Automation system PSS 4000 – “Building block system"

PSS 4000 – Simplify your automation™ with ...  
- a multi-master communication concept  
- scalable, decentralised hardware structures  
- an easy-to-use configurator
Pilz is your solution supplier for all automation tasks. Including standard control functions. Pilz developments protect man, machine and the environment.

Pilz has a tradition as a family-run company stretching back over 60 years. Real proximity to customers is visible in all areas, instilling confidence through individual consultation, total flexibility and reliable service. Worldwide, round the clock, in 31 subsidiaries and branches, as well as 21 sales partners on every continent.

More than 1 900 staff, each one of them an ambassador for safety, make sure that your company’s most valuable asset – your staff – can work safely and free from injury.

Further information: www.pilz.com +
Webcode: web0837
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Automation solutions from Pilz – at home in every industry.
Automation system PSS 4000 – Simplify your Automation™
With the automation system PSS 4000 you can implement the widest range of automation projects – for safety and automation. Stand-alone applications through to networked plant and machinery can easily be implemented with PSS 4000. Coordinated hardware and software are available for this purpose, along with the real-time Ethernet SafetyNET p.

With the Industry 4.0-compatible automation system PSS 4000 you can put your trust in a future-proof system!

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Pilz automation solutions – All in One: Safety & Automation

Pilz offers you solutions for complete automation. From sensor technology to control and drive technology – with safety and automation included. On all components and systems, simple commissioning, simple handling and simple diagnostics play an important role!

Profit from flexible automation solutions for small machines or even large, networked plants. Regardless of whether you want to standardise your safety, implement safety and automation in the periphery or are looking for the solution for complete automation.

Pilz solutions are embedded into the relevant system environment – whether a new structure or a retrofit – and open for a variety of interfaces and functionalities.

The perfect combination:

Control technology enables numerous application options, including monitoring of electrical and functional safety, through to complete machine control.
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The perfect combination:

- Control technology enables numerous application options, including monitoring of electrical and functional safety, through to complete machine control.

In combination with the various control systems, safe sensors and decentralised modules guarantee the efficient use of plant and machinery in compliance with standards. Ready-to-install systems and universally compatible solutions offer high potential savings.

In the area of drive technology, the offer includes drive-integrated safety functions, safe logic functions and the connection of visualisation, sensor and actuator technology.

Your plant or machinery are completed with operator and graphics devices from Pilz.

Design, programming, configuration, commissioning, diagnostics and visualisation can be achieved quickly and simply using Pilz automation software.

Pilz offers scalable solutions to suit each requirement – from sensor technology to control and drive technology.
The automation system PSS 4000 consists of various hardware and software components, plus the real-time Ethernet SafetyNET p and corresponding network components. The individual components are closely compatible, providing the ideal solution for your automation project. The automation system’s innovative software platform PAS4000 manages all the editors and provides for uniform handling.

PSS 4000 is ...

... a safety control system
- More space in the control cabinet due to its small dimensions, modular design and decentralised structures
- Flexible to use due to a wide range of PLC functions (Bool, Word, Integer, …)
- Open system due to a connection to various communication protocols

... a control system for automation
- Joint programming for safety and automation in accordance with EN/IEC 61131-3, in a single tool
- Hardware-independent workflow: Program first, then select hardware

... safe communication via SafetyNET p
- Flexibility, robustness, long distances – wireless, fibre optic
- Use of existing Ethernet structures and coexistence with other protocols

... an engineering tool for safety and automation
- Simple handling and structuring of programs due to the graphics “Structure Editor” PASmulti
- Supports the mechatronic approach and offers excellent structuring options (blocks, modules, libraries)
- Genuine software instantiation
- High degree of standardisation as subprojects can be re-used

... a reduction in engineering costs

Online information at www.pilz.com
Consistent distribution of control functions – mechatronic approach

Whereas in classic automation a standalone, centralised control system monitors the plant or machine and processes all the signals, the PSS 4000 allows control functions to be distributed consistently. Process or control data, fail-safe 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 control system, 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.
Engineering – Configuration – Commissioning

With the automation system PSS 4000 you have the optimum system for all phases of automation: engineering/configuration, commissioning and operation.

Merging safety and automation
For simple communication exchange, use one environment for safety and automation, in which hardware and software are intelligently dovetailed. The system is physically mixed but logically separated, so it operates without feedback. The communication network’s protocol structure guarantees stable network transfer. Telegrams containing safety-related information, such as a person entering a plant’s danger zone, arrive safely at the intended recipient.

Reduced engineering – shorter project runtimes
On many automation systems, the hardware must be selected for configuration/programming without exception. Subsequent modifications are very costly.

On PSS 4000 it’s different: the hardware can be selected and the program divided on the hardware at a later point in the process because it is largely independent of the configuration stage.

Shorter project runtimes because subtasks can run in parallel: Possibility to select the hardware and divide the program on the hardware at a very late point in the process

Subsequent machine expansions: user program can be distributed to another control system without any great effort

Partial commissioning and partial operation of individual machine parts
Integration into existing systems.

**Open system for enhanced flexibility**

The automation system PSS 4000 is an open system that can be integrated into existing automation architectures without difficulty and can therefore be integrated into various third-party control systems. The control systems PSSuniversal PLC and PSSuniversal multi can be docked into a primary third-party control system – and perform safety and automation functions.

**Easy programming and configuration**

The software platform PAS4000 comprises different editing tools and a number of software blocks. In PAS4000, the tools for configuration, programming, commissioning and operation are closely matched. The data interfaces are standardised, making information easier to exchange in all phases of automation. You can quickly and intuitively create programs for safety-related and automation functions. The graphics Program Editor PASmulti is available for this purpose, along with editors compliant with EN/IEC 61131-3.
Engineering – Configuration – Commissioning

Diagnosis and visualisation – professional, comprehensive and easy to manage
Machine downtimes and extensive troubleshooting are consigned to the past thanks to the diagnostic options from Pilz. In addition to the system diagnosis, which the PSS 4000 hardware performs itself, operators can also configure their own specific process diagnosis.

