip. A semi-transparent circular lens or window is positioned in the center, revealing a different layer or component of the chip. A dark, diagonal shape cuts across the image from the top-left towards the bottom-right, creating a sense of depth and focus on the text.

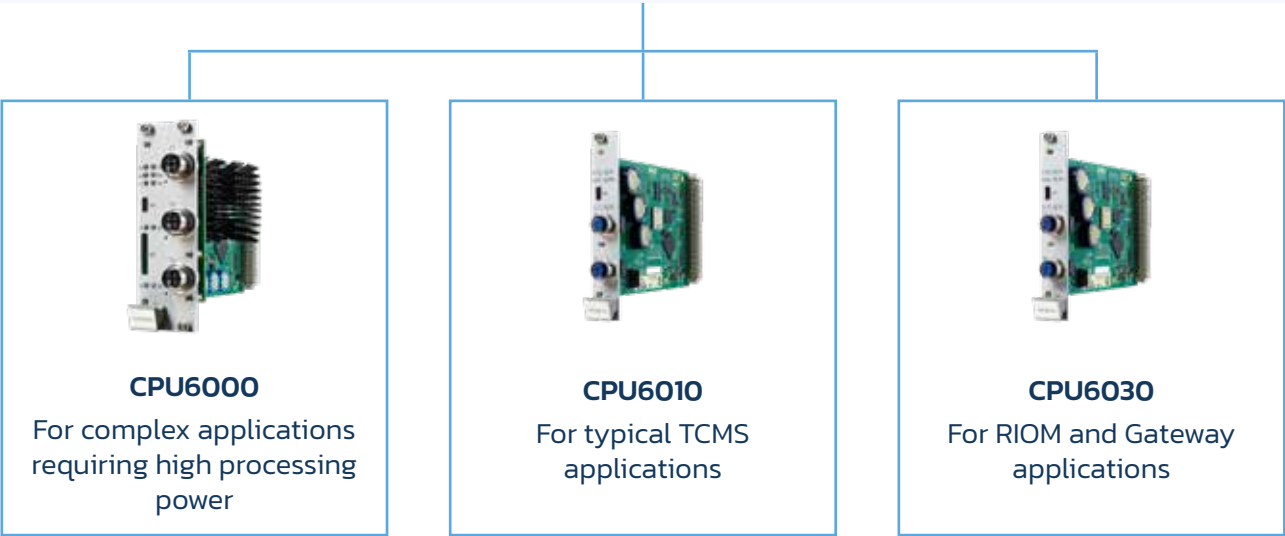
Next Generation Processing Core

CRA ready

CPU6000 Series

All our Safety Applications are based on our latest high-performance CPU6000 Series, providing state-of-the-art cybersecurity features and serving as the processing core of our next-generation platform.

A cryptographically verified secure-boot chain ensures that only trusted, manufacturer-approved software runs on a device.



Scalable CPU Range for Optimal Fit

The CPU6000 Series offers a scalable selection of processing options, from high performance multicore units to cost optimized single core modules. With multiple performance variants, you can select exactly the processing capability each system requires. This avoids unnecessary cost or over specification while ensuring the system remains efficient, scalable and well matched to the requirements of different train designs.

CRA Ready

Secure-by-design in accordance with the Cyber Resilience Act (CRA), Regulation (EU) 2024/284.



Cyber Secure

Meets railway-specific requirements defined in the upcoming IEC 63452. Supports up to Security Level 2.



SIL 2 Certified

Certified to SIL 2 according to EN 50129 and EN 50716.



SDTv2 & TRDP

Supports SDTv2 (Safe Data Transmission) and implements TRDP.



