



Our solutions for railway technology

PILZ
THE SPIRIT OF SAFETY

Application stories
about industrial safety
technology on railways.



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► Rail engineering - an introduction

As a company that operates internationally as a technology leader, Pilz has many decades of experience in the field of safe automation. The highly sensitive and heavily safety-relevant railway sector can benefit from this experience and from the use of proven industrial automation products.

Profound knowledge of railway-specific standards

Many railway applications have already been implemented internationally using Pilz components and systems:

- Control of level crossing protection systems
- Line control and communication tasks
- Functions in and around the train

Particularly robust control system for the railway industry

With the automation system PSS 4000 we have developed a special control system for the railway sector, which meets the high environmental requirements and also the normative conditions stipulated by CENELEC. The automation system PSS 4000 has been specially upgraded technically and is particularly robust to electromagnetic interference, extreme temperatures and mechanical load. Applications up to SIL4 are possible with this control system.

Benefits for railway technology:

- Open, independent automation system rather than proprietary special solutions
- Standardised solutions for hardware and software in accordance with IEC 61131, plus communication in accordance with IEC 61784
- Standardised, individually adaptable software blocks
- Fast, simple programming with graphics Program Editor
- Smooth development process due to integrated security mechanisms in the control system
- Remote maintenance and rapid diagnostics possible
- Suitable for autonomous systems as well as applications with connections to signal boxes

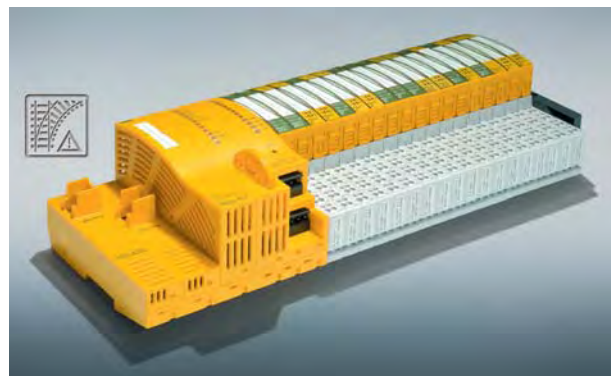
- Insensitive to temperature, robust in terms of EMC and mechanical load
- Uncomplicated approval due to certified base system in accordance with CENELEC/TÜV

Read more about our solutions for railway technology in this brochure. We take you through our successful international projects and applications in railway engineering. Experience what Pilz can do for you. We care about your automation and we automate safely. Please contact us for more information. We hope to get in touch soon.

Safe regards,

Pilz Netherlands

+31 (0)347 320477 | info@pilz.nl



Automation system PSS 4000r from Pilz.



► Barrier-free safety

Author: Frank Breuninger, Rail Industry Manager, Pilz GmbH & Co. KG

Automation system PSS 4000 from Pilz as an economical solution for level crossing control systems

When it comes to exemplary rail transport systems and punctuality, Switzerland is happily held up as the perfect example. To increase safety on level crossings, the Swiss Federal Transport Office (BAV) has specified reliable safety-related solutions for unsecured level crossings. In Switzerland, the automation system PSS 4000 is proving that standardised industrial solutions can implement the high, safety-critical requirements of rail transport economically.

Anywhere that man and machine come together, the associated hazards and risks must be debated. In an industrial environment, a wide range of protection and safety systems ensure that plant and machine operators come to no harm, while simultaneously guaranteeing high productivity. In everyday life also, rules and safety measures ensure safe processes where different transport users come together. People are fallible, however: intelligent safety solutions must provide protection where even an accidental breach of the rules could have serious repercussions for life and limb. There are still a large number of unsecured level crossings in Switzerland today. The Swiss Federal Transport Office (BAV) intends to remove these hazard areas by 2014 and is stipulating that unsecured level crossings must be fitted with reliable safety-related solutions. From purely economic considerations, the first step for individual line operators will be to check which routes are dispensable. For protection systems with barriers will rarely be considered for what are generally single-track level crossings on low-use lines. The focus is therefore on sophisticated, economical solutions. Engineers at Innolutions GmbH had already been putting some thought into the concept of holistic, cost-effective and failsafe safety solutions. The Swiss firm is based in Neuenhof and specialises in protection systems for the railway sector. "We were already in contact with Pilz at this point and were aware of the extensive portfolio of automation solutions for standard and safety. The idea was to transfer these industry-proven solutions to signal control and monitoring systems on level crossings", says Marco Suter, General Manager of Innolutions.