Various measures can be used to detect errors quickly and effectively:
- Detailed plain text messages with details of location or Equip-ID (equipment identifier) for each event
- Comprehensive “step-by-step” remedies
- Events are prioritised and responsibilities defined
- Pre-defined messages are easy for users to adapt

You can read your diagnosis texts quite simply on a variety of display units such as the operator and visualisation device PMI or on a PC. With PASvisu you have a visualisation software that you can use to display diagnosis.

Visualisation of Pilz diagnostics with PASvisu.

With the simple, intuitive visualisation software PASvisu, you can visualise your plant and machinery with ease. The direct project link between PAS4000 and your PASvisu project enables shorter project times and faster engineering. A joint database guarantees automated data synchronisation in the background – saving you time and effort.
Applications and approvals

Our extensive expertise in a wide range of applications has been brought to bear in the automation system PSS 4000. Different functions are available to implement the most diverse range of applications.

- **Automotive industry:** e.g. for use in bodywork construction and final assembly
- **Packaging technology:** highly flexible packaging processes for enhancing productivity
- **Level crossings:** e.g. autonomously operated level crossings or those linked to signal boxes
- **Cable cars:** the realisation of cable car applications, e.g. fibre-optic cable applications for long distances
- **Press applications:** for implementation of the safe electronic rotary cam arrangement on mechanical presses; in combination with the camera-based protection and measuring system PSENVip for the implementation of dynamic muting on press brakes
- **Bridge protection:** the control and coordination of bridges and sluices
- **Amusement parks:** for controlling motors and recording positions and speed
- **Stage technology:** monitoring of stage hoists, speed and rotational direction
- **Automatic guided vehicle systems:** monitoring of the speed and travel direction of individual transport units
- **Fire protection systems:** safe monitoring and control of fire protection systems

Specific approvals – more than the industry requires

The automation system PSS 4000 has specific approvals and complies with standards that enable it to be used in other industries (in addition to classic mechanical engineering).

... in the railway sector:
- Relevant railway standards: EN 50121-3, EN 50121-3-2, EN 50121-4, EN 50155, EN 50126, EN 50128, EN 50129, for safety functions in accordance with SIL 2, SIL 3, SIL 4

... in the lifts/escalators sector:
- EN 81-1/2: European lift standard, describes the construction of lifts
- EN 115-1: European standard, describes the safety of escalators and moving walks

... in the fire protection sector:
- NFPA 85/86: US standard, describes the application area of furnaces
Real-time Ethernet SafetyNET p

The real-time Ethernet SafetyNET p is designed for complete automation. The open system allows time-critical control data to be transmitted – for automation and for safety-related applications (within the scope of the Machinery Directive). The safety mechanisms in SafetyNET p are designed in such a way that faults do not necessarily have to lead to the application stopping. This ensures high availability of the machine/system. SafetyNET p is the backbone of the automation system PSS 4000.

One system for the entire automation technology
SafetyNET p allows safety-related data to be transmitted over the same cable on which non-safety-related data is also being transmitted. The whole network is universally based on standard Ethernet in accordance with IEEE 802.3.

This safe communication was developed in accordance with relevant standards such as EN/IEC 61508 and is suitable for safety-related applications PL e of EN ISO 13849 and SIL 3 of EN/IEC 62061. All safety mechanisms are encapsulated in the protocol itself and are hidden for the user. SafetyNET p operates in accordance with the black channel principle, which means that network components other than the safe bus subscribers are considered to be non-safety-related.
Wide-ranging application options
The real-time Ethernet SafetyNET p can be flexibly employed with a variety of network components. This enables a classic (electric) twisted pair cabling, allowing a distance of up to 100 metres to be bridged between subscribers. Fibre-optic communication can be used to bridge greater distances. Cable lengths of 5 kilometres in multi mode technology and 32.5 kilometres in single mode technology can be realised – delivering immunity to interference, particularly in the case of applications where enhanced resistance to electromagnetic disturbances is required.

Another alternative available is DSL technology, which permits distances of up to 10 kilometres. In applications in which cables would interfere or cannot be used, wireless communication can be used. To transmit SafetyNET p wirelessly, WLAN from the range compliant with IEEE-802.11 can be employed.

Coexistence capability and routing
SafetyNET p is 100 % Ethernet, which allows different Ethernet protocols to be run in the same network at the same time. This means that the usual IT protocols but also other automation protocols can be run in parallel.

The real-time Ethernet is also routing capable. What this means is that larger groupings of machines and machine components can be networked in defined segments with the customary IT methods. This can be done using standard commercial infrastructure components. As a result, SafetyNET p supports full flexibility when designing your applications and network topologies.
Software platform PAS4000

The software platform PAS4000 comprises several editors for PLC programming and configuration as well as software blocks.

In PAS4000, the tools for configuration, programming, commissioning and operation are closely matched. The data interfaces are standardised, making information easier to exchange in all phases of automation.

The control systems PSSuniversal PLC can be programmed in PAS IL (Instruction List), PAS STL (Structured Text) and PAS LD (Ladder Diagram) in accordance with EN/IEC 61131-3. The graphics Program Editor PASmulti is also available for simple configuration and programming of PSSuniversal PLC and PSSuniversal multi.

PAS4000 contains a comprehensive language package. All tool texts and tutorials are available in various languages.
Program Editor PASmulti – For simple configuration and structuring

It’s easier than it’s ever been to create programs simply, quickly and intuitively using the Program Editor PASmulti on the automation system PSS 4000. A comprehensive library of automation and fail-safe blocks enables a high level of reusability.

- Use the mouse for wiring: Inputs and outputs can be freely configured by drag-and-drop and linked using logic elements.
- Two worlds, standardised handling: Whether you are programming in the IEC world or configuring with PASmulti, the programming environment is the same and is therefore very easy to handle.
- For automation and safety tasks.

Editors for PLC programming for safety and automation

The control systems PSSuniversal PLC can be programmed as programmable logic controllers for automation and safety tasks in accordance with EN/IEC 61131-3. The editors PAS IL (Instruction List), PAS STL (Structured Text) and PAS LD (Ladder Diagram) are classified by TÜV Süd as LVL (Limited Variability Languages). This means that the editors for PLC programming meet the requirements for creating safety-related user software.

