In 2006 the Esim railway diagnostic department was founded. The Esim railway diagnostic department was founded in 2006 and it operates in design, prototyping and highly engineered systems production for railway infrastructure monitoring. The diagnosis requires high measuring technology applied in a hostile environment such as the railway infrastructure. In 2008 the OpERA system (Opto Electronic Railway Analysis) has been realized in order to measure all the railway track geometry parameters.

The versatility and the enthusiasm of the Esim company, featuring a gradual strengthening of design and production department, expanding technical capabilities and gaining market share of the Italian diagnostic railway market. This led the development of systems such as TInS (Tunnel Inspection System), which allows the detection of the minimum structure gauge outline of obstacles by providing all necessary information to the maintenance of tunnels and the exceptional transport management, or TR-GSM, which allows remote monitoring of rail track temperature and their visualization and analysis through a web application developed by Esim engineers. The know-how has allowed to undertake, with major rail partners, ambitious experimental projects and engineering of the new diagnostic system unattended with high technological content, which enables automatic infrastructure monitoring without operators help.

Numerous patents registered of developed projects confirm high technology level of the Esim. Clients are constantly growing both in Rete Ferroviaria Italiana Sp.A. and on the narrower market of granted railways, all thanks to the wide range of available diagnostic systems.

In spite of the amount of received orders, the Esim does not neglect the continuous innovation of systems and processes. In fact, three new monitoring systems are in development for electric traction line, the state of the rail fastening systems and the rail track internal state. The versatility and the enthusiasm of the Esim technicians team, supported by the high company know-how, has allowed the company to break into a market with growing demand for technology.

**UNATTENDED DIAGNOSTIC SYSTEM** | **PAG. 4**

The unattended diagnostic system takes off the track geometry quality, monitoring track gauge, cant deficiency, twist, longitudinal levels and alignments, in automated and remote way without maintenance staff.

**PANTOGRAPH VIDEO INSPECTION** | **PAG. 6**

The video inspection pantographic system allows the acquisition of high resolution color images of running trains pantographs even at high speed, in order to evaluate the state of the contact strips wear of the same. The system allows the electronic storage of images and makes them available for inspection at remote operators.

**RAIL TRACK TEMPERATURE MONITORING SYSTEM (TR-GSM)** | **PAG. 8**

The TR-GSM diagnostic system allows remote monitoring of rail track temperature. It consists of a variable number of measuring points which can be positioned in all the critical areas for temperature variation.

**ROLLING STOCK DYNAMIC WEIGHING SYSTEM** | **PAG. 10**

The rolling stock accelerations measurement system calculates accelerations to which a rolling stock is subject in every required point. Sensors can be installed on coach, in bogies and axle box. Also the system allows to store them persistently and perform an off-line analysis.

**TRACK GEOMETRY MEASUREMENT SYSTEM** | **PAG. 12**

The track geometry measurement system detects track geometry quality, monitoring track gauge, cant deficiency, twist, longitudinal levels and alignments, with a dedicated staff support.

**TUNNEL INSPECTION SYSTEM** | **PAG. 14**

The tunnel inspection system measures the internal profile of railway tunnels and cant deficiency. The used technology allows an accurate reconstruction of the gallery by the high number of cross sections acquired.

**ROLLING STOCK DYNAMIC WEIGHING SYSTEM** | **PAG. 16**

The Rolling Stock Dynamic Weighing System detects the load on each wheel of running trains and allows to highlight the longitudinal and transversal imbalances which axles and bogies are subject, generating alarms for weight thresholds overcoming, set by the user. The system allows to display persistently stored data. It is also possible to make remote the displaying data information through the Web server.

**AXLE BOX TEMPERATURE MONITORING SYSTEM** | **PAG. 18**

The Axle box temperature monitoring system analyzes the thermal variation of the same in a stable and secure way, in order to provide, during the running, several alarm levels when tolerance thresholds are passed, set by the operator. The system gives the possibility to store and view data in order to perform off-line analysis.
The purpose of the Unattended Diagnostic System for Track Geometry Quality Monitoring is to evaluate the track geometry quality by means of specific monitoring parameters like: track gauge, cant deficiency, twist, longitudinal levels (left and right), alignments (left and right). The System monitors these parameters in automated and remote way without the engagement of maintenance staff. It uses several innovative technologies to acquire and to synchronize geometry parameters. A remote user can schedule and manage all maintenance activities related to the observed track geometry parameters. For these reasons, the unattended diagnostic has a lot of advantages:

- Increased security and availability of the railway line due to derailment prevention;
- Increase of the railway lines submitted to maintenance;
- Increase frequencies of acquired measurements;
- Reduction in maintenance of management cost (staff, vehicles, stocks).