Automation system PSS 4000

Today, the automation system PSS 4000 from Pilz demonstrates its flexibility and openness in a wide range

of classic mechanical engineering applications as well as in car production. PSS 4000 is even used in the chemical industry, on cable cars, dockside cranes and sluice systems. The benefit: it examines aspects of standard automation and safety within one system. What's more, PSS 4000 offers the benefits of a decentralised control structure without the complexity that is normally associated with such a system. In detail, the automation system PSS 4000 consists of multiple hardware and software components, plus the real-time Ethernet SafetyNET p and corresponding network components. These can be used to connect other decentralised control systems and input/output modules, as well as to download both safety-related and non-safety-related data. The control systems are based on the decentralised I/O system PSSuniversal.

Innolutions worked in conjunction with VT Verkehrs- und Industrietechnik AG, who are also based in Neuenhof, to develop the safe level crossing control system MICRO VT009+, on the basis of the automation system PSS 4000. This system can be used on single-track level crossings and has SIL 3 approval in accordance with CENELEC (EN 50129). Compared with a fully barriered version, the MICRO VT009+ solution is significantly cheaper to purchase. "Of course, that's an argument our customers like to hear", says René Meier, who is responsible for sales and marketing at VT Verkehrs- und Industrietechnik AG. The basic equipment on the system includes the amber/red alternating flashing lights with acoustic horn, which are positioned on masts on both sides of the crossing, St Andrew's crosses, axle counters at a relevant distance to the intersection, plus a control cabinet housing the components for the automation system PSS 4000. This includes the control system PSSuniversal PLC, which can be configured with the necessary input and output modules.

If a level crossing is fitted with the MICRO VT009+, the



system is activated as soon as rail vehicle approaches. The amber lights flash for three seconds and then switch to a constant amber for the same period. At the same time, the classic audible signal which is standard in Switzerland will sound. The red light then turns red for 12 seconds. The train passes the crossing, the amber lights flash for another 3 seconds and then finally go out. The installed axle counters register the axes before and after each carriage passes; signalling ends at the rearmost axis of the combination. Should an error occur, the “flashing amber” function would immediately be activated on a continual basis. In the event of an error, the system automatically sends a short message via mobile radio to a previously determined address, such as a control centre, for example, which then initiates appropriate measures. The “flashing amber” function is guaranteed in each case, based on the configurable safety relays PNOZmulti Mini.

Versatile in railway technology

“That’s why we use the automation system PSS 4000 from Pilz, particularly in our MICRO VT009+, because it has a logical structure in terms of its practical application and programming, it is easy to manage and is extremely

flexible”, says René Meier, summarising the system’s benefits. With PSS 4000 on board, the system can also be adapted to situations in which several streets converge at an intersection, for example. Autonomous operation is therefore guaranteed in every case, as required by the Public Transport Association (VöV) in Switzerland.

Since the MICRO VT009+ first demonstrated its capabilities on the Häusern crossing on the Bern-Schwarzenburg line in April 2011, further crossings have been modernised or are in the process of being converted. “Even if most unsecured level crossings might already be closing for economic reasons, there still remains a large number requiring a safety update”, says Marco Suter. When this will happen and to what extent depends on pan-European specifications and the statutory provisions of the respective state authorities. The urgent need of many countries to modernise their railway infrastructure should fit well with this standard, industry-proven, safe and economical solution. In any case, as a centralised unit for standard and safety, the flexible automation system PSS 4000 is versatile enough to undertake far more complex tasks in the field of railway technology. ■



► Technological change in the control box

Author: Geert de Bruycker, Pilz Belgium

Why the Antwerp metro is more punctual with the Pilz automation system PSS 4000

As railway control systems get older, failures and breakdowns start to accumulate. As a result, operation can quickly grind to a halt, particularly on local public transport. The industry-proven SIL 4-capable automation system PSS 4000 is replacing obsolete electronic boards on the underground intersection of three metro lines in the centre of Antwerp. Step by step, the innovative, software-based control and safety solution from Pilz has replaced the existing technology, without interfering with the complex electrical periphery. Since then, operation of the metro around Centraal Station has been more reliable.

