



RAIL SIGNALLING SOLUTIONS

Safety, availability and flexibility for the highest demands

MIPRO

PROVEN RAILWAY SAFETY EXPERTISE

Mipro is a Finnish railway system specialist with nearly 30 years of experience in developing and supplying interlocking and traffic control solutions. Mipro's products are based on advanced technologies, railway safety standards and close co-operation with end users.

HIGHLY MODIFIABLE AND FLEXIBLE INTERLOCKING AND SIGNALLING SYSTEM

Mipro's computer-based fail-safe interlocking and signalling system, is developed to control and manage high-frequency and demanding rail operations. The modular and flexible system architecture enables various traffic and operation modes, future expansions and modifications, as well as easy integration in existing infrastructures.

The system is suitable for controlling primary lines, secondary lines and marshalling yards and for setting main routes and shunting routes.

The system monitors and controls train movements and the wayside equipment and indicates their status allowing reliable traffic management.

Thanks to the modular hardware and software structure, the system easily adapts to customer-specific requirements and various environments. Individually configurable interlocking solutions can also be easily extended at any life cycle stage and without interrupting the operation.



KEY FEATURES

- SAFETY:** Two-out-of-two architecture for all modules. SIL4 certified.
- AVAILABILITY:** Optional redundancy for maximum availability. Uses standard Ethernet-based communication. Enables an efficient use of railway capacity.
- FLEXIBILITY:** Supports distributed, centralised and mixed system architectures. Integrates easily into the existing infrastructure. Supports the European Railway Traffic Management system ERTMS on ETCS levels 1 and 2.
- EVOLUTION:** New intelligence for flexible and cost-effective interlocking solutions.



CERTIFIED HARDWARE AND SOFTWARE ENSURE SAFETY

Mipro's interlocking and signalling system platform is based on widely spread components that have been proven for reliability and functionality in numerous environments and locations. The entire hardware concept is certified on Safety Integrity Level 4 (SIL 4) in accordance with CENELEC standards EN 50126, EN 50128 and EN 50129.

The system programming complies with standard IEC 61131-3. This ensures well defined programming structures and tools which make programming, testing and validation easy in the office environment before the site testing. The software uses two fully independent diverse processors for each vital process part. The software is certified for use in SIL4 applications.



ADAPTABLE INTERFACES

One of the system key features is its easy adaptation to the existing infrastructure. The system is capable of interfacing with several types of existing point machines, interlocking, signalling, track circuit, train detection and ATP equipment.

Interfaces to a specific application and trackside equipment can be defined as per case. Predefined solutions by Mipro are also available for object controllers (OC) and trackside equipment, for example for shunting signals, centralised points and main signals.

The system is compatible with both relay and computer-based interlocking systems. Data transmission between adjoining interlocking systems is implemented using a safety I/O connection point or a safety communication protocol. Data exchange and interlocking rules between two systems are defined in a specific application.

SECURE COMMUNICATION

Based on the use of open standardised interfaces, Mipro's interlocking system ensures reliable communication between various systems. The communication is based on the industry-standard Ethernet network that guarantees a reliable data transmission without delays. A redundant ring topology is used to enhance the system reliability and fault tolerance.

The interlocking system data communication network includes

- > an interlocking network, consisting of the interlocking system Ethernet ring network (field cabinets)
- > a CTC communication interface
- > an optional external system network that is separated from the interlocking network by means of a router/firewall and which comprises an Ethernet network for external systems
- > HMI Local Control Network (Local Operator Panel, LOP), if needed.

The interlocking system can be connected to any upper level traffic control system via a communication interface defined according to the particular system settings.