### Technical Specifications

<table>
<thead>
<tr>
<th>Measured Parameters</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track Gauge</td>
<td>±1 mm</td>
</tr>
<tr>
<td>Elevation</td>
<td>±5 mm</td>
</tr>
<tr>
<td>Deflection (3 m)</td>
<td>±0.5 ‰</td>
</tr>
<tr>
<td>Deflection (1 m)</td>
<td>±0.5 ‰</td>
</tr>
<tr>
<td>Longitudinal level left-right (3 m)</td>
<td>±4 mm</td>
</tr>
<tr>
<td>Longitudinal level left-right (1 m)</td>
<td>±4 mm</td>
</tr>
<tr>
<td>Alignment left-right (3 m)</td>
<td>±4 mm</td>
</tr>
<tr>
<td>Alignment left-right (1 m)</td>
<td>±4 mm</td>
</tr>
</tbody>
</table>

### System Architecture

The System is composed by two main subsystems (On-board Subsystem, track-side Subsystem). The On-board Subsystem acquires information on track geometry using the laser profiling of the rails and the inertial movement unit. All these information are spatially synchronized and elaborated by the Opera (Optoelectronic Railway Analysis) component. The On-board subsystem recovers measurements synchronization information from the ground equipment of the system (Points of Recalibration Services) and it uploads the information produced towards Data Elaboration Center. Track-side Subsystem through the Data Processing Center calculates the information produced by the on-board Subsystem to track geometry measurements to verify railway infrastructure quality. A remote user can schedule and manage all maintenance activities related to the observed track geometry parameters.
DESCRITION
The video inspection pantograph (VIP) system allows the acquisition of high resolution color images in any climate and meteorological condition, of trains running pantographs at speeds of up to 300 km/h in order to evaluate the wear condition of the pantograph contact strips. Through the shooting areas, the system acquires images and transmits them immediately to a control station that stores the files. The system makes available the recorded images for remote viewing to operators. The imaging devices are also equipped with internal memory which allows to temporarily store the images, thus protecting the system from unwanted events such as the power absence or disservice of telecommunication lines. The transmission of data from the acquisition area to the control station, is provided by a connection with fast transfer of images.

CHARACTERISTICS
The VIP system is based on several innovative characteristics:

- High resolution color images system for immediate pantographs verification;
- Interception system for reading the passage of running trains;
- Integrated internal storage system in place of recovery, useful to preserve acquired images in any eventuality;
- Instant images transmission from shooting place to the central desk;
- User-friendly operator interface, intuitive and easy to use.

APPLICATIONS
Acquisition of high resolution color images of pantographs in order to:
- Maintain the efficiency of the pantographs without stopping the vehicle;
- Ensure no break in service;
- Reduce operating costs;
- Improve safety standards of rail vehicles on running.

INSTALLATION
The video inspection pantograph system is designed to minimize problems related to its installation and maintenance. The installation consists of the fastening of removable boxes, containing system components, in component wiring and connection of the imaging devices to the central desk. The system requires a low frequency of maintenance activities.

TECHNICAL SPECIFICATION
PANTOGRAPH VIDEO INSPECTION (VIP)

<table>
<thead>
<tr>
<th>Measuring technology</th>
<th>Optic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Speed</td>
<td>300 km/h</td>
</tr>
<tr>
<td>Diagnostic components</td>
<td>Pantograph wear status, frame, suspensions, sliding parts</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&gt;95%</td>
</tr>
<tr>
<td>Insulation</td>
<td>Total using optical technology</td>
</tr>
<tr>
<td>Data transfer</td>
<td>Ethernet</td>
</tr>
<tr>
<td>Host</td>
<td>Windows</td>
</tr>
<tr>
<td>Database</td>
<td>PostgreSQL</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-15 ÷ +55 °C</td>
</tr>
</tbody>
</table>
RAIL TRACK TEMPERATURE MONITORING SYSTEM (TR-GSM)