Immediately below the city of Antwerp, three metro lines meet in the triangle formed by the stations Astrid, Opera and Diamant. In the process, two lines are transferred into one section of track at each of the three stations. Control and monitoring systems ensure that only one train can enter the station at a time. In the past at these points disruptions to operation increased. "The circuit boards and its electromagnetic components have been in service for more than 35 years; it's becoming increasingly difficult to purchase the appropriate spare parts. At the same time, those members of staff who are familiar with this technology are retiring", says Guido Maesschalck, Electronic Engineer at De Lijn, local public transport operator in greater Antwerp.

Hub of modern automation

Clearly there was an urgent need for action: what was needed was a modern, software-based solution to replace the functionality of the ageing control and monitoring technology. There was also an initial requirement to leave the whole electrotechnical infrastructure around the points and control cabinets untouched. The revamp process was to be modular and gradual, with the final changeover at the three hubs happening almost overnight. After all, nobody wanted local public transport to be paralysed for months. The railway operator put the project out to tender; the German automation company Pilz came into the picture due to recommendations from the railway sector. The company had been represented with a branch in Belgium since 1995. "Following an initial reference project we were positive that with Pilz we had found the right partner for modernising the control and safety-related technology on this sensitive triangle", says Guido Maesschalck. The first challenge was to develop a project scenario that

was tailored to this specific case. "At the beginning we actually had little more than a pair of old electrical and track plans. First of all, we analysed the hardware and software in line with the requirements and structured the project workflow in parallel", says Geert de Bruycker, the responsible Project Manager at Pilz Belgium. A binding schedule was used to define milestones, select hardware tools and develop the corresponding software applications.

Certified automation system for rail operation

A central component in the new control and safety solution is the automation system PSS 4000. Pilz developed the industry-proven automation system to meet the particular requirements of rail transport: these special modules have an -R ("Railway") in the type description and are robust against electromagnetic interference, extreme temperatures and the mechanical loads that typically occur in a railway environment. The -R modules in the automation system PSS 4000 have CENELEC approvals in accordance with EN 50126, EN 50128, EN 50129 and EN 50155. PSS 4000-R already has railway-specific safety approvals as a product feature. The modules can be used in various applications within the railway industry with different safety integrity levels. These include control functions on track building machinery and traction units, as well as control or monitoring functions in the signalling area, such as signal monitoring on level crossings, control and safety technology or signal box connection for example. The automation system is SIL 4-capable across the whole application.

Safe, one train at a time

Put simply, the task of the Pilz automation system PSS

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PSS 4000 on the three hubs is to guarantee orderly, safe and efficient operational workflows. More reliably, powerfully and efficiently than the technology. On the three identical track junctions, the new software-based automation solution ensures that only one train driver at a time is granted free access to the station. Should there still be a train in the station, the signals on both tracks will be red. If two trains arrive almost simultaneously, the automation system decides which train has priority in accordance with a specified mode. PSS 4000 controls and monitors not only the point setting and light signals but also the sensors and detectors attached to the track bed. These are responsible for the minimum distance between two trains. If the distance falls below the minimum value, the automation system automatically brakes the rear train. The train driver has a display indicating the maximum speed at which he can travel, depending on the situation. If he ignores this display, the automation system will again brake the train. The PSS 4000 also detects cable breaks and the failure or malfunction of signal lamps and distance sensors, taking the appropriate safety-related measures.

Space-saving and compact in the control cabinet

Three PSS 4000 module units are used on each of the three railway switches and communicate via SafetyNET p. PSS 4000 consists of several function groups; safe PLCs, I/O devices and various I/O modules are available as hardware components for safety and automation functions. The modular units take exactly the same space

in the control cabinets as the old electrical circuit boards. The Master module (MAW) with the higher level control and monitoring functions is located in the central control cabinet next to the points, the two Slave modules (MV"- and MV"+) are in the control cabinets on the signalling systems for the feed-in tracks.

