A new direction in signalling technology
Alister - Electronic Interlocking System
Alister Electronic Interlocking System for Small and Medium-Sized Stations

Alister is a modular, compact and particularly cost-effective electronic interlocking system developed by Funkwerk Information Technologies and tailored exactly to the current and future needs of main and regional lines with small and medium-sized stations. What makes Alister special is that the system is based on a safe platform with programmable logic controllers (PLC). This means low investment and operational costs and, at the same time, the highest degree of future-compliancy.

**The need to modernise regional interlockings**

On most regional lines signalling is still performed by mechanical and electro-mechanical interlockings which are complex and cost-intensive to operate. Railway companies with this type of line need to modernise their signalling technology – with a long-term perspective so that they can offer passengers a modern and attractive rail service for the future. They need a flexible solution which can grow with and be adapted to new requirements at any time.

**Optimised operations management**

But the focus is not only on modernised technology. Adapting operations management to the specific conditions of regional lines also results in a considerable potential for optimisation. Funkwerk’s electronic interlocking Alister was designed especially for the requirements of regional lines, one of the most important being automation of operations management by means of remote control of stations from a control centre.

**Future-compliant thanks to modular standard components**

Programmable logic controllers (PLC) have been in use in industrial automation for many years. They have proved to be extremely safe, reliable and economical. This is why Funkwerk IT decided to use these standard components consistently in all signalling applications, thus taking a significant step in a new direction in signalling technology. It is these components which also provide the technological platform for Alister. The Alister system therefore offers substantial advantages for regional line operators: configurable standard modules ensure simple interfacing to existing signalling installations. Furthermore, the modular PLC concept means that spare parts are inexpensive and always immediately available, and upgrading with new device generations is a simple procedure.
Modern information technologies
The use of modern information technologies in signalling increases compatibility and interoperability. Engineering data in XML enable easy checking of new or altered installation configurations. Thanks to UML, interlocking functions can be easily verified and validated, which simplifies approval procedures.

Highest safety level
Safety has the highest priority in all types of stations. For this reason all Alister components were developed in full compliance with CENELEC EN 50126, 50128 and 50129. The interlocking system is based on a safe interlocking platform and meets Safety Integrity Level SIL 4. The operation of the Alister system is based on conventional procedures in control and safety technology. This includes a technically safe workstation for input of non-routine, safety-critical actions. The Alister interlocking thus enables cost-effective operations management on main and regional lines with small and medium-sized stations while retaining the high safety standards demanded from railways today.

Key Advantages at a Glance
- Use of long-term technology standards (e.g. PLCs, Ethernet)
- Scalable system architecture with high safety level (SIL 4) and availability
- Manufacturer-independent open interface management
- Tool-supported development process
- Flexible, graphic engineering
- Compact, modular design
- Maintenance-friendly diagnostics system
- Tried and tested operation procedures
- Immediately available, low-cost spare parts
- Low life-cycle costs
Open, scalable standard technologies

During the development of the Alister system Funkwerk IT decided in favour of a scalable design which would meet the specific requirements of regional networks in every respect. Instead of a complex specialised solution, Alister offers a modern standard solution at a much lower investment and operational cost. The electronic interlocking can be easily upgraded, re-organised and linked to any type of already existing system. In addition, it is compact and easy to operate.

Flexibility – now and in the future
Thanks to the modular system concept of Alister, PLC upgrading, further development and replacement of components are easy procedures. The advantage: any necessary alterations to the hardware or software affect only single modules, not the entire system. The life-cycles of each part within the system can be used to the full. Consistent use of modern industrial standards for hard- and software also means that spare parts can be obtained without delay and at low cost. The long-term availability of components and compatible exchange for new module generations guarantee a long service life of the entire Alister interlocking system.

Compact design
The use of standard components means that the complete interlocking can be built into a compact, space-saving cabinet. This minimises the space needed in technical buildings, e.g. control centres or switch boxes.

Open interfaces
Thanks to the use of industrial standards, Alister works with open, flexibly configurable interfaces. Track-side elements are triggered by means of digital I/O-modules. This means that in addition to the internal interfaces between the internal interlocking installation and the control centre, rail traffic control system and power supply, connections to external systems of other manufacturers are easy to set up. If required, customer-specific interfacing is possible by means of universal adapter modules. Existing track-side installations or elements of different manufacturers, for example, such as axle-counters, point machines, LED or conventional signals and level crossings can be connected to the Alister platform.
Tried and tested philosophy of operation
Alister is operated by means of commercially available standard PCs, analogue to conventional procedures in control and safety technology. During routine operation, rail traffic is controlled automatically by means of an intelligent train routing function. As the operation and work processes of the system are not different from the interlocking types in the core network, Alister can be integrated without problem into modern regional control centres. There is therefore no need for time- and cost-intensive training of interlocking staff on the new system.

Effective diagnosis
Alister is easy to maintain and has a convenient diagnostics system. The diagnostic tools integrated into the workstation PC detect, record and evaluate faults, at the same time providing effective support for their elimination.

Easy engineering
A graphic engineering environment enables flexible and fast alteration of the individual stations. New installations or interlockings under construction can be implemented in a very short time. Engineering data and user codes are kept strictly separate. The result: the time and work involved in development and approval procedures is minimised.
The basic concept of the Alister system consists of three areas: the control level, the safety level and the external installations. An important feature of the Alister interlocking by Funkwerk Information Technologies is its decentralised structure with I/O and adapter modules located in the immediate vicinity of the track-side elements.

**Control level**

The control level contains all functions for monitoring, controlling and operating the interlocking itself and also the traffic control functions of train describing and routing. By means of an image signal comparison device, a technically safe workstation ensures correct display of the operational situation at all times. At this level, staff manage routine operation as well as non-routine, safety-critical situations. The operation system also controls train tracking and routing and issues disruption reports.

Local interlockings are operated and monitored in a regional control centre. As many as ten interlockings on one section can be controlled from each workstation. The local interlockings are connected to the control centre by means of fibre optic cables.

**Safety Level**

The safety level consists of the safe interlocking functions including the entire logics of the interlocking system. At this level the operator’s input is converted into control commands and checked to exclude human error or technical faults. A local interlocking is installed in every station. This interlocking controls the functions in every station. The Alister system also allows grouping of smaller stations to form a larger local interlocking control section. The safety level supplies the control level with relevant data for displays and operation. The interlocking core consists of a dual-channel safe PLC platform. The interlocking commands are transmitted to the external installations by means of technically safe communication (Safe Ethernet). Track-side elements are triggered by means of standard I/O modules, in some cases using special adapter modules for customer-specific interfaces.
**External installations**

Points, LED signals, track vacancy detectors and other elements in trackside installations are triggered by I/O and adapter modules which are installed decentrally in the immediate vicinity - the modules for signals in boxes affixed direct to the signal mast, the modules for all other elements in cabinets placed beside the track. The I/O modules for level crossings are installed in the appropriate switch box. All external elements are connected to the I/O modules by means of signalling cable. The I/O modules communicate in turn with the interlocking core via fibre optic cable. In this way it is possible to span long distances between interlockings and external installations. Furthermore, fibre optic cable technology is not susceptible to electromagnetic interference.

**Alister – the new standard**

With its modular design, flexibility and intelligent use of programmable logic controllers, the electronic interlocking Alister by Funkwerk Information Technologies sets a new standard for the future. A fast return-on-investment and minimised life-cycle costs are the positive result for interlocking operating companies.