

Safe automation: complete and simple

Ostfildern, November 2017 – **As you work towards a networked factory the demands on automation technology rise: interlinked plants with distributed tasks require more complex relationships with the individual elements in the overall process chain. Complex, decentralised architectures, which are difficult for users to operate, are the result. With the automation system PSS 4000, Pilz is consistently pursuing a modular, distributable approach. It enables you to reap the benefits of a decentralised control structure without having to face the higher complexity that this would usually involve.**

Until now, automation solutions have often been characterised by independent, standalone functions: safety technology, control technology, visualisation technology and motion control systems are independent systems. The large number of systems and architectures adds complexity to the plant control.

The automation system PSS 4000 from Pilz enables you to build automation solutions that cover automation and safety-related tasks in equal measure, but are still easy for the user to operate. The central idea behind PSS 4000 is to merge safety and automation. PSS 4000 enables you to reap the benefits of a decentralised control structure, without having to accept the increased complexity that would normally result when programs are distributed on different controllers. Operation is simplified, while the level of standardisation is increased.

Distribution of control functions

While in traditional automation systems a single, centralised controller monitors the plant or machine and processes all the signals, PSS 4000 allows control functions to be distributed. Process or control data, failsafe data and diagnostic information are exchanged and synchronised via Ethernet. For the control function, therefore, it makes no difference where the respective program section is processed. Instead of a centralised controller, a user program distributed in runtime is made available to the user within a centralised project. All network subscribers are configured, programmed and diagnosed via this centralised project. This enables simple, standardised handling across the whole project. As a result, following the ideas of Industrie 4.0, plants can be broken down into manageable, independently functioning units, the mechatronic modules. In order to support the mechatronic approach, PSS 4000 allows hardware-independent programming. The decision as to which part of the user program will run in which module with the relevant hardware is only taken when the three disciplines of mechanics, electrics and automation technology are merged.

Software: Safety and automation under one interface

Transferring functions to the software brings users flexibility and scalability, reduces the variety of hardware types and simplifies maintenance and diagnostics on automation solutions. The familiar IEC 61131-3 PLC languages are available for programming automation tasks. However, once the safety of programming software becomes an issue, users are able to configure programs using function blocks that are functionally encapsulated but ready-certified. If they want to use the flexible function range of a complete programming language, however, they still need to tread

an arduous path involving a complex software development and validation process in accordance with safety specifications – approaching academic level.

For automation and safety to merge, therefore, it must be possible to use the full scope of the familiar languages for PLC controllers even when safety functions are programmed. The fewer the exclusions the controller manufacturers need to formulate in their safety-related instruction sets, the fewer functional restrictions there will be.

PSS 4000 meets these challenges with the software platform PAS4000. Various editors and blocks are provided, which can be used for automation as well as safety-related tasks. The simple, block-based program editor PASMULTI is available for design engineers. PASMULTI also provides a comprehensive library of pre-certified software blocks for position detection or general functions such as emergency stop, for example. Users can add their own software blocks too. For “genuine” programmers, however, PAS4000 also contains editors for Ladder Diagram (LD), Instruction List (IL) and Structured Text (STL). What's special about that? For the first time, these EN/IEC 61131-3 editors have been classified by TÜV Süd as LVLs (Limited Variability Languages) in the field of industrial automation, thereby meeting in full the requirements for the creation of safety-related user software, as specified in application standards such as EN/IEC 62061 and EN ISO 13849-1.

The programming environment of the graphics program editor is identical to that of editors designed in accordance with EN/IEC 61131-3, enabling simple operation. For example, customised software blocks written by users in PAS IL for standard or safety-

related functions can be transferred to PAsmulti without further ado. As a result, complex projects containing software components from various editors can be clearly structured.

The individual editors are used to varying degrees, depending on the country or region. While Instruction List or Structured Text is often used for programming within Europe, Structured Text is particularly prevalent in Australia. Programmers in USA and in Japan, for example, prefer Ladder Diagram.

Scalable controllers

In detail, the automation system PSS 4000 consists of hardware and software components such as the real-time Ethernet SafetyNET p and various programming editors designed for use in different sectors, with their application-oriented function blocks.

The PSS 4000 hardware includes controllers of various performance classes. The controllers PSSuniversal PLC are the “all-rounders” of the automation system PSS 4000. They are suitable for large, distributed plants such as those found on production lines or in the process industry, as well as unusual applications such as sluice systems or loading systems. They are programmable logic controllers (PLC), offering new solution approaches, including in combination with other components. So it's possible, for example, to safely record and monitor position and speed.