The electrotechnical periphery is unchanged

To summarise, the automation system PSS 4000 demonstrates several advantages when gradually modernising railway control and monitoring infrastructure in rail operations. The measures can be implemented piecemeal, in stages. All the electronic periphery, consisting of signal, control and alarm technology as well as the control cabinet cabling, remains untouched. So the automation system PSS 4000 also performs an interface function between the old control boxes. The modular technology is highly standardised; individual adjustments to specific tasks can easily be made. Once the modules have been tested successfully in offline mode, the system is quickly ready for use: the software platform PAS4000 from Pilz is available to create, configure and set parameters for safety-related applications and to download them to the control system. "For us, the automation system is the basis on which to make other track sections safer and more reliable over the next few years. Thanks to the hardware and software, plus excellent support and advice from Pilz, we are certainly on the right track", says Guido Maeschalck, summarising. ■



► Safety right down the line

Author: Adrian Ludi, Pilz Switzerland

SafetyNET p and PSS 4000 as the basis for remote control and protection on rail networks

Railway systems can be compared with distributed production systems in industry: as an operator, the objective is to find a simple way to incorporate even remote sections into an integrated overall concept and to monitor and control the process from a central control station, without having an immense amount of wiring to do. The real-time Ethernet SafetyNET p works in conjunction with the automation system PSS 4000 from Pilz to perform holistic control and safety tasks in the rail industry. The system has the necessary CENELEC approvals and is even SIL 4-capable across the whole application.



The railcar from the GoldenPass line pulls away from the station at Montreux on Lake Geneva at 8.45 precisely. Over the next two and half hours, the train will wind its way over mountain passes and valleys, through one of Switzerland's most scenic and attractive regions. It will reach Zweisimmen at 10:43, arriving in Lenk im Simmental at 11:21 – on time, as is almost always the case. The metre-gauge train is fitted with panoramic cars; on its journey it will have passed a total of 36 villages and stops, around 50 level crossings as well as numerous signal and control devices.

Economical solutions are in demand

From a control and automation technology perspective, rail networks are widely distributed systems; in terms of their operation and safety, they are highly demanding on many levels. Above all, the components need to be able to interact efficiently and reliably.

The private rail company Compagnie du Chemin de fer Montreux Oberland Bernois (MOB) has been operating a 75-kilometre rail network in Switzerland since 1901, including the line between Montreux – Zweisimmen – Lenk. Economical solutions are in demand on every level if they are to stay competitive in the long-term with an attractive transport and service offering. This

applies to the railway engineering technology too, of course. Appropriate operating and control concepts must optimise processes and traffic flow, but most also offer maximum safety. The latter is particularly important where hazards typically occur, such as on level crossings, for example. This is a particular challenge, not least because of the huge distances that are involved.

Industrial automation technology for railway systems

Intelis SA is based in Bussigny-près-Lausanne and has specialised in all-round railway control and safety concepts for both private and public train operators since 2007. The remote control solution INIS-TC developed by Intelis is responsible for ensuring that rail traffic on the 75 kilometre line from Montreux to Lenk is optimised to run smoothly and safely. The Swiss Federal Transport Office (BAV) has granted the necessary operating permit. At the heart of the remote control solution is the real-time Ethernet SafetyNET p in conjunction with the automation system PSS from Pilz. Having demonstrated its flexibility and openness not only in classic mechanical engineering but also on cable cars and dockside cranes, the innovative automation solution for standard and safety is now being put to use in rail transport.

SafetyNET p connects the subsystems over long distances and using various media. PSS 4000 examines aspects of standard automation and safety within one system, offering the benefits of a decentralised control structure without the complexity that is normally associated with such a system. In detail, the automation system PSS 4000 consists of multiple hardware and software components, such as the decentralised I/O



system PSSuniversal, plus the real-time Ethernet SafetyNET p and corresponding network components. These can be used to connect other decentralised control systems and input/output modules. Modules with -R (Railway) in the product name are characterised by a particularly robust design. The overall solution meets increased safety and environmental requirements up to SIL 4 of CENELEC 5012x.

