FOGTEC®
FIRE PROTECTION

# *Designed for Rail*



EN

– Rail systems –



# The benefits of fire protection in rail vehicles

## *Worst-case scenario – fires*

Fires can break out in many areas of a traffic system as well as on rail vehicles themselves. Whether they are caused by passengers or merely due to damages in equipment, electronics or locomotives, they can rapidly become devastating.

Early fire detection and promptly automated firefighting responses can minimise vehicle and infrastructure damage considerably or even prevent it entirely. Minimisation of damage patterns, more safety for passengers and staff as well as rapid reactivation due to shorter interruptions to operation are just some benefits of these system solutions. In addition, a system on board can have positive effects for insurance costs.

## *Compensation of construction requirements for modern design*

During planning of vehicle concepts or underground passenger transport systems, active firefighting systems enable a high degree of flexibility and individual adaptation. They can for example render fire protection doors superfluous while reducing fireproofing requirements for partition walls. Application-specific design also means retrofit in existing vehicle fleets.

The system allows freedom of design and choice of materials.

## *Innovative licensing solutions*

The number of international regulations and standards has increased considerably over the past few years. At the same time, significant investments have been made in infrastructures. This influences vehicle-specific engineering and material requirements. Whereas this represents a fundamental challenge for fire detection and firefighting systems, they frequently constitute a cost-optimised alternative for meeting such safety specifications.

## *Individual solutions and know-how*

FOGTEC has been developing and supplying active fire protection system solutions for rail-based transport around the globe since many years and is one of the world's leading suppliers of this technology. Our team possesses unique expertise in the areas of design, application development as well as international certifications and norms for rail vehicles. Constant monitoring by quality management, working in close cooperation with project management and development processes based on requirements of the ISO 9001 standard, enable project progress to be recorded such that it can be viewed and reproduced at any time.

Close, long-term partnerships are a fixed component within a functioning network of partners, suppliers and subcontractors and have enabled us to create an effective global infrastructure.

## *From planning to realisation*

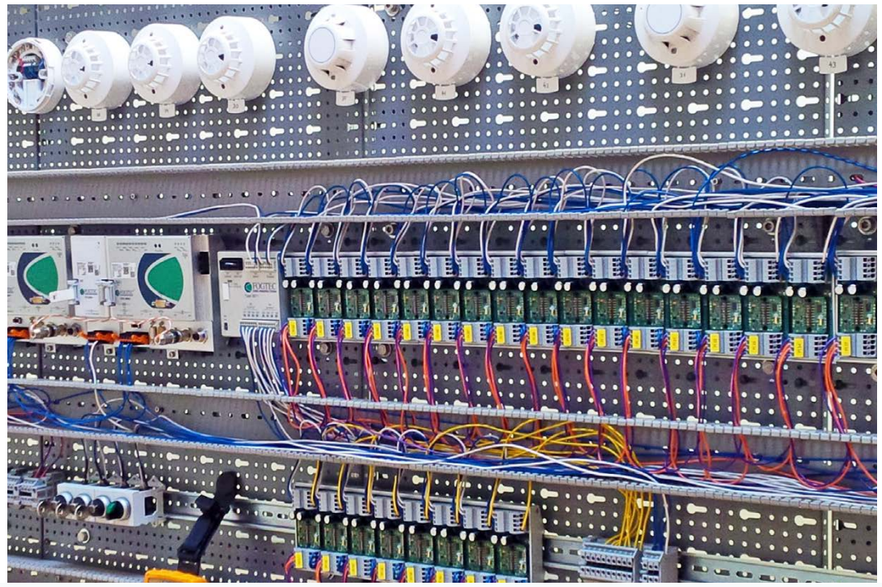
As a complete service provider, we can offer all-round support for our customers on all aspects of fire protection out of one hand:

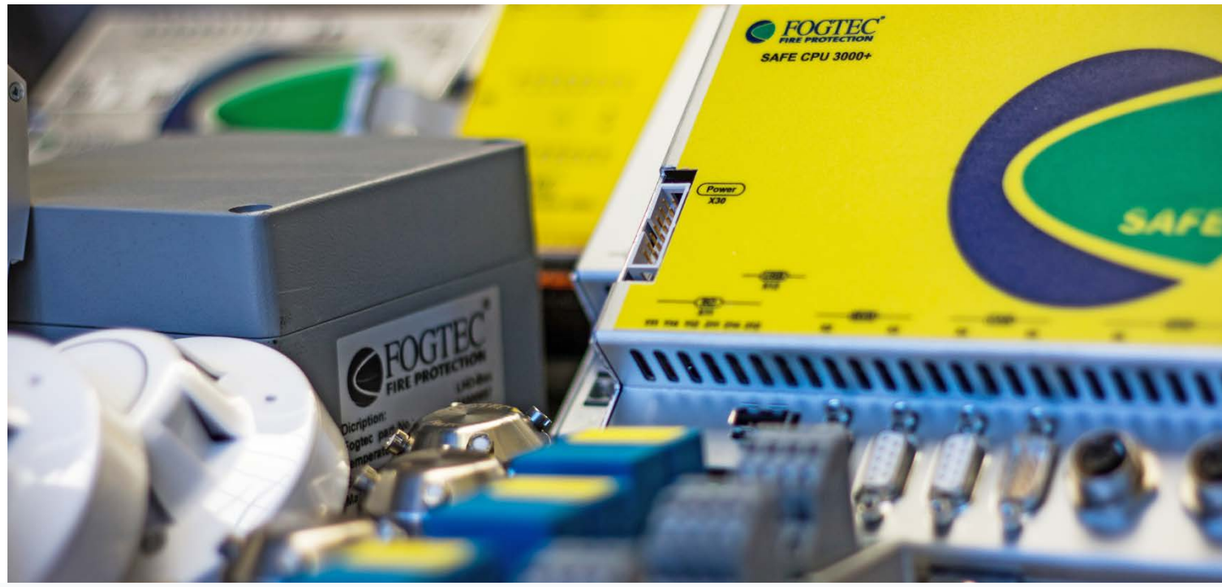
- Fire protection engineering for new or advanced vehicle developments
- Fire hazard analyses
- Fire and smoke testing
- Feasibility studies
- Development of systems in the area of fire detection and firefighting technology
- Software development
- Installation and commissioning
- Maintenance and service

## *Safety with SIL 2*

A team of specialists in the areas of software programming, electrical engineering and mechanical and hydraulic construction ensures the latest requirements and optimal integration can be realised. The role of safety integrity levels (SILs) is just as important here as optimised diagnostics procedures, flexibility of system architecture design, realisation of platform concepts and low life cycle costs.

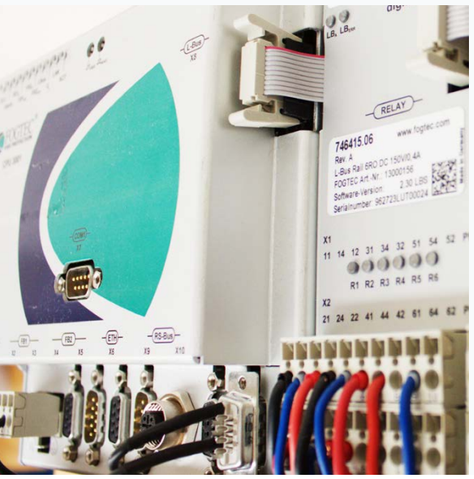


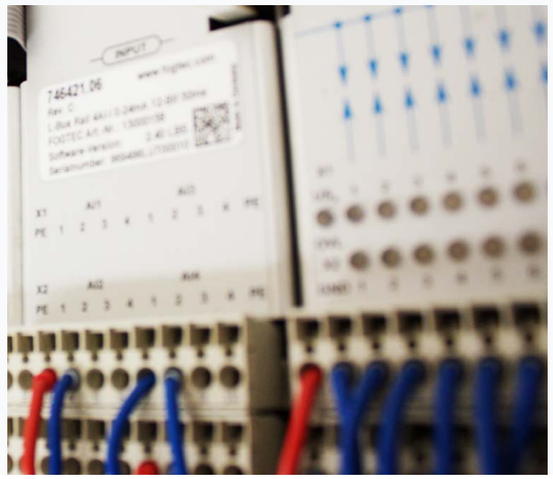





# Fire Detection Systems for rail traffic

FOGTEC fire detection systems for rail traffic are highly versatile, have a modular structure and are flexible and reliable. The product portfolio includes intermittent and linear temperature indicators, smoke detectors/smoke switches, aspirating smoke detectors, gas sensors, flame detectors, video analysis systems and communication components like display-based human-machine interfaces (HMI).




## *1000 series*

Products in the 1000 series are deliberately designed for cost-optimised system solutions. System components are characterised by their simple, low-cost system design and enable protection of both individual areas as well as entire vehicles. The 1000 series requires no software, but more complex modules with a data interface can be added if needed.

As well as all components meeting the EN 51055 and EN 50121 rail standards, the higher-quality evaluation units also enable system architectures with verification of functional safety up to SIL 2.