DESCRIPTION
The ESIM diagnostic system TR-GSM is designed for remote monitoring of rail track temperature, and it is designed to work in the centralized railway diagnostics systems, related to technological and infrastructural installations that the railway infrastructure management can develop according to their requirements both to improve infrastructure availability and railway traffic management. Based on RFI standards, it consists of a variable number of measuring points, installable in all the critical areas in regard to temperature variations. The system can use the GSM, GSM-R, the telephone network, or LAN network to send information to a central server for data storage. Information access is standardized by RFI standards and is guaranteed by a password-protected web interface.

CHARACTERISTICS
The TR-GSM system is based on several innovative features:
- Temperature sensors with high levels of accuracy and reliability;
- Galvanic isolation devices which guarantees security system;
- Real-time processing of detected temperature;
- Measurement redundancy to ensure constant reliability;
- Measurement points can be installed in remote areas, including those without electric power;
- Database creation for measures in chronological detail;
- Implementation of redundant control algorithms;
- Compactness, easy installation and weather protection;
- Reliability and durability.

APPLICATIONS
Remote monitoring of rail track temperatures in order to:
- constant verification of temperature in remote areas;
- Promptly signaling of the achievement of specific temperature levels;
- Statistical trend of measured temperatures over time;
- Staff employment is not necessary for temperature measurement;
- Circulation security levels increase significantly.

INSTALLATION
The installation process of temperature monitoring system is designed to allow easy upgrade, with modular implementation. Indeed is sufficient to install the box with the three measuring sensors on the shank of the rail through bolts anchoring. To preserve the safety of the steel structure the holes are made at the rail track neutral axis.

In proximity of measuring points is located a terminal box where is installed the electronic control unit and the GSM interface.

If the area in which is required the installation of the measuring point is without an electrical supply, it is possible to add an off-grid PV system, properly sized.

<table>
<thead>
<tr>
<th>TR-GSM</th>
<th>RAIL TRACK TEMPERATURE MONITORING SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring Technology</td>
<td>Smart/Electronic</td>
</tr>
<tr>
<td>Measuring range</td>
<td>-30, +80°C</td>
</tr>
<tr>
<td>Accuracy</td>
<td>&lt;0.5°C</td>
</tr>
<tr>
<td>Sensors</td>
<td>3</td>
</tr>
<tr>
<td>Algorithm</td>
<td>Redundant control</td>
</tr>
<tr>
<td>Protocol Interface</td>
<td>GSM, GSM-R, GPRS, UMTS, LAN, PSTN</td>
</tr>
<tr>
<td>Host</td>
<td>Window</td>
</tr>
<tr>
<td>Database</td>
<td>PostgreSQL</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-30, +80°C</td>
</tr>
</tbody>
</table>

TECHNICAL SPECIFICATION

TR-GSM System di diagnostico realizzato per il monitoraggio della temperatura rail
Sistema Ferroviario di Controllo Calese
ROLLING STOCK ACCELERATIONS MEASUREMENT

DESCRIPTION
The rolling stock accelerations measurement system has a great versatility, it is projected to measure the acceleration to which a rolling stock is subject, in every point it is required. Sensors can be indistinctly installed on coach, bogies and axle box. Measurement intervals and the related band depend on the location of the sensors. System software has an user-friendly interface and provides the availability of real time reading data and database storage. Data are integrated with immediate speed values and with the train location thanks to the interfacing with odometry system. The rolling stock accelerations measurement system is also provided of a tool for the off line data analysis.

CHARACTERISTICS
The rolling stock acceleration measurement system is based on several innovative characteristics:
• Piezoelectric or capacitive sensor technology;
• Sensors able to work in hostile environments;
• Mono-axial, bi-axial, tri-axial sensors;
• Compact and easy installation process;
• High speed analog to digital converter;
• Galvanic isolation for signals derived from sensors installed on critical points;
• High sampling frequency for high speed measurement;
• Reliability and long life sensor.