Phasing out classis relay technology

Even today, classic relay technology with positive-guided contacts is still widely used in railway and signal engineering. As part of modernisation measures, however, it is becoming the trend wherever possible to replace wearing, cable-intensive hardware with powerful software, coupled with an easy-to-use network. Safety and economy are not mutually exclusive in this; in fact, they are mutually dependent. For Intelis, the initial task was to work out the potential of automation, as well as the potential risks along the single-track route. All points, signal boxes, level crossings, signals, track parts and block signalling systems were considered along with specific customer requirements, as part of an overall assessment. "How can we simplify the system?

How can we replace automated and conventional relay technology with software? How do we integrate the relay technology that's still necessary and how can we guarantee safe operation?", says Roland Balimann, Technical Manager at Intelis, summarising the questions that were posed at the start of the project. Intelis started by conducting a feasibility study to test potentially suitable products and systems on the market. The requirements analysis essentially demanded safety level SIL 3 for safety-related commands and feedback, the ability to adapt to new and existing protection systems and the ability to use industrial products and systems. The result showed a clear case for the flexible, modular automation system PSS 4000 and SafetyNET p from Pilz, which Intelis ultimately chose.

Safe data transfer

Today, 17 stations are equipped with the safe programmable control unit PSSuniversal, which has an integrated interface to the signal box. This sends information to the communication server and also to the programmable safety systems via SafetyNET p. It was here in particular that the modularity of the components

proved to be a particular advantage; the inputs and outputs could be configured in standard and failsafe mode according to need, with minimum wiring. The SafetyNET p network is a closed loop; a fibre-optic cable connects all the components that communicate with each other across the whole route. Today, dispatchers monitor and control all rail traffic on the line safely and reliably from two central control stations in Montreux and Zweisimmen. They receive regular as well as safety-critical messages, which display the status of the rail traffic and signal boxes without feedback and in real-time. If necessary the dispatcher can actively control rail traffic or take appropriate measures if faults should occur. Data exchange is via SafetyNET p, which is approved by TÜV to SIL 3. If a fault should occur anywhere on the loop, data exchange is still guaranteed through intelligent switches. Appropriate operator panels are used to visualise information and operating states, graphically represent the stations and display alarm and event messages. But the actual safety always stays close to the action: it is always the respective PSSuniversal head modules on site that check whether a half barrier is closed or a track section is actually free, for example.

Easily integrated into existing networks

Intelis has been using products and solutions from the automation specialists from Ostfildern, near Stuttgart, for some time. Ultimately it's to do with having industry-proven products that have already demonstrated their safety and reliability, without exception. "The modular design of the automation system PSS 4000 offers users many benefits: they only buy what they actually need; the system is future-proof and can grow to suit requirements. What's more, solutions can easily be integrated into existing networks and can also be quickly installed using SafetyNET p. Ultimately, the price/performance ratio is simply right", says Roland Balimann. Soon, the funicular that connects to the railway line in Les Avants will also be integrated into the existing and successfully operating INIS-TC remote control system. "Something else that we value in our co-operation with Pilz is the fact that the company is always open to suggestions on ways to optimise the system. As a result, we are always able to offer customers solutions that use state-of-the-art technology" says Roland Balimann, summarising. A partnership of equals; and with new projects, it's set to continue. ■

► Controls replace shunting!

Author: Pascal Fischer, Pilz Switzerland

Automation system PSS 4000 rides along as the safety interface on remote-controlled locomotives

The task of the wireless remote control system LocControl100 from railway technology specialists Schweizer Electronic AG is to send control commands from a mobile control console to a locomotive using safe, wireless technology. In conjunction with the PSS 4000 automation system from Pilz, which is installed on the TRAXX AC Last Mile Locomotive from Bombardier Transportation, this control platform can be used to implement special add-on functions safely and flexibly, meeting customers' exact specifications. The remote control system is certified to SIL3 and makes automated rail operation more flexible and more productive, without having to compromise on safety.

The freight depot in Muttenz near Basel in the early evening: at one of Europe's largest freight depots, an electric locomotive shunts back and forth between parallel tracks. Following some invisible plan, it collects sets of different freight wagons; on a train formation track it gradually assembles them to form a mixed freight train, comprising more than 70 wagons. An everyday occurrence in a marshalling yard. However, this locomotive is not a classic shunting locomotive but a mainline TRAXX AC Last Mile type locomotive from Bombardier. Look more closely and you'll also see that the driver's cab on the locomotive is empty.