## *3000+ series*

The 3000+ series has been specially designed for rail traffic. The series complies with all the relevant rail industry standards, enabling full system architecture up to SIL 2 level.

One of its strengths is its high degree of flexibility, which enables the safety level of a vehicle platform to be specified as soon as the system architecture has been defined. Due to the system's basically modular design, installation in platform solutions is simple to configure for all vehicle manufacturers, allowing verification within a short time and making integration considerably easier.

The latest series of special detectors can be integrated inconspicuously into ceilings – an added benefit enabling design freedom for vehicle manufacturers.

## *7000 series*

The 7000 series uses smoke aspiration technology and enables complex technical solutions for the detection and monitoring of fire incidents. The technology comprises various data interfaces and is the first system on the market verified according to EN 45545.

The 7000 series product portfolio can be supplemented with gas and infrared sensors, flame detectors and image analysis systems for CCTV systems, data gateways (e.g. for use on WTB, Profibus), GSM remote-access systems (e.g. for error analysis from control centres or service locations) and various displays that function as human-machine interfaces.

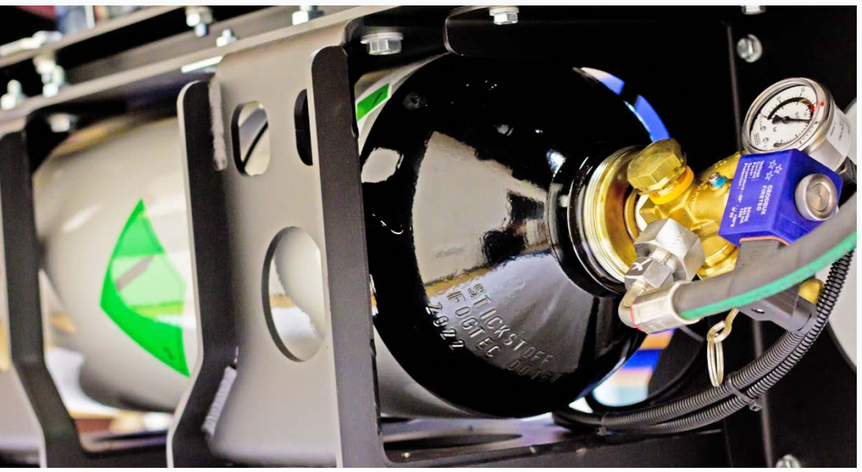






# Firefighting Systems

FOGTEC firefighting systems increase the level of safety for rail vehicles, while also having a positive effect on availability and the budget as a whole. Their efficiency has been verified during fire tests on all continents on a 1:1 scale and monitored by independent experts.



## *High-pressure water mist systems*

FOGTEC high-pressure water mist systems have become standard firefighting equipment in rail vehicles due to their low life cycle costs and high level of reliability. They are most frequently used in public areas to protect passenger compartments, WCs, driver's cabins and staff areas.

The effective and sustainable technology where microfine droplets of pure water are used for firefighting is also used with diesel power packs, diesel and electrical locomotives and for protection of special vehicles.

Due to the very small installation sizes, small pipe diameters and relatively light weight, retrofit of this system in rail vehicles is simple and can be done at low cost.

## *Aerosol systems*

Aerosol systems are suitable for use in extreme ambient conditions. Aerosol is electrically non-conductive so it does not impair electronic components during firefighting. FOGTEC aerosol systems come in the form of aerosol generators and are mainly used in technical areas such as electric device boxes and diesel engine rooms.

Aerosol systems generate their extinguishing agent by a chemical reaction that is only triggered if electrically activated. Up until this point, the extinguishing agent and reactive agent are held compactly in small assemblies.

## *Gas extinguishing systems*

Gas extinguishing systems are suitable for use in enclosed areas containing technical equipment.

The systems are compact and can be integrated easily into control boxes, switching cabinets or higher-level systems. In addition, no harmful by-products are generated like with chemical extinguishing gases, and they generally have no effect on the surrounding technical equipment. Being non-toxic, no restrictions on the use of nitrogen extinguishing systems exist.

# Fully-compliant Project Implementation

As an IRIS-certified fire protection company, extremely high standards for process and implementation workflows according to EN 50126 are in place at FOGTEC.



## *Process workflows in accordance with IRIS requirements*

Application specifications are derived from customer specifications and supplemented with the relevant country-specific peculiarities and standards, as well as requirements determined from experience. These form the fundamental basis of the entire conceptual structure.

Any necessities such as for software and system certifications (EN 50128, EN 50129), as well as the relevant RAMS documentation, are taken into account. Hazard analyses and risk analyses can be performed in this context both for specific systems and also on a project and production basis in order to detect any risks early on and ensure the goals of projects are met.

