



PAS4000

► Software

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SD means Secure Digital

General

This document contains important information, which must be noted. This document also contains details of the changes made in the software tool from one version to the next.



INFORMATION

Please also read the document entitled "Product Modifications PSS 4000", in which the optimisations and known problems of the PSS 4000 firmware are described. The document can be found at www.pilz.com or in PAS4000 (see online help, "Show product modifications").

System requirements

Operating system:	64 Bit version of Windows 10 and 11; no virtual machine
Processor:	Intel i5 (2.9 GHz) or AMD equivalent
RAM:	Min. 4 GB
Available hard drive space:	Approx. 1 GB
Screen resolution:	min. 1024 x 768 pixels; 4k monitors or higher are not supported
Colour quality:	32 Bit
Text size:	Smaller – 100% (default)
Interfaces:	Ethernet interface
To create reports in PAS4000 and view documentation:	Adobe Acrobat Reader, from Version 7.1.0 or Microsoft Word, Version 2007 to 2010

Installing and uninstalling

Installing via the install program

- ⇒ Double-click on the install file "PAS4000 x.xx.xx - setup.exe" and follow the on-screen instructions.

Uninstalling via the uninstall program

- ⇒ In the Windows program list, right-click on **Pilz -> PAS4000 x.xx.xx** and select **Uninstall**.

Silent install

It is also possible to have an unattended ("silent") installation of PAS 4000. In this case the installation is carried out without any user interaction and the installation process runs in the background.

- ⇒ Start the installation by entering one of the commands described below in the Windows command line, the Windows search field or in a batch file.

Command for installation with default values:

"<Absolute directory of the install file>" /S

Example:

```
"c:\myFiles\PAS4000 1.20.0 - setup.exe" /S
```

Command for installation with specifications:

"<Absolute directory of the install file>" /S /lang='<Tool language>' /D=<Absolute install directory>

Example:

```
"c:\myFiles\PAS4000 1.20.0 - setup.exe" /S /lang='de' /D=C:\myPrograms
```

Supported arguments:

Argument	Meaning	Match case
/S	Run file silently.	Yes
/lang	Tool language in which PAS4000 is to be displayed. You can also switch the language once PAS4000 has been started. Argument is optional. Value range: de: German en: English Default value: If the language for the operating system is German, then German is the default language, otherwise English.	No
/D	Install directory; must be entered as the final argument, argument is optional Default value: %programfiles(x86)%\PILZ	Yes

Note: "start /wait" can be added to the install command so that no further commands are started until the install command has been executed in full:

```
start "" /wait "c:\myFiles\PAS4000 1.20.0 - setup.exe" /S /  
lang='de' /D=C:\myPrograms
```

Silent uninstall

The uninstall can also be run silently.

⇒ Start the uninstall by entering the command described below in the Windows command line, the Windows search field or in a batch file.

Uninstall command:

"<Absolute directory of the uninstall file>" /S

Example:

```
"C:\Program Files (x86)\Pilz\PAS4000 1.20.0\uninstallerData\uninstall.exe" /S
```

Note: "start /wait" can be added to the uninstall command so that no further commands are started until the uninstall command has been executed in full:

```
start "" /wait "C:\Program Files (x86)\Pilz\PAS4000 1.20.0\uninstallerData\uninstall.exe" /S
```

Tool languages

The software tool PAS4000 is published in the tool languages German and English.

As soon as translations for the software tool are available, they will be provided within a service pack. You'll find the service pack in the software tool PASupdate or on the Internet under <http://www.pilz.com/support/downloads/>.

The following languages can be provided:

- ▶ French
- ▶ Spanish
- ▶ Italian
- ▶ Portuguese
- ▶ Japanese
- ▶ Chinese

Important information



NOTICE

With firmware versions below 1.6.0, the safety function may be restricted in the following cases:

- If no FS input modules and no FS output modules are used on a PSSu head module with a firmware version below 1.6.0.
- If FS input modules and FS output modules are present on a PSSu head module with a firmware version below 1.6.0, but neither the PSSu head module itself nor any other PSSu head module within the project both reads the FS inputs and writes to the FS outputs.

If your application is affected we recommend that you update the firmware of the PSSu head modules to the latest firmware version.

**NOTICE**

With firmware version 1.6.0, the safety function may be restricted if the plant has not been commissioned in accordance with the check lists in the PSS 4000 Safety Manual and

- In at least two programs on a PSSu head module (any firmware version), the same digital FS input is read on a different PSSu system (firmware version 1.6.0)
- or in a PSSu head module (any firmware version), digital FS outputs are written on a different PSSu system (firmware version 1.6.0) of performance class PLC or Multi
- or with the same PI variable on a PSSu head module (any firmware version), several digital FS outputs are written on a different PSSu system (firmware version 1.6.0) of performance class I/O.

If your application is affected we recommend that you update the firmware of the PSSu head modules to the latest firmware version.

Compatibility of PSS 4000 firmware and PAS4000

		Firmware version					
		1.1.x	1.2.x	1.3.x	1.4.x	1.5.x	1.6.x ... 1.24.x
PAS4000 version	1.3.x	---	---	◆	◆	◆	◆
	1.4.x	---	---	◆	◆	◆	◆
	1.5.x	---	---	◆	◆	◆	◆
	1.6.x	---	---	◆ ²⁾	◆ ²⁾	◆ ^{1) 2)}	◆
	... 1.24.x						

Versions marked with a diamond symbol (◆) are compatible.

- ▶ Within projects, devices whose firmware version is compatible with the used PAS4000 version are interchangeable. In other words, from firmware version 1.3.0, a defective device within a project can be replaced by a device with a newer firmware version.
- ▶ With PAS4000, online actions can be executed on all devices with compatible firmware versions.
- ▶ Once a project has been opened with a newer PAS4000 version it may no longer be opened using older PAS4000 versions.
- ▶ ¹⁾ If a project only has one device, whose firmware version is 1.5.x, and the firmware version of the device in the project is updated to 1.6.0 or later, the check sum "FS Device Project" and the check sum "FS Project" will change.
- ▶ ²⁾ If a project contains a device with a Diagnostic Server and the project is built with PAS4000 from Version 1.6.x, then the device with the Diagnostic Server must at least have firmware version 1.6.0.

- ▶ With PAS4000 Version 1.11.4 or older, if the firmware on a device without naming data is updated from a version older than 1.12.0 to Version 1.12.0 or newer, the IP address of the device may change. As a result, the confirmation message will not be displayed even though the firmware update has been successful; it takes a long time before you can close the dialogue box.
- ▶ On a PSS 4000-operable device from a third-party manufacturer, if the firmware is updated from a version older than 1.12.0 to Version 1.12.0 or newer, then naming must be performed again.

Please note:

- ▶ We recommend that all devices in a project are operated using the same firmware version.
- ▶ If a project uses devices with different firmware versions, the project should be built using the PAS4000 version that corresponds to the project's most recent firmware version or a newer version of PAS4000. This is the only way to ensure that all entries in the diagnostic list and diagnostic log are displayed correctly.
Exception: If a project is built with PAS4000 Version 1.6.0 or a later version, some diagnostic messages for devices up to firmware version 1.5.1 will not be displayed correctly.

Compatibility with SecurityBridge

If a version $\geq 1.20.0$ of the PSS 4000 firmware or PAS4000 is used, the SecurityBridge PCOM sec br2 must have a firmware version $\geq 1.0.4$. If an older firmware version of the SecurityBridge is used, problems may arise when scanning the network, for example.

Migration of projects

- ▶ Execute online actions

For some online actions (e.g. variable watch, dynamic program display), there is a requirement for the offline and online project to match.

If there is an offline project that matches the online project, the migration may have the following impact:

- If the offline project is migrated, but not rebuilt, the online actions can be executed.
- If the offline project is migrated and rebuilt, in many cases the online actions can no longer be executed, even though the project's check sums have not changed.

Remedy: Download the project.

- ▶ Migration from $\leq 1.10.0$ to $\geq 1.24.0$

With PAS4000 Version $\geq 1.24.0$, you cannot open and edit projects that were created using PAS4000 Version $\leq 1.10.0$.

Remedy: Open the project first using a PAS4000 Version $\geq 1.11.0$ to $\leq 1.23.2$ and then with the current version of PAS4000. Alternatively you can contact Pilz and we will carry out the migration for you.

- ▶ Migration from $\leq 1.19.2$ to $\geq 1.20.0$

If a project has been created with PAS4000 Version 1.19.2 or older and is migrated to a version $\geq 1.20.0$, the check sum for the resource assignment will change. This check sum does not influence the check sum for "FS Project".

- ▶ Migration from $\leq 1.12.2$ to $\geq 1.13.0$

If a project has been created using PAS4000 Version 1.12.2 or older and several different ST module bus cycle times have been output within the project during the build for a PSSu system, several cycle times may change as a result of building with PAS4000 Ver-

sion 1.13.0 or newer.

This is because the calculation of the ST module bus cycle time has been optimised in order to guarantee a deterministic system behaviour. Other cycle times may also change as a result, such as the check sum "FS Project". If the new cycle times are shorter, this can limit the system's availability.

Remedy: Check and adapt the cycle times. The cycle times of the FS module bus and ST module bus can be reduced with the help of the FS module bus oversampling rate and ST module bus oversampling rate (see Online help).

- Migration from $\leq 1.6.0$ to $\geq 1.8.0$ of projects containing the modules PSSu E F INC and/or PSSu K F INC

If a project that has been created using PAS4000 Version 1.6.0 or older and contains the modules PSSu E F INC and/or PSSu K F INC is opened in PAS4000, the "Multiple evaluation" property will be set to the "Single evaluation" option for each of these modules in the properties view.

On the module PSSu K F INC, the setting can be changed back after migration. The module PSSu E F INC only supports "Single evaluation".



NOTICE

Migration from $\leq 1.6.0$ to $\geq 1.7.0$ of projects containing Multi programs

If a project has been created with PAS4000 Version 1.6.0 or older and includes Multi programs, the execution order of the Multi blocks, and therefore the check sum "FS Project", may change if the project is built with PAS4000 Version 1.7.0 or newer.

In this case, all the safety functions will need to be revalidated and retested.

- Migration from $\leq 1.6.0$ to $\geq 1.7.0$ of projects with faulty basic diagnostic items

A project that has been created with PAS4000 Version 1.6.0 or older and contains faulty basic diagnostic items (process diagnostics) can no longer be built using PAS4000 Version 1.7.0 or newer. The faulty BDIs will be displayed when you attempt to build.

Remedy: Open every affected BDI type in the Diagnostic Editor and re-select the variable for the condition. If Pilz blocks are affected, please send your project to Pilz.

- Migration from $\leq 1.6.0$ to $\geq 1.7.0$ of projects with the modules PSSu K S RS232 and/or PSSu K S RS232 Modbus ASCII

Before you open a project in PAS4000 Version 1.7.0 or newer, which was created using PAS4000 Version 1.6.0 or older and contains one or more modules PSSu K S RS232, follow the instructions below:

- Open the project in PAS4000 Version 1.6.0 or the PAS4000 version with which it was created.
- Note down the configuration and the I/O mappings of all modules PSSu K S RS232.
- Open the project in the current PAS4000 version.
When the project is migrated, modules PSSu K S RS232 (order number 312 438) are replaced by modules PSSu K S RS232 Modbus ASCII (order number 312 438).
- Check the module configuration and I/O mappings of each module for which you are actually using a module with the order number 312 438.

- Delete from the project every module for which you are actually using a module with the order number 312 439 and insert the correct module. Then perform the configuration and I/O mapping again.

**NOTICE****Migration from $\leq 1.2.5$ to $\geq 1.3.0$ of projects containing Multi programs**

If you have created a project using the prototype of the Multi Editor, all safety functions will need to be revalidated and retested after the project is migrated to Version 1.3.0 or newer.

(14969)

Licensing

The PASunits required for licensing are managed in PASunits accounts.

The accounts are managed using "CodeMeter" software from WIBU SYSTEMS. This software has been installed on your computer along with PAS4000. That is why you will also

find the  icon in the Windows status bar.

Change to the "FS project" check sum

The "FS project" check sum indicates whether changes have been made to the FS project. If the "FS project" check sum is unchanged, then the FS project has not changed. If the "FS project" check sum has changed, then changes have been made to the FS project. There may be two different causes for these changes:

- ▶ Changes via the user
- ▶ Changes via PAS4000

Optimisations on PAS4000 can cause the check sum to change, if an unchanged, old project is built using a new PAS4000 version.

With any type of change to the FS project, you should note the procedure documented in the PSS 4000 Safety Manual (chapter entitled "Change, maintenance, decommissioning", under "Changes").

Editing a project on different PCs

Editing of the same project on different PCs is not supported.

Example: If PAS4000 is installed on two PCs, the same project may not be added to the Project Manager on both PAS4000s.

Storage location for projects

Projects must be stored on a local drive to enable all actions to be executed in PAS4000.

You are not prevented from storing projects on network drives and in cloud storage, but we

do advise against it.

If several users are to have access to a project, we recommend you use PAS4000 version management.

Connection between PAS4000 PC and devices

For data transfer between the PAS4000 PC and the devices in the project, the connection must have a bandwidth of at least 1 MBit/s and a round trip time of no more than 250 ms.

Version management

PAS4000 operates as a Client of the Subversion® (SVN) version management. PAS4000 supports Version 1.6 and 1.11 of the Apache™ Subversion® server. Other subversion servers are possible, but have not been tested.

Security incident management

Should the product have a security vulnerability, this will be published in a security advisory. You'll find the security advisories under www.pilz.com/security. You can also report any security problems there.

Known problems

- ▶ Tracing: Displaying traces in PASscope
 - The value range for displaying variables is limited.
Integers: -999999999999999 ... 999999999999999
Floating point numbers: 5E-308 ... 5E+308
 - If the exponent of a floating point number is a multiple of 10, an incorrect variable value is displayed.
 - If the value of a variable requires more than 52 digits in binary representation (IEEE 754), rounding errors occur and an incorrect variable value is displayed.
- ▶ Forcing prevents network scan and project activation
If "forcing" is performed within a project, the network cannot be scanned, nor can another project be activated.
Remedy: Restart PAS4000 or end forcing.
(19026)
- ▶ The build will fail when using the cross-project SNp communication
When the cross-project SNp communication between two tasks is used and a task cycle time greater than 1000 ms is configured for both tasks, the build of both projects will fail.
Remedy: Reduce the task cycle time of the relevant tasks to a value less than or equal to 1000 ms.
(30121)
- ▶ **Undo** and **Restore** actions
The **Undo** and **Restore** actions do not work in the same way in all PAS4000 Editors.
(13766)
- ▶ Display of project report
If the project report is created as a PDF file, then it will only be displayed correctly in Adobe Reader DC or X if the following settings are made:
 1. Open Adobe Reader.
 2. In the **Edit** menu, select **Preferences** and then **Page Display**.
 3. Under **Resolution**, select **Use system setting**.
 4. Under **Rendering**, enter "None" under **Smooth Text**.
 5. Press **OK** to confirm your entries.
(29026)
- ▶ Entering Unicode characters
In PAS4000, Unicode characters cannot be entered with the key combination "Alt +<4-digit number>" or "Alt Gr +<Key for the character>".
Remedy: Copy characters to the clipboard and then paste into PAS4000.
(32800, 32821)

IEC 61131 programming:

- ▶ Large anonymously declared arrays (ARRAY)
When large anonymously declared arrays with initial values are declared, PAS4000 may crash.
Remedy: Divide a large array into smaller arrays.
(20476)

► Names of blocks and DDTs

If terms from the Windows operating system (e.g. CON, PRN, AUX, NUL, COM1, LPT1,...) are used as names for blocks or DDTs, the build will fail.
(32727)

Process diagnostics

► Multi programming: BDI instances are not displayed

If a block with basic diagnostic items is inserted into a component block and the component block is not instantiated in a Multi program, none of the instances for the BDIs is displayed.

