Digital Railways

Electronic Level Crossing Protection System

LEXIS



PrvníSignální

Intelligent Protection of Level Crossings

Securing traffic flows is a major challenge, especially at crossing points, as demands on the safety and availability of technical facilities are constantly increasing. Level crossing protection systems are components of railway signalling technology and are responsible for reliably securing road and rail traffic crossing points.



- Fully electronic protection system suitable for any crossing configuration
- Designed for operators of main, regional, industrial and urban railways
- Highest safety level (SIL4)
- Highest availability reduces intersection downtime and delays to rail and highway traffic
- Simple design, powerful features
- State-of-the-art preventive diagnostics

Proven Quality

Based on more than 40 years of experience in railway signalling technology, the LEXIS digital level crossing protection system is equipped with intelligent field components that include:

- Road signals
  - yellow/red light signals,
  - flashing lights,
  - double flashing lights, etc.
- Monitoring signals
- Axle counters
- Vehicle sensors
- Barrier drives

The system defines the standard in the market for level crossing protection systems. With installations in Europe and America, the flexibility, competence, and experience of První Signalni Signalling Systems in the field of level crossing protection technology have been proven time and again.

Due to the consistent use of digital components, diagnosis and control via modern and intelligent communication paths have become standard.

Intelligent field elements make it possible to outsource control and monitoring tasks. This means that more information can be processed and recorded on a decentralized basis and made available for more efficient control of the entire system. This information is used for state-of-the-art system diagnosis.

Maintenance and diagnostic tasks can be centralised by using public or private communication channels.

Furthermore, digital data connections such as EULYNX SCI-LX (Standard Communication Interface for Level Crossings) can be easily established by means of RaSTA (Rail Safe Transport Application) secured via IP-based networks, whereby an intelligent link to neighbouring interlocking systems is possible.

Modern methods also make it possible to exchange information with the vehicle, as all the data are intelligently made available at any location and there are no limits to the amount of information that can be processed. The system forms the basis for the integration of LEXIS into ETCS.



Amazing Flexibility

Since the beginning of the development of digitalised control and safety technology, První Signalní has pursued a modern and flexible platform strategy.
The První Signalní platform NEXUS has been continuously developed since then and forms the basis for our LEXIS level crossing and the MODEST-GEMINI interlocking.
It follows the concept of distributed intelligence and allows functions and hardware to be decoupled from each other and thus to react individually to even the most varied customer requirements.



The NEXUS platform consists of:

- The hardware modules
- The associated firmware
- The operating systems
- The generic basic software components

The components are always identical and used for both the LEXIS level crossing technology and the MODEST-GEMINI digital interlocking.

This common platform results in cost-optimising synergy effects, helping to simplify development, approval, production and the supply of spare parts.

The same spare parts can be kept in stock for maintaining both the MODEST-GEMINI digital interlocking and the LEXIS level crossing technology, thus minimizing parts storage and the maintenance staff can easily be trained for two very similar technologies.

The necessary and often very different functions and requirements of the markets are met by planning the software on a project-related basis.

The platform strategy makes us optimally equipped to implement a broad range of market-specific requirements.

The use of LEXIS level crossing technology in various countries in Europe and America without needing to generate customised hardware proves the success of this strategy.

Modular Structure

The concept of the LEXIS works according to the principle of distributed intelligence. Information is transmitted from digital field components to a safe system core. From that point, the information is processed and the appropriate commands are transmitted to the field components.

The portfolio of input/output modules of the NEXUS safe control platform includes fully electronic modules for the implementation of interfaces to wayside equipment and neigbouring systems:

- NX_SI16 16 safe binary inputs with common ground
- NX_SI8 8 safe binary inputs with separate ground
- NX_SO8 8 safe binary outputs
- NX_SR5 5 safe binary outputs (dry contacts)
- NX_SP1 safe control of flashing lights and barrier drives
- NX_SIG1 safe control of 6 lamps of monitoring signals
- NX_AXC integrated axle counter card sensing up to 3 wheel detectors





Control Technology

The control technology of level crossing protection system consists of

- Level crossing controller
- Diagnostic subsystem
- Communication subsystem
- Power supply