The PLC programming languages can also be combined quite simply with the Program Editor PASmulti.

- Safety and automation in one system
- Simple handling for complex tasks
- Simple combination of PAS IL, PAS STL, PAS LD and PASmulti enables structured working and clear programs
- Comprehensive library for automation and safety blocks
Software platform PAS4000

Blocks – Reusability and standardisation
A comprehensive library of ready-made safety-related and non-safety-related blocks is available, enabling a high level of reusability. Blocks you create yourself, e.g. in PAS STL (Structured Text), can be used with PASmulti – in the same way as ready-made blocks. Blocks can be combined, enabling you to define more complex functions.

• Projects are organised and structured by function.
• Blocks can be reused as often as you like.
• Changes in the block are documented and managed centrally.

Diverse and wide-ranging: software blocks
In addition to general control blocks such as PID (function of a PID controller) and scaling (scaling input values), safety-related, TÜV certified blocks are also available to monitor functions such as emergency stop pushbuttons, light grids, safety gate switches, etc.

• Hardware-related blocks (e.g. FS_AbsoluteEncoder) provide driver blocks for specific hardware modules.
• Application-related blocks (e.g. FS_CamController) are used to create your press applications or in burner management.

The software modules of the PAS4000 can be found directly using the tool in the software library.

Online information at www.pilz.com

Type of variable | Name of the I-variable | Name of the block type | Name of the O-variable | Data type
---|---|---|---|---
SAFEBOOL | input_1 | Block_1 | Output_1 | SAFEBOOL
SAFEBOOL | input_2 | | Output_2 | SAFEBOOL
SAFEBOOL | input_3 | | Output_3 | SAFEBOOL
SAFEBOOL | | | Output_4 | SAFEBOOL
SAFEBOOL | | FS_EmergencyStop | | SAFEBOOL
SAFEBOOL | | FS_Incremental-Encoder | | SAFEBOOL
SAFEBOOL | | FS_Scaling | | SAFEBOOL
SAFEBOOL | | FS_CamController | | SAFEBOOL
SAFEUSINT | SwitchType | FS_LightCurtain | Enable | SAFEBOOL
SAFEBOOL | AutoStart | | DiagOperated | SAFEBOOL
SAFEBOOL | AutoReset | | DiagReadyForReset | SAFEBOOL
SAFEBOOL | MonitoredReset | | DiagReadyForTest | SAFEBOOL
SAFEBOOL | StartupTest | | DiagSwitchError | SAFEBOOL
SAFEBOOL | SimultaneityTime | | DiagInputNotValid | SAFEBOOL
SAFEBOOL | DelayTime | | | SAFEBOOL
SAFEBOOL | InputNC1 | | | SAFEBOOL
SAFEBOOL | InputNC2 | | | SAFEBOOL
BOOL | Reset | | | SAFEBOOL

Design of a software block.

Example of a fail-safe block.
Project Manager – Simple and clearly arranged
With PAS4000, projects can be managed simply and clearly.
The project tree in the tool helps with orientation:

1. **Programming**
   The program can be created independently of the hardware, various editors are available for programming in accordance with EN/IEC 61131-3 and for configuration (Multi programming).

2. **Process diagnosis**
   Using the Diagnosis Editor, a diagnosis message can be assigned quickly and simply to each variable in the user program. As a result, you have system and user diagnosis available in one system.

3. **Hardware configuration**
   The configuration of the PSSuniversal systems, consisting of head module and I/O modules, is defined in the Hardware Configurator.

4. **Resource assignment**
   This is where you define which section of the user program is to be executed on which resource (control system) in the safety or automation section.

5. **I/O mapping**
   The variables from the process image are linked to the actual hardware signals. The program is built and downloaded to the control system(s).

6. **Commissioning**
   The dynamic program display and variable list help you to commission your machine quickly.

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**PAS4000 Online Help – Fast and comprehensive**
The online help can be called up directly within the tool and offers a diverse range of support. In addition to a getting started section and information on general software handling, you can also find information about subjects such as hardware configuration, diagnosis within the tool and the PAS4000 licensing model.
Tips and tricks, which are adapted with each new software version, complete the online help.
Diverse functions to meet your requirements

The automation system PSS 4000 is characterised by the perfect interaction between individual components and software elements. Various functions, such as safe motion monitoring for example, help you to implement your applications.

Safe motion monitoring within the automation system PSS 4000

On the automation system PSS 4000, the safe monitoring function is wholly integrated within the user software. Two different measuring principles, and therefore different functions, can be implemented.

Safe motion monitoring with one encoder

A compact I/O module (which can be combined with the control systems PSSuniversal PLC or PSSuniversal multi) is available for safe monitoring of up to 8 axes per control system up to PL d, with only one encoder. You benefit from reduced reaction times and increased productivity due to a local fast shutdown – irrespective of the PLC cycle time.

Benefits of the solution:
- Reduced reaction times, higher productivity
- Errors are minimised and projects can be implemented quickly due to the simple setting of speed functions in the software
- Fast commissioning, maintenance and service due to simple diagnosis on the set limit values and parameters via the tool
- Use of existing encoders
- Implementation of safety functions in accordance with EN 61800-5-2:
  - up to PL d with only one Sin/Cos encoder
  - up to PL e with a safety-related encoder
  - up to PL e with combination of encoder and proximity switch, with additional gear monitoring
Safe position monitoring with two encoders
In the automation system PSS 4000, "safe speed" and "safe position" are possible due to the combination of counter modules, special function blocks in the user program and two non-safety-related encoders.

Benefits of the solution:
- Safe evaluation of speed, position and standstill using non-safety-related encoders
- The safe monitoring function is transferred to the user software
- Greater flexibility when monitoring limit values due to dynamic limit value monitoring in the user program

Fast Control Unit for fast switching operations
The Fast Control Unit is the first compact I/O module to contain a high-performance, safe logic function. Local safe inputs can be switched to the outputs with minimum time loss (400 µs). Particularly short and time-critical signals (650 µs pulse duration) can also be read in.