APPLICATIONS
Rolling stock accelerations measurements are used in order to:
• Evaluate passenger ride;
• Evaluate accelerations transmission (from axle boxes to bogies and later from bogies to coach);
• Evaluate rail infrastructure state;
• Generate alerts in case of speed exceeded threshold, set by the user;
• Set maintenance or control interventions on rail track infrastructure.

INSTALLATION
The rolling stock accelerations measurement system installation is function of the chosen configuration. In fact, according to required acceleration relief type, sensors can be installed on axle boxes, bogies or coach. Every sensor will be placed in a watertight metal box able to guarantee a great mechanic protection. The acquisition and elaboration units can be installed in a cabinet inside the coach hosting the sensors, it is possible to organize an operator place to view and store acquired information.

The system is made for the integration with other measurement system and needs an odometry unit to localize the measurements. There are no particular prescription for sensor and acquisition equipment installation. Some brackets will be simply applied to bogies, to coach and on axle box to lock the boxes (contained size).

<table>
<thead>
<tr>
<th>Measuring Technology</th>
<th>Piezoelectric - Capacitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring frequency</td>
<td>0 - 1000 Hz, 1 Hz</td>
</tr>
<tr>
<td>Full speed</td>
<td>300 km/h</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Measured parameter</td>
<td>Coach, bogies and axle box</td>
</tr>
<tr>
<td>Measuring axes</td>
<td>XYZ</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP67</td>
</tr>
<tr>
<td>Unit</td>
<td>N/µG</td>
</tr>
<tr>
<td>Database</td>
<td>MySQL</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-30 - 60 °C</td>
</tr>
</tbody>
</table>

1 According to the location of the sensor.
**DESCRIPTION**

The track geometry measurement system integrates laser triangulation technology with high precision inertial systems. The installation simplicity allows the use of this system on any convey: passenger, freight or dedicated. Measurements are effected upon several and different parameters of track geometry and of rail internal profile (measurements on the external rail profile are optional and provide additional laser sensors). The system software of track geometry measurement has a graphic interface allowing real time reading data and a database able to store all measurements of a travelled way and to localize them through the installation with an odometry system. Furthermore the system has a tool for off line analysis of acquired data.

**CHARACTERISTICS**

The track geometry measurement system is based on the following innovative characteristics:

- Synergy of laser triangulation techniques and inertial measurements based on aeronautic technologies;
- High performances and elaboration unit;
- Integration in real time of all system acquired data;
- User-friendly software interface;
- Real time measurement visualization;
- High sampling frequency for high speed measurement;
- Software for the off-line analysis of effected measurements.

**APPLICATIONS**

Monitoring of railways infrastructure in order to:

- Set timely interventions of extraordinary maintenance;
- Study new timings for ordinary maintenance;
- Integrate different measured parameters;
- Guarantee the improvement of rail circulation;
- Improve safety standards.

**INSTALLATION**

The track geometry measurement system is planned to be installed on rail vehicles; laser sensors can be installed below the bogie and hooked to the cart. The measurement system of track geometry is prepared to the integration with other diagnostic systems and it needs an odometry unit to localize the effected measurements.

The elaboration units can be installed in a cabinet inside the carriage used for measurement together with the operator place.

The installation of all equipments does not need particular prescription, a detailed study of technical draws is thus necessary to chose optimal location. Suitable anchoring systems will be easily applied to install boxes containing system sensors.

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**TECHNICAL SPECIFICATION**

**TRACK GEOMETRY MEASUREMENT SYSTEM**

<table>
<thead>
<tr>
<th>Measuring technology</th>
<th>Optics - Inertial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring frequency</td>
<td>3001Hz</td>
</tr>
<tr>
<td>Max Speed</td>
<td>180Km/h</td>
</tr>
<tr>
<td>Smooth Ir</td>
<td>0.2 mm</td>
</tr>
<tr>
<td>Measuring Geom</td>
<td>Gauge, cant def. &amp; y, mold, longitudinal levels, alignments</td>
</tr>
<tr>
<td>Reference measured 1</td>
<td>left and right inner profiles</td>
</tr>
<tr>
<td>Host</td>
<td>Unix - Windows</td>
</tr>
<tr>
<td>Database</td>
<td>MySql</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10 ÷ 50 °C</td>
</tr>
</tbody>
</table>