Dual Homing

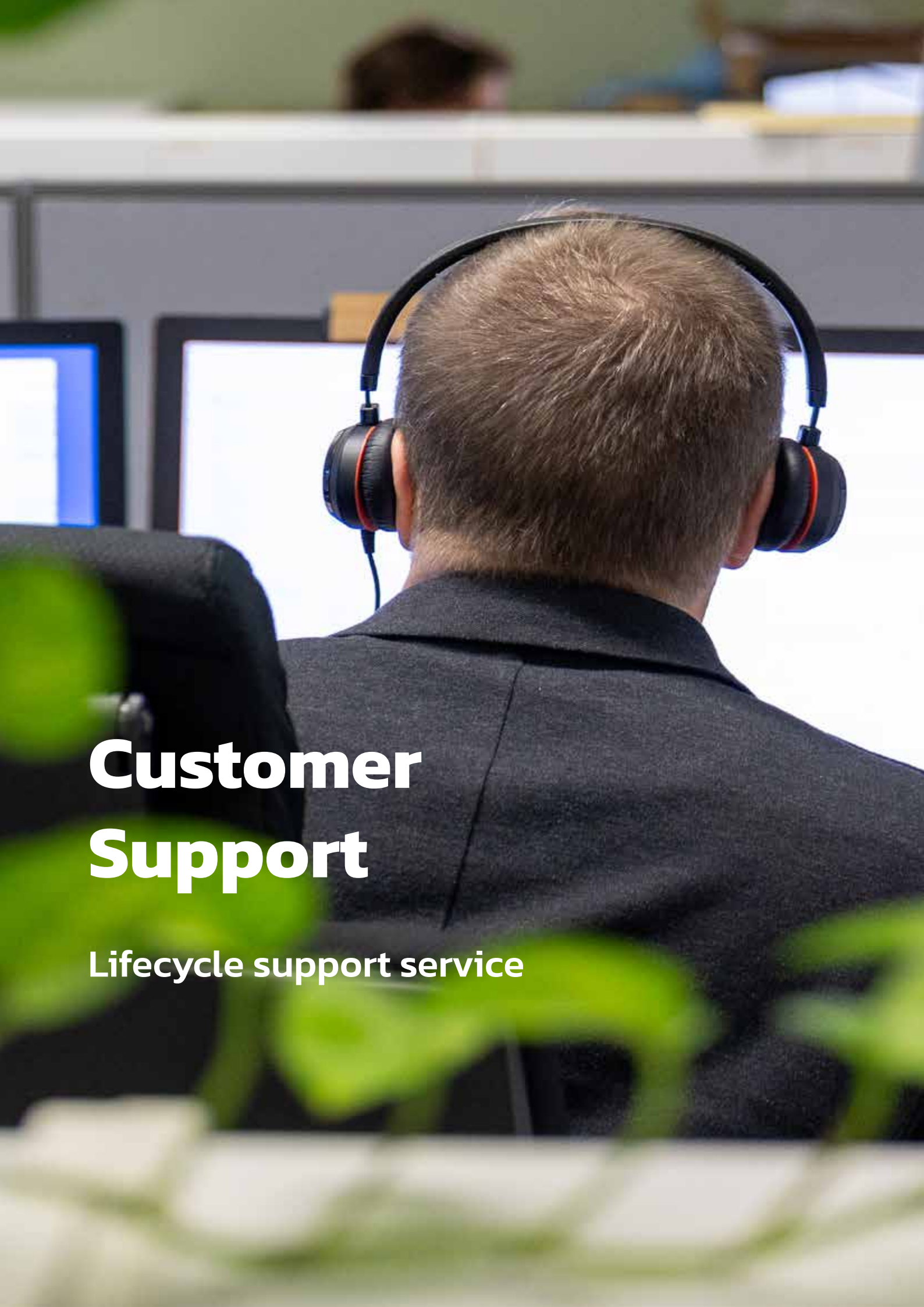
Dual homing as standard.



GoA4

Capable of Grade of Automation (GoA) up to Level 4 in compliance with EN 62290.



A person with short brown hair, seen from the back, wearing a black headset with red accents. They are sitting at a desk in a call center, with multiple computer monitors visible in the background. The person is wearing a dark grey or black jacket. The scene is brightly lit, and there are some blurred green plants in the foreground.

Customer Support

Lifecycle support service

Project Support

EKE-Electronics is uniquely positioned to assemble project teams tailored to meet the specific requirements of each customer. Dedicated project and support teams, based at our headquarters in Espoo, Finland and Shanghai, China, have experience in delivering solutions to over 150 train fleets and to a wide variety of train builders around the world. This wealth of knowledge and expertise ensures exceptional support for every project.

Our project teams are flexibly scaled to match the size, complexity and phase of each project. This approach enables us to efficiently deliver solutions for both new train fleets and retrofit projects.

After-Sales Support

Implementing a SIL Safety Application is only the beginning. Maintaining performance, reliability, and compliance throughout the vehicle lifecycle requires ongoing technical support from a partner who understands the architecture, application and operational environment.

Lifecycle Support Service



Long-term product support ensures continued access to technical expertise, repairs, spare parts, and troubleshooting services. Our commitment helps customers navigate through product obsolescence concerns and maximize the value of their investment throughout the system lifecycle.

Technical Support



Expert assistance for troubleshooting, fault analysis, software updates, and configuration changes. Our engineers help resolve issues quickly and ensure systems continue to perform as intended.

Lifecycle Upgrades



As operational requirements evolve, we support software enhancements, vehicle modifications, and system updates, helping customers extend functionality and maintain performance throughout the vehicle lifecycle.