Benefits of the solution:
- Flexibility and highest switching speed
- Flexible and freely programmable due to full access to the I/O signals in the control program
- As fast as the fixed wired option due to the local logic function
- Optimised shutdown process on inductive loads due to reverse voltage

Safe electronic rotary cam arrangement
The optimum solution for a universal control system for mechanical presses: the safe electronic rotary cam arrangement PSS 4000. The solution consists of the control system PSSuniversal PLC, press blocks (CamController) and the rotary encoder PSENecco. This solution replaces conventional mechanical rotary cam arrangements.

Benefits of the solution:
- Safe cams for run-up and overrun with dynamisation for a safe stop at TDC with a variable number of strokes
- Continuous overrun measurement to minimise down times
- Support for adjustment of the stroke length through adoption of the electrical angle
- Excellent manipulation protection

Signals are forwarded directly and rapidly. The user program has read and write access.

Safe speed, safe position – with two encoders.

Safe electronic rotary cam arrangement – approved safety solution compliant with EN 692.
The PSSuniversal PLC control systems are the ideal solution for interlinked, complex plants. Whether networked or as a stand-alone control system, they are the perfect solution for safety and automation. The control systems PSSuniversal multi are suitable for applications on machines or smaller plants. Thanks to the fine granularity of its periphery modules, the device class PSSuniversal I/O allows a highly flexible and cost-efficient adjustment to the application’s I/O requirement.

### Type code for control systems PSSuniversal

<table>
<thead>
<tr>
<th>Product area</th>
<th>Design</th>
<th>Device class</th>
<th>Functions</th>
<th>Interfaces</th>
<th>Storage medium</th>
<th>Application area</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSu PSSuniversal</td>
<td>H Head module</td>
<td>PLC1 m</td>
<td>PLC controller I/O device</td>
<td>F Fail-safe S Standard</td>
<td>DP DPsafe</td>
<td>SD SD memory card</td>
</tr>
</tbody>
</table>

The automation system is suitable for a wide variety of automation tasks.
Modular system structure
Assemble the input and output modules on your control systems and I/O systems individually to suit your requirements. This way you can tailor the system structure to your precise needs. If subsequent adaptations are required, modules can simply be expanded or exchanged.

1 Head modules
Various head modules are available in the performance classes PLC, multi and I/O.

2 Input/output modules
For safety-related or non-safety-related digital or analogue signal processing. Up to 64 input/output modules can be installed in any order. Compact modules with high packing density are also available.

3 Supply voltage modules
These modules can be used as “refresh modules”.

4 Base modules
Carrier units for the input and output modules and for the supply voltage modules. These are simply plugged onto the base modules and are easy to change when adjustments are made to the system.
Selection guide for control systems PSSuniversal

Common features
- PSSuniversal module bus for connection of up to 64 I/O modules for automation and safety functions
- Integral power supply
- Integrated switch function for SafetyNET p linear topology
- SD card to store the device project and configuration data
- International safety standards:
  - EN/IEC 61508 up to SIL CL 3
  - EN ISO 13849 up to PL e

Control systems PSSuniversal PLC

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSu H PLC1 FS SN SD</td>
<td>312 070</td>
<td>Safety and automation functions</td>
</tr>
<tr>
<td>PSSu H PLC1 FS SN SD-T</td>
<td>314 070</td>
<td>Can be configured with the graphics Program Editor PASmulti</td>
</tr>
<tr>
<td>PSSu H PLC1 FS DP SN SD</td>
<td>312 071</td>
<td>Programming in PAS IL (Instruction List) and PAS STL (Structured Text) and PAS LD (Ladder Diagram) in accordance with EN/IEC 61131-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Programming via Ethernet TCP/IP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max. number of fail-safe tasks: 9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max. number of standard tasks: 9</td>
</tr>
</tbody>
</table>

Two versions of the control system are available:
- PSSuniversal PLC with two SafetyNET p interfaces
- PSSuniversal PLC with SafetyNET p and PROFIBUS-DP interface (Slave)

Control systems PSSuniversal multi

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSu H m F DP SN SD</td>
<td>312 065</td>
<td>Local safety functions</td>
</tr>
<tr>
<td>PSSu H m F DP ETH SD</td>
<td>312 060</td>
<td>Programming via graphics program editor</td>
</tr>
<tr>
<td>PSSu H m F DPsafe SN SD</td>
<td>312 066</td>
<td>Max. number of fail-safe tasks: 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Devices with SafetyNET p interface:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max. number of SafetyNET p connections: 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Devices with PROFIBUS-DP interface:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-safety-related functions, PROFIBUS-DP 12 MBit/s</td>
</tr>
</tbody>
</table>

Three versions of the control system are available:
- PSSuniversal multi with SafetyNET p and PROFIBUS-DP interface (Slave)
- PSSuniversal multi with Ethernet and PROFIBUS-DP interface (Slave)
- PSSuniversal multi with SafetyNET p and PROFIBUS/PROFIsafe interface (Slave)

Decentralised system PSSuniversal I/O

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSu H FS SN SD</td>
<td>312 085</td>
<td>Communication with other SafetyNET p devices (RTFN)</td>
</tr>
<tr>
<td>PSSu H FS SN SD-T</td>
<td>314 085</td>
<td>Module bus for non-safety-related I/O modules</td>
</tr>
</tbody>
</table>
Selection guide for PSSuniversal I/O modules

### Supply voltage modules

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Automation functions</th>
<th>Fail-safe functions</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSu E F PS-P</td>
<td>312 185</td>
<td>314 185</td>
<td>-</td>
<td>Periphery power supply, passive (24 V periphery)</td>
</tr>
<tr>
<td>PSSu E F PS</td>
<td>312 190</td>
<td>314 190</td>
<td>-</td>
<td>Power supply, passive (24 V periphery and 5 V system)</td>
</tr>
<tr>
<td>PSSu E F PS1</td>
<td>312 191</td>
<td>314 191</td>
<td>-</td>
<td>Power supply, buffered (24 V periphery and 5 V system)</td>
</tr>
<tr>
<td>PSSu E F PS2</td>
<td>312 192</td>
<td>314 192</td>
<td>-</td>
<td>Power supply, buffered (24 V periphery and 5 V system)</td>
</tr>
</tbody>
</table>