## *Individual consultation*

Our team consults in all safety and fire protection requirements. This includes the definition of requirements catalogues, the development of system solutions for new vehicle concepts, application-specific developments for existing vehicle platforms and upgrade projects for existing fleets.

As well as expertise in all relevant industry areas, our team is also highly versed in national and international regulations and legal requirements and in close contact with country-specific auditors, approval bodies and receiving institutions.

## *Risk analyses*

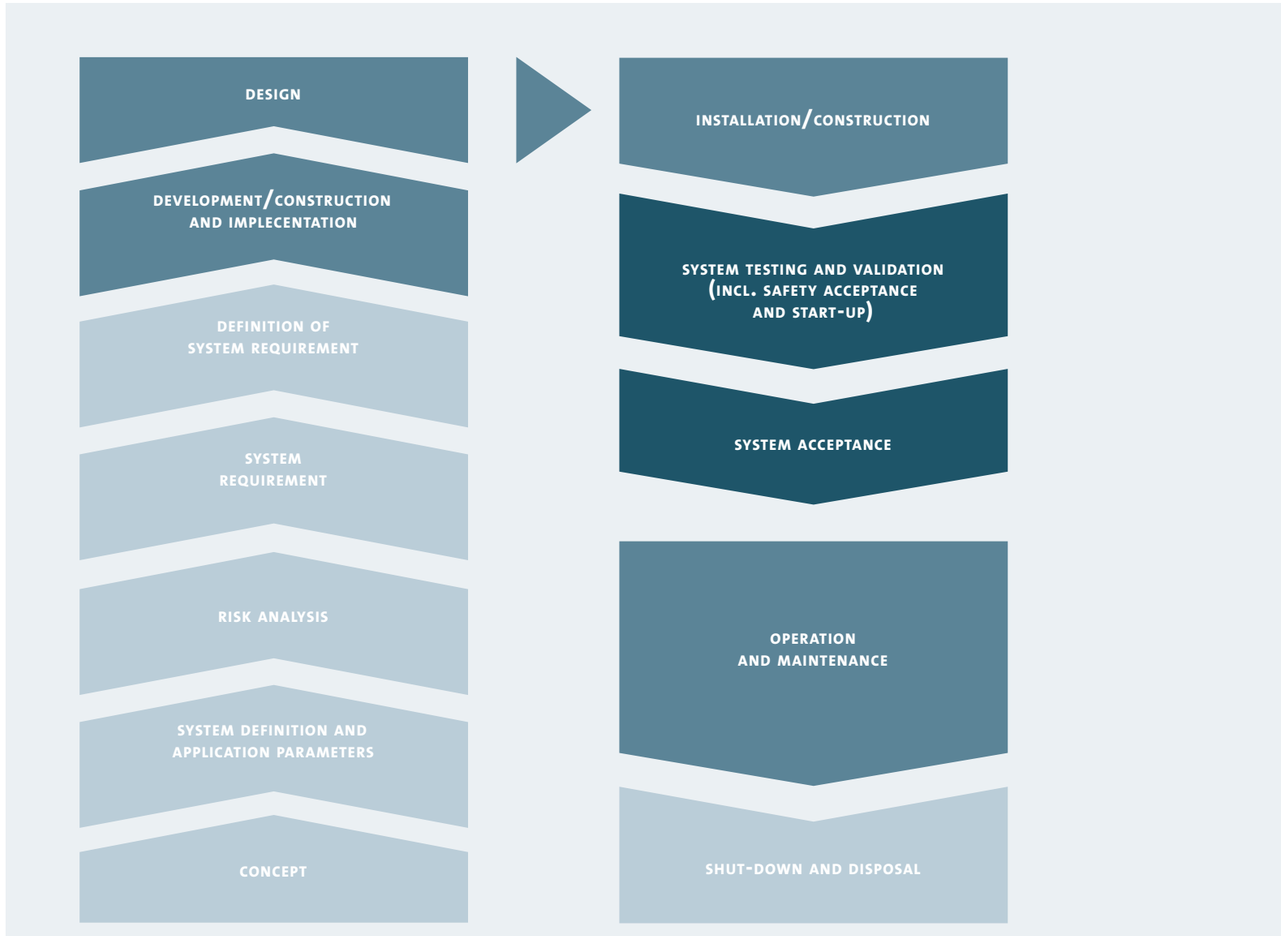
During such analyses, risks are determined and evaluated in order to define any weaknesses in rail vehicles or traffic systems early on. Protection concepts can be derived from these studies that contribute to a technical design which leads to both economic and operational efficiency.

