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PSSuniversal

Programmable control systems PSS®

System Description – No. 21256-EN-04

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SD means Secure Digital.

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1.1 Validity of the documentation

This documentation is valid for PSSu systems in system environment A.
A PSSu system in system environment A may be used in the

- Decentralised system PSSu I/O with SafetyBUS p
- Decentralised system PSSu I/O with ST fieldbuses such as CANopen, DeviceNet
- **Not** in the automation system PSS 4000

It is valid until new documentation is published.

The latest documentation is always enclosed with the product.

1.2 Overview of the documentation

1 Introduction

The introduction is designed to familiarise you with the contents, structure and specific order of this system description.

2 Overview

This chapter contains a brief description of what constitutes a PSSu system.

3 Safety

This chapter must be read as it contains important information on safety regulations.

4 Basics

This chapter describes the PSSu system as a whole and provides configuration guidelines.

5 PSSu systems on SafetyBUS p

This chapter shows how the PSSu systems are connected to SafetyBUS p.

6 Commissioning

This chapter describes the commissioning process step-by-step and explains the aids that are available.

7 Diagnostics

This chapter contains a description of the available diagnostic procedures.

8 Appendix

The appendix contains information in table format.

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1.3 Definition of symbols

Information that is particularly important is identified as follows:



DANGER!
This warning must be heeded! It warns of a hazardous situation that poses an immediate threat of serious injury and death and indicates preventive measures that can be taken.



WARNING!
This warning must be heeded! It warns of a hazardous situation that could lead to serious injury and death and indicates preventive measures that can be taken.



CAUTION!
This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.



NOTICE
This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken.



INFORMATION
This gives advice on applications and provides information on special features, as well as highlighting areas within the text that are of particular importance.

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2.1 General

A PSSu system is assembed from a variety of modules, to suit the functions required. The modular structure makes it easier to react to modifications and adjustments.

The scope of a PSSu system can also be adapted retrospectively, e.g. by

- Extending the number of I/Os
- Modifying the I/O technology
  (e.g. by using relay outputs instead of semiconductor outputs)
- Adding I/O functions
  (e.g. by retrospectively adding analogue evaluation, counter functions, temperature evaluation)

PSSu systems can be assembled for

- Safety-related tasks
  Module selection must be based on failsafe modules (FS modules).
- Non-safety-related tasks
  Standard modules (ST modules) may be selected.
- Safety-related and non-safety-related tasks
  The PSSu system can be assembled using a mixture of FS and ST modules.

SafetyBUS p is the preferred system to use for safety-related networked tasks.
Data transfer via SafetyBUS p is based on CAN technology. The safety of the data transfer is achieved through the protocol. The protocol includes the following security mechanisms:

- Formation of CRC sums
- Echo mode
- Connection tests
- Addressing tests
- Time monitoring functions

2.2 Objective of the PSSu system

The objective in using PSSu systems is to achieve the following:

- Standard and safety in one product
- Multifunctionality
- Function and performance range tailored exactly to the application
- Flexibility and expandability
- Less work involved in installation, commissioning and maintenance
- Greater availability
- Uncomplicated control of safety-related systems
- Standardised functionality for safety-related components

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2.3 Features of the PSSu system

PSSu systems are characterised by the following features:

- The head module determines the application range of a PSSu system, for example:
  - Application as a decentralised I/O system
  - Connection to various fieldbus systems
  - Safety-related communication via SafetyBUS p
  - Safety-related communication via PROFINET with PROFIsafe Profil
- The input/output modules determine the functions of a PSSu system, for example:
  - Digital input/output
  - Analogue input/output
  - Counter for incremental encoder and absolute encoder
- Using the local enable principle, an ST control system can switch the FS outputs on a PSSu system via an ST bus system.
- Only the base modules are hard-wired, so electronic modules can be exchanged without having to rewire.
- Wireless links can be established for data transfer using InduraNET p from Pilz.

2.4 System software for PSSu systems

System software is available to provide support when designing and assembling a PSSu system, configuring modules and during the wiring test. It consists of the following parts:

PSSuniversal Assistant

The PSSuniversal Assistant is a software package that provides support for designing and assembling PSSu systems. The software is available licence-free and can be used independently from the system software PSS WIN-PRO.

The PSSuniversal Assistant has the following function range, for example:

- Create project with PSSu systems and assemble PSSu systems
- Configuration of module parameters
- Generate project parts list
- Update modules' firmware
- Print/documentation

PSSuniversal Configurator

The PSSuniversal Configurator is a software package used to configure a PSSu system for SafetyBUS p or PROFINET/PROFINET with PROFIsafe profile. The software can only be used in conjunction with the SafetyBUS p Configurator of the PSS WIN-PRO system software or the Siemens software SIMATIC STEP 7 - HW Config.