### Digital I/O modules

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Automation functions</th>
<th>Fail-safe functions</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSu E S 4DI</td>
<td>312 400</td>
<td>314 400</td>
<td>312 401</td>
<td>4 inputs</td>
</tr>
<tr>
<td>PSSu E S 4DO 0.5</td>
<td>312 405</td>
<td>314 405</td>
<td>312 406</td>
<td>4 outputs (0.5 A)</td>
</tr>
<tr>
<td>PSSu E S 2DO 2</td>
<td>312 410</td>
<td>314 410</td>
<td>312 411</td>
<td>2 digital outputs (2A)</td>
</tr>
<tr>
<td>PSSu E S 2DOR 2</td>
<td>312 511</td>
<td>314 511</td>
<td>-</td>
<td>2 relay outputs, volt-free, 2 A</td>
</tr>
<tr>
<td>PSSu E S 2DOR 10</td>
<td>312 510</td>
<td>314 510</td>
<td>-</td>
<td>3 relay outputs, volt-free, 10 A</td>
</tr>
<tr>
<td>PSSu E F 4DI</td>
<td>312 200</td>
<td>314 200</td>
<td>-</td>
<td>4 inputs</td>
</tr>
<tr>
<td>PSSu E F 4DO 0.5</td>
<td>312 210</td>
<td>314 210</td>
<td>-</td>
<td>4 outputs, single-pole, 0.5 A</td>
</tr>
<tr>
<td>PSSu E E 2DO 2</td>
<td>312 215</td>
<td>314 215</td>
<td>-</td>
<td>2 outputs, single-pole, 2 A</td>
</tr>
<tr>
<td>PSSu E F DI OZ 2</td>
<td>312 220</td>
<td>314 220</td>
<td>-</td>
<td>1 input, 1 output, dual-pole 2 A</td>
</tr>
<tr>
<td>PSSu E F 2DOR 8</td>
<td>312 225</td>
<td>314 225</td>
<td>-</td>
<td>2 relay outputs, volt-free, 8 A</td>
</tr>
<tr>
<td>PSSu K S 16DI</td>
<td>312 430</td>
<td>-</td>
<td>-</td>
<td>16 digital inputs</td>
</tr>
<tr>
<td>PSSu K S 8DI BDO 0.5</td>
<td>312 431</td>
<td>-</td>
<td>-</td>
<td>8 digital inputs, 8 digital outputs (0.5 A)</td>
</tr>
<tr>
<td>PSSu K S 16DO 0.5</td>
<td>312 432</td>
<td>-</td>
<td>-</td>
<td>16 digital outputs (0.5 A)</td>
</tr>
</tbody>
</table>

### Analogue I/O modules

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Automation functions</th>
<th>Fail-safe functions</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSu E S 2AI U</td>
<td>312 440</td>
<td>314 440</td>
<td>-</td>
<td>2 inputs (0 ... 10 V se; 0 ... 10 V dif; -10 ... 10 V dif)</td>
</tr>
<tr>
<td>PSSu E S 4AI U</td>
<td>312 445</td>
<td>314 445</td>
<td>-</td>
<td>4 inputs (0...10 V se)</td>
</tr>
<tr>
<td>PSSu E S 2AI I se</td>
<td>312 450</td>
<td>314 450</td>
<td>-</td>
<td>2 inputs (0 ... 20 mA; 4 ... 20 mA)</td>
</tr>
<tr>
<td>PSSu E S 2AO U</td>
<td>312 460</td>
<td>314 460</td>
<td>-</td>
<td>2 outputs (0 ... 10 V; -10 ... 10 V)</td>
</tr>
<tr>
<td>PSSu E S 4AO U</td>
<td>312 465</td>
<td>314 465</td>
<td>-</td>
<td>4 outputs (0 ... 10 V)</td>
</tr>
<tr>
<td>PSSu E S 2AO I</td>
<td>312 470</td>
<td>314 470</td>
<td>-</td>
<td>2 outputs (0 ... 20 mA; 4 ... 20 mA)</td>
</tr>
<tr>
<td>PSSu E S 2AI RTD</td>
<td>312 490</td>
<td>314 490</td>
<td>-</td>
<td>2 analogue inputs, resistance thermometer</td>
</tr>
<tr>
<td>PSSu E S 2AI TC</td>
<td>312 500</td>
<td>314 500</td>
<td>-</td>
<td>3 analogue inputs, thermocouples</td>
</tr>
<tr>
<td>PSSu E F AI I</td>
<td>312 260</td>
<td>314 260</td>
<td>-</td>
<td>1 input (0 ... 25 mA), passive</td>
</tr>
<tr>
<td>PSSu E F AI U</td>
<td>312 265</td>
<td>314 265</td>
<td>-</td>
<td>1 input (-10 ... +10 V), passive</td>
</tr>
</tbody>
</table>

- Extended temperature range
- Expanded diagnosis functions in the automation sector
## Selection guide for PSSuniversal I/O modules

### Modules with special functions

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Automation functions</th>
<th>Fail-safe functions</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PSSu K F FCU</strong></td>
<td>312 435</td>
<td>-</td>
<td>-</td>
<td>Fast Control Unit, 12 digital inputs, 2 digital outputs (single-pole, 2 A), 2 digital outputs (dual-pole, 2 A)</td>
</tr>
<tr>
<td><strong>PSSu K F FAU B</strong></td>
<td>312 420</td>
<td>-</td>
<td>-</td>
<td>Fast Control Unit, evaluation device for PSENvip 2, basic version; 4 digital inputs, 2 digital outputs (single-pole, 2 A), 2 digital outputs (dual-pole, 2 A)</td>
</tr>
<tr>
<td><strong>PSSu K F FAU P</strong></td>
<td>312 421</td>
<td>-</td>
<td>-</td>
<td>Fast Control Unit, evaluation device for PSENvip 2, productive version; 4 digital inputs, 2 digital outputs (single-pole, 2 A), 2 digital outputs (dual-pole, 2 A)</td>
</tr>
</tbody>
</table>