## *From concept to implementation*

Our team will accompany starting from the concept and project management through to installation and commissioning of the system. This support over the whole life cycle is a key element in our full-service concept, which also includes support for mid-life overhauls or end-of-life disposal.

## *Fire protection concepts*

Fire protection concepts form the basis for the licensing of rolling stock vehicles, vehicle platforms and upgraded vehicles, thus defining their organisational, operational and technical requirements. In these concepts, typical environmental loads in rail vehicles form the basis for the design of fire detection and firefighting systems.






## *System development and validation*

Systems are developed in close consultation with the customer, taking into account mandatory standard requirements. Particularly with fire detection systems, smoke tests are an important component during the corresponding verification process in order to guarantee correct, goal-oriented system-design and provide sufficient legal assurances for both vehicle manufacturers and system suppliers.

The effectiveness of firefighting systems is verified during 1:1 fire tests. However, FOGTEC has performed several hundred fire tests for rail transport equipment applications, such as for diesel locomotives, underfloor power packs, passenger compartments and sleeper cars. In many cases, effectiveness can beverified based on existing fire tests due to the comprehensive range of our testing and inspections.

Once the design parameters have been defined from the vehicle-specific parameters, system-specific tests are carried out in test labs.

## *Integration engineering*

Almost two decades we investigated the integration of fire protection systems in existing vehicle structures or geometries as well as in new vehicles. Modules developed for creating production-optimised assemblies using 3D engineering or FEM simulation models have optimised installation and preassembly times and reduced the need for spare parts.

## *Economical design*

Compact construction enables a highly positive balance between energy and weight. Particularly with vehicle fleets being prepared for a new life phase and thereby facing new, usually more stringent fire protection requirements, retrofitting using FOGTEC systems has proven more than worthwhile on many occasions.

Disposal and recycling concepts also constitute a fixed component of the portfolio of services.

## *Worldwide servicing*

A holistic servicing concept and a worldwide network of service partners enable us to provide comprehensive, rapid support for our customers. The service portfolio covers aspects of preventive and corrective maintenance, repairs at short notice and spare-parts deliveries.

The team can also carry out complete refurbishment projects. These retrofits of fire detection and firefighting systems are performed directly with the operator.

One key foundation element for our holistic concepts are comprehensive, highly detailed diagnostics concepts, particularly for new product platforms.

Through an online access module, an analysis of the condition of each individual system can be made and remote diagnosis performed. This leads to a comprehensive service concept and fleet management in cooperation with customers.





# References from around the world – more than 25,000 systems in use

### *FOGTEC systems can be found in all modern vehicle concepts*

- High-speed trains
- Regional EMU trains
- Regional DMU trains
- Electric locomotives
- Diesel locomotives
- Diesel engine rooms and power packs
- Passenger carriages
- Metro trains
- Trams
- Monorail trains
- Track construction and maintenance vehicles

### *Reliability for the high-speed range*

The high-speed network is growing throughout the world year by year, connecting cities with one another. At the same time, the topography and physical limits of the rail system mean bridges and tunnels are key elements when it comes to line routing. This is leading to excessively long system sections with difficult evacuation conditions.

This necessitates the installation of active fire protection systems and use of these within holistic project analyses to create simplified safety and evacuation concepts.

### *Safety on metros, monorails or trams*

Against a background of continuing urbanisation and the ongoing growth of cities, rail-based systems make an increasingly important contribution to everyday mobility. An increasing density of traffic users and heightened passenger safety requirements are key elements in this development.

Combined with difficult evacuation conditions for underground or overground transport concepts, this is also leading to a need for innovative fire protection system solutions.

### *Regional transport*

Regional transport includes a wide range of vehicle types and concepts, but even on shorter routes this should not lead to compromises in safety when compared to other transport modes.

Double-decker vehicles with significantly longer evacuation times, diesel engines directly under passenger compartments or routes that pass underground are reasonable for the installation of fire protection systems in regional transport.

### *Smart Concepts*

An optimal overall result for a complex traffic system requires intelligent engineering. Previously, however, the infrastructure of a metro system with its stations and tunnels had been planned virtually entirely independently of the vehicles. As a result, a great amount of potential for optimisation and cost savings had not been made use of, since metro systems in particular have the benefit that vehicles using them are clearly defined.

With its team of specialist designers, FOGTEC combines fire protection measures for both of these subareas – stations and vehicles – together. This means, the balance between rolling stock and stations is not evaluated separately, but rather is designed so that the optimal solution is found for the operator using an iterative approach. As result, for example, requirements for escape routes or the size of the smoke extraction systems in stations can be significantly reduced.






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