Remedy: Insert component block into a Multi program
(14699)

Watch, control and force variables

► Variable watch

In projects with many devices, variable watch sometimes fails after a few hours.

Remedy: Restart PAS4000.
(73784, 33605)

Changes in Version 1.24.0

New functions

► New FIXED and LFIXED data types

The data types FIXED (fixed point number with 6 decimal places) and LFIXED (fixed point number with 11 decimal places) are available. The data types can only be used on the device PSSu H PLC2 FS SN SD(-T) with PSS 4000 firmware from Version 1.24.0.

► Nesting of derived data types

The restrictions in the use of derived data types have been relaxed for the device PSSu H PLC2 FS SN SD(-T) with PSS 4000 firmware from Version 1.24.0. The following is now possible:

- One and multi-dimensional arrays can be declared as named or anonymous data types. The data type of the array elements can be an elementary data type or a derived, named data type.
- Structures can be declared as named data types. The data type of a structure element can be an elementary data type, a derived named data type or an anonymously declared single/multi-dimensional array.

The nesting depth must be ≤ 16 .

► "Bind device projects to devices" function

Until now, devices with a device key have also executed projects without a project key. Now it is possible to configure that a device with a device key only executes projects with the matching project key.

► Windows 11

The use of PAS4000 under Windows 11 is supported.

► Export namespace and Equip-IDs when building

If an OPC Server is configured for the project, a CSV file can be exported during the build process. The CSV file contains all the variables from blocks (POUs, Multi blocks) that are assigned resources. In the PSS 4000 namespace, this corresponds to the content of the path "prj::<ProjectName>.user_prg.". For each PI variable that is assigned to an input/output on the module bus, the Equip-ID of the corresponding sensor/actuator is in the CSV file.

Optimisations

► Default setting for SNTTP Clients was changed

If an SNTTP Server is configured for a project, until now all other devices in the project automatically became SNTTP Clients. The default setting has now been changed so that PCs and PMIs are no longer automatically configured as SNTTP Clients.

► Device naming

Device naming cannot be carried out if a device is in the state "Major FS error".
(33555)

► Display of memory used

The "Memory used" is displayed for each resource in the online resource information. This value now also includes the memory space used by active online changes.
(33403)

► Security vulnerabilities

Several non-critical security vulnerabilities have been rectified.

► Migration from $\leq 1.10.0$ to $\geq 1.24.0$

With PAS4000 Version $\geq 1.24.0$, you cannot open and edit projects that were created using PAS4000 Version $\leq 1.10.0$.

Remedy: Open the project first using a PAS4000 Version $\geq 1.11.0$ to $\leq 1.23.2$ and then with the current version of PAS4000. Alternatively you can contact Pilz and we will carry out the migration for you.

► Build changes

In some cases, the device projects could not be executed on the controllers (diagnostic message S-0100-0225) after the project was built in PAS4000 using the "Build changes" operation. This problem has now been rectified.

(74285, 74293)

► Project download

The **Download backup copy** option now no longer needs to be re-activated with each download. PAS4000 remembers the setting and automatically applies it for the next download.

(73759)

► OPC UA Server: Display of DDTs

OPC UA Servers with a PSS 4000 firmware version $\geq 1.18.0$ have not displayed variables with DDTs as data types if the variables were declared in a certain order. This problem is rectified if the project is built using a Version $\geq 1.24.0$ of PAS4000.

(74144)

IEC 61131 programming

► Compare online and offline project

The comparison result has displayed changes in POU's created using the LD programming language, although the POU's had not been changed. This happened, for example, if a project was rebuilt following a download, without any changes having been made, and a comparison was then carried out. This problem has now been rectified.

(74175)

► "struct" character string in POU name

The project build no longer fails if the name of a POU contains the "struct" character string.

(73994)

Changes in Version 1.23.2

Optimisations

► Large arrays in PASconnect subprojects

In a PSS 4000 project, if the PASconnect interface was activated and arrays with more than 100 elements were used in the user program, the build failed. This problem has now been rectified.

(74172)

► MUX block

The build no longer fails when the MUX block is executed on the FS resource and more than 7 of the block's inputs are used.

(74173)

► Java library Log4j

The Java library Log4j (Version 1.2.15) was updated to Version 2.17.2.

(74170, 74179)

► PSS 4000 OPC Server UA

For OPC UA Servers with a PSS 4000 Firmware Version $\geq 1.18.0$, the elements of variables were not displayed when the variable's data type was a structure (DDT), the data type was used for several variables in different declaration blocks and the declaration blocks were declared in a certain sequence. This problem has now been rectified.

(74178)

Changes in version 1.23.1

Optimisations

- Build project after migration

On some projects, the build after a migration failed if the project contained ARRAY type variables, whose initial values were declared in abbreviated syntax (e.g. "[12, 20, 8(10)]"), and these variables were used as application parameters. This problem has now been rectified.

(74086)

Changes in version 1.23.0

New functions

► Tracing

With tracing, a controller records its own process data and saves it on the SD card. Tracing can be used for debugging and for application purposes, to record the time course of variable values (braking curves, for example). Tracing is not a safety-related function. The recorded variable values can be displayed using the tool PASscope. PASscope is installed automatically with PAS4000.

Tracing is available exclusively on the device PSSu H PLC2 FS SN SD(-T) with PSS 4000 firmware from Version 1.23.0.

► SafetyNET p scheduling mode

SafetyNET p scheduling mode can be configured for each PSS 4000-exclusive device. The mode "Reduce SafetyNET p response time" or "Reduce SafetyNET p receive load" is possible. See "System Description PSS 4000", chapter on "SafetyNET p", section entitled "SafetyNET p scheduling mode".

The scheduling mode can be configured in the project properties and in the device properties.

► New block

FS_MSO_PITreader_Visu

► Automatic project licensing

A project can now be licensed automatically if the project is downloaded directly/indirectly. If this option is selected, it is no longer necessary to license the project manually after project changes. As a prerequisite, the project must already have been licensed manually once and there must be sufficient project credit (PASunits).

► Read access to PSS 4000 OPC Server UA

For each PSS 4000 OPC Server UA it is possible to configure a port, to which OPC Clients have read-only access.

► New API commands

- Delete a resource assignment
- Delete all resource assignments
- Delete an I/O mapping
- Delete a configuration of the enable principle
- Delete all I/O mappings
- Configure SafetyNET p scheduling mode

► Create hardware XML

An XML file can be created, which contains the hardware configuration of the PSSu systems and PSS67 devices. It includes the configuration of the head module and electronic modules, e.g. the test pulse configuration. It does not include the resource assignment and fieldbus configuration.

Optimisations

- ▶ Groups of application parameters

The groups' meaning has changed. Groups can still be used to combine application parameters that have the same value, but groups can now also be used to structure the application parameters, irrespective of their values.

- ▶ Version management

It is now possible to check out several projects that have the same name.

Should there already be a project with the same name in the Project Manager, then the new project to be inserted is given a project name suffix in round brackets, e.g. "(1)". This project name suffix is exclusively used for displaying the project in PAS4000. The project name suffix can be entered by the user.

- ▶ I/O mapping list

The configurations of the enable principle are now displayed in the I/O mapping list in addition to the I/O mappings.

- ▶ PAS4000 API Server

Now the PAS4000 API Server only responds to commands under the default IP address 127.0.0.1 (localhost). This means that API commands are only executed when they are entered on the local computer. It is not possible to issue API commands via the network in the default setting.

The default IP address can be changed. Once the IP address has been changed, the PAS4000 API Server can also be accessed via the network. Additional security measures may be required.

(73985)

- ▶ Restore backup copy

When restoring the backup copy of a PSS 4000 project, in some cases, the field for entering the password was not displayed. This problem has now been rectified.

(73711)

- ▶ Upload backup copy

It is now also possible to upload the backup copy of a PSS 4000 project from a device when the backup copy was downloaded in a different time zone.

(73736)

- ▶ Online Network Editor

If the Online Network Editor was open for a long time, the connection to some devices was lost. This problem has now been rectified.

(73760)

- ▶ CodeMeter Runtime

Version 7.30a of the CodeMeter Runtime from WIBU-SYSTEMS AG is now installed with the software tool PAS4000. The CodeMeter Runtime is used to manage the licences. Security in the CodeMeter Runtime has been optimised.

Changes in Version 1.22.2

Optimisations

- ▶ Project download via a slow network

If the download is via a network with high message delay (e.g. with VPN access to very remote devices), then the download is now more stable.

(73640, 73857)

- ▶ Network scan

If the Online Network Editor was open for several hours, in projects with many devices the network scan sometimes failed. This problem has now been rectified.

(73786, 73706)

- ▶ CodeMeter Runtime

Version 7.21a of the CodeMeter Runtime from WIBU-SYSTEMS AG is now installed with the software tool PAS4000. The CodeMeter Runtime is used to manage the licences. The CodeMeter Runtime security has been optimised.

Changes in Version 1.22.1

New functions

► Indirect project download

With an indirect project download, the project is divided into device projects. The device projects are stored on SD cards or in a directory along with the naming data. To complete the indirect download, the user must transfer the device projects to the devices manually, e.g. by inserting the SD card into a device and performing the deliberate operator action. In this way the data can be prepared for operation without there being a connection between PAS4000 and the devices.

► IEC61131 programming: SFC Editor

The Sequential Function Chart programming language is supported. SFC is a graphics-oriented language, i.e. the instruction part is shown in graphic form. Program-type and function block-type POU's can be created in SFC.

► New blocks in the PAS4000 library

- FS_MSO_PITreader_Keypad
- FS_MSO_PITreader_Keypad_PLC

► New API commands

- Open existing project
The command opens an existing project.
- Delete POU
- List all POU's in the project

► PMI v8 series

The following PMIs are supported:

- PMI v807
- PMI v812
- PMI v815

Optimisations

► FS heartbeat cycle time for SafetyNET p

The default value for the FS heartbeat cycle time has been changed from 120 ms to 100 ms.
(73607)

► Variables of the TIME data type

When controlling variables and configuring application parameters it was possible to enter values that were too high for variables of the TIME data type. This problem has now been rectified.
(73611)

Multi programming

► "Author" property

In the properties view of Multi programs and component block types it is now possible to edit the "Author" property.
(33487)

IEC 61131 programming

► Non-volatile STL function blocks

Even if a function block that is programmed in STL is instantiated on the FS resource as RETAIN PERSISTANT, the download no longer fails and the device project can be started.

This problem used to occur exclusively in PAS4000 version 1.21.x.

(73619, 73622)

Changes in Version 1.21.2

Optimisations

- ▶ CodeMeter Runtime

Version 7.10a of the CodeMeter Runtime from WIBU-SYSTEMS AG is installed now with the software tool PAS4000. The CodeMeter Runtime is used to manage the licences. In older versions of the CodeMeter Runtime there were several security vulnerabilities, see security advisory "WIBU CodeMeter Runtime" (document number 1005485).

- ▶ Tool languages

In Version 1.21.0 it was not possible to install the Service Pack with the tool languages French, Spanish, Italian, Portuguese, Japanese and Chinese. This problem has now been rectified.

Changes in Version 1.21.0

New functions

- ▶ Test value in the process image

For the modules PSSu E F AI I(-T)(-R) and PSSu E F AI U(-T)(-R), it is possible to configure in PAS4000 that the test value of the analogue input signal is available in the process image. The test value is needed if the safety-related precision of the analogue input module is to be increased during 1-channel operation, see operating manual for the input module.

There is also an API command that can be used to add the test value to the process image.

Optimisations

- ▶ Windows 10, 64 Bit

Installation and operation of PSS 4000 is only supported on the 64 Bit version of Windows 10. PSS 4000 can also be installed on other versions of Windows, but these versions have not been tested and Pilz does not offer any support for them.

(CID1794)

IEC 61131 programming

- ▶ Incorrect result or major FS error

The following three calculations led in an ST-POU to an incorrect result and in an FS-POU to a major FS error.

- STRUCT or ARRAY as return value

If the SEL or MUX function was called in a POU and the same function was called twice in this call and the return value of this function was a structure (STRUCT) or an array (ARRAY).

(33545)

- Overflow in the case of calculations with integers

If two INTEGER values were compared in a POU and these values were also subtracted from one another and an overflow occurred during the subtraction. This problem only occurred in PSS 4000 firmware version 1.19.x and 1.20.0.

(33544)

- STL: Overflow in the case of calculations with integers

If calculations with INTEGER values were made in an expression, which led to an overflow and also a division (e.g. $(myINT1 + myINT2)/int\#2$). This problem only occurred in PSS 4000 firmware version 1.19.x and 1.20.0.

(33506)

Changes in Version 1.20.0

New functions

► New PSSu modules

The following modules are supported:

- PSSu H PLC2 FS SN SD
- PSSu H PLC2 FS SN SD-T
- PSSu H FS2 SN SD
- PSSu H FS2 SN SD-T

If you replace the corresponding old modules with new ones, e.g. replace PSSu H PLC FS SN SD with PSSu H PLC2 FS SN SD, you will need to adapt the PSS 4000 project; this will not change the check sum for "FS Project".

► Version management of projects

PAS4000 operates as a Client of the version management Subversion® (SVN).

In PAS4000, a PSS 4000 project can be added to version management. This way, changes to the project and its elements (e.g. POU's) can be documented over time. Each change is recorded and can be traced by the user.

► PASconnect interface version 1.3.0


PAS4000 supports the PASconnect interface version 1.3.0.

In PASconnect projects with PASconnect interface version 1.3.0, the dependencies between PSS 4000 projects involved in cross-project communication have been reduced. Changes to one PSS 4000 project are less likely to need the other PSS 4000 projects to be built.

► SafetyNET p: Configurable times

The "Cycle time of the FS heartbeat (tSNp FS-HBT)" and the "Maximum transmission delay time of SafetyNET p RTFN (tDelaySNp RTFN)" is now configurable. With cross-project SNp communication, the configurability depends on the selected PASconnect interface version.

► Silent install

It is also possible to have an unattended ("silent") installation of PAS 4000. In this case the installation is carried out without any user interaction and the installation process runs in the background. See [Installing and uninstalling](#)  3].

► Display of controllers' memory usage

For all devices with an FS resource and/or ST resource it is now possible to display the memory available for the user program in PAS4000 and the disk space occupied by the user program. See "Show online resource information" in the online help.

You can also read the values via the PSS 4000 namespace.

► Import diagnostic texts

All texts from the basic diagnostic items in a project can be exported into a CSV file. The texts can be edited in the CSV file and can then be re-imported into the project.

Optimisations

- ▶ Create current debug data for Pilz

The user can now choose whether to create the data for all the devices in the network or only for the devices in the active project. There is no network scan when the debug data is created for the active project.

(32698)

- ▶ Default user management

When a new project is created and when projects that previously had no project protection are migrated, a default user "FS_User" is now always created, which can be found in the default user group "FS_UserGroup". The user can decide whether to also create the default user "ST_User". The default user "ST_User" is in the default user group "ST_UserGroup". A password must be entered for each user that is created.