Further information on the camera-based protection system PSENvip: Webcode: web5569

### Encoder modules

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PSSu E S ABS SSI</strong></td>
<td>312 480 314 480</td>
<td>1 absolute encoder SSI</td>
</tr>
<tr>
<td><strong>PSSu E S INC</strong></td>
<td>312 485 314 485</td>
<td>1 incremental encoder</td>
</tr>
<tr>
<td><strong>PSSu E S INC 24V se</strong></td>
<td>312 486 314 486</td>
<td>1 incremental encoder 24V</td>
</tr>
<tr>
<td><strong>PSSu E F ABS SSI</strong></td>
<td>312 275 314 275</td>
<td>1 absolute encoder SSI</td>
</tr>
<tr>
<td><strong>PSSu E F INC</strong></td>
<td>312 280 314 280</td>
<td>1 incremental encoder</td>
</tr>
<tr>
<td><strong>PSSu K F EI</strong></td>
<td>312 433</td>
<td>Encoder interface, for connection and evaluation of encoders (Sin/Cos, TTL, HTL, proximity switches 24 V)</td>
</tr>
<tr>
<td><strong>PSSu K F INC</strong></td>
<td>312 437</td>
<td>1 incremental encoder, including socket for simple encoder connection</td>
</tr>
</tbody>
</table>

### Distribution modules

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PSSu PD</strong></td>
<td>312 195 314 195 312 197</td>
<td>Voltage distribution, passive (24 V)</td>
</tr>
<tr>
<td><strong>PSSu PD1</strong></td>
<td>312 196 314 196</td>
<td>Voltage distribution, passive (4 potentials)</td>
</tr>
<tr>
<td><strong>PSSu E PS-P 5V</strong></td>
<td>312 590</td>
<td>Periphery power supply, 5 V</td>
</tr>
<tr>
<td><strong>PSSu E PS-P +/-10V</strong></td>
<td>312 591</td>
<td>Periphery power supply +/-10 V</td>
</tr>
<tr>
<td><strong>PSSu E PS-P +/-15V</strong></td>
<td>312 592</td>
<td>Periphery power supply +/-15 V</td>
</tr>
</tbody>
</table>

### Communication modules

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PSSu E S RS232</strong></td>
<td>312 515 314 515</td>
<td>Serial interface RS232</td>
</tr>
<tr>
<td><strong>PSSu E S RS485</strong></td>
<td>312 516 314 516</td>
<td>Serial interface RS485</td>
</tr>
<tr>
<td><strong>PSSu K S RS232</strong></td>
<td>312 438</td>
<td>Serial interface RS232, including socket for connecting serial connectors, with driver for Modbus ASCII</td>
</tr>
</tbody>
</table>

### Link modules

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PSSu XB F-T</strong></td>
<td>- 314 092</td>
<td>Base station expansion module for ST/FS signals</td>
</tr>
<tr>
<td><strong>PSSu XR F-T</strong></td>
<td>- 314 093</td>
<td>Remote station expansion module for ST/FS signals</td>
</tr>
</tbody>
</table>

1) These electronic modules cannot be combined with PSSu H FS SN SD or PSSu H FS SN SD-T.
### Selection guide for infrastructure components

#### Unmanaged switches PSSnet SLL

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSnet SLL 5T</td>
<td>380 600</td>
<td>5 electrical ports</td>
</tr>
<tr>
<td>PSSnet SLL 4T 1FMMSC</td>
<td>380 604</td>
<td>4 electric ports, 1 fibre-optic port, multimode port</td>
</tr>
</tbody>
</table>

**Common features**
- Plug-and-play (no configuration necessary)
- Diagnostic LEDs
- Can be used for industrial Ethernet systems such as SafetyNET p, PROFINET RT, Ethernet/IP, Modbus TCP

#### Managed Switches PSSnet SHL

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Technical features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSnet SHL 8T MRP</td>
<td>380 601</td>
<td>8 electrical ports</td>
</tr>
<tr>
<td>PSSnet SHL 6T 2FMMSC MRP</td>
<td>380 602</td>
<td>6 electric ports, 2 fibre-optic ports, multi mode port</td>
</tr>
<tr>
<td>PSSnet SHL 6T 2FSMSC MRP</td>
<td>380 650</td>
<td>6 electric ports, 2 fibre-optic ports, single-mode port</td>
</tr>
</tbody>
</table>

**Common features**
- Extensive management functions for configuration and diagnosis
- Web-based management for access via web browser
- Ring redundancy MRP
- Redundant voltage supply
- Can be used for industrial Ethernet systems such as SafetyNET p, PROFINET RT, Ethernet/IP, Modbus TCP

#### SafetyNET p connector, cable, stripping tool

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SafetyNET p Connector RJ45s</td>
<td>380 400</td>
<td>Standard connector for IP20 installation, quick connection, RJ45 mating face, housing form compatible with PSSuniversal stabilising collar, ambient temperature: -40 °C ... +70 °C</td>
</tr>
<tr>
<td>SafetyNET p Cable</td>
<td>380 000</td>
<td>Cable (by the metre), conductor cross-section AWG 22, CAT 5e, four-core</td>
</tr>
<tr>
<td>SN CAB RJ45s RJ45s, 0.5m</td>
<td>380 001</td>
<td>0.5 m cable with 2 x RJ45 connector</td>
</tr>
<tr>
<td>SN CAB RJ45s RJ45s, 1m</td>
<td>380 003</td>
<td>1 m cable with 2 x RJ45 connector</td>
</tr>
<tr>
<td>SN CAB RJ45s RJ45s, 2m</td>
<td>380 005</td>
<td>2 m cable with 2 x RJ45 connector</td>
</tr>
<tr>
<td>SN CAB RJ45s RJ45s, 5m</td>
<td>380 007</td>
<td>5 m cable with 2 x RJ45 connector</td>
</tr>
<tr>
<td>SN CAB RJ45s RJ45s, 10m</td>
<td>380 009</td>
<td>10 m cable with 2 x RJ45 connector</td>
</tr>
<tr>
<td>Stripping Tool</td>
<td>380 070</td>
<td>Installation tool for SafetyNET p Cable and Connector</td>
</tr>
</tbody>
</table>