Remote & On-Site Assistance



Remote support enables rapid response to technical issues, while on-site assistance can be provided for commissioning, investigations, upgrades, and maintenance activities when required.

Service Agreements



Service agreements can be tailored to meet your operational needs through defined response times, technical support, maintenance services, and obsolescence management.

With decades of experience in train control, EKE-Electronics delivers dependable long-term support that helps customers protect their investment, maintain operational readiness, and keep vehicles running safely and efficiently for years to come.



Automatic Selective Door Operation & Correct Side Door Enable

**SIL 2 Certified | Compatible with Any TCMS |
Balise-Free Positioning**

Overview

Automatic Selective Door Operation (ASDO) is a SIL 2 railway safety system that releases only the doors positioned next to a platform. The system reduces the risk of unsafe passenger disembarkation at stations with short or irregular platforms. ASDO identifies the exact door locations relative to the platform edge. This improves accuracy compared with older systems that unlock doors by coach or car.

Correct Side Door Enable (CSDE) is integrated into ASDO or can be provided as a standalone solution.



Key Features

Balise Free



The system uses odometry and GNSS to locate the train. This removes the need for expensive trackside balises and cuts long-term infrastructure cost.

Compatible with any TCMS



ASDO fits into any Train Control and Management System. The standardized architecture reduces engineering lead time.

CSDE Integrated



CSDE is part of ASDO and allows only the doors on the correct side to open. It keeps the doors on the wrong side disabled for safety.

Automatic Direction Change



Door and step status is maintained when the train changes direction or during cab switches.

Station Database with Version Control



Station and platform data is stored for building the network. It's easy to update for route or track changes and includes version control, viewable via the ASDO HMI.

Automatic Train Configuration



The system identifies the train configuration and tracks the number of cars in the formation. It also detects the sequence of those cars to support accurate door control.

ASDO Configurations

Optional Features

A range of optional features are available to enhance safety, positioning accuracy, and integration flexibility. All options comply with SIL 2 safety standards and are designed for seamless integration with andyTCMS.

RFID Beacons

1

RFID beacons installed before platforms provide identification and positioning data, transmitting platform ID, length, side, and direction; validated against the Station Database and ESN configuration. SIL 2 certified, with flexible reader installation and no additional hardware.

ETCS Eurobalises

2

ETCS Eurobalises installed before platforms provide identification data via Packet 44, including platform ID, length, and direction; prioritized over RFID. SIL 2 compliance via TRDP and SDTv2, with no additional hardware for integration.

Position on the Platform

3

Exact train positioning at platforms can be achieved using RFID beacons and an on-board database of platform dimensions and beacon positions, enabling safe door openings based on the train's precise location.

TRDP and SDTv2 Protocols

4

TRDP and SDTv2 protocols provide communication between the ASDO function and on-board train systems, supporting safe data exchange.

Step Control

5

Step control configures sliding step patterns for each station, displaying them on the ASDO HMI alongside door patterns and sending enabling signals to the TCMS for step operation; this function is not safety-related.

Multiple Stopping Points on Platform

6

Multiple stopping points enable train doors to align at different platform positions, configured in the Station Database for various train compositions, supporting flexible stopping strategies and alignment of PRM (Persons with Reduced Mobility) doors.

Cybersecurity

ASDO uses a cybersecurity architecture that meets IEC 62443-4-2 Security Level 2 and aligns with EU Cyber Resilience Act principles for secure-by-design operation.

The platform is built on the same next-generation CPU line used across the TCMS family, providing a hardened processing environment designed to resist tampering and unauthorized software through a cryptographically protected secure-boot chain.

Access to the system is controlled through individual user credentials, ensuring that only authorized users can interact with critical functions. Legacy services such as FTP and Telnet are disabled by default, while secure communication is enabled through SCP and SSH protocols.

Network exposure is further reduced through a configurable firewall, allowing unused Ethernet ports to be disabled. Authentication is strengthened through SSH key-based mechanisms, and all login attempts are recorded in an audit trail, providing full traceability and supporting security monitoring and compliance.

Specification



Technical Data

Minimum rack size:
280 mm × 133 mm × 215 mm

Minimum weight:
2.3 kg + module weight

Input voltage:
24 V DC and 110 V DC

Operational temperature:
−40 °C to +70 °C



Compliance

- ✓ SIL 2
- ✓ EN 50126
- ✓ EN 50129
- ✓ EN 50716
- ✓ RIS-2747-RST
- ✓ IEC 62443-4-2 up to SL 2



On-Board Hot Axle Box Detector

Continuous temperature monitoring for
preventative maintenance regardless of
location

Overview

Wayside HABD systems provide effective monitoring where axle box temperatures can be measured from wayside locations. However, detection capability depends on vehicle geometry and sensor visibility.