(33156)

- ▶ ARRAY element as application parameter

A project can now also be built when an ARRAY element is used as the application parameter and no explicit start value for this ARRAY element is stated in abbreviated notation during initialisation (e.g. element "myARRAY[0]" in `ARRAY myARRAY : ARRAY[0..7] OF INT := [2(), 6(2)];`).

(33154)

- ▶ Properties of the modules PSSu K F EI and PSSu K F EI CV(-T)

The properties displayed for the modules in PAS4000 have been adapted to match the technical details in the operating manuals. The following values have been changed:

- Module supply: Consumption by module = 240 mA
- Periphery supply: Consumption by module = 45 mA

The calculation of the required supply voltage is now also correct as a result.

(33259)

IEC 61131 programming

- ▶ STL: Use of functions

In an IF, CASE, FOR or WHILE instruction, if one function was used in the header and another function in the instructions, an internal fault occurred on the FS resource (diagnostic message S-0101-0090) and the device project was not started. This problem has now been rectified.

(33187)

- ▶ STL: I/O variable in FOR instruction

If an I/O variable was used as a control variable in a FOR instruction, a major FS error occurred. This problem has now been rectified.

(33194)

Changes in Version 1.19.2

Optimisations

► Online help

In the online help of Version 1.19.0, the maximum transmission delay time of SafetyNET p RTFN ($t_{\text{DelaySNp RTFN}}$) is described incorrectly. The help topic "Design guidelines for PSS 4000 -> Reaction times -> Times that influence reaction times" was corrected. No change was made to PAS4000.

The transmission delay time is, as in the previous versions, $2 \times t_{\text{BasicSNp RTFN}}$ (33370)

Changes in Version 1.19.0

New functions

► New PSSu modules

The following head modules are supported:

- PSSu H PLC1 FS SN SD M12-T
- PSSu H FS SN SD M12-T

► PMI 6 series

The following PMIs are supported:

- PMI 607 primo
- PMI 612 primo
- PMI 638 primo
- PMI 607 Control
- PMI 612 Control
- PMI 638 Control

► SNTP

- If an SNTP Server is configured for a project, all other devices in the project automatically become SNTP Clients. This may be undesirable on PCs and PMIs. As a result, PCs and/or PMIs may now be excluded from SNTP and operate with their own time base.
- When a project is created, a device is no longer automatically configured as an SNTP Server.
- There is an API command that can be used to configure the SNTP Server.

► PSS 4000 OPC Server UA: Access to ARRAYS

Two types of access to ARRAYS can be configured for the PSS 4000 OPC Server UA. With the index-based access type, each array element in the namespace is represented in a separate node. With the complete ARRAY access type, there is just one node in the namespace for the ARRAY.

► User management: New privilege

The "User management" privilege now exists. A user can use this privilege to configure user management.

The API command "createUserGroup" has been extended accordingly.

(The "user management" operation has been removed from the privilege "Non-safety-related operations in PAS4000".)

► Protection of Multi blocks

Multi programs and component blocks can be write and read-protected.

► Logged debug data

If certain events occur, debug data will be recorded on any PSS 4000 device with firmware version $\geq 1.18.0$; this data is saved on the device's SD card. The debug data can be helpful to Pilz if PSS 4000 devices show unexpected behaviour.

PAS4000 can be used to upload and delete debug data from the SD card. These operations can be performed on a single device or on several devices simultaneously.

Optimisations

► Device naming

- The accessibility of devices during device naming has been improved.
(31612)
- Device naming for a PSS 4000-PC that has never previously been named no longer fails if the PAS4000-PC is in the same subnetwork as the PSS 4000-PC.
(32989)

► Online changes

- When there was high utilisation of the FS or ST resource, in rare cases the system reported that the online change could not be executed when the online change had been executed successfully. This problem has been rectified.
(32555)
- An online change to a POU is not permitted if the set of fixed values of REAL and LREAL data type used in the instruction part and declaration part of the POU is changed in the process. Details are available in the online help.

► Firmware update

After a firmware update had failed on several devices, because the network connection had been interrupted for example, a subsequent firmware update could be registered as complete, although it was still running. This problem has been rectified.
(32826)

► Build project

The build no longer fails if a task has the name "UDP".
(32923)

► IEC61131 programming, STL: CASE statement in POUs

In POUs that are programmed in STL, there is now no problem using a VAR_TEMP type variable as the selector in a CASE statement.
(32938)

Watch, control and force variables

► Values for control/force

It was impossible to enter negative values in hexadecimal or octal format, even if the values were within the data type's valid value range.
This problem has been rectified.
(32657)

Changes in Version 1.18.1

Optimisations

- ▶ Multi programming
The performance of PAS4000 when processing large projects containing Multi programs has been improved.
(32538, 32779)
- ▶ Derived data types
The performance of PAS4000 when processing large projects in which derived data types (DDTs) are used has been improved. The watch, control and force functions in these projects have also been improved.
(32744, 32745)
- ▶ Filtering in the I/O mapping editor
When filtering in the I/O mapping editor, some results that met the filter criteria were not displayed. This problem has now been rectified.
(32760)
- ▶ Downloading projects
The time it takes to download projects in which the "Bind device project to SD cards" function is used has been greatly reduced.
(32770, 32780)

Changes in Version 1.18.0

New functions

► New head modules

The following head modules are supported:

- PSSu H PLC1 FS SN SD M12-R
- PSSu H FS SN SD M12-R

► Windows 10

The use of PAS4000 under Windows 10 is supported.

► Firmware update

The firmware update can now be started for several devices at once. The firmware update is executed in the background of PAS4000, meaning you can continue working with PAS4000 but the online actions are not available.

► Downloading the project backup copy

If the project download is executed, a backup copy of the project can also be downloaded onto one of the devices in the project. This means that the project source data are always available.

The backup copy is created automatically. It can be protected with a password.

► Long data types

The elementary ST data types (LINT, ULINT, and LWORD) and FS data types (SAFE-LINT, SAFEULINT, and SAFELWORD) are now supported.

► User management: New privilege

There is now a "Project download only" privilege. This privilege gives the user the right to download a project and nothing else.

► Coding Rules Checker

The Coding Rules Checker tool consists of two parts:

– Programming rules

When programming in PAS4000, the programming rules help you to comply with various generally applicable guidelines for good programming. The programming rules will not detect any errors in the programming and program logic.

Only the FS blocks in the Multi and IEC 61131 programming are checked, i.e. the blocks that are highlighted in yellow in the Project Manager.

– Check list

The check list can be used to check whether a PSS 4000 project has been developed in accordance with generally applicable guidelines. It contains questions about the specification, the implementation of specified requirements and compliance with programming guidelines. The check list is not intended to check the program logic. The check list has been compiled by qualified persons who are familiar with the preparation of safety-related applications.

The check list is intended as an aid and does not claim to be exhaustive. The user has sole responsibility for implementing safety-related applications carefully, in compliance with the standards.

- ▶ Cycle time list

All user-configurable cycle times for a project can be displayed in a list.

If a cycle time is to be changed, the user can jump from the cycle time list to the location where the cycle time is configured.

- ▶ IP connections

For raw TCP connections, acceptance of shorter data lengths during reception can be configured. The associated API commands are also adapted accordingly.

- ▶ New API commands

There are now API commands to configure user management for a PSS 4000 project.

- ▶ New block in the PAS4000 library

FS_SafetyEYE

Multi programming

- ▶ Backup copies of multi programs and component blocks can be created.

- ▶ Multi programs and component blocks can be write-protected.

IEC 61131 programming

- ▶ Library element of LD-POUs

Now library elements can also be created from function blocks and functions programmed in LD.

Process diagnostics

- ▶ Exporting diagnostics texts

All texts from the basic diagnostic items in a project can be exported into a CSV file.

Optimisations

- ▶ Problem view

- Filter operation is simplified.

- The suppression of warnings can now be switched on and off.

- The problem view status bar shows whether any problems are hidden.

- Problem view settings (such as enabled filters) are saved for each project. Only the list of suppressed warnings is a tool setting.

- ▶ Copy and paste

- If name conflicts arise when elements (such as POU's and devices) are inserted into a target project because elements of the same name already exist, the user can now decide for each element whether the existing element should be overwritten, the copied element inserted with a new name, or the element skipped.

- If elements such as multi programs or POU's are copied, it is no longer the case that all called-up blocks are also copied. Only the selected elements are copied.

- ▶ TRUE/FALSE in API commands

If a parameter of the STRING data type in an API command requires the entry of TRUE or FALSE, the following versions are now accepted: "TRUE", "True", "true", "FALSE", "False", "false".

(32314)

► I/O mapping

The representation of PI variables from IEC 61131 programming has been changed. In the tree representation, a node is now displayed for each function block instance, and the associated PI variables are arranged below it. The overview of I/O mappings can also be filtered according to the name of the function block instance.

(18225)

► Elementary library: TRUNC block

If the I-variable *IN* is not assigned when the TRUNC block is called, the build no longer fails.

(32171)

► IEC 61131 programming, STL: Use of the "-" operator

If the "-" operator is applied to operands with unsigned data types, the build has failed up to now. Now the build fails only if the operand is of the ULINT data type.

(32339)

Changes in Version 1.17.2

Optimisations

- Uninstall

The uninstaller of PAS4000 has been optimised.

Changes in Version 1.17.1

Optimisations

► Download to affected devices

During a project download, only those devices should ever receive new device projects whose device project has changed. Since Version 1.16.0 of PAS4000, devices could be also affected by the project download whose device project had not changed at all. This problem has now been rectified.

(32226)

► Multi programming: Comparison blocks

When a comparison block (e.g. GT) is used, and an input or both inputs are not connected, this problem will now be displayed already during the programming, and it will not lead to a fault only while building.

(32224)

► IEC61131 programming: Functions in STL

In Version 1.17.0 of PAS4000, building failed when an STL function was called in the user program and the following conditions were met:

- In the function there was an IF statement without ELSE branch that wrote the function value.
- In the function there was another IF statement with ELSE branch. This IF statement wrote the function value in all the branches.
- At no point in the function has the function value been written without condition.

This problem has been rectified, and building is again possible.

(32273)

Changes in Version 1.17.0

New functions

► User management

Users are created in user management; the offline and online actions they can perform are also defined there. That way the project can be protected from unauthorised access and changes. User management offers "Protection against unintended or accidental mis-use" (Security Level 1 of IEC 62443).

User management replaces the FS login and project protection.

► Bind device projects to SD cards

This function guarantees that a project cannot be copied from one SD card to another and therefore duplicated.

For this function, PSSu systems are required with a PSS 4000 firmware version $\geq 1.17.0$ and with security SD cards (e.g. PASkey SD Card, order number 317801). Basic types and T-types of head modules should have a hardware version ≥ 4.1 (exception: the head modules PSSu H PLC1 FS SN SD M12(-T)(-R) and PSSu H FS SN SD M12(-T)(-R) types should have a hardware version ≥ 1.0). Older hardware versions should only be used for test purposes because access to the security card does not work reliably on older versions. Naming data and project data may get lost, so that a new naming process and project download may be necessary.

This function is not supported by PSS67 devices.

► Cross-project Snp communication

For cross-project Snp communication, it is now possible to define which PI variables are to be used for communication. These PI variables form the PASconnect interface.

As a result it is possible to make changes to project-internal PI variables or to the project-internal I/O mapping, without having to generate new data for PASconnect. There is no need to re-build all the PASconnect subprojects.

► New IP67 device

The device PSS67 PLC1 16FDI is supported.

► Create library element from DDT

A library element can be created from a derived data type. The library element can be imported into the PAS4000 Library and is then available to every project.

► New API commands

– Restore POU backup copy

This command restores the backup copy of a POU and inserts the POU (program, function block or function) into the project.

– Configure PROFIBUS-DP Slave

– Configure PROFIBUS-DP Slave with PROFIsafe

– Configure EtherNet/IP Adapter

– Configure PROFINET IO DEVICE

– Bind device projects to SD cards

– Protect POU (write-protect or write and read-protect)

– Create DDT (also enables folders to be created for DDTs)

– Create configuration for wiring test

► Preliminary: Coding Rules Checker

PAS4000 includes a preliminary version of Coding Rules Checker in English language.

The Coding Rules Checker consists of two parts:

– Programming rules

When programming in PAS4000, the programming rules help you to comply with various generally applicable guidelines for good programming. The programming rules will not detect any errors in the programming and program logic.

Only the FS blocks in the Multi and IEC 6113 programming are checked, i.e. the blocks that are highlighted in yellow in the Project Manager.

– Check list

The check list can be used to check whether a PSS 4000 project has been developed in accordance with generally applicable guidelines. It contains questions about the specification, the implementation of specified requirements and compliance with programming guidelines. The check list is not intended to check the program logic. The check list has been compiled by qualified persons who are familiar with the preparation of safety-related applications.

The check list is intended as an aid and does not claim to be exhaustive. The user has sole responsibility for implementing safety-related applications carefully, in compliance with the standards.

The final version of the Editor will be available in Version 1.18.0 of PAS4000.

► Create backup copy

When you create a backup copy of the project you can select whether the data from the built project is to be included.

(29013)

► Change the basic properties of devices

– The product type of devices can be changed; for example, the head module of a PSSu system can be changed from PSSu H PLC1 FS DP SN SD to PSSu H m F DP SN SD.

– Basic properties can be changed for several devices simultaneously, the firmware version for example.

(30467)

► Multi programming

– Compare Multi programs/component blocks

It is now possible to compare two Multi programs or two component blocks.

– Connections inside CBs

Within a component block, points on the left-hand point rail can now be connected to points on the right-hand point rail.

(21976)

– Tooltip for I-PI points

When you move the cursor over a block's I-PI point, the tooltip now also displays the test pulse configuration of the corresponding digital input.

(25939)

– I/O mappings in the Multi Editor

I/O mappings between PI variables can now also be performed in the Multi Editor.

(27906)

- Compare projects
When the FS comparison result is exported, the differences in the Multi programming are now also exported.
(31799)
- Names of interface points
If the properties of an interface point are displayed in the properties view, the name of the interface point can be changed there.
(17047)
- Global search
Now the global search also browses Multi programs, component blocks, the location information of devices and the instruction part of LD-POUs.
(26880)
- Create configuration for wiring test
You can use the "Force variables" action to test whether the inputs and outputs on PSSu systems and PSS67 devices are wired correctly. The variable lists required for forcing can be created automatically using the action "Create configuration for wiring test".
- IEC 61131 programming: Annotations in the LD Editor
An annotation can be created for each element in the instruction part. A comment can be entered in this annotation.
(27342)
- Number of devices in the project
A project may contain a maximum of 128 PSSu systems and PSS67 devices in total.
(31794)
- "Go to" action in the I/O Mapping Editor
The "Go to" action is now available in the I/O Mapping Editor. If a PI variable or datum (e.g. input on the module bus) is highlighted, it is possible to jump to the corresponding Editor.
(31156)
- Test pulses on PSSu modules
On modules with digital inputs, test pulses are now switched on in the default configuration, where previously they were switched off.
This also affects the API command `setModuleProperties`.
- Generate parts list
Previously it was possible to generate the parts list for the whole project. Now it is also possible to generate the parts list for an individual device.
- Hardware version
In the online information, two digits are now used to display the hardware version of devices "*<Major hardware version>.<Minor hardware version>*".

Optimisations

- Interface display
In some editors and views of PAS4000, text was not displayed in full if a monitor with the resolution 1920 x 1080 was used and Windows was set for the font size 125 %. This problem has now been rectified.
(27799, 31619)

► OPC UA Server

In order to use a PSS 4000 OPC Server UA in the project, all devices in the project must have a PSS 4000 firmware version $\geq 1.15.0$.