#### Gateways

<table>
<thead>
<tr>
<th>Type</th>
<th>Order number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSSnet GW1 MOD-CAN</td>
<td>311 602</td>
<td>Protocol converter from Modbus/TCP Slave to CANopen Slave</td>
</tr>
<tr>
<td>PSSnet GW1 MOD-EtherCAT</td>
<td>311 601</td>
<td>Protocol converter from Modbus/TCP Slave to EtherCat Slave</td>
</tr>
</tbody>
</table>
# Selection guide for software and software blocks PAS4000

## Software in the automation system PSS 4000

<table>
<thead>
<tr>
<th>Type</th>
<th>Features</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PAS4000</strong></td>
<td>Software platform in the automation system PSS 4000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Editors PAS STL (Structured Text), PAS IL (Instruction List), PAS LD (Ladder Diagram) in accordance with EN/IEC 61131-3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Graphics Program Editor PASmulti</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Online help</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Special licence model</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Software can be downloaded from the Internet, <a href="http://www.pilz.com/pss4000">www.pilz.com/pss4000</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASunits: Once enabled for production operation, the project is licensed in PAS4000, PASunits are calculated for the functions used and credited to the project from the software’s points account</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASunits 500 317910</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASunits 1000 317920</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASunits 5000 317930</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASunits 10000 317940</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PASkey: USB crypto memory for secure storage and transfer of PASunits 317999</td>
<td></td>
</tr>
</tbody>
</table>

## General fail-safe control blocks

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FS_EmergencyStop</strong></td>
<td>Configures and monitors the function of E-STOP pushbuttons with one or two N/C contacts.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FS_LightCurtain</strong></td>
<td>Monitors the function of light grids with 2 N/C contacts.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FS_SafetyGate</strong></td>
<td>Monitors the function of safety gate switches with up to 3 contacts.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FS_Operating ModeSelectorSwitch</strong></td>
<td>Monitors up to 8 positions on an operating mode selector switch. Unneeded inputs may remain unassigned. Once the switchover time has elapsed, only one contact at a time may be closed.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FS_SafetyValve</strong></td>
<td>Monitors the operation of safety valves of the single, double and directional type.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FS_TwoHandControl</strong></td>
<td>Monitors whether the two pushbuttons on the two-hand control are operated simultaneously (within 0.5 s). In accordance with EN 574, two-hand pushbuttons of type II A (2 N/O contacts) or type II C (combination of 2 N/O and 2 N/C contacts) can be used.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FS_Muting</strong></td>
<td>Used to temporarily suspend safety functions (ESPE/AOPD) without interrupting the process (muting), in accordance with EN 61496-1.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FS_SafeEthernetConnection</strong></td>
<td>Used for safe communication based on Industrial Ethernet. The underlying protocol is Modbus/TCP: a point-to-point connection (1:1 communication relationship) can be implemented as a result. The following are used as communication partners: PSSuniversal PLC with PNOZmulti (base units PNOZ map ETH).</td>
</tr>
</tbody>
</table>
### Hardware-related blocks

<table>
<thead>
<tr>
<th>Block Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS.CounterDual</td>
<td>Used in conjunction with the blocks FS.AbsoluteEncoder and/or FS.IncrementalEncoder to calculate the following safe values: Position, speed and standstill.</td>
</tr>
<tr>
<td>FS.AbsoluteEncoder</td>
<td>Calculates a counter status (in increments) from the measured value from the absolute encoder and monitors the module status.</td>
</tr>
<tr>
<td>FS.IncrementalEncoder</td>
<td>Initialises the counter, calculates the current counter status (in increments) and transmits status information.</td>
</tr>
<tr>
<td>FS.AnalogueInput Dual</td>
<td>Monitors redundant, analogue input values for upward violation of a value range, downward violation of a value range and upward violation of a difference between the analogue input value 0 and analogue input value 1 over a defined period of time (plausibility check).</td>
</tr>
<tr>
<td>FS.Scaling</td>
<td>Scales an analogue input value and sends it to an O-variable.</td>
</tr>
</tbody>
</table>

### Application-related blocks

<table>
<thead>
<tr>
<th>Block Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS.PressOperatingModes</td>
<td>Controls and monitors the setup, single stroke and automatic operating modes of a mechanical press.</td>
</tr>
<tr>
<td>FS.CamEvaluation</td>
<td>Monitors the mechanical rotary cam arrangement of a press for plausibility of the signals from the run-on cam and run-up cam, failure of the dynamic cam and run-on cam, upward violation of the run-on at top dead centre.</td>
</tr>
<tr>
<td>FS.CycleModeLightCurtain</td>
<td>Enables the cycle mode (control) for triggering the press stroke when using a light curtain in the standard and Sweden operating modes.</td>
</tr>
<tr>
<td>FS.CamController</td>
<td>Provides the position signals for a press control. It uses the angle values, from the block FS.PositionToAngle for example, to identify the signal for achieving top dead centre and so enables the shutdown of the press. It is used in the safe, electronic rotary cam arrangement.</td>
</tr>
<tr>
<td>FS.BurnerManagementSystem</td>
<td>Fully controls the burner cycle, including pre-purge, tightness control, ignition, afterburn, post-purge, etc.; depending on the setting, function monitoring based on the relevant step, continuous monitoring of the safety chains.</td>
</tr>
</tbody>
</table>

### Standard-based control blocks

<table>
<thead>
<tr>
<th>Block Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AND</td>
<td>The AND is a basic link that functions on the principle that if two states apply, the result is true.</td>
</tr>
<tr>
<td>OR</td>
<td>The OR is a basic link that functions on the principle that if either one or the other state applies, the result is true.</td>
</tr>
<tr>
<td>FlipFlop</td>
<td>Saves the state of the input signal until it is reset.</td>
</tr>
<tr>
<td>Timer</td>
<td>Generates an output signal for a set time after the start.</td>
</tr>
</tbody>
</table>