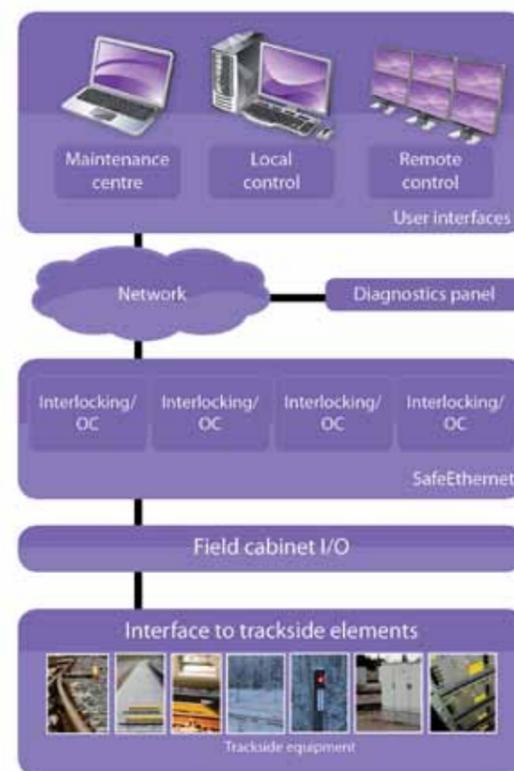
FLEXIBLE SYSTEM ARCHITECTURE

INDIVIDUAL SOLUTIONS ACCORDING TO CUSTOMER NEEDS

Mipro's interlocking and signalling system is based on object-oriented design and programming principles and is, thus, capable of offering interlocking solutions for a wide range of environments and requirements. It also provides the most appropriate architecture - centralised, distributed or mixed - for each solution.

The system hardware consists of modules that can be installed as stand-alone units or furnished in compact rack and cabinet structures. These can be freely located: distributed in various locations along the trackside or on the marshalling yard, or centralised in one control centre. In the third option, the interlocking modules are installed centrally in one location and the object controllers are distributed in controller cabinets.

By selecting an appropriate architecture for each interlocking solution you can optimise the need for cabling and device facilities. For example, a distributed solution for a suitable track geometry can reduce considerably the entire system's cabling costs.



MIPRO'S INTERLOCKING SYSTEM ARCHITECTURE ENABLES EASY CONNECTIONS TO TRACKSIDE EQUIPMENT.

OPTIMAL COMBINATION OF RAMS

RELIABILITY

Mipro's interlocking and signalling systems have proven their reliability in numerous railway deliveries: they control over 2000 rail track kilometres in Finland. For example, at the Kokkola-Ylivieska double-track section, Mipro's interlocking system controls the traffic on one of Finland's busiest railway lines.

The Kokkola-Ylivieska signalling system project covers the existing single-track section and the new double-track section, and all the necessary interfaces between the tracks.

The high availability of Mipro's interlocking and signalling system is also ensured by comprehensive maintenance and user support services provided by Mipro. The user support is tailored case by case according to customer needs and system availability requirements.

Facts and figures of the Kokkola-Ylivieska project:

- > The total length of the section is about 80 track kilometres (50 miles).
- > Part of the Trans-European Transport Network (TEN-T).
- > The section includes seven traffic places: three bigger stations (Riippa, Kannus and Eskola) and four crossovers (Matkaneva, Kälviä, Sievi and Karhukangas).
- > The number of signals along the track section is about 118
- > The number of centralised points (with two motors) is about 36.
- > The technical nominal speed provided by the system is 250 kilometres per hour.

AVAILABILITY

Mipro's interlocking system ensures an uninterrupted rail traffic by using redundant components and data transmission connections in critical locations and situations. The system provides:

- > possibility to use redundant system modules, full hot-standby (CPUs and all active modules are duplicated); the redundancy need is defined case by case.
- > a redundant Ethernet network with alternative routes for the interlocking system
- > redundant power supply
- > separate communication channels for commands to be transmitted to the interlocking.

MAINTAINABILITY

The system structure is the key factor to ensure the high maintainability of Mipro's interlocking system. When the operations and functions of a certain controllable area are allocated to a dedicated cabinet, hardware or software, the disturbances in that area do not impact on the entire system functionality.

Thanks to the system's proven implementation and design principles the maintenance costs remain low. The use of moving parts, for example, is minimised to limit the number of eventual component failures. The system also includes versatile maintenance tools. For example, the maintenance laptop or the alarms display located at the trackside cabinet can be used for indicating diagnostic data, upgrading the software, monitoring and issuing alarms.

SAFETY

Mipro's system fully meets the high safety integrity required from safety-related railway systems and is certified on Safety Integrity Level 4 (SIL4).

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Our operations are managed in accordance with an integrated management system certified according to ISO 9001 standard, and an environmental system certified according to ISO 14001.

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