The controllers PSSuniversal multi can be used as small controllers within the system network – with PSSuniversal PLC or PSSuniversal I/O – or as a standalone device. As open controllers they can be used in existing automation structures. These

controllers are suitable for standalone machines or smaller interlinked plants.

The third device class PSSuniversal I/O is used for decentralised networking plus the transfer of safety-related and non-safety-related signals at field level. The fine granularity of the periphery modules enables them to be economically tailored to the application's I/O requirement, with a high level of flexibility.

Communication: one protocol for all data

Powerful communication networks are a prerequisite for modularising standalone machines and plant elements to form units that can work autonomously or in combination. An important component of PSS 4000 is the connection to the real-time Ethernet SafetyNETp. As a result, it is possible to network all control components and transfer safety-related and non-safety-related data. SafetyNET p transfers safety-related data and non-safety-related control information across a system in a way that is physically mixed but logically separate, so it is free from feedback. SafetyNET p is certified to SIL 3 in accordance with IEC 61508, so it is suitable for applications in which safe communication via SafetyNET p is used to protect operating and maintenance personnel.

In addition to SafetyNET p, as an open system PSS 4000 can also be integrated into additional networks. So PSS 4000 supports the diversity of languages from a technical standpoint as well: the controllers PSSuniversal PLC support the communication protocols that are used to varying degrees depending on country and region, such as the PROFIBUS protocol for example, which is particularly popular in Europe, Ethernet/IP, which is often used in

the USA and Asia, as well as EtherCAT, CANopen and Modbus TCP. As a result there are no problems exchanging data with the most diverse range of third party controllers – irrespective of country, region, industry and machine type.

Software modules reduce the engineering work

A number of different modules can also be added to the automation system PSS 4000 for use in various industries. This way Pilz takes into account the trend for transferring functions to the software. For special requirements in press technology Pilz has developed the safe electronic rotary cam arrangement PSS 4000, for example, which greatly simplifies the operation of mechanical presses. Cams no longer need to be installed manually, but are set as parameters via software.

If safety is regarded as an integral part of the overall plant/machine function, it is possible to implement automation solutions that meet plant productivity and availability requirements but still remain clear and simple. With PSS 4000, customers only need one system, with one communication mode and one tool, to resolve all automation tasks. Operation is simplified, while the level of standardisation is increased.

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Fig. 1 F-PSS-4000-Systembaukasten-cold-15x10.jpg (Pilz GmbH & Co. KG)

The automation system PSS 4000 consists of hardware and software components, plus the real-time Ethernet SafetyNET p and corresponding network components.

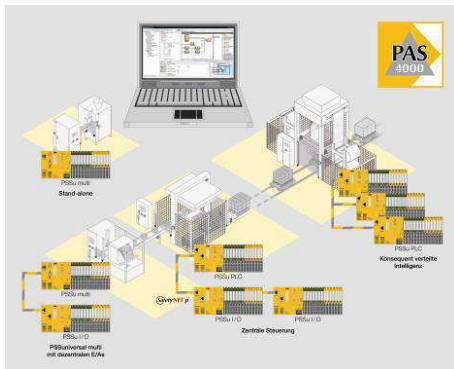


Fig. 2 G_Press_PSS_4000_02_2012_09.jpg (Pilz GmbH & Co. KG)

The automation system PSS 4000 is suitable for all automation tasks: from stand-alone applications to the implementation of classic automation with a centralised controller and the consistent distribution of control functions to the periphery.



Fig. 3 G_Press_PSS_4000_02_2012_09.jpg (Pilz GmbH & Co. KG)

With standardised editors for both automation and safety-related tasks, the user is free to combine configuration with function blocks or programming with source code within EN/IEC-61131-3 compliant editors.



THE SPIRIT OF SAFETY

Texts and photos are also available to download from www.pilz.de.

The Pilz Group

The Pilz Group is a global supplier of products, systems and services for automation technology. Based in Ostfildern, near Stuttgart, the family-run company employs around 2,400 people. With 42 subsidiaries and branches around the world, Pilz supplies safe solutions for people, machinery and the environment. The technology leader offers complete automation solutions comprising sensors as well as control and drive technology – including systems for industrial communication, diagnostics and visualisation. Consulting, engineering and training round off its international range of services. In addition to mechanical and plant engineering, solutions from Pilz are used in many sectors such as wind energy, railway technology and robotics.

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