The PAS4000 software blocks can be found directly within the tool in the software library.
Tool download: www.pilz.com/PSS4000
Contact

IN
Pilz India Pvt Ltd.
Office No 202, Delite Square
Near Aranyeshwar Temple
Sahakar Nagar No 1
Pune 411009
India
Telephone: +91 20 2421399-4/-5
Telefax: +91 20 2421399-6
E-Mail: info@pilz.in
Internet: www.pilz.in

IT
Pilz Italia S.r.l.
Automazione sicura
Via Gran Sasso n. 1
20823 Lentate sul Seveso (MB)
Italy
Telephone: +39 0362 1826711
Telefax: +39 0362 1826755
E-Mail: info@pilz.it
Internet: www.pilz.it

JP
Pilz Japan Co., Ltd.
Safe Automation
Ichigo Shin-Yokohama Bldg. 4F
3-17-5 Shin-Yokohama
Kohoku-ku
222-0033 Yokohama
Japan
Telephone: +81 45 471-2281
Telefax: +81 45 471-2283
E-Mail: pilz@pilz.co.jp
Internet: www.pilz.jp

KR
Pilz Korea Ltd.
Safe Automation
22F Keumkang
Penterium IT Tower Unit B
810 Gwanyang-dong, Dongan-gu
Anyang-si, Gyeonggi-do, 431-060
South Korea
Telephone: +82 31 450 0677
Telefax: +82 31 450 0670
E-Mail: info@pilzkorea.co.kr
Internet: www.pilz.co.kr

MX
Pilz de México, S. de R.L. de C.V.
Automatización Segura
Convento de Actopan 36
Jardines de Santa Mónica
Tlalnepantla, Mx. 54050
Mexico
Telephone: +52 55 5572 1300
Telefax: +52 55 5572 1300
E-Mail: info@pilz.com.mx
Internet: www.pilz.mx

NL
Pilz Nederland
Veilig automatisering
Haveneerweg 22
4131 NM Vianen
Netherlands
Telephone: +31 347 320477
Telefax: +31 347 320485
E-Mail: info@pilz.nl
Internet: www.pilz.nl

NZ
Pilz New Zealand
Safe Automation
Unit 4, 12 Laidlaw Way
East Tamaki
Auckland 2016
New Zealand
Telephone: +64 9 6345350
Telefax: +64 9 6345352
E-Mail: office@pilz.co.nz
Internet: www.pilz.co.nz

PL
Pilz Polska Sp. Z o.o.
Safe Automation
ul. Ruchliwa 15
02-182 Warszawa
Poland
Telephone: +48 22 8847100
Telefax: +48 22 8847109
E-Mail: info@pilz.pl
Internet: www.pilz.pl

PT
Pilz Industriteleletronik S.L.
R. Eng Duarte Pacheco, 120
4 Andar Sala 21
4470-174 Maia
Portugal
Telephone: +351 229407594
Telefax: +351 229407595
E-Mail: pilz@pilz.pt
Internet: www.pilz.pt

RU
Pilz RUS OOO
Ugreshskaya street, 2,
bldg. 11, office 16 (1st floor)
115088 Moskau
Russian Federation
Telephone: +7 495 665 4993
E-Mail: pilz@pilzrussia.ru
Internet: www.pilzrussia.ru

SE
Pilz Skandinavien K/S
Safe Automation
Energigata 10 B
43437 Kungsbacka
Sweden
Telephone: +46 300 13990
Telefax: +46 300 30740
E-Mail: pilz.se@pilz.dk
Internet: www.pilz.se

TR
Pilz Emniet Otomasyon
Ürünleri ve Hizmetleri Tic. Ltd. Şti.
Kayıtdağı Mahallesi Dudullu Yolu Yolu Cad.
Mecnun Sok. Duru Plaza No:7
34755 Ataşehir/Istanbul
Turkey
Telephone: +90 216 5775550
Telefax: +90 216 5775549
E-Mail: info@pilz.com.tr
Internet: www.pilz.com.tr

TW
Pilz Taiwan Ltd.
7F.-3, No. 146, Songjiang Rd.
Zhongshan Dist., Taipei City
104, Taiwan
Telephone: +886 2 2568 1680
Telefax: +886 2 2568 1600
E-Mail: info@pilz.tw
Internet: www.pilz.tw

US
Pilz Automation Safety L.P.
7150 Commerce Boulevard
Canton
Michigan 48187
USA
Telephone: +1 734 354 0272
Telefax: +1 734 354 3355
E-Mail: info@pilbusa.com
Internet: www.pilz.us

In many countries we are represented by sales partners. Please refer to our homepage www.pilz.com for further details or contact our headquarters.
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**Americas**
- Brazil
  - +55 11 97569-2804
- Canada
  - +1 888-315-PILZ (315-7459)
- Mexico
  - +52 55 5572 1300
- USA (toll-free)
  - +1 877-PILZUSA (745-9872)

**Asia**
- China
  - +86 21 60880878-216
- Japan
  - +81 45 471-2281
- South Korea
  - +82 31 450 0680

**Australia**
- +61 3 95446300

**Europe**
- Austria
  - +43 1 7986263-0
- Belgium, Luxembourg
  - +32 9 3217575
- France
  - +33 3 88104000
- Germany
  - +49 711 3409-444
- Ireland
  - +353 21 4804983
- Italy
  - +39 0362 1826711

**Scandinavia**
- +45 74436332

**Spain**
- +34 938497433

**Switzerland**
- +41 62 88979-30

**Turkey**
- +90 216 5775552

**United Kingdom**
- +44 1536 462203

You can reach our international hotline on:
- +49 711 3409-444
- support@pilz.com

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Presented by:

Pilz GmbH & Co. KG
Felix-Wankel-Straße 2
73760 Ostfildern, Germany
Tel.: +49 711 3409-0
Fax: +49 711 3409-133
info@pilz.com
www.pilz.com

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