EKE-Electronics' on-board HABD provides direct measurement and continuous monitoring of all configured bearing locations, including internally located axle boxes. Continuous monitoring throughout the journey helps identify abnormal temperature trends early, which is particularly important in high-speed operations where conditions can change rapidly.



Key Features

Automatic Alarms and Actions



The system continuously monitors temperature against predefined thresholds. Deviations trigger automatic alarms, enabling rapid response and reducing the risk of equipment damage or delays.

Direct Safety Actions



The platform supports direct safety actions at critical limits, including activating the train's emergency brakes to bring the train to a stop. This prevents hazards and protects passengers and staff while minimizing operational impact.

Configurable Alarm Levels



Configurable alarm levels enable tailored safety responses, with thresholds set by train type, bearing characteristics and operating conditions.

Fully Redundant System



A redundant design removes single points of failure. Multiple independent sensors continuously monitor axle box temperatures, with backup components taking over automatically in case of faults.

Compatible with any TCMS



The HABD system supports integration with any TCMS, regardless of supplier.

Advantages of On-Board HABD

On-board vs Wayside

On-board and wayside HABD systems both monitor axle box temperature, but their capabilities differ. The following points highlight how on-board monitoring enables earlier detection, improved accuracy, and better visibility.

1 Continuous Monitoring vs Single-point Measurement

Continuous real time monitoring allows axle box temperatures to be tracked throughout the entire journey. In contrast, wayside systems rely on single-point measurements taken only when a train passes fixed detection locations.

2 Earlier Fault Detection

Gradual temperature changes can be identified as they develop, enabling earlier fault detection. Wayside systems capture only momentary readings, limiting their ability to recognise issues before they become critical.

3 Full Train Coverage (including in-board or internal axle boxes)

Full coverage of all axle points, including internal axle boxes, improves detection capability. Wayside systems depend on external or line-of-sight measurements, leaving certain areas without direct monitoring.

4 No Gaps Between Detection Points

Gaps between detection points are removed through continuous data collection. With wayside systems, faults can develop undetected between fixed installations, creating blind spots in condition monitoring.

5 Train-specific Configuration

Configuration can be adapted to specific train types, bogies, and bearing characteristics. Wayside systems apply a generic approach, which does not account for the operating behaviour of individual trains.

6 Higher Detection Accuracy and Insight

Detailed condition insights are achieved through continuous data and train-specific configuration. Intermittent wayside measurements provide less context, making accurate assessment and decision-making more difficult.

Cybersecurity

The on-board HABD uses a cybersecurity architecture that meets IEC 62443-4-2 Security Level 2 and aligns with EU Cyber Resilience Act principles for secure-by-design operation.

The platform is built on the same next-generation CPU line used across the TCMS family, providing a hardened processing environment designed to resist tampering and unauthorized software through a cryptographically protected secure-boot chain.

Specification



Technical Data

Minimum rack size:
483 mm × 133 mm × 215 mm

Minimum weight:
4 kg + module weight

Input voltage:
24–110 V DC

Operational temperature range:
–40 °C to +70 °C



Compliance

- ✓ SIL 2
- ✓ EN 50126
- ✓ EN 50129
- ✓ EN 50716
- ✓ EN 15437-2
- ✓ IEC 62443-4-2 up to SL 2

A close-up photograph of a hand operating a train control panel. The hand is holding a black joystick. Above the joystick is a numeric keypad with buttons labeled 3, 4, 5, 6, 7, 8, 9, and 0. The panel itself has some text in Portuguese, including 'ACELERAÇÃO' (Acceleration) and 'FREIAGEM' (Braking). A blue diagonal overlay covers the lower half of the image, containing the title and subtitle.

Vigilance Control System

**Monitors train driver activity to support
safe train operation**

Overview

The Vigilance Control System is a SIL 2 safety function that monitors train driver activity to support safe train operation. Also known as the dead man's switch or driver safety device, it ensures that the driver remains alert and responsive while the train is in motion.

Continuous supervision allows the system to detect a lack of driver response within defined timeframes. If no action is taken, a controlled sequence is initiated, ultimately bringing the train to a safe stop.



Key Features

Adjustable Interval Timings



The interval values can be modified to align vigilance checks with specific operational needs. Well configured timing reduces unnecessary alarms while maintaining safety performance.

Customisable Alarm Levels



Alarm thresholds can be adapted to suit environmental conditions and operational requirements. Relevant alarms support driver awareness and help avoid unnecessary distractions.