(31703)

► Restore backup copy

When restoring backup copies, data is stored in the temp directory. Once the action is complete, this data is now deleted automatically.

(31924)

► Perform online changes

If online changes are to be performed, the actions "Watch variables", "Force variables", "Show diagnostic list" and "Show diagnostic log" no longer need to be stopped.

(31332)

Changes in Version 1.16.2

Optimisations

- Change diagnostics of Pilz control block

If the instance of a basic diagnostic item of a Pilz control block (e.g. FS_EmergencyStop) was changed and then the block, in which the corresponding Pilz control block is called up, was copied into a different project, the user program of the target project was not executed. The diagnostic message S-0801-0002 "Internal error in the device project" was displayed after a download of the target project to the controller. This problem has now been rectified.

(31887)

Changes in Version 1.16.1

Optimisations

- Incompatible Firmware versions

If a PSS 4000 OPC Server UA exists in a project, PAS4000 now ensures that incompatible firmware versions no longer occur. A project with PSS 4000 OPC Server UA can be built only when all the devices in the project have at least the PSS 4000 firmware version 1.15.0.

(31838)

- Scan network

When a PSS 4000 OPC Server UA was running on the PAS4000 PC, and no project was active in PAS4000, the "Scan network" action could not be executed. This problem has now been rectified.

(31837)

- PMI v5 as PSS 4000 OPC Server UA

When a PMI v5 was configured as PSS 4000 OPC Server UA, the project could not be built. This problem has now been rectified.



(31841)

Changes in Version 1.16.0

New functions

- IEC61131 programming: Application parameters

Application parameters can be used to adapt PSS 4000 projects to a plant's specific requirements without changing the user program. All application parameters and their values are listed. If the PSS 4000 project is to be adapted to a plant's requirements, the values of the application parameters are changed and the project rebuilt. The check sum "FS project" is changed in the process. But there is also a check sum "FS project without application parameters", which remains unchanged. There is also a check sum that exclusively contains the values of the application parameters. This can make it easier to have the project approved again.

- ▶ New PSSu module
The module PSSu K F EI CV-T is supported.
- ▶ New IP67 device
The device PSS67 IO1 16FDI is supported.
- ▶ Process diagnostics: Disable instances of basic diagnostic items
The enable can now also be configured for individual instances of a basic diagnostic item. If the enable is not granted, no diagnostic message is entered for the instance in the diagnostic list.
(23174)
- ▶ Multi programming
 - Annotations
An annotation can be created for each point on the point rail of component blocks and for each Multi block on the worksheet of component blocks and programs. A comment can be entered in this annotation.
 - Find
It is now also possible to search for texts in the Multi editor.
- ▶ IEC61131 programming: LD editor
 - Hide interface points
It is possible to hide the unused I/Os of blocks. This action can be performed for individual blocks or for all blocks.
 - Shortcuts
The shortcuts for pasting elements has been optimised, see online help "User program -> IEC 61131 programming -> Using IEC 61131 editors -> LD editor -> Edit networks".
- ▶ Export FS comparison result
If two projects are compared, the differences in the safety-related parts can now be exported.
- ▶ Compare resource assignments
The resource assignments of two projects can be compared.
- ▶ Dynamic program display of POU's
If dynamic program display is run for a POU, the POU can now be opened precisely at the point that is visible in dynamic program display view (in dynamic program display view, right-click on the required point and select **Open IEC61131 editor (offline)**).
- ▶ Cross reference list
The action "Go to" is now available at more points in the cross reference list.
If I/O mappings are displayed, for example, it is possible to jump to the user program and the device editor.
If you jump to a block and dynamic program display is active for this block, then you will jump to dynamic program display.
- ▶ Build project
On the "Build changes" button in the toolbar it is now possible to recognise whether a project is built () or whether changes have been made to the project, which require it to be rebuilt ().

Optimisations

- ▶ Test pulse configuration

If new modules are added to a PSSu system, test pulses are now switched on automatically for FS inputs.

- ▶ Identify devices in the network

Device identification (blink test) now also works if the device is in a different subnetwork to the PAS4000-PC.

(19313)

- ▶ Windows system restore

PSS 4000 projects could be damaged if Windows system restore was used. This problem has now been rectified.

(25006, 31226)

Changes in Version 1.15.0

New functions

► PSS 4000 OPC Server UA

The configuration of OPC Servers of the type PSS 4000 OPC Server UA is supported.

► 4 OPC Servers

A PSS 4000 project may now have a maximum of 4 OPC Servers. These may be PSS 4000 OPC Servers (classic) and PSS 4000 OPC Servers UA.

► New PSSu module

The module PSSu K F EI CV is supported.

► UDP communication using blocks

Data transfer controlled through the user program via the User Datagram Protocol (UDP) is supported.

► Multi programming

Derived data types (DDTs) for interface points can now be used in Multi programming:

- anonymous one-dimensional arrays
- Arrays and structures that have been declared in the DDT Editor

► IEC61131 programming

- Permitted online changes to functions

In the declaration part of functions, local variables (VAR) may now also be changed. (29438)

- Highlight all points of use

In the IL Editor and STL Editor, all the points at which a variable is used are highlighted when the cursor is positioned on the variable. There are no highlights within comments. (24888)

- Paste function block from the library into the instruction part

In the IL Editor and STL Editor, a function block can now be pasted from the library into the instruction part without the function block first being instantiated. The block is instantiated automatically when pasted. (7754)

- Declare all undeclared variables of a POU

All variables that are used in the instruction part but are not yet declared can now be declared in a single step using the quick fix. (26248)

- Font size

The font size can be configured. The setting applies for the IL Editor, the STL Editor and the declaration part of the LD Editor, but not for the dynamic program display. (27901)

► Tool languages

Previously there were individual PAS4000 versions that were also made available in French, Spanish, Italian, Portuguese, Japanese and Chinese.

From this version onwards, PAS4000 will be published in the tool languages German and English. A service pack will be made available for the software tool some time after pub-

lication. The service pack will contain the user interface texts and the corresponding documentation (e.g. online help, readme...) in additional languages.

The service pack can be found in the software tool PASupdate or on the Internet at <http://www.pilz.com/support/downloads/>

► Project report

The report now also contains the parts list.

► Default setting for the project directory

A directory can now be configured in the tool settings. This is used as the default directory when a new project is created or when a project is saved under a new name, for example.

(13562)

► New API command: Set naming data

Optimisations

► Perform actions

If the user started an online action in PAS4000, previously PAS4000 would report the other actions that the user needed to stop first. Now PAS4000 offers to stop these actions for him.

(23401)

► Project Manager

If the user activates a project, it is now expanded immediately in the Project Manager.

(26746)

► Create backup copy

After a backup copy has been created, a success message is now displayed so that the user knows that the action is complete.

(26983)

► Create library element from POU

The call hierarchy in the POU may now have a maximum of 10 levels, rather than 3. If other library elements are called within the POU, hierarchy levels in these library elements will now also be counted.

► "Clean up errors" tool

The "Clean up errors" tool is no longer in the editors/views; it is now located on the toolbar for all editors/views.

(29723)

► Duplicated entries in the diagnostic log

If you switched between projects in PAS4000 or the diagnostic log was displayed immediately after the Network Editor was closed, then the situation could arise in which log entries were displayed twice. This problem has now been rectified.

(28466)

► Naming data

The subnet mask and gateway address can now also be entered in the device properties, so that this data is available during device naming.

(30424)

► Import library element into PAS4000 Library

When a library element (e.g. a Pilz block) is imported into the PAS4000 Library, all the editors are no longer closed and the project in the Project Manager is no longer collapsed.

(17448)

Multi programming

► Check sum "Multi program, FS"

When an IEC 61131 basic block is used in a Multi program and an interface variable, which is declared as an array, is changed in IEC 61131 programming, the check sum "Multi program, FS" is now changed.

(21953)

IEC 61131 programming

► Print active window

When a POU is printed, the properties of the POU are now also printed.

(28252)

► LD Editor

– Paste library elements from the palette into a network

Library elements can now also be pasted by dragging them into a network. The procedure for pasting the same library elements multiple times has also changed.

(27646)

– Navigation using arrow keys

Navigation through networks using the arrow keys has changed.

(29716)

– Online changes to LD-POU

If a function call or OR operation is pasted into the instruction part of a "function" type LD-POU, the online change no longer fails.

(29438)

► Declaration of variables of data type LREAL

If an invalid initial value is entered when declaring variables of data type LREAL, this error is now displayed when programming rather than during the build process.

(30550)

► Function block with the name "Config"

When a project contained a function block with the name "Config", it could not be built. This problem has now been rectified.

(30556)

► POU with the name "Accumulator"

When a project contained a POU with the name "Accumulator", it could not be built. This problem has now been rectified.

(30520)

► SEL function in STL POUs

When the SEL function was called within a branch (IF) in an STL POU, the project could not be built. This problem has now been rectified.

(30638)

Watch, control and force variables

▶ Change value for forcing/controlling

When forcing was active for a variable, the value for forcing/controlling could not be changed without first stopping the forcing process. Forcing is now stopped automatically.
(27905)

▶ Start forcing and controlling a variable

In the dialogue box in which you change the value for forcing/controlling, there is now a button, which can be used to start controlling/forcing for the variable.
(28450)

Changes in Version 1.14.2

This version is available in the following languages:

- ▶ German
- ▶ English
- ▶ French
- ▶ Spanish
- ▶ Italian
- ▶ Portuguese
- ▶ Japanese
- ▶ Chinese

Changes in Version 1.14.1

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

- ▶ Build project and perform download
Building and downloading of large projects have been optimised.
(30330)

Changes in Version 1.14.0

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ Cross-project SafetyNET p communication

It is now possible to exchange data between PSS 4000 devices that are located in different PSS 4000 projects via FS/ST SafetyNET p RTFN.

With cross-project Snp communication, each PSS 4000 project can read the O-PI variables of the other PSS 4000 projects and write to the I-PI variables of the other PSS 4000 projects.

Each individual PSS 4000 project in PAS4000 is created for this purpose. The I/O mapping between the PI variables of the PSS 4000 projects is made in the software tool PAS-connect. Each individual PSS 4000 project must then be built and downloaded to the devices.

- ▶ Bind device projects to devices

This function is used to guarantee that a project can only be executed on devices that have previously been prepared using the appropriate device key for the project. Plant builders (OEMs) in particular, who use the PSS 4000 devices in their plants and sell them on to their customers, can use this function to guarantee that their customers always buy their PSS 4000 devices from them.

- ▶ Generate parts list

A list can be generated, containing all the products used in the hardware configuration as a CSV file. The parts list contains the order number and quantity for each product that is used. The parts list also contains potential accessories.

- ▶ PMI v507 and PMI v512

The devices PMI v507 and PMI v512 are supported.

- ▶ More information about devices in the Network Editor

The following information is now also displayed in the Network Editor after scanning:

- Preferred DNS Server
- Alternative DNS Server
- DHCP activated
- Firmware revision number
- Last firmware update
- Vendor ID
- Device key
- Port of SNTP Server

Optimisations



NOTICE

The description of the following blocks has been changed:

FS_EmergencyStop
 FS_EmergencyStop_PLC
 FS_EnableSwitch
 FS_EnableSwitch_PLC
 FS_FootSwitch
 FS_FootSwitch_PLC
 FS_LightCurtain
 FS_LightCurtain_PLC
 FS_SafetyGate
 FS_SafetyGate_PLC

If "automatic start/automatic reset" is selected (I-variable *AutoStart*), then this will also occur when the inputs' valid bits switch from FALSE to TRUE. See description of the I-variable *AutoStart* in the Online Help.
(30217)

► Enable principle

If the ST data source and the FS data source were on the same PSSu system and the FS hardware output was on a different PSSu system, the FS hardware output could not be controlled with the ST data source. While the FS data source and the valid bit of the FS data source were TRUE, the FS hardware output was switched on. This fault has now been rectified.

(30363)

► Scan network

The network scan no longer fails if there are more than 40 PSS 4000 devices in the network.

(17590)

► Problem view

If there are a large number of problems, the Problem view no longer freezes.

(25112)

Multi programming

► Blocks MIN, MAX and MUX

With the blocks MIN, MAX and MUX, the number of used connection points *IN1* ... *IN8* can continue to be determined by the user, but all configured connection points must now also be connected.

(21748)

IEC 61131 programming

► Blocks MIN, MAX and MUX

With the blocks MIN, MAX and MUX, the number of used I-variables *IN1* ... *INn* can continue to be determined by the user. However, the I-variables must now be used in consecutive ascending order.

(21748)

Process diagnostics

▶ Multi programming: Location information

The location information for the basic diagnostic item is now displayed correctly, even if the PI variable is used by an IEC basic block in a basic diagnostic item in the location information or the PI variable itself is renamed in IEC 61131 programming.

(29626)

Watch, control and force variables

▶ Add variables from Multi programming to the variable list

If the **Add variable to variable list** dialogue box was called up in variable list view, PI variables from IEC 61131 basic blocks were not displayed if they belonged to sub-blocks of the IEC 61131 basic block. This fault has now been rectified.

(29612)

Changes in Version 1.13.3

This version is available in the following languages:

- ▶ German
- ▶ English
- ▶ French
- ▶ Spanish
- ▶ Italian
- ▶ Portuguese
- ▶ Japanese
- ▶ Chinese

Changes in Version 1.13.2

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

- ▶ Cycle time exceeded due to dynamic program display

When performing the dynamic program display with PAS4000 Version 1.13.1 the task cycle time was exceeded in certain cases. This error has now been rectified.

(29785)

Changes in Version 1.13.1

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

- ▶ Scan network

When an SNTP server has been found on the network while performing the "Scan network" action with PAS4000 Version 1.13.0, the PAS4000 PC has been configured as SNTP Client and the PAS4000 PC system time has been set to the time on the STNP server. This error has now been rectified.

(29731)

Changes in Version 1.13.0

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ SafetyNET p protocol version 2
SafetyNET p protocol version 2 is supported.
- ▶ Resumption of FS communication with SafetyNET p protocol version 2
Communication via FS SafetyNETp RTFN is resumed automatically after communication errors if the FS SafetyNET p waiting period has elapsed and the fault has been rectified and/or the error is no longer present. The FS SafetyNET p waiting period can be configured.
- ▶ Debugging: online changes
After a project download, individual POU's in the user program can be changed (instruction part and temporary variables in the declaration part), without the need to repeat the download. The POU's are transferred directly to the RAM of the affected devices.
Online changes may be disabled for applications in accordance with the code NFPA 85.
Devices with a PSS 4000 firmware version $\geq 1.13.0$ are required for online changes.
Online changes can only be performed in IEC 61131 programming, not in Multi programming.
- ▶ New system section
The new system section "PROFINET IO DEVICE" can be configured.
- ▶ Pulse stretching on PSSu K F FCU
"Pulse stretching" mode on the PSSu module PSSu K F FCU can be configured.
- ▶ Compare devices
The hardware configuration of two devices from the same project or from different projects can be compared.
- ▶ Projects with the same name
Projects with the same name can be added to the Project Manager. A suffix is appended to the name to differentiate.
- ▶ Multi programming
 - The design of the Multi Editor has been completely revised and the representation of the blocks, interface points and wiring has been improved.
The output of the Multi blocks in the project report has also been redesigned.
 - Several Multi blocks can be highlighted and combined to form a new component block.
- ▶ IEC 61131 programming
For POU's that are programmed in IL or STL, it is possible to set the font size for the project report.
(27900)
- ▶ Windows 8
Operation of PAS4000 under Windows 8 is supported.