Safe, wireless shunting operation with a thousand metre range

Between the tracks stands a shunting locomotive driver, keenly monitoring the scene. His hands maintain constant contact with switches, pushbuttons and the control knob on a yellow operator device he carries around his neck. This wireless remote control system has been specially developed for rail operation by Schweizer Electronic. The shunter uses it to move the locomotive forwards and backwards, to brake, accelerate and, when necessary, to issue visual or audible signals. With a corresponding device on the locomotive/receiver side and following identification via RFID key, the handbag-size control device can be used to manoeuvre locomotives up to a distance of 1,000 metres. The frequencies can be selected directly in the field, so the device can be operated in various countries, using the same equipment. Typical application areas include shunting, flow and crossing operations. This was the first time that a mainline locomotive was fitted with this wireless remote control system, the

background being that train operating companies are increasingly turning to flexible, efficient shunting and logistics concepts. A mainline locomotive of this type can take over at least part of the process of splitting a train or assembling a freight train. This reduces or even eliminates the need to use special shunting locomotives.

Competence in railway technology

Schweizer Electronic has its headquarters in Reiden/CH. With its competency and expertise it has made a name for itself on the tracks over the years, both in Europe and further afield. With 150 staff, the company focuses on innovative solutions for safeguarding construction sites and level crossings, as well as wireless remote control systems for freight locomotives. "When Bombardier enquired about a sophisticated wireless remote control system for locomotives, our first approach was to consider a standard solution that was already developed", says Thomas Koch, Product Manager for Wireless Systems at Schweizer Electronic. Bombardier plays a worldwide leading role in the development of modern rail technologies and vehicles.







The Canadian Aviation and Rail concern has several production sites in Germany, with around 8,000 staff. The project that was launched in conjunction with Schweizer Electronic soon increased in complexity as the details were specified: the implementation of additional functions that were outside the normal scope of a wireless remote control system placed great demands on all concerned. "We had to examine how we could implement the necessary additional performance and safety features as efficiently as possible, in terms of both electrical and control technology. We tested a number of versions, but these seemed either too expensive, too inflexible or not future-proof", says Thomas Koch.

Interface between receiver and locomotive control system

The Swiss railway experts had already worked with Pilz in previous years to develop solutions; the company has been represented with a subsidiary in Switzerland since 1996. Pilz, as a safe automation solutions supplier, had experience of the rail sector. That much was known. Schweizer Electronic got the company on board to implement a sophisticated application program. "In order to implement the additional functions required by Bombardier and ultimately gain approval, we needed an additional instance, which would compare the signals sent to the locomotive from the add-on functions with the status data from the machine, check it for feasibility and consistency and then issue the enable to the locomotive control system, triggering the required action", says Bernd Maier from Pilz Customer Support. That's a task that the automation system PSS 4000 reliably fulfils, as the interface between the receiver and locomotive control system.

Automation goes railway technology

Pilz developed the basic, industry-proven automation system PSS 4000 in accordance with EN 61508 for industrial automation applications. To meet the specific requirements of rail transport, the automation company created special modules with an -R (Railway) in the type description. These are robust against the electromagnetic interference, extreme temperatures and mechanical load that typically occur in a railway environment. The -R modules in the automation system PSS 4000 have GENELEC approvals in accordance with EN 50126,

EN 50128, EN 50129 and EN 50155. The automation system is SIL 4-capable across the whole application. As a result, R-modules are suitable for various applications in the railway sector: it is possible to control and monitor not only traction units and track laying machinery, but signals as well. In the past the system has also proved its performance on cable cars, dockside cranes and sluice systems. As the same time the automation system PSS 4000 is also suitable for use in control and safety technology or in signal box connections.