Minimum Speed Threshold Adjustment



Operators can modify the activation speed for vigilance checks. They are only triggered when the train is operating above this speed threshold. A tailored threshold prevents unwanted activations during low-speed manoeuvres.

Extendable Functionality



The Vigilance Control System operates as a standalone solution or as part of a wider EKE-Trainnet® installation. Modular architecture supports additional I/O channels by adding modules or selecting a larger rack.

Event Recording



The system can act as an event recorder. It can record event data and signals, store vigilance status, and transmit messages when paired with suitable wayside communication equipment.

Monitor a Range of Actions



The system can supervise a pedal or push-button input. Other actions can be configured to match specific operator requirements.

How Does the Vigilance Control System Work?

Driver activity is monitored through a pedal, a dedicated button, or another configured action. The system follows a predefined schedule using T1, T2, and T3 intervals. At each interval, the driver must perform a defined action.

If there is no response, an action is triggered.

System Activated

1

The system is activated when the train is operating above 10 km/h.

Vigilance Notification

2

The driver must perform an action.

Alarm Light

3

If there is no activity after T1, the alarm light blinks.

Alarm Bell

4

If there is no response within T2, the alarm bell rings.

Emergency Brake

5

If there is no response within T3, the emergency brake is applied. Automatic braking also engages if the Vigilance Control System loses power.

Cybersecurity

The Vigilance Control System uses a cybersecurity architecture that meets IEC 62443-4-2 Security Level 2 and aligns with EU Cyber Resilience Act principles for secure-by-design operation.

The platform is built on the same next-generation CPU line used across the TCMS family, providing a hardened processing environment designed to resist tampering and unauthorized software through a cryptographically protected secure-boot chain.

Specification



Technical Data

Minimum rack size:

280 mm × 133 mm × 215 mm

Minimum weight:

2.3 kg + module weight

Input voltage:

24–110 V DC

Operational temperature range:

–40 °C to +70 °C

MTBF:

290 316 h

Ingress Protection (IP) Rating:

20 (up to IP 67 available on request)



Compliance

- ✓ SIL 2
- ✓ EN 50126
- ✓ EN 50129
- ✓ EN 50716
- ✓ IRS 50641
- ✓ IEC 62443-4-2 up to SL 2

A close-up photograph of a train wheel and its suspension system, showing the wheel's tread and the surrounding mechanical components. The image is partially covered by a dark blue diagonal overlay that contains the text.

Lateral Acceleration Monitoring

**Detecting abnormal lateral vibrations in
real time**

Overview

Lateral Acceleration Monitoring (LAM) is a SIL 2 certified on-board system that detects abnormal vibrations in real time at an early stage, before they develop into a safety risk. This early detection supports uninterrupted service and enables operators to respond proactively.

LAM also provides valuable insights into wheelset condition, helping maintenance teams plan tasks with greater accuracy. In addition, track damage indicators support more efficient scheduling of essential maintenance work, contributing to reliable and well-managed train operations.



Lateral Acceleration Monitoring

Key Features

Real time Data Processing



Lateral acceleration is captured and processed in real time using methods aligned with UIC 518:2009, ensuring consistent measurement across all operating conditions. Continuous sampling provides reliable data, enabling maintenance teams to identify emerging issues quickly and respond without delay.

Configurable Alarm Levels



Multiple alarm levels can be configured to match safety thresholds and operating rules, with threshold values set according to recognized standards or validated through online testing. Escalation ensures that lower levels alert maintenance teams while higher levels can trigger automated actions.

Build with Redundancy



Redundancy can be added to increase availability, with backup components preserving data flow and monitoring in the event of a component fault. Continuous monitoring reduces the risk of missed detections and supports dependable, uninterrupted operation.

Cybersecurity

The Lateral Acceleration Monitoring system uses a cybersecurity architecture that meets IEC 62443-4-2 Security Level 2 and aligns with EU Cyber Resilience Act principles for secure-by-design operation.

The platform is built on the same next-generation CPU line used across the TCMS family, providing a hardened processing environment designed to resist tampering and unauthorized software through a cryptographically protected secure-boot chain.

Specification



Technical Data

Minimum rack size:

280 mm × 13 mm × 215 mm

Minimum weight:

2.3 kg + module weight

Input voltage:

24–110 V DC

Operational temperature range:

–40 °C to +70 °C



Compliance

- ✓ SIL 2
- ✓ EN 50126
- ✓ EN 50129
- ✓ EN 50716
- ✓ UIC 518
- ✓ IEC 62443-4-2 up to SL 2





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Certification

v3.0