- ▶ Create backup copy
The target directory can now be selected when creating a backup copy of the project.
- ▶ Copy check sums
If the overview of all the check sums is displayed in the project (highlight the project in the Project Manager, right-click on the highlight and select "Show check sums"), then the check sums can now be copied to the clipboard, so that they can be pasted into a text file, for example.
(28077)
- ▶ API command to configure the project compatibility version
There is an API command that can be used to configure the project compatibility version:
`PASAPI.setProjectCompatibilityVersion(<Version number>);`

Optimisations



NOTICE

Error in the description of the blocks TP, TON and TOF

The behaviour of the timers TP, TON and TOF complies with the behaviour required by the standard IEC 61131-3.

The implementation-specific behaviour on the output interface of the blocks TP, TON and TOF, when the input variable PT is changed after the timer has elapsed, was described incorrectly in the online help. The description now corresponds to the actual behaviour of the timers.

(29405, 29406, 29408)

- ▶ Lengthy version information stopped download
If more than 199 characters were entered under "Version" in project properties in PAS4000, the project download failed. This error now no longer occurs.
A maximum 256 characters are permitted. It is not possible to enter more than 256 characters.
(29002)
- ▶ Error while building
 - If the project contains an FS SafetyNET p connection, through which data of data type TIME, DATE, TIME_OF_DAY or DATE_AND_TIME is to be transferred, the build no longer fails.
(29221)
 - If the memory requirement for variables from a POU is greater than approx. 64 KByte, the build no longer fails.
(29194)
 - If the user program uses a block from the PAS4000 Library that contains VAR_TEMP type variables, the build no longer fails.
(28753)

► T-type of some voltage distribution modules

The T-type of modules PSSu E PS-P 5V, PSSu E PS-P +/-10V and PSSu E PS-P +/-15V does not exist and is no longer shown in PAS4000. Except: in migrated projects that use the T-type head modules, the modules remain unchanged in the hardware configuration. (29407)

► Change to the check sum

Various optimisations on PAS4000 can cause the check sum "FS Project"/check sum "FS device project" to change, if an unchanged, old project is built using the new PAS4000 version.

IEC 61131 programming

► Signs in ARRAY declaration

If a sign is entered when declaring an array in an array limit (myArray:ARRAY[0..+10] OF BOOL), the build no longer fails. (28834)

► Ladder diagram: Comparison contact

The check sum of the POU did not change when a value was changed on a comparison contact. This fault has now been rectified. (29215)

Watch, control and force variables

► Multi programming: Force PI points

If a PI point on a component block was connected within the component block to a block that was assigned to a different resource than the component block, then it was not possible to force the PI point. This fault has now been rectified. (13712)

Changes in Version 1.12.2

This version is available in the following languages:

- German
- English
- French
- Spanish
- Italian
- Portuguese
- Japanese
- Chinese

Optimisations

- Change to check sum "FS Project"

If a project has been built using PAS4000 Version 1.11.4 or older and the project uses multiple instances of the same derived data type (DDT), the check sum "FS Project" is changed when the project is built using Version 1.12.0. This error has been rectified in Version 1.12.2.

(28839)

Process diagnostics

- Location information for Pilz blocks

With many Pilz blocks from the PAS4000 library "---" has been displayed as location information for diagnostic messages, or the location information of the block instead of the location information of the sensor/actuator. This fault has been rectified in the new versions of the blocks.

(28182)

Changes in Version 1.12.0

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ New PSSu module

The module PSSu K F EI is supported.

- ▶ New blocks in the PAS4000 library:

- FS_FBL_Monitoring
- FS_FBL_Monitoring_PLC

Blocks for the PSSu module PSSu K F EI:

- FS_EI_Basic
- FS_EI_SDIM
- FS_EI_SOSM
- FS_EI_SSM0
- FS_EI_SSM1_SSRM

- ▶ Context-sensitive online help

Help with the current context is displayed when you press "F1".

For example:

- Help with the active editor or view
- Help with the selected element in a palette (e.g. a PSSu module or a block)
- IEC 61131 Editors: Help with the Pilz block from the library, if a type name or instance name is selected

- ▶ API for IP connections

IP connections can be created and configured with the API for PAS4000.

- ▶ LD Editor

- New functions

ADD, SUB, DIV, MUL, MOD and MOVE
(25462)

- Select all

If an element in a network is selected, all elements in the network are selected by pressing "Ctrl + A". If no element is selected in a network and no comment either, the whole instruction part is selected by pressing "Ctrl + A".
(23710)

- Move multiple elements

It is now possible to select multiple elements in a network and move them within the network.
(23715)

- Available networks and elements
The number of networks that can still be added to a POU is displayed (maximum 200), as is the number of graphic elements that can still be added to the selected network (maximum 100).
(23732)
- Type conversion
Previously there was a separate block in the palette for each possible type conversion (e.g. BOOL_TO_INT). Now there are three blocks that can be used universally: *_TO_**, *_BCD_TO_** and *_TO_BCD_**
(24330)
- Swap element
Elements in a network can be changed:
A contact can be changed to another contact or a coil.
A coil can be changed to another coil or a contact.
A function can be changed to another function.
A function block can be changed to another function block.
If possible, the element's assignment of values/variables is maintained during this change.
(25121)
- ▶ Palettes in all editors
 - Favourites
In each palette it is possible to define favourites among the elements, which are then displayed in the upper part of the palette.
(23721)
 - Filter
If filter text is entered, only the elements containing the filter text in the name are displayed.
(23721)
- ▶ IP address of programming interface
 - Now, only the network adapter configured as the programming interface and with the configured IP address is used to execute online functions.
 - If a PC in a project is both a PAS4000-PC (PC on which PAS4000 is installed) and a PSS 4000-PC (PC with OPC Server), the IP address of the programming interface (PAS4000-PC) will also be used as the IP address for the PSS 4000-PC.
- ▶ Project report
Comments will now be shown in green.
(25510)
- ▶ DDTs in the Project Manager
Subfolders for derived data types can now be created in the "Derived data types" folder.
(21495)
- ▶ Disable autocomplete
It is possible to switch off autocomplete on text. This currently affects the IEC 61131 Editors in particular. If autocomplete is disabled and the text "VAR" is entered in the declaration part of a POU, for example, then "VAR_END" will no longer be inserted automatically.
(24887)

Optimisations

- ▶ **System diagnostics: Location information with runtime errors**
The correct location information is now displayed with runtime errors in read-protected program-type POU's.
(17426)
- ▶ **Device naming**
During device naming, if an invalid IP address or an invalid device name is entered, device naming will fail. Device naming can now be performed again without having to re-start PAS4000.
(27772)
- ▶ **PAS4000-PC with multiple network adapters: Online actions while project devices are starting up**
If online actions (e.g. project download) are performed using PAS4000 while devices in the project are still starting up, the situation no longer arises in which the PAS4000-PC can no longer reach the devices.
(22189)
- ▶ **Scanning networks with multiple network adapters**
If the PAS4000-PC has multiple network adapters in the same subnetwork, scanning (scan network, scan project) could fail. This fault has now been rectified.
(24022, 26212)
- ▶ **PCs with multiple network adapters: Multiple use of IP addresses**
The project download no longer fails if there are multiple network adapters on the PAS4000-PC and one of these is used as a programming interface while another has the same IP address as another device in the project.
The project download also no longer fails if a PSS 4000 PC in the project has multiple network adapters and one of these is used for communication within the project while another has the same IP address as another device in the project.
(22987)
- ▶ **Display of programming interfaces is incomplete**
When setting the programming interface, inactive network adapters are also available for selection, even when no cable is connected and the LINK_LED is unlit.
(24099, 26243)
- ▶ **Download when operation is running**
A project download no longer fails if it is started while devices are running with a high load.
(26644)
- ▶ **Firmware update when operation is running**
A firmware update no longer fails if it is started while the device is running with a high load.
(26857)
- ▶ **Save project as**
If the project is in credit (PASunits), all or part of the PASunits can be transferred to the project with the new name.
In the following cases it is now no longer possible to transfer the PASunits:
 - The project is licensed and a successful project download has already been carried out.

- The project is a restored backup copy.

(23833)

- ▶ IP connections

The Server allocation table is no longer displayed on a separate tab but under the list of IP connections, when a Server connection is selected.

(24767)

Multi programming

- ▶ I/O mapping in the Multi Editor

When I/O mapping in the Multi Editor, target data is now highlighted in green if it is already mapped, but additional mappings are possible.

(14989)

- ▶ Block display

Symbols are now used to indicate whether automatic reset is activated, including on the blocks FS_AbsoluteEncoder, FS_AnalogueInputDual and FS_AnalogueInputSingle.

(20713)

- ▶ Data types ST_I_SER and ST_O_SER

PI points of the data type ST_I_SER and ST_O_SER can be created and I/O-mapping can now also be performed for these points.

(14339)

- ▶ Rename component block interface points

Even if there is no instance of a component block type available in a Multi program, its interface points can be renamed in the open component block.

(22282)

- ▶ Interface points with structures as data types

If the interface points of two blocks are connected, the data type of these interface points is a structure (DDT or I/O data type) and one block is assigned to an FS resource and the other to an ST resource, this project can now be built.

(22524)

IEC 61131 programming

- ▶ Functions

If you move the mouse pointer over a function call in the IL or STL Editor, the data type of the function value is now also displayed.

(20162)

- ▶ Resource Global Variable Editor

You can now show and hide line numbers in the Resource Global Variable Editor.

(22228)

- ▶ Save active editor

If two POU's were open, both had been changed and both called up the same Pilz block, it was impossible to save only one of the two POU's. This problem has now been rectified.

(16661, 16890)

- ▶ IEC 61131 programming: Maximum 5 blocks

Dynamic program display can be run for a maximum of 5 blocks at a time. If dynamic program display is to be started for a sixth block, it must first be stopped for one of the other blocks.

(17648)

► Check sum "POU type with subelements"

If the same function block is used in multiple projects, the check sum "POU type with subelements" for the function block is now displayed correctly in the inactive projects as well as the active project.

(22750)

► Change to the check sum "FS Project" after pragmas are added

If a pragma (braces with text, e.g. "{abc}") is inserted into an FS-POU that is assigned to a resource, this change no longer has any influence on the check sum "FS Project".

(23865)

Process diagnostics

► Error in the diagnostics

The project build no longer fails if there are errors in the process diagnostics.

(21742)

► Location information in types and instances

If a PI variable is configured for the location information in the type of a basic diagnostic item, this will now also be used in the instances of the basic diagnostic item.

(27726)

► Incorrect BDIs displayed in the Diagnostic Editor

If the Project Manager contains multiple projects, the situation could arise in which the title bar of the Diagnostic Editor contained the name of the active project, but the BDIs from an inactive project were displayed. This problem has now been rectified.

(21212)

Dynamic program display

► IEC 61131 programming: Start of dynamic program display

Once dynamic program display has been started for a block, it takes a little time before values are displayed. If the start button was re-operated during this time, dynamic program display was no longer possible for this block. This problem has now been rectified.

(21894)

► IEC 61131 programming: Maximum 1400 rows in POU's

In the case of dynamic program display of POU's with more than 1400 rows in the instruction part, a warning is now displayed, indicating that dynamic program display will only be run for approx. 1400 rows.

(24803)

Changes in Version 1.11.4

This version is available in the following languages:

- ▶ German
- ▶ English
- ▶ French
- ▶ Spanish
- ▶ Italian
- ▶ Portuguese
- ▶ Japanese
- ▶ Chinese

Changes in Version 1.11.3

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

- ▶ Cross reference list

If a block type is selected, the cross references for the corresponding instances are now also displayed. If a block instance is selected, the cross references for the type and all other instances are also displayed.

- ▶ Switch diagnostic language

The diagnostic language now switches correctly.

- ▶ Limit the problems displayed in problem view

If there are a large number of problems in the project, updating the problem view may be a slow process and this will negatively effect working with PAS4000. If this is the case or you wish to prevent this happening, you can limit the number of problems to be displayed.

Changes in Version 1.11.0

This version is available in the following languages:


- ▶ German
- ▶ English

New functions

▶ Resource assignment

- The resource assignment is now made in the Resource Assignment Editor. This offers simple procedures for executing, changing and deleting the resource assignment.
- The task properties are configured in the Resource Assignment Editor.
- Multi programming: Multi programs and component blocks must also be assigned to a resource.
- Multi programming: All sub-blocks automatically inherit the resource assignment of a Multi program/component block.
- Mark block with "Do not execute"
If the programming of a block is not yet finished or the corresponding plant section is not yet ready for operation, the block can be marked with "Do not execute" after the resource assignment. In this case, the block will not be added to the device project when the project is built and will not be transferred during download.

▶ Error handling

If a user changes an element, PAS4000 updates the points at which the element is used, where this is possible without disadvantaging the user. An automatic update will not be carried out at points where relationships need to be deleted (e.g. I/O mappings in the I/O Mapping Editor, interface point connections in the Multi Editor). Any errors that occur are highlighted and must be rectified by the user, using the new "Clean up errors" tool , for example.

▶ I/O Mapping Editor

- Filter by valid I/O mapping targets
The valid mapping targets can be displayed for each datum for which I/O mapping can be configured.
- The resource assignment is no longer a prerequisite for the I/O mapping of variables for IEC 61131 programming.

▶ Problem view

Problem view offers a number of new options:

- Problems can be filtered by a text that is entered.
- Problems can be filtered by severity (error, warning, information).
- It is possible to filter by problems belonging to the element that is highlighted in the Project Manager.
- It is possible to suppress the display of many warnings, e.g. "Variable is declared, but not used".
- The problems that are displayed can be exported to a CSV file.

- Cross reference list
The display of cross references has been revised.
- Determine language of diagnostic texts
It is possible to configure the diagnostic language that is used when building the project.
- Project report
It is possible to use style sheets in templates.
- Compliance with IEC 61131-3
The help now contains Pilz's statement regarding compliance with standards.

Optimisations

- Optimisation of PAS4000
Actions are executed more quickly and larger projects can be edited.
- Instance tree: Displaying I/O mappings
The I/O-mapping for a PI variable is now also displayed in the instance tree when the variable is used for the enable principle.
(12915)
- Building large projects
Large projects are built more quickly.
(26653)
- Copying between projects
If program sections from one project are copied into another project, which uses the blocks FS_AbsoluteEncoder or FS_IncrementalEncoder, and the versions of these blocks are different in both projects, this no longer leads to a defective target project.
(25624)

Multi programming

- Update user library elements in the project
If the user changes a user library element so that a name that was previously used for an O-PI variable is used for an I-PI variable after the change has been made, this no longer leads to errors when the user updates his project with the new version of the library element.
(24753)

IEC 61131 programming

- Change programs' POU type
If a program is already assigned to a resource and is then converted into a function block, the program's resource assignment is now deleted automatically and the build no longer fails.
(10509)
- Resource assignment
If a POU in which the REAL/LREAL data type is used is assigned to an FS resource, the resource assignment is now immediately marked as faulty.
(21336)

Process diagnostics

- Basic diagnostic item condition
If a basic diagnostic item is created for a block, only a variable from the block itself may be used in the condition and not a variable from the sub-blocks.

- ▶ PI variables in remedy

A PI variable can now be selected for the location information "Terminal" or "Sensor/Actuator" in basic diagnostic item types.