1 With measuring intervals of 0.5 m
2 Measurements of other parameters of the internal profiles can be implemented.
TUNNEL INSPECTION SYSTEM (TINS)

DESCRIPTION

The ESIM Tunnel Inspection System is designed to measure the internal profile of the railway tunnels and the cant deficiency. Its versatility allows installation on various kind of rolling stock. It is based on laser flight time technology and the opto-electronic sensors allow an accurate reconstruction of the tunnel through the acquisition of a large number of cross sections. The number of sections depends by transit speed of rolling stock of measurement, while the data localization is guaranteed by an integrated odometry system. In the next figure is shown a simulated sequence of acquisitions for the three dimensional reconstructions: the distance between two sections is equidistant only in the case of uniform speed. The measurement are automatically stored in a database (unit of archive) which can be analyzed through the post-elaboration software.

CHARACTERISTICS

The ESIM Tunnel Inspection System is based on many innovative features and the first of these is the flight time laser technology. The system allows to do cross measurements of the internal profile related to the center of the rolling plan. An inertial platform provides necessary measurements to parameters evaluation of the raised part of the rail. The system has an optional video camera for an immediate visual response of potential obstacles noticed by sensor laser. All measurements, both related to the raised part and to the gauge structure are synchronized to the rail track km signal provided by an integrated odometry system. The post-elaboration software allows the review of whole acquisition just to every single profile control. Graphic functions allow the calculation of distances between the gauge structure points and of the section. The software allows the choice between different gauge structures standard and integration of special outline.

APPLICATIONS

Monitoring railway tunnels shake in order to:

• Minimize the risk of impact between rolling stock and tunnels;
• Keep a check on tunnels structural collapse;
• Monitoring and spatial identification of cracks;
• Store captured data.

INSTALLATION

The installation system considers the low invasiveness on diagnostic rolling stock. Indeed, installation consists on fixing a metallic box on the front or the back of the coach; it contains the inertial laser system, with small size, so, the anchorage on the coach does not cause any alteration of its limit outline. The mounted box height must not exceed of 1 meter from the iron flat, after the identification of the installation side. Following this expedient the system will be able to measure also the distance of both rails, to have a fixed reference of each acquired tunnel profile. The high range of measurement of the optical sensor allows the diagnosis of every tunnel type: single track tunnel, double track tunnel, up to highest tunnel.

TECHNICAL SPECIFICATION

TUNNEL INSPECTION SYSTEM (TINS)

<table>
<thead>
<tr>
<th>Structure gauge measuring range</th>
<th>Circle with 15 m radius</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure gauge measurement resolution</td>
<td>±1 mm</td>
</tr>
<tr>
<td>Maximum scanning speed</td>
<td>100 profiles per sec</td>
</tr>
<tr>
<td>Cant deficiency interval measurement</td>
<td>[-160, +160] mm</td>
</tr>
<tr>
<td>Cant deficiency measurement resolution</td>
<td>±1 mm</td>
</tr>
<tr>
<td>Cant deficiency accuracy measurement</td>
<td>±5 mm</td>
</tr>
<tr>
<td>Measuring technology</td>
<td>Laser - Inertial</td>
</tr>
<tr>
<td>Laser Classe</td>
<td>II B</td>
</tr>
<tr>
<td>Angular measurement resolution</td>
<td>Ø27° (+3 mm to 5 m distance)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10°C to +45°C</td>
</tr>
</tbody>
</table>

ESIM | Railway diagnostic systems
esimgroup.com | info@esimgroup.com
ROLLING STOCK DYNAMIC WEIGHING SYSTEM

DESCRIPTION
The Rolling Stock Dynamic Weighing System, based on optical technology, provides total immunity to electromagnetic interfaces of use and maintenance. The system is able to detect the load that weighs on each wheel of a train in transit and to highlight possible longitudinal and transverse imbalances of each axle and bogie and finally to generate alarms due to the passing of thresholds weight set by the user. The software of the Dynamic Weighing system is based on an intuitive graphical interface for real time reading data and on a database containing the history of measurements and alarms issued. The software provides an interface to any existing database and the ability to remotely read the data through web servers.