The indoor control technology can be allocated in

- Outdoor cabinets
- Containers / Cabins
- (Concrete / Prefabricated) Houses

If placed indoor, the technology can be installed as

- Rack mounted
- Cabinet mounted





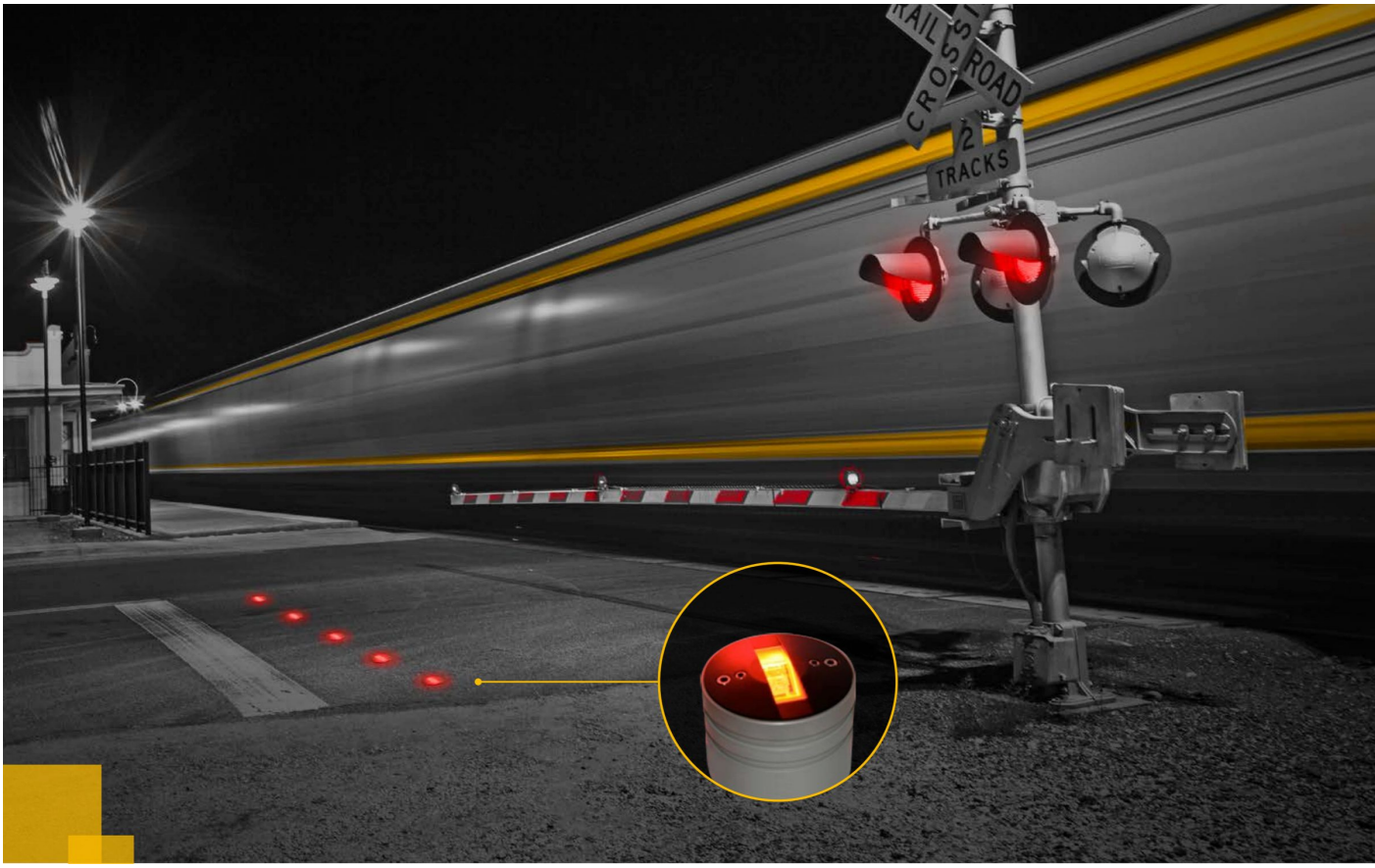
Wayside equipment



LEXIS is very flexible and covers a wide portfolio of outdoor elements with which it can work safely and reliably.

To inform road users of an approaching train at level crossings, various light signs and signals are used. For this purpose, we offer variable configuration of

- flashing lights
- acoustic warning devices
- barrier drives with barrier arms
- half or full barrier arms with LED lamps
- edge warning lights



Common characteristics:

- Very long service life
- Low maintenance
- Simple construction
- Low energy requirement

Flashing lights

LEXIS can control flashing lights of both types

- incandescent (lamps can be of single or dual filament) and
- LED lamps
- various diameter (typically 200 mm)

Barrier drive

LEXIS can operate various types of barrier drives with wide portfolio of gate arms

- hydraulic or electric barrier drives
- arm length up to 12 meters
- gate arm material – wood, composite, aluminum
- optionally with gate arm integrity control
- gravitational or standard
- optionally with gate arm lamps



Train detection

LEXIS offers a wide range of train detection and associated alert activation and deactivation functionality. Either track circuits or, increasingly, wheel detectors with optional directional outputs are used.

For station crossings, information from the station signalling equipment with which the crossing has either a signal or data (communication) secure link is used to activate and deactivate the crossing.

For island applications it is possible to have both separate detectors as strike-in and strike-out point (always 2 and 2 on each crossing track). The most common configuration is 2 sections that overlap each other at the crossing with the road and the sections are monitored by axle counters. For this case, LEXIS preferably uses its own solution for the evaluation unit of the integrated axle counter (using the NEXUS module NX_AXC).