(13820)

Watch, control and force variables

- ▶ Force state

The force state in the variable lists is now displayed correctly.

(13958)

- ▶ Multi programming: VAR_TEMP type variables

If all variables of a Multi block are added to a variable list, VAR_TEMP type variables are now suppressed automatically.

(23950)

Changes in Version 1.10.0

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ New PSSu modules

The following modules are supported:

- PSSu K F FAU B
- PSSu K F FAU P

- ▶ New blocks in the elementary library:

- pssGetCheckSumFsProject
- *_BCD_TO_**
- *_TO_BCD_**

- ▶ New blocks in the PAS4000 library:

- FS_PinchPointControl_PLC
- FS_PSEnvipMuteOSSD_PLC
- FS_RampMonitoring_PLC

- ▶ The following blocks may now also be executed on the control system PSSu multi:

- *_TO_**
- TRUNC
- Simple arithmetic (ADD, MUL, SUB, DIV, MOD, ABS, SQRT)
- Logarithmic calculations (LN, LOG, EXP)
- Trigonometric calculations (SIN, COS, TAN, ASIN, ACOS, ATAN)
- Bit shift (SHL, SHR, ROL, ROR)
- SEL
- pssGetMsTickCount
- FS_SafeEthernetConnection

(24489)

- ▶ Project report

- The report can be output as a Word file.
- Templates can be used to determine the appearance and content of the report's title page, header and footer.

- ▶ Comments on DDTs and POUs

A comment that is entered in the element's declaration part can be displayed in the element's properties view.

- ▶ IP connections: Raw TCP

External communication via Raw TCP can be configured.

► IP connections: Raw UDP

For each connection with send data (transmission type "send", "send/receive") it is possible to configure whether the send operation should only occur if the send data has changed.

► Location information for diagnostics on PSSu systems

In the PSSu Module Editor there is now a table for entering all the location information for a PSSu system. Rows from the table can be copied to the clipboard and can be pasted into another project or into a CSV file. Data can also be pasted into the table from the clipboard.

► Automatic I/O mapping for PSSu systems

I/O mapping can be executed automatically for digital inputs and outputs on a PSSu system.

► API for PAS4000

PAS4000 provides an interface for application programming (API).

► Displaying Equip IDs in the PSSu Module Editor

The Equip ID is now displayed for each terminal on the tabs "Digital FS Inputs" and "Digital FS Outputs".
(21819)

► Renaming structure elements

Individual elements of the STRUCT data type can be renamed.
(21498)

► IEC 61131 programming:

– Parentheses

If a pair of parentheses is present and the cursor is positioned on the right, next to one of the parentheses, then the other parenthesis is highlighted with a red frame. This works with all editors in the declaration part; with the IL and STL Editor it also works in the instruction part.
(24136)

– LD Editor: Tab keys

The tab keys can now be used to navigate between the individual inputs and outputs of function blocks and functions.
(23839)

– LD Editor: Draw lines

You can use the line tool to insert vertical lines into networks.
(25113)

– LD Editor: Delete lines

Vertical lines in networks can be deleted.
(25113)

► Diagnostic Editor: Filter by diagnostic identifier

The BDIs in the Diagnostic Editor can now be filtered by diagnostic identifier (DID). It's possible to enter the complete DID (e.g. P-0001-0004) as well as the abbreviated form (e.g. P-1-4).
(24763)

Optimisations

- ▶ Compare DDTs

The situation no longer comes to pass in which DDTs from different projects cannot be compared.

(22247)

- ▶ Build

It is now also possible to build a project if it contains a PI variable whose name begins with an underscore followed by a number (e.g. "_5").

(25380)

- ▶ Projects without version number

If there is no version number for the project in the project properties, the build no longer fails.

(26025)

IEC 61131 programming:

- ▶ LD Editor: Safety state after interface change

If the safety state (FS/ST) of an FB or FUN changes, the POU symbol in the network is updated accordingly and is displayed in the correct colour.

(23948)

Dynamic program display

- ▶ Dynamic program display with multi-dimensional arrays

Correct values are now displayed for the elements of multi-dimensional arrays in dynamic program display.

(24318)

Changes in Version 1.9.2

This version is available in the following languages:

- ▶ German
- ▶ English
- ▶ French
- ▶ Spanish
- ▶ Italian
- ▶ Portuguese
- ▶ Japanese
- ▶ Chinese

Changes in Version 1.9.1

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ LD Editor
IEC 61131 programming can now also be executed in LD (Ladder Diagram).
- ▶ New Pilz blocks:
 - FS_Cam
 - FS_TwoHandControl_PLC
- ▶ Multi programming
 - Show feedback loops
If a feedback loop is present in a Multi program or component block, the input at which the feedback occurs is marked with a white point. The connections that form the loop are highlighted by clicking on the point.
(16981)
 - Show inter-task communication
The data flow between various tasks can be displayed in Multi programming. If a block receives an input signal from a block that is executed in another task, then the input is marked with a purple point.
(21169)
- ▶ Raw UDP connections: Configuration of Time to Live (TTL)
The number of hops that a Multicast send telegram may pass can now be configured. A device with a firmware version from 1.9.0 is needed.

Optimisations

- ▶ Change of state missing when diagnostic log is exported
When the diagnostic log is exported, information as to whether the diagnostic message arrived or was cleared at the stated time is now also displayed.
(23231)
- ▶ Project protection: Build possible with level 2 password
If a user with a level 2 password wanted to download a project and the current project was not built, he was able to build the project. This is now prevented.
(23594)
- ▶ Firmware update: PAS4000 crashed after firmware update
The rare cases in which PAS4000 crashed after a successful firmware update no longer occur.
(16305)
- ▶ Online actions on PCs of the same name
Online actions no longer fail if a project is built on a PC and the PC's IP address is subsequently changed or the project is opened on another PC that has the same name in the Online Network Editor, but a different IP address.
(21568, 21693)

► Consistency ranges

For an FS resource task, the consistency range "O-PI variables of a task without resource global variables" is divided into two areas when transmitted via SafetyNET p, in case the task contains O-PI variables of both FS and ST data types. The same applies for the consistency range "Resource global O-PI variables of a task".

In both cases, a warning is now displayed during the build process.

(21629)

► Project download failed

If the project is saved in a directory whose path name contains special characters, the project download no longer fails.

(23107)

► System diagnostics: Location information for runtime errors

If the I-variable of a block is assigned an array element and an invalid index is stated during the user program's runtime, an incorrect line number was previously displayed in the location information for the runtime error. With projects built with PAS4000 from Version 1.9.0, the location information is correct.

(23876)

► System diagnostics: Runtime error when converting from LREAL to REAL

If the conversion from LREAL to REAL leads to an overflow during runtime, this runtime error will now be detected and reported in every case.

(24528)

Multi programming

► Redundant functions have been removed:

– Create new component block

A new component block can be created by dragging the **Empty Component Block** element from the palette into a Multi-Editor or by selecting **Create New Component Block** after right-clicking on **Component Block Types** in the Project Manager.

A new component block can no longer be created by highlighting several Multi blocks and selecting **Create New Component Block**.

– Configure block interface

Interface points can now be configured only on the point rail and no longer in the **Configure Block Interface** window.

– Show PI points

PI points, including their I/O mapping, are displayed exclusively in the Multi Editor. The PI points view has been removed.

– Create IEC 61131 basic block

An IEC 61131 basic block can be created by dragging a POU into a Multi Editor. It is no longer possible to create empty IEC 61131 basic blocks; the **Empty IEC 61131 Basic Block** element is no longer available in the Multi Editor palette.

(23221)

► Rename component block interface points

It is now also possible to rename interface points for component blocks if there is at least one instance of a component block type available in a Multi program, but the component block is also instantiated in a component block type, for which no instance is available in a Multi program.

(23188)

IEC 61131 programming:

▶ STL Editor: Syntax error in FOR loop

An error is no longer issued during the build process when there is no space before the "DO" in a FOR instruction.

(22972)

▶ Using the floating point number 0.0 on the FS resource

If the floating point number 0.0 (literal of REAL data type) is used in a block and it is assigned to an FS resource, this error will be detected during the build process rather than causing a major FS error during runtime.

(24198)

▶ R_EDGE/F_EDGE in FS function blocks

If an FS function block contains one or more I-variables with the attribute R_EDGE or F_EDGE and one or more functions are called up within the function block, a major FS error of the FS resource or FS module bus does no longer occur.

(23981)

Process diagnostics

▶ Reuse diagnostic identifier

Previously a diagnostic identifier was not allowed to be reused if a basic diagnostic item with this diagnostic identifier already existed within the project and had been downloaded to devices. This restriction has now been lifted.

(19946)

Changes in Version 1.8.1

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ EtherNet/IP Adapter

It is possible to configure external communication via the EtherNet/IP Adapter.

- ▶ User elements in the PAS4000 Library

Individual library elements can now be created from POU's and can be added to the PAS4000 Library. These library elements will then be available in every project. Depending on how they have been created, the library elements can be used in both IEC 61131 programming and Multi programming.

In order to create a library element from a POU, the POU must meet certain conditions (see online help, "Create library element from POU").

- ▶ New Pilz block:

FS_PSENCs

- ▶ New PSSu modules

The following modules are supported:

- PSS E F ABS SSI-T
- PSS E F INC-T
- PSSu E S 2AI RTD
- PSSu E S 2AI RTD-T
- PSSu E S 2AI TC
- PSSu E S 2AI TC-T
- PSSu E S 4DI-D
- PSSu E S 4DO 0.5-D
- PSSu E S 4DO 0.5-TD
- PSSu E S 2DO 2-D
- PSSu E S 2DO 2-TD
- PSSu E S PD-D

- ▶ Comparison of resource global variables

The resource global variables of two projects can be compared.

- ▶ PMI 5

The following new products from the PMI 5 Series are now supported:

- PMI 516
- PMI 518
- PMI 526
- PMI 531
- PMI 538

► Multi programming

The comparison blocks GT, GE, EQ, NE, LT and LE can now also be used on control systems of the performance class PSSu multi.

(19863)

Optimisations

► Build error due to cycle time configuration

Even if the FS task cycle times are configured to produce a SafetyNET p basic cycle time of more than 1342 ms, the build no longer fails.

(22713)

► No devices after scanning the network

Devices are found reliably after the first network scan. It is no longer necessary to repeat the action.

(22485)

► Device duplicated when scanning the network

Even if the data on a device is changed (e.g. IP address is changed) while the network is being scanned, the device is no longer displayed twice.

(22528)

► Error after project download

In rare cases, Windows displayed the message "PSS 4000 is no longer working" after a project was downloaded. This problem has now been rectified.

(22594)

► DDTs

If a derived data type is to be created, it is now also possible to click on an icon in the toolbar or select the menu **Program -> Derived Data Type**.

(21499)

► Windows XP

PAS4000 now also supports Language Packs under Windows XP. As a result, PAS4000 can also be used on PCs with Windows XP when the language of the operating system is not English or German.

► Rename valid bit of a resource global variable

If the valid bit of a PI variable is declared as a resource global variable and is renamed using the "Rename" action in the Resource Global Variable Editor, the build no longer fails.

(21223)

► PSSu Module Editor: Slots

In rare cases, the sequence of the modules in the PSSu Module Editor may be displayed differently to that of the Project Manager (the slot assignment from the Project Manager was used during the build process). This problem has now been rectified.

(22262)

► Firmware update on a PMI

A firmware update now works reliably on PMIs.

(22636)

Multi programming

- ▶ FS blocks with mixed input interface

If it is possible to access non-safety-related data (ST data) within an FS block, then this is an "FS block with mixed input interface". This will now be displayed as half green / half yellow.

(19373)

- ▶ Blocks "IO_DataTypeSplitter" and "IO_DataTypeMerger"

I/O data types that contain only one element in their structure can now also be selected as I/O data types, e.g. FS_I_DI.

(22511)

- ▶ Change data type of a PI point

If the data type of a PI point in a component block is changed, a test to check that compliance with the connection rules is maintained within the component block is now carried out immediately rather than waiting for the build process.

(21412)

IEC 61131 programming

- ▶ STL: Check sum calculation for POU's

During a function call in the STL programming language, if an I-variable is assigned an expression in which another function is called (e.g. a := fun1(in1 := fun2(...));), the following check sums are now calculated correctly:

- Check sum "FS-POU type with subelements"
- Check sum "ST-POU type with subelements"
- Check sum "FS device project"
- Check sum "FS project"

(23111)

- ▶ Write and read-protect POU

Even POU's that are not independent (i.e. that contain POU's in the call tree/instance tree that are also called in other POU's) can now be write and read-protected.

(20021)

- ▶ Instance tree with write and read-protected FBs

The name of a write and read-protected FB is now displayed in the instance tree even if the FB does not contain interface variables.

(20659)

- ▶ Calling function blocks and functions

When calling a function block or function, if an I-variable is assigned with the function value of a function and this function value is of a derived data type (user DDT or I/O data-type), the build no longer fails.

(21633, 21673)

- ▶ VAR_IN_OUT type variables

If a VAR_IN_OUT variable is declared and a derived data type (DDT) or anonymous array is selected as data type, the block is now executed correctly, even if the variables are assigned the value of a VAR_OUT variable from another block.

(22165)

- ▶ Seal POU

The menu for sealing a POU can now be found under "Protect POU" (right-click on a POU in the Project Manager, select **Protect POU -> Seal**).

(20662)

► Delete function blocks

If the type of a function block is deleted from a project, and in the project there was an instance of the FB which had the same name as the FB type, the project could no longer be built. This problem has now been rectified.

(20169, 21898)

► STL and devices with PSS 4000 firmware version < 1.5.0

If parts of the user program have been programmed in STL, the download of the project to devices with a PSS 4000 firmware version < 1.5.0 will now be prevented because it cannot be guaranteed that the code will be executed correctly on these devices.

(22190)

► Function block without resource assignment

There is a function block where either the block itself or its sub-blocks is connected to one or more basic diagnostic items. If this block is instantiated under the same name in both an IEC 61131 program and a Multi program and no resource assignment has been performed for the IEC 61131 program, the project could not previously be built. This problem has now been rectified.

(21803)

Process diagnostics

► Protected basic diagnostic items

In the Diagnostic Editor, basic diagnostic items that belong to protected blocks are now marked accordingly.

(20769)

Dynamic program display

► IEC 61131 programming: "&" operation

If a POU is programmed in IL and the operation "&" is used, the operator is now displayed correctly in the dynamic program display view.

(21605)

► Multi-element variables

If multi-element variables (e.g. structures) are displayed in the dynamic program display view, a message appears, advising you to double-click on the variable to display all its elements.

(21497)

Changes in Version 1.7.0

This version is available in the following languages:

- German
- English

New functions

- PROFIBUS-DP Slave with PROFIsafe
External communication via PROFIBUS-DP with PROFIsafe can be configured.
- Derived data types (DDT)
The user can declare arrays and structures as derived data types and use them in IEC 61131 programming.
- REAL and LREAL data types
The ST data types REAL and LREAL are supported.
- New Pilz block:
FS_LimitValueMonitoringHighRange
- Modified Pilz blocks
New versions are available of the following Pilz blocks:
 - FS_AbsoluteEncoder
 - FS_IncrementalEncoder
 - FS_TwoHandControl
 - FS_CounterDual
 - FS_CamController
 - FS_PositionToAngleThe changes are described in the block documentation in the online help.
- New PSSu modules
The following modules are supported:
 - PSSu H m F DPsafe SN SD
 - PSSu E S 2DOR 2(-T)
 - PSSu E S 2DOR 10(-T)
 - PSSu E S INC 24V se(-T)
 - PSSu K S 16DI
 - PSSu K S 16DO 0.5
 - PSSu K S RS232
- Project comparison
Two offline projects can be compared.
- Compare I/O mappings of projects
The I/O mappings of two projects can be compared.
- Show check sums
All check sums in a project are displayed in one view.