CHARACTERISTICS
The Rolling Stock Dynamic Weighing System is based on innovative features:
• Optical sensors technology;
• Polling laser technology question;
• Fiber optic data transmission;
• Ethernet interface communication;
• User-friendly software configuration;
• Total electromagnetic immunity;
• Remote information;
• More data points from a single host managing;
• High sampling rate measurements for high speed trains;
• Wide measurement range;
• Periodical self adjustment of system calibration;
• Reliability and durability.

APPLICATIONS
Dynamic monitoring of convoys is designed to:
• Measure both traverse and longitudinal imbalance weight;
• Ensure the improvement of the railway circulation;
• Report in real time anomalies;
• Determine verification measurement in case of malfunction.

INSTALLATION
The Rolling Stock Dynamic Weighing System is easy to install, because the sensors used to measure the weight of the train in transit are applied in proximity of the cross roads. The number of sensors can vary from four to eight depending on the required accuracy. The configuration with multiple sensors increase the quality of measurements. Installation is performed in a symmetrical correspondence of both rails. The control unit may be located in any building near the point of dynamic weighing. Both sensors that control units are small in size and do not require particular requirements for installation. The characteristics of the system allows transportability and versatility. For a remote control a communication infrastructure is necessary, for example intranet or internet.

TECHNICAL SPECIFICATION

<table>
<thead>
<tr>
<th>ROLLING STOCK DYNAMIC WEIGHING SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring points</td>
</tr>
<tr>
<td>Measuring range</td>
</tr>
<tr>
<td>Hardwearing</td>
</tr>
<tr>
<td>Bandwidth</td>
</tr>
<tr>
<td>Database</td>
</tr>
<tr>
<td>Host</td>
</tr>
<tr>
<td>Channel Interface</td>
</tr>
<tr>
<td>Terminal Voltage</td>
</tr>
<tr>
<td>Operating temperature</td>
</tr>
</tbody>
</table>

1 The measuring points, along the rails, can be varied according to the requirements.
2 The value is related to the train transit speed.
AXLE BOX TEMPERATURE MONITORING SYSTEM

DESCRIPTION
The axle box temperature monitoring system is designed in order to the occurrence of detecting a temperature greater than a predefined critical temperature. The aim of axle box temperature monitoring system is to analyze that the temperature variation of axle box is in durable and safety way and to get suitable alarms when the tolerance thresholds, set by the customer, are overtaken. The monitoring system consists of several modular devices: FBG sensors, optoelectronic interface analyzer and computer for the storage, evaluation and information visualization. All temperature data will be available for matching and for statistic analysis with information that derive from other measuring system. The system is able to measure the temperatures of all kind of axle boxes mounted on the several rolling stock.

CHARACTERISTICS
The system is based on the following innovative features:
• Fiber Bragg Grating temperature sensors for a whole and absolutely electromagnetic immunity;
• Fiber optic connections between sensors and analyzer;
• Current generation optoelectronic analyser interface for high speed data acquisition;
• Industrial PC;
• High volume data storage;
• Real time threshold and data values graphic matching;
• Optional GPS integrated system for measurements localization;
• On line statistic analysis;
• On line axle boxes temperature matching;
• Off line review mode;
• Rugged packages and connections.

APPLICATIONS
Measurement and storage of axle boxes temperature to:
• Order a prompt stop of trains in case of overheating;
• Study new timing for normal maintenance (based on predictive algorithms);
• Integrate temperature values acquired with the parameters of dynamic coach behavior;
• Improve the reliability of the railway traffic;
• Improve safety standards of the rolling stock.

TECHNICAL SPECIFICATION
AXLE BOX TEMPERATURE MONITORING SYSTEM

INSTALLATION
The axle box measuring system is developed to be installed on the whole common railway vehicles. The Fiber Optic sensors (FBG) can be installed on all the axle boxes of the boogie without any interface with its normal functioning and maintenance. Furthermore the fiber optic, which is the main structure of system, allows an electric cabling procedure starting from the sensors to arrive in optoelectronic interfaces and unit elaborations accommodated into the coach. The elaboration unit with its personal computer can be installed into a normal industrial rack with its relative operator station for the monitoring of the parameters acquired. The system performs to the whole electronic isolation intrinsic by the FBG technology.