One-stop safety

When the locomotive is running, PSS 4000 monitors the prescribed speed. In the event of uncontrolled acceleration, the system initiates emergency braking. Although space is at a premium in a locomotive's control cabinet, PSS 4000 is comparatively compact and space-saving, with a head module, 13 input modules, 5 relay modules and 6 semiconductor output modules. In total the system offers 52 inputs and 34 outputs (10 relay outputs and 24 semiconductor outputs). As with the industrial version, the PSS 4000 brings with it the benefits of a decentralised control structure – without the complexity this usually involves. As a service provider and supplier, Pilz was involved in the software architecture, component design, implementation, test specifications and necessary tests. "In this project, particular attention was paid not only to the control tasks and programming, but also to validation and documentation. Both are unavoidable for approval. In this case Pilz demonstrated competence and team spirit, working in close cooperation with our company", says Thomas Koch.

The automation system PSS 4000 from Pilz proves its versatility, with applications in a variety of locomotives and in various railway systems. "We believe that there are railway operators in other countries who will also need to optimise control and monitoring processes. There is an urgent need in numerous countries to modernise the railway infrastructure; this ought to increase even further the demand for a standard, TÜV-tested and economical solution that's EBA-approved", Bernd Maier is keen to stress. The flexible automation system PSS 4000 from Pilz is versatile enough to take on complex tasks in the field of railway technology. ■



► No bridge too far

Author: Jan van der Heide - Pilz Netherlands

Pilz supports RailCom in renovating thirteen railway bridges

ProRail commissioned RailCom to overhaul the technical systems of thirteen railway bridges in the north and east of the Netherlands. During the process the bridges were connected to a new IP communication network and their outdated technology was replaced with modern solutions. Pilz supported the company with its extensive knowledge and experience, including in the field of detail engineering and putting all the compulsory technical documentation in order.

In principle all moveable railway bridges in the Netherlands are controlled remotely. During summer months this operates according to a certain schedule, in which shipping traffic are kept informed of the opening times - such as once an hour. Outside the season, the bridge only opens when there is demand from shipping traffic and when possible, taking rail traffic at the time into account.

From ATM to Fides

In 2013, ProRail – responsible for maintenance of the rail systems - established that the economic lifespan of the telecom installations used by all the bridges, was coming to an end. For this reason a tender was issued for replacing and updating the telecom installation for thirteen railway bridges and the associated control sites at three traffic management (TM) posts in Groningen, Zwolle and Arnhem. The contract was finally awarded to RailCom; a branch of VolkerRail, which specialises in telecom and low voltage applications.

Anton van de Lagemaat from RailCom, project leader of this project: "The complete system per railway bridge that needed to be renovated, not only concerns the remote control system to open and close the bridge, but also a public address system, video communication system, voice communication system, transmission equipment and cabling for the telecommunication for each bridge. The cameras are used for monitoring purposes and the intercom system to communicate with shipping traffic, which can easily register using the system to request the bridge be opened.

An important element of the specifications was the transmission network. Historically, ProRail has used the national ATM network (Asynchronous Transfer Mode) for communicating bridge operations etc. Since this

network is seriously outdated, ProRail shifted to its own, much faster, IP communication network, Fides. An important step in the renovation project involved connecting the bridge's remote control system to this new network. A large number of the hardware components also had to be replaced. These ranged from a separate PLC or control screen to complete control boxes."

Project design

The designs for each bridge were individually developed by an engineering firm. The designs automatically gave rise to the requirements that applied to the work performed by Van de Lagemaat's team. In their interpretation and the detail engineering use was made, for example, of the expertise and experience offered by Pilz; specialist in automation technology with a specific focus on security. Willem Sonneveldt, Project Leader Services and Certified Machinery Safety Expert® explains: "In this project we predominantly issued advice related to security and we were involved in putting the compulsory documentation in order."

With regard to security, Sonneveldt focuses, among other things, on the fact that the new IP network is an open network that is more sensitive to external breaches. For this reason it was recommended that fail-safe components be used, for which the specifications prescribed standard components by Siemens. These components offer separate addressing and ensure double security. Sonneveldt: "Pilz has no problem working with components from other suppliers when the specifications require it. We are also happy to provide support to apply these components in the correct manner and integrate them in existing situations."



Willem Sonneveldt, CMSE®, Project Leader Solutions Department at Pilz Netherlands and Maarten van Dis, CMSE®, Project engineer at Pilz Netherlands.