- ▶ Show project statistics

Project statistics can be displayed for a project, e.g. the number of devices, the number of IP connections, the number of POU's in IEC 61131 programming.

- ▶ Process diagnostics: Configuration of priorities, scopes and responsibilities

Priorities, scopes and responsibilities are now configured on separate tabs in the Diagnostic Editor.

(17826)

- ▶ Block protection

The procedure for protecting blocks has changed. The properties of write-protected, write and read-protected and sealed blocks have also changed. See online help.

- ▶ Licensing

When a project is licensed, the PASunits account may be on any PC in the network on which PAS4000 is installed. Previously, the PASunits account had to be on the PC on which the PAS4000 used to licence the project was installed.

Multi programming

- ▶ Execution order of basic blocks

The execution order for the basic blocks within a task is calculated by PAS4000 based on the positioning of the basic blocks in the Multi Editor and can be displayed.

If the resource assignment for two instances of a component block is comparable, the basic blocks for both instances are executed in the same order. The same applies to Multi programs with the same content.

- ▶ Creating IEC 61131 basic blocks

In Multi programming, IEC 61131 basic blocks can now also be generated from protected or sealed POU's.

Optimisations

- ▶ Project download

After a project download, the system no longer waits until all the devices have been rebooted. The download dialogue box can be closed beforehand.

(20424)

- ▶ Project report

The project report now only contains basic diagnostic items that are assigned to blocks.

(13649)

- ▶ PAS4000 and OPC Server on the same PC

If PAS4000 and the OPC Server are operated on the same PC, PAS4000 can now be closed without exiting the OPC Server.

(10954)

- ▶ Virtual PROFIBUS modules

During the build process, a warning is now issued if virtual PROFIBUS modules have not been I/O mapped.

(15447)

Multi programming

- ▶ Moving interface points on the point rail

It is now possible to move interface points on the point rail using drag and drop.

(19393)

- ▶ Building extensive Multi programs
The project can now be built reliably, even if a Multi program is very large and all the Multi program's basic blocks are assigned to the same task.
(19521)
- ▶ Parameter points of component blocks
When entering values for parameter points of component blocks, it is not necessary to state the data type (e.g. enter "44" instead of "INT#44").
(14010)

IEC 61131 programming

- ▶ Deleting sealed POUs
Sealed POUs can now also be deleted from the project.
- ▶ Problem view
The problems within a project are saved and can be viewed at any time in the problem view. This now applies even to projects added recently to the Project Manager.
(14825)
- ▶ Changing PI variable names
The I/O mapping for a PI variable is no longer lost when a function block is used as an IEC 61131 basic block in Multi programming and the name of the PI variable is overwritten in the function block's declaration part.
(19885)
- ▶ Block "GetMsTickCount"
The duplicate of the block "pssGetMsTickCount" with the name "GetMsTickCount" has been removed from the Elementary Library.
(19931)

Process diagnostics

- ▶ "<???" as location information
If "Terminal" or "Sensor/Actuator" is selected for the location information in a basic diagnostic item, but the I/O mapping for the corresponding PI variable has not been performed, "<???" will now be displayed in the diagnostic list and log instead of the location information.
(16119)
- ▶ Basic diagnostic items no longer prevent build
If a variable is used in the condition for a basic diagnostic item and a Pilz block within the project contains a variable of the same name, the build no longer fails.
(18691)
- ▶ User-defined responsibilities, scopes and priorities
It is now possible to delete user-defined responsibilities, scopes and priorities.
(19649)

Watch, control and force variables

- ▶ Variable watch of POUs
In the instance tree, if a POU is selected which is to be added to a variable list, only the interface variables (I-, O-, combined I/O and PI variables) of the POU are now added to the variable list; the local variables are no longer added.
(19765)

► Extension variables in protected blocks

If a sealed or write and read-protected block is added to a variable list, locally declared extension variables (e.g. valid bits) are now no longer visible in the variable list.
(19846)

Dynamic program display

► Multi programming: Changes to the CB/Multi program

Errors no longer occur if a CB/Multi program is changed while it or another instance of the same CB type is open in the Dynamic Program Display Editor.
(12171)

► Multi programming: Faster display

The values in dynamic program display are now updated more quickly.
(14181)

► Data types FS_I_FCU and FS_O_FCU

The content of variables of the data type FS_I_FCU and FS_O_FCU are now displayed in dynamic program display.
(19950)

Changes in Version 1.6.0

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ New Pilz blocks:

- FS_BurnerManagementSystem
- FS_BurnerManagementSystem_PLC

- ▶ New PSSu modules

The following modules are now supported:

- PSSu K F FCU

- ▶ PMI 5

PSS 4000-suitable products in the PMI 5 Series are now supported.

- ▶ Getting started

The Getting Started manual uses a simple example to describe how to create projects with PAS4000. The Getting Started manual is part of the online help and can be called up via *Help, Getting Started*.

(19323)

- ▶ Changes to the I/O Mapping Editor

There are some changes in the I/O Mapping Editor, for example:

- There are now more options for performing several I/O mappings at once, see online help.
- When the module bus I/O data is displayed, in the case of I/O data types with only a single element, this element can be hidden.

(19318)

- ▶ I/O mapping list

All the I/O mappings available within the project are displayed in the I/O mapping list.

The I/O mapping list is a view that provides various filter options. I/O mappings can also be copied from the list and pasted into a different project. It is also possible to copy into a CSV file (e.g. an Excel file) and to paste from a CSV file.

(18998)

- ▶ PROFIBUS-DP Slave Editor

The list is displayed showing the identification bytes of all the configured virtual PROFIBUS modules. It is used for comparison with the configuration in the PROFIBUS-DP Master.

(15049)


Multi programming

- ▶ Automatic resource assignment when blocks are inserted

If additional blocks are added to a component block/Multi program, these blocks are automatically assigned to a resource. This setting can also be disabled.

IEC 61131 programming

▶ Show/hide line numbers

There is now a button  on the PAS4000 toolbar which is used to show/hide the line numbers in the IEC 61131 Editors.

(6382)

Dynamic program display

▶ Multi programming: Open Multi Editor

It is now possible to switch from the Dynamic Program Display Editor to the Multi Editor in order to edit the Multi block (right-click in the Dynamic Program Display Editor and select *Open Multi Editor*).

(14993)

▶ IEC 61131 programming: Line numbers

Line numbers are now displayed during the dynamic program display of POUs.

(8642)

Optimisations**IEC 61131 programming**

▶ Display of check sum

The check sums of POUs are now displayed on a separate tab in the properties view.

(10292)

▶ IL Editor: Warnings and error messages

Even if the keyword "END_..." (e.g. END_PROGRAM) is outcommented, information on errors and warnings is still displayed when the mouse pointer is moved over an error or warning marking.

(9298)

▶ Content Assistant

The Content Assistant can now also be called up when the cursor is directly in front of a semicolon.

(18855)

Process diagnostics

▶ Entering location information

The entry of location information for a message or remedial action has been improved.

(15358)

▶ BDIs with the same name

It is now possible to create BDIs of the same name for different blocks in a project. BDI names must only be unique within a block.

(10211)

Changes in Version 1.5.0

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ STL Editor
IEC 61131 programming can now also be executed in STL (Structured Text Language).
- ▶ Windows 7
PAS4000 now also runs under the 64-Bit version of Windows 7.
- ▶ New Pilz blocks:
 - FS_Muting
 - FS_Muting_PLC
- ▶ Reboot
A device reboot can now be triggered in PAS4000. A device reboot corresponds to a cold start (switch voltage off and then on again).
- ▶ PMI 4
PSS 4000-suitable products in the PMI 4 Series are now supported.
- ▶ New PSSu modules
The following modules are now supported:
 - PSSu H m F DP SN SD
 - PSSu H m F DP ETH SD
 - PSSu H PLC1 FS SN SD-R
 - PSSu H FS SN SD-R
 - PSSu E S RS485(-T)
 - PSSu E AI SHT1(-T)
 - PSSu E F PS-P-R
 - PSSu E F PS2-R
 - PSSu E F 4DI-R
 - PSSu E F 2DI 60-R
 - PSSu E F DI OZ 2-R
 - PSSu E F 4DO 0.5-R
 - PSSu E F 2DO 2-R
 - PSSu E F 2DOR 8-R
 - PSSu E F AI I-R
 - PSSu E F AI U-R
- ▶ Hardware configuration: Create new device
When a new device is created, there are now filters to narrow the selection of product types. Alternatively, the order number can also be entered to select a product type.
(15286)

- Process diagnostics: Order of remedial actions
The order of the remedial actions can now be changed.
(10768)

Optimisations

- Build and download on different PCs
If a project is built on one PC and the project download is then executed using a different PC, the project on the second PC no longer needs to be rebuilt.
(14979)
- Menus in the Online Network Editor
The reset, restart, start and stop menus in the Online Network Editor have been restructured.
- Protection of project, level 2
When project protection is activated for a project, once the password for level 2 (read access) has been entered it is no longer possible to amend the project, nor is it possible to amend the user program in the Multi Editor.
(17438)
- Save the editors before scanning the network
Before performing the "Scan network" action, the user is prompted to save all the editors. If the user clicks on OK, all the editors are now saved, including the PSSu Module Editor.
(17989)
- Licensing: Overview of PASunits accounts
Accounts with 0 PASunits are now also displayed in the overview of PASunits accounts.
(13746)
- Search in the diagnostic log
The full text search in the diagnostic log now works.
(15207)
- Online actions
If a project was downloaded and the Multi Editor then opened, in rare cases it was no longer possible to perform online actions. This fault has now been rectified.
(18301)
- Removing projects from the Project Manager
Projects with project protection can now be removed from the Project Manager without having to enter a password.
(17883)
- I/O Mapping Editor
The "Overview of I/O mappings" table in the I/O-Mapping Editor can now be sorted in every column without error.
(14192, 16936)
- Project version
The project version can now be changed when a new project is created and also in the project properties of an existing project.
(13506)

Multi programming

- ▶ CB/Multi program no longer switches to an "unsaved" state for no reason
If you click on a type conversion block in a saved CB/Multi program, the CB/Multi program is no longer marked as changed and must no longer be resaved.
(14001)
- ▶ Build no longer fails due to a missing resource assignment
If a PI point in a component block is connected within the component block to a block which is not assigned to a resource, the build no longer fails.
(14855)
- ▶ Nested component blocks
The project can still be built even if the nesting level of the component blocks in a Multi program is greater than 4.
(17573)
- ▶ Inserting rows and columns
When inserting rows and columns in the Multi Editor, the number can now be entered via the keyboard.
(15271)
- ▶ Building the project
 - In many cases, projects containing Multi programs are now built faster.
(17278, 17977, 17609)
 - It is now rarer for the build of projects containing Multi programs to fail.
(17815, 18008)
- ▶ Renaming devices
In rare cases, Multi programs could no longer be opened after a device in the project had been renamed. This fault now no longer occurs.
(17587)
- ▶ Creating IEC 61131 basic blocks
If an IEC 61131 basic block is created from a POU that contains I-variables with the attribute R_EDGE or F_EDGE, these I-variables are now displayed as connection points.
(18004)
- ▶ Using the block FS_SafetyValve
The valve type is now configurable, even if the block is called up in a component block.
(18423)
- ▶ Connection between UINT and INT is prevented
The Multi Editor now correctly prevents connections being established between connection points of the UINT and INT data type.
(18545)

IEC 61131 programming

- ▶ Renaming POU
If a POU is renamed in the Project Manager (right-click on the POU, *Rename* option) and the POU is open, the name in the open POU is now updated.
(14524)
- ▶ Unreachable code in POU
If a POU contains operations that can never be executed, because they follow an unconditional jump for example, this no longer leads to an internal PAS4000 error.
(17385)

► Access to ARRAY elements

When accessing an ARRAY element, a variable can now be stated as well as a literal (e.g. "LD myArray[2, myVar]"), without this resulting in invalid error messages or warnings.

(17866, 18019)

► Formatting in comments

When saving, text in comments (e.g. keywords) is no longer formatted by PAS4000.

(6780)

► Content Assistant

In some cases, the Content Assistant could not be called up if there were comments at the start of the POU. This fault has now been rectified.

(9921)

Process diagnostics

► IEC 61131 programming: Migration of old projects

When a project has been migrated from PAS4000, Version 1.1.x to the current PAS4000 version, basic diagnostic items from Pilz blocks no longer become invalid.

(17657)

► PI-variable for location information

The sporadic fault whereby a PI-variable could not be selected for the location information when configuring a BDI has now been rectified.

(18616)

► Pre-defined conditions for BDIs

When configuring a BDI, all available pre-defined conditions are now displayed, even for variables of data type WORD.

(14743)

► IEC 61131 programming: Displaying BDI instances

If a function block in a POU was instantiated more than once as follows, the corresponding BDI instances in the Diagnostic Editor were not displayed and the diagnostics did not work:

myEstop1, myEstop2, myEstop3:FS_EmergencyStop_PLC;

This fault has now been rectified.

(18951)

► Display BDI properties

If the properties view is closed, it can now be opened by right-clicking on the BDI type in the Diagnostic Editor and selecting "Properties".

(15023)

Watch, control and force variables

► Multi programming: Current value for the I-variable of the VALID block

The current value for the I-PI point of a component block is now also displayed if the point in the component block is connected to the I-connection point on a VALID block.

(17849)

Dynamic program display

- ▶ IEC 61131 programming: Selecting the instance

If the program display is called up for a POU and the project only contains one instance of that POU, the program display will start immediately. It is no longer necessary to select the instance.

(6604)

Changes in Version 1.4.3

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

- ▶ Resetting a device

Even if a system section or the whole device is in a STOP condition, the device can be reset via the Online Network Editor of PAS4000.

(18445)

IEC 61131 programming

- ▶ Data types of resource global variables

If different data types are stated for the same resource global variable in the Resource Global Variable Editor and in a POU's declaration part VAR_EXTERNAL, this error will be detected during the build process. This also applies if the safety state is the only difference between the data types, e.g. INT and SAFEINT.

(18578)

- ▶ R_EDGE and F_EDGE

Pulse edge detection now functions without error when an I-variable with the attribute R_EDGE or F_EDGE does not have a value assigned before or when the function block is called.

(18608, 18642)

- ▶ Copy POU folder

When a POU folder is copied from one project to another, the POUs can then be edited in the target project, without having to restart PAS4000.

