

Background information

Pilz GmbH & Co. KG
Felix-Wankel-Straße 2
73760 Ostfildern
Deutschland/Germany
www.pilz.com

Reducing cost and complexity with the standardised automation system PSS 4000

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Page 1 of 5

Tried and tested Industrial automation technology for railway systems

Existing signalling and control technology in the rail transport industry, particularly on regional lines, is largely based on classic signal box technology. Control systems from industry, such as the automation system PSS 4000-R from Pilz, are possible options for the essential modernisation of infrastructure on the rail network. They help to significantly reduce the cost pools that have so far dominated in purchasing, engineering, operation and servicing. It is a prerequisite for the use of these solutions that they meet the high safety requirements laid down in the CENELEC EN 50155 and EN 5012x standards for rail transport.

Signal and control solutions in rail transport have so far been largely proprietary. In other words, the technologies have been designed, developed and manufactured specifically for use in rail transport. Normative requirements, project-specific features and a limited number of options for standardisation are cost-related factors in today's applications. Even today, classic relay technology with positive-guided contacts is still widely used in railway and signal engineering.

As part of modernisation measures, however, the trend is now towards replacing wearing, cable-intensive hardware with powerful software.

Safety and economy complement each other: given their widespread availability in the industrial environment and the use of standardised and hence proven industrial components, programmable logic controllers (PLCs) such as those used in industry, e.g. for mechanical engineering, are characterised by lower acquisition costs. Software tools simplify and reduce the configuration work, improve diagnostic options and facilitate maintenance and repair.

SIL 4 capability: the automation system PSS 4000-R

Pilz developed the basic, tried-and-tested industry automation system PSS 4000 in accordance with EN 61508 for industrial automation applications. To meet the specific requirements of rail transport, Pilz developed special modules with an -R (Railway) in the type description. These are robust enough to withstand 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 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. That makes the automation system SIL 4-capable across the whole application.

The rail solution PSS 4000-R comprises a number of function modules: Safe PLCs, I/O devices and various I/O modules for safety and automation functions are available as hardware components. Devices communicate with each other via the real-time Ethernet communication system SafetyNET p, based on 10/100 BASE-T. TCP/IP, Modbus/TCP and UDP raw data, among others, can be exchanged with other devices parallel to the safety protocol. SafetyNET p can be used on standardised network components such as Ethernet switches or DSL modems, thus offering a high degree of freedom in terms of extension and topology.

The latest expansion stage also allows the flexible RaSTA protocol to be used.

User-friendly programming

The software platform PAS4000 is available to create, configure and set the parameters for a safety-related application and to download it to the control system. It is responsible for creating and processing an application program. This includes reading in the digital and analogue process signals, logical and chronological processing of these signals in the logic unit, outputting digital and analogue process signals to control the process and transferring safety-relevant data via SafetyNET p.

Software components are the IEC 61131-3 PLC editors and a special module editor, PASmulti.

The automation system PSS 4000 from Pilz is used not only in classic mechanical engineering but also in car production. Thanks to its openness and flexibility, it can also be used by customers in the chemical industry, on cable cars, dockside cranes and sluice systems. The benefit is that it examines aspects of 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.

The certified -R modules based on it can be used in a variety of applications within the railway industry with different safety integrity levels. These include control or monitoring functions in signalling systems, such as monitoring signals at level crossings, control and safety technology or signal box connection, control functions of rolling stock and track laying machinery.

Modernisation during ongoing operation

The automation system PSS 4000-R offers numerous advantages when it comes to the staggered modernisation of railway control and monitoring infrastructure in rail operations: The measures can be implemented step by step and selectively. The entire electronic periphery, comprising signalling, control and communication technology as well as the cabling between the control cabinets, remains untouched. The automation system PSS 4000 thus also fulfils the role of an interface between the old control boxes. Designed with a modular structure, the technology offers a high degree of standardisation, allowing individual modifications to meet particular requirements.

The automation system PSS 4000-R is used throughout Europe to protect barriered and unbarriered level crossings, handling control and safety functions along the Golden Pass line in Switzerland, for instance, and neuralgic station nodes of the metro system in the Belgian city of Antwerp.

Pilz is a member of the German Railway Industry Association (VDB).

Pilz Group

The Pilz Group is a global supplier of products, systems and services for automation technology. The family-run company with headquarters in Ostfildern employs around 2,500 people. With 42 subsidiaries and branches, Pilz creates safety for man, machine and environment worldwide.

The technology leader offers complete automation solutions comprising sensors, control technology and drive technology - including systems for industrial communication, diagnostics and visualisation. An international range of services with consulting, engineering and training rounds off the portfolio. Pilz solutions are used not only in mechanical engineering and plant construction, but also in numerous sectors such as intralogistics, railway technology and robotics.

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THE SPIRIT OF SAFETY

September 2018
Page 5 of 5

Contact for journalists:

Martin Kurth

Corporate and Technical Press

Telephone: +49 711 3409-158

Email: m.kurth@pilz.de

Sabine Karrer

Technical Press

Telephone: +49 711 3409-7009

Email: s.skalez-karrer@pilz.de