Uniformity

The extent to which the renewals were implemented was determined by a combination of the technical condition of the installation and the available regional budget. Pilz provided the necessary recommendations for updating some PLC programs. Van de Lagemaat: "Every one of the thirteen bridges renovated in this project is unique. Some are powered hydraulically, others electrically, but there was no question of developing a single solution that could subsequently be 'rolled out' across all the bridges. With this in mind, Pilz also examined and assessed each situation individually. Consequently some controls remained unchanged, others were partly updated and some were also completely reprogrammed. The latter was the case, for example, when the old PLC was replaced by a new one, including new input and output modules. We benefit from the fact that identical components are now used for the controls, which simplifies maintenance and the identification of defects. Technicians only have to be familiar with one system and this also offers advantages in terms of logistics."

Documentation

Providing support for the documentation may not sound particularly exciting, but it was vitally important for the project's success. Sonneveldt: "The requirements the commissioning party imposed related to documenting all components used, the underlying decision-making and maintenance required etc. were relatively strict. The same applied to the operating and maintenance manuals that we comprehensively examined and updated, or reviewed where necessary. Therefore the documentation constitutes an important part of the tests, which simply fail if the documentation is not in order."

Implementation and SAT

Van de Lagemaat is more than satisfied with how the final installation of all the overhauled elements and their delivery went. "Insofar as was possible and necessary, the systems - including entire control boxes - were developed and tested at Pilz. The Factory Acceptance Tests (FATs) were also conducted at this location and I can only say that all the tests went without a hitch. We had to be rather creative during the final installation of some of the solutions. There was a control box that

had to be installed on a pillar, which was half-submerged in the water. At first the idea was to achieve this by installing pontoons, but finally we opted to use a telescopic handler and everything worked out perfectly!"

Due to all the thorough preparations the final Site Acceptance Tests were also passed with flying colours. "The greatest challenge in this project was the timetable," reveals Van de Lagemaat. "You also have to deal with the design of an old installation that has to be translated into a new installation and also involves diverse parties that have to approve the final detailed design. Constructing new installations always means adhering to a strict timetable. In all cases we started on Tuesday or Wednesday, which meant everything was operational by Friday. The SAT (Site Acceptance Test) was then performed Saturday night, which was attended by all possible responsible parties. That still left Sunday for solving any potential problems, but this was basically unnecessary."

He continues: "We also experienced a distinct learning curve with the first two bridges. During these months a practical approach was developed that we subsequently applied to the remaining bridges. It is always good to see how you improve efficiency per renovation over time and increasingly become attuned to one another. We felt that the trouble-free SATs - that were conducted on Saturday night outside the sailing season - were the ultimate reward for this."

No bridge too far

At the time this is being written all the bridges are operating as required and the final touches are being made to the Technical Construction Files for approval of the final two bridges. Both parties consider it a great and challenging project, which certainly offers prospects for the renovation of undoubtedly, many more railway bridges in the Netherlands. ■



► More railway applications from Pilz

Mariazellerbahn

The Mariazellerbahn is an electrified railway in Austria. The railway has a track width of 760 mm and runs from the city of Sankt Pölten in Lower Austria via Ober-Grafendorf to the pilgrimage site Mariazell. The railroad has a length of 84 km. Pilz delivered 80 crossings (barrier & signals) for this project.



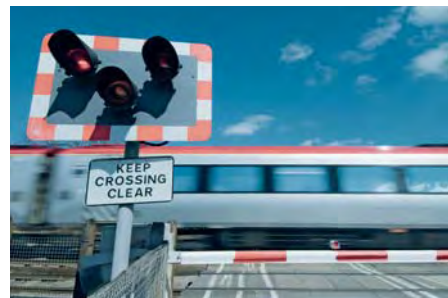
JHMD (Czech Republic)

JHMD operates two railway lines, which are known under the numbers 228 and 229 of the "České dráhy", Czech Railways. In cooperation, Pilz delivered 30 crossings (barrier & signals) for this project.



MICRO type level crossing

Based on control system PSS 4000 this standalone level crossing meets all requirements in accordance with SIL 3. Where the Pilz PNOZmulti is a redundant system for failure monitoring in the event of a fault, the system reacts with "flashing amber" in compliance with CENELEC regulations.





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