(18668)

Changes in Version 1.4.0

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ Windows 7
PAS4000 now also runs under the 32-Bit version of Windows 7.
- ▶ New Pilz blocks:
 - FS_SafeEthernetConnection
 - FS_CRC

Optimisations

- ▶ Naming a PC
After the PC naming operation has been performed, the user is informed that he needs to restart the PC manually.
(16660)
- ▶ Restore backup copy
Even if a project's content is hidden in the Project Manager, the backup copy of this project can still be restored.
(16348)
- ▶ Online task information
When a task is in a TERMINATED state, the task state is displayed correctly.
(16565)
- ▶ Message texts in the diagnostic list
Message texts (max. 512 characters) are now displayed in the diagnostic list in full.
(9622)

Multi programming

- ▶ Resource assignment
Resources only need to be assigned for basic blocks and no longer for Multi programs and component blocks.
(15001)
- ▶ Error marking on IEC 61131 blocks
If another POU is called within a POU and the other POU is deleted, the calling POU will be marked with an error symbol. If the calling POU is assigned to an IEC 61131 block, the IEC 61131 block will also now be marked with an error symbol.
(14701)
- ▶ Building when resource assignment is missing
If a block from the elementary library is connected to a block which is not assigned to a resource, the build will fail, which is correct. However, the user will now be given information on how to resolve the problem in the problem view.
(15246)

- Changing a non-instantiated component block
Changes to the interface points of a component block can now also be made if the component block is not instantiated in a Multi program.
(16458)
- Displaying the data types
The point's data type is one of the items displayed when the mouse pointer is moved over a block's interface point. The data type is now also displayed correctly when *Abbreviations for data types* is activated in the tool settings.
(16552)
- Building with a certain block combination
Two user-programmed IEC 61131 blocks are available; one function is assigned to each. If the output on the first block is connected to a type conversion block, whose output is in turn connected to the second block, a build is now possible.
(16913)
- Sequence of the interface points on IEC 61131 blocks
Showing and hiding interface points no longer influences the sequence of the interface points on the IEC 61131 block. The interface points are now displayed in the same sequence in all instances of an IEC 61131 block.
(15766)
- Sequence of the interface points on component blocks
The interface points on a component block are now displayed in the same sequence as in the open component block.
(15929)

IEC 61131 programming

- Multi-dimensional arrays (ARRAY)
The process of saving POU's in which arrays with many dimensions are used is now faster.
(12313)
- IL Editor: Show and hide code
Nested code can now be shown and hidden.
(15349)

Process diagnostics

- IEC 61131 programming: BDI instances are copied
If a sealed POU is copied into a project and another POU containing basic diagnostic items is called from within the POU, the basic diagnostic items are now copied with it.
(13026)
- Changing the location information requires a rebuild
Now the project must also be rebuilt if the *Kind* setting is changed in the location information of a basic diagnostic item.
(16909)
- Sorting BDIs
In the Diagnostic Editor, basic diagnostic items can now be sorted alphabetically.
(11437)

Watch, control and force variables

- ▶ Variable watch even when FB is empty
If a variable list contains a function block with an empty instruction part, this no longer has any influence on watching other variables in the list.
(8100)
- ▶ Forcing variables of the DATE or DATE_AND_TIME data type
When a variable of the DATE or DATE_AND_TIME data type is forced, the value that has been entered is now used for forcing.
(15472)
- ▶ Multi programming: Insert from instance tree
Variables can now be dragged from the instance tree of a component block or Multi program to a variable list.
(15721)
- ▶ Forcing the valid bit
The valid bit can now be forced irrespective of the corresponding I-PI variable.
(14607, 15691)

Dynamic program display

- ▶ Multi programming: Name display of CB type and CB instance
When dynamic program display is run on a component block, both the name of the CB type and the name of the CB instance are displayed.
(16645)

Changes in Version 1.3.2

This version is available in the following languages:

- German
- English

New functions

Function blocks **_PLC** for IEC 61131 programming

For some safety functions there are now function blocks available with a block interface that has been optimised for IEC 61131 programming:

- FS_EmergencyStop_PLC
- FS_EnableSwitch_PLC
- FS_FootSwitch_PLC
- FS_LightCurtain_PLC
- FS_OperatingModeSelectorSwitch_PLC
- FS_OutputFBL_PLC
- FS_SafetyGate_PLC

Optimisations

- FS_CamController

There is a new version of the block FS_CamController (Camshaft electr.) available in the PAS4000 library.

- IEC 61131 programming

- Safety state of POU

In IEC 61131 programming, an FS-POU becomes an FS-POU with mixed input interface only in the following circumstances:

- Declaration of an I-PI variable that is **not** an FS data type
- Declaration of a variable of type VAR_INPUT, VAR_IN_OUT or VAR_EXTERNAL, that is **not** an FS data type
- Call/instantiation of a POU in which an I-PI variable or a VAR_EXTERNAL type variable is declared, which is **not** an FS data type
(16597)
- Open POU
Even if there are many projects in the Project Manager, PAS4000 no longer crashes when opening a POU.
(16801)
- Copying POU folders
After copying and pasting a POU folder POU's can be edited in the folder without errors occurring.
(17134)

- Renaming or deleting variables

It is now possible to rename or delete variables that are used in several basic diagnostic item conditions, without errors occurring.

(17145)

- ▶ Process diagnostics: Diagnostic messages after renaming a POU

The linked basic diagnostic items remain when renaming a POU. The diagnostic messages are displayed correctly.

(16804, 16808)

Changes in Version 1.3.1

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

- ▶ Potential safety problem on FS resources with multiple tasks
A potential safety problem on projects containing more than one task in an FS resource has been rectified.
(17135)
- ▶ Potential problem on ST resources with multiple tasks
A potential problem on projects containing more than one task in an ST resource has been rectified.
(17135)

Changes in Version 1.3.0

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

Multi Editor

The Multi Editor provides a graphics editor for creating the user program in accordance with the component model. Blocks are merged into programs via connection lines. Component blocks can be used to structure programs in a hierarchy. The following blocks can be used in the Multi Editor:

- ▶ Function blocks and functions created by the user in IEC 61131 programming
- ▶ Component blocks created by the user
- ▶ Standardised IEC 61131 blocks for basic functions and PSS 4000 system blocks for system-based functions which are provided by Pilz
- ▶ Pilz blocks for applications such as E-STOP pushbuttons, presses

Optimisations

- ▶ IEC 61131 programming
 - Displaying POU protection
In inactive projects, the *Protection* tab is now displayed in the POUs' properties view. (14775)
 - Safety state of functions
The safety state (FS, ST) is now defined in accordance with a function's content. (9983)
 - Copying a large number of POUs
Multiple POUs can now be copied and pasted into a project without error. (14595)
 - Sealing ST-POUs
Even ST users can now seal ST-POUs. (14597)
 - Copying in the Compare Editor
If two POUs with identical names (from different projects) are compared and the content of one POU in the Compare Editor is copied into the other POU, identical check sums are also now calculated. (8601)
 - Copying POUs
If POUs are copied into a project, this no longer affects the I/O mappings in the project. (14778)

- ▶ Diagnostics in general
 - Displaying the diagnostic log
Errors in the display of the diagnostic log have been rectified.
(14793)
- ▶ System diagnostics
 - Incomplete remedy for system messages
All remedial actions are now displayed for system messages in the diagnostic list.
(11124)
- ▶ Process diagnostics
 - Array element or structure element in the condition
If an array element or structure element is used as a variable in the condition for a diagnostic message, the condition is now evaluated correctly. If the condition is "TRUE", the diagnostic message is displayed.
(16097, 16098)
 - No process diagnostics on Pilz blocks
The display of diagnostic messages now also works for Pilz blocks of Version 1.0.0.
(15314)
 - Resource global variables in the condition
IEC 61131 programming: If a resource global variable is used in the condition for a basic diagnostic item, an instance of the BDI is displayed first if the resource global variable is referenced in a POU as VAR_EXTERNAL.
(12775)
 - BDI instances for Pilz blocks are missing
IEC 61131 programming: If a Pilz block is instantiated in a function block, the instances for the basic diagnostic items are now also created.
(14158)
 - BDI instances of Pilz blocks are not deleted
IEC 61131 programming: If a Pilz block is instantiated in a POU and the POU is deleted, the instances of the Pilz block's basic diagnostic items are also now deleted.
(14263)
 - BDI instances of Pilz blocks are not copied
IEC 61131 programming: If a Pilz block is instantiated in a POU and the POU is copied, the instances of the Pilz block's basic diagnostic items are also now copied.
(14315)
 - Copying the basic diagnostic items of Pilz blocks
Basic diagnostic items of Pilz blocks can now be copied from one project to another.
(14228)
 - Renaming free basic diagnostic items
BDIs that are not connected to a block can now be renamed.
(10752)
- ▶ Watch, control and force variables
 - Changing the display format
Incorrect values are no longer displayed when the display format is changed.
(14926)

- Resource global variables with valid bit
If a resource global variable is added to a variable list and a VALID extension has been declared for that variable, the valid bit is now also added to the variable list automatically.
(14863)
- Renamed blocks are not watched
If a POU/block is renamed, the variable lists are now also updated automatically.
(10336)
- No update when clicked
Clicking on a variable no longer affects the watching of other variables in the variable list.
(7766)
- ▶ Dynamic program display
 - IEC 61131 programming: Stopping after running for an extended period
Dynamic program display runs stably.
(15264)
 - Not all devices online
Dynamic program display can now also be run when not all devices in the project are connected to SafetyNET p.
(15332)
- ▶ Administrator rights in order to run
Administrator rights are no longer required to run PAS4000.
(12665)
- ▶ PC not OPC Server
A project can now also be built when a PC is added to the project as a device that is not configured as OPC Server.
(11090)
- ▶ Configuration of the SNTP Server
When the window for configuration of the SNTP Server is opened, the current configuration is now displayed.
(14536)
- ▶ Changing the IP address of the SNTP Server
If the IP address of the device operating as the SNTP Server is changed, the configuration of the SNTP Server is now updated automatically.
(14184)
- ▶ PROFIBUS-DP Slave configuration
The current setting for "Swap bytes" is now displayed correctly in the PROFIBUS-DP Slave Editor.
(14765)
- ▶ Online action allegedly active
Execution of an action is no longer refused on the grounds that an online action is being performed, when no online action is active.
(14791)
- ▶ Download
Reliability of the download and the messages during download has been increased.
(14792, 14962, 15027, 15340)

- SafetyNET p connections
Large amounts of data can now be exchanged between devices because multiple SafetyNET p connections are provided.
(14844, 14234)
- *Find and replace* action
The *Find and replace* action is now limited to the active editor.
(14871)
- Restore backup copy
It is no longer necessary to rebuild the project after a backup copy has been restored.
(15817)
- Online task information after languages are switched
The online task information is now displayed after the tool language is switched from English to German.
(15869)
- Unknown projects in Project Manager
Even after a large number of online actions have been performed, unknown projects with 16-digit numerical names no longer appear in the Project Manager.
(10619)
- Check sum "FS Project" when naming data is changed
If the naming data of a device with an FS resource and/or FS modules is changed, the check sum "FS Project" is now also changed.
(12518)
- Device naming
The entry of invalid characters in device names is now prevented.
(14628)
- Cross reference list: Displaying the basic diagnostic items
The basic diagnostic items are now also displayed in the cross reference list for variables that are used in the condition for a basic diagnostic item.
(5818)
- Raw UDP connections
Raw UDP connections with a "Transmission/Reception" role can now be I/O mapped because separate arrays (ARRAY) are generated for send data and receive data.
(13943)
- ARRAYS
Arrays can now be saved and edited more quickly.
(11947, 13003, 15024)
- Automatic activation of a project
A project is no longer activated automatically when PAS4000 is started.
(15643)
- *Go To* menu option in problem view
If *Go To* is selected in problem view and the target is the PSSu Module Editor, the Editor is now opened and the problem is highlighted.
(6129)

► Editing a project on different PCs

If a project is saved and edited alternately on different PCs, there are no longer any problems when building.

(6547)

Changes in Version 1.2.5

This version is available in the following languages:

- ▶ German
- ▶ English

FS_CamController The block FS_CamController (electr. rotary cam arrangement) is not supplied in the current version of PAS4000. The block that was previously supplied (Version 1.0.0) may only be used in consultation with Pilz. A new version of the block will be available soon. Please contact Pilz if you wish to use this block.

Optimisations

- ▶ IL programming: Operations S and R
In FS POU's, the operation S or R can now also be used on elements of an array that has been declared as a resource global variable.
(15375)
- ▶ SafetyNET p communication
If the I/O mapping or resource assignment is changed in a project and the project is subsequently not downloaded to every device, SafetyNET p communication between the devices affected by the change will be prevented.
(15090)

Changes in Version 1.2.4

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

SafetyNET p

Data transfer has been optimised. It is now possible to transfer more data of the BOOL data type between SafetyNET p subscribers. This optimisation does not affect the transfer of data of other data types.

Changes in Version 1.2.3

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

Valid bit

When a resource is running on a PSSu system and valid bits from inputs on other PSSu systems are processed within it, it now receives correctly set valid bits.

(14676)

Changes in Version 1.2.2

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

- ▶ Build project
Projects can now be built irrespective of whether or not the resource assignment has already been made.
(14513)
- ▶ Topics displayed in online help
All help topics are now displayed correctly in the online help.
(14477)
- ▶ Online help in German
If the tool language is set to German in PAS4000, the online help is also shown in German.
(14459)

Changes in Version 1.2.1

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

- ▶ Newly supported modules
 - PSSu H PLC1 DP SN SD
 - PSSu K S 8DI 8DO 0.5
 - PSSu XB F-T
 - PSSu XR F-T
- ▶ Licensing

A licensing system has been introduced for PAS4000.
- ▶ Online help

The online help contains a description of the key functions of PAS4000, the complete programming manual and a description of the Pilz blocks.
- ▶ Project

A project can now contain 512 devices.
- ▶ Project protection

Access to projects can be protected through passwords. There are two levels: read-only and unlimited access.
- ▶ I/O mapping
 - I/O mapping can be performed before the resource assignment.
 - Complete structures (I/O data types) and arrays can be mapped.
- ▶ Build

There is now an option to rebuild just the changes. This speeds up the build process considerably.
- ▶ Create backup copy

All the files in a project can be saved in a file for backup purposes or for transferring the project.
- ▶ Tool settings

Some default settings for working with PAS4000 can now be made in the tool settings.
- ▶ IEC 61131 programming

PI variables can be declared as arrays.

Optimisations

- ▶ Device naming

Device naming can also be performed when a device is in a different subnet to the PAS4000-PC.

► IP Connections Editor: Modbus/TCP Client

The permitted value ranges for data lengths on the various function codes are now implemented correctly.

(10830)

Changes in Version 1.1.3

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

Dynamic program display

The dynamic program display can now also be executed for comprehensive POU's with several hundred variables and lines.

Process diagnostics

Several optimisations in the process diagnostics area have been implemented.

Changes in Version 1.1.2

This version is available in the following languages:

- ▶ German
- ▶ English

New functions

Task information in the OPC namespace

The minimum, maximum and current scan time for each task is now displayed in the namespace.

Optimisations

Download time reduced

The download time for a project with process diagnostics has been considerably reduced.

Diagnostic Editor

Instances of basic diagnostic items are now displayed correctly for Pilz blocks.

Time stamp in diagnostic list and diagnostic log

Different time stamps are no longer displayed for the same entry in the diagnostic list and diagnostic log.

Location information in the process diagnostics

Location information in the process diagnostics is now displayed correctly.

Valid bit for external data from Modbus/TCP

It is now possible to build projects in which PI variables with valid bit are declared, which are mapped to external data from Modbus/TCP.

Error message: "Java heap space"

The error message "Java heap space" no longer appears when building or downloading and PAS4000 operates correctly.

Changes in Version 1.1.1

This version is available in the following languages:

- ▶ German
- ▶ English

Optimisations

An internal error in the management of the block library (Pilz blocks, standardised functions and function blocks) has been rectified.

We recommend that you no longer use Version 1.1.0 of PAS4000.

Support

Technical support is available from Pilz round the clock.

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