Bells

Road users at level crossings are usually alerted to an approaching train by means of acoustic signalling devices in addition to the light signals. Our level crossing acoustic signals guarantee an optimal acoustic warning.

It is important that the acoustic signals are clearly audible under all conditions. However, the acoustic level should not have a disturbing effect on the surroundings of the level crossing. In addition to lowering the volume level by means of a timer, our acoustic signals can automatically adjust the output volume to the ambient volume.



Remote control

LEXIS allows remote connection. The train dispatcher at the remote station can monitor the status of the equipment on a large screen. Of course, multiple level crossings on one line or in a controlled area can be monitored.

If the configuration requires it, it is also possible to perform remote control of LEXIS using computer peripherals or a touch screen monitor.

Monitoring, controlling and linking to station safety equipment can be implemented in both adjacent stations.

Another option is a secure connection to the station interlocking or line block. Thanks to this link, a possible fault or emergency condition will be reflected in the functional behaviour of the connected devices.



Local control

LEXIS also allows local control via a switch board control panel. An authorised traffic employee can put the crossing into lockout, open the crossing in an emergency or close it manually.

The necessary indications of the equipment status are available.

Effective power supply

A safe and efficient power supply for railway safety technology has a direct influence on its availability and the operating costs of the system.
In order to ensure high availability of the power supply, batteries are used as a mains substitute. The power supply of the safety technology and the battery are under monitored management. This subsystem features a compact design, low weight and high efficiency.

Equipment:

- 1,000 to 1,400 watts of charging power for secondary DC voltages of 18 V, 24 V, 30 V, 36 V or 60 V
- Very compact design
- Low weight
- High efficiency (typ. 90%)
- Control by means of temperature-dependent charging characteristics
- Display for current, voltage, consumption and temperature values
- Monitored by NEXUS and diagnostic subsystem

Further features:

- Adjustable maximum current limit
- Adjustable charging time at gassing voltage
- Display of battery voltage even during mains failure
- Mains failure counter
- Fault output via relay contact
- Option to cascade multiple power sources in case of increased power demand
- Optional relay contacts as external interface, e.g. voltage monitoring or mains failure



Modern service concept

Each LEXIS level crossing has a diagnostic module that is connected to the safe system core via a non-reactive interface. The diagnostic data received via this interface can be displayed either graphically or text-oriented. The information can also be made available for remote access.

Diagnostic computer

The diagnostic software installed on the local or remote PC processes data received from the LEXIS and makes it available to service and maintenance staff.

The diagnostic computer is identical to that used in other Prvni Signalni product solutions.

Diagnostic interface

For maintenance personnel, the graphical user interface of the diagnostic system provides an overview of the states of all subsystems of the level crossing in an overview screen. In addition to the display of active status changes, such as the opening and closing of the barriers or the status of the track sensors, faulty elements are also visualised clearly and in real time.

Further diagnostic information can be accessed via the menu and analysed by means of online help or additional evaluation tools.

Data exchange

In our networked world, it is of great importance that data is always available where it is needed. The diagnostic system of the LEXIS forms the basis for this availability. The diagnostic computer can forward the determined diagnostic data via a wide variety of transmission paths. In addition to leased line-oriented data transmission via copper or fiber optic connections, a wide variety of digital transmission paths such as the internet, telephone and mobile phone networks can also be used. The transmitted diagnostic data can be provided as a website, regardless of location.

Diagnostic centre

In a diagnosis centre, all connected level crossings (and interlockings) can be monitored simultaneously. The diagnostic data are available in one place and maintenance and servicing operations can be planned and coordinated from there. The software of the diagnostic centre is an application optimised for the requirements of service and maintenance, which can be operated intuitively and does not require any special knowledge.





Summary

- LEXIS integrates control of flashing lights and barrier drives
- Configuration tools simplify application design and installation setup
- LEXIS eliminates all relays in a level crossing technology
- Can be easily customized
- Shift maintenance focus from "Find and Fix" to "Predict and Prevent".
- Includes event logger and analyzer
- Immediate fault reporting increases maintenance efficiency

- Covers applications from the very simple to the most complex configurations
- Meets **SIL4** of CENELEC safety standards EN 50 126, EN 50 128, EN 50 129 and EN 50 159
- Offers easy configuration and testing prior to delivery, as well as simple and quick on-site setup
- LEXIS can control flashing lights, both incandescent (single or dual filament) and LED, various types of gates (gate operators) and gate arm lamps
- Track circuits, axle counters and wheel detectors can be interfaced
- Capable to interface other vital logic via signal or vital communication lines
- Communication links are fully redundant and use industry standard protocols (RS485/RS232/LonWorks/Ethernet/TCP/IP)
- Copper or fiber optic cabling or wireless communication
- Supports fail-safe data transmission using safe and secure protocols
- Optional radio strike-in and radio monitoring
- Additional solar power supply
- Diagnostics places maximum emphasis on fault prevention with early detection of faults
- Offers Web-based diagnostics

LEXIS

Safety First

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