The PSSuniversal Configurator has the following function range, for example:

- Assemble PSSu system
- Configure PSSu system for SafetyBUS p
- Configure PSSu system for local enable principle
- Configuration of module parameters
- Configure PSSu system for PROFINET or PROFINET with PROFIsafe profile

  A licence for PSSuniversal Startup is required to download the FS configuration to a PSSu system via the Siemens software SIMATIC STEP 7 – HW Config.
- Print/documentation

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2.4 System software for PSSu systems

PSSuniversal Startup

PSSuniversal Startup is a software package used to test the wiring of a PSSu system connected online. A separate licence is required for the software. The software has the following function range, for example:

- Upload the system data of a PSSu system
- Test the wiring of the inputs on a PSSu system
- Test the wiring of the outputs on a PSSu system (forcing)
- Display system properties and system information
- Read error stack
- Print/documentation

PSSu systems can be assembled using both the PSSuniversal Assistant and PSSuniversal Configurator. However, it is easier and clearer to assemble a system while designing a configuration with the PSSuniversal Assistant. Already assembled PSSu systems can be imported in both system software sections.

Once installed, all the above system software sections are available. PSSuniversal Assistant and PSSuniversal Startup can be launched via the "Programs" directory" or a desktop icon, while PSSuniversal Configurator can only be launched via the SafetyBUS p Configurator of the PSS WIN-PRO system software or the Siemens software SIMATIC STEP 7 - HW Config.

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3.1 General guidelines

Please refer to the safety guidelines in the operating manual for the products you are using, and in the “Safety Manual PSS 3000”. The safety manual also includes check lists designed to help you with the safety-related planning, construction and operation of a plant.

You should also refer to the information provided

- In the PSSuniversal Installation Manual
- In the system software's online help

The standards current at the time of going to print shall apply.

3.2 Intended use

A PSSu system is designed for use in an industrial environment as follows.

- Safety-related applications in the FS section, including connection to safe bus systems
- Non-safety-related applications in the standard section, including connection to standard bus systems.

Before using a PSSu system in safety-related applications it is necessary to perform a safety assessment in accordance with the Machinery Directive.

In principle, PSSu systems can be used in any situation where the result of the risk assessment indicates they may be used. However, they are primarily suitable for use in machine safety circuits in which a safe condition is brought about by the removal of power.

Examples:

- Presses
- Transfer lines
- Tank storage facilities
- E-STOP functions
- Burner control systems
- Cable cars/traction operations
- Stage technology
- Process engineering

The following is deemed improper use in particular:

- Any component, technical or electrical modification to a product
- Use of a product outside the areas described in the product documentation
- Use outside the documented technical details.

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3.3 Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by competent persons.

A competent person is someone who, because of their training, experience and current professional activity, has the specialist knowledge required to test, assess and operate the work equipment, devices, systems, plant and machinery in accordance with the general standards and guidelines for safety technology.

It is the company's responsibility only to employ personnel who:

- Are familiar with the basic regulations concerning health and safety / accident prevention
- Have read and understood the safety guidelines given in this description
- Have a good knowledge of the generic and specialist standards applicable to the specific application.

3.4 Failsafe inputs/outputs

In FS applications, it is essential that short circuits and open circuits are unable to cause a hazardous condition within a plant.

The way in which this is done will depend on the degree of hazard from the plant section, the switching frequency of the sensors and the level of safety of the sensors and actuators. These points must be assessed in conjunction with the certification body responsible for safety (e.g. BG, TÜV).

Depending on the application area and its respective regulations, the FS section can be used up to SIL CL 3 of EN 62061 and up to PL e (Cat 4) of ISO 13849-1.

Various tests may be configured on FS input/output modules. These tests can be used to detect many short circuits and open circuits. Examples of such tests are:

- Off tests for outputs that are switched on
- On tests for outputs that are switched off
- Tests for shorts between the outputs
- Test pulses for detecting shorts between contacts on inputs

Wiring guidelines and connection examples are available in the operating manuals or data sheets for the input/output modules.

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4.1 Structure of a PSSu system

A PSSu system is a modular, programmable system for controlling plant and machinery. For PSSu systems there is a system software consisting of PSSuniversal Assistant, Configurator and Start-up. The system software provides support as you select, configure and commission components. A PSSu system consists of:

- One head module
- At least one supply voltage module
- Input/output modules for standard and failsafe applications
- End bracket to secure the system at the start
- Terminating plate with integrated bus terminating resistors and end bracket to secure the system at the end

Head module:

- Connects the sensor/actuator level for standard applications with standard fieldbus systems (e.g. PROFIBUS-DP)
- Connects the sensor/actuator level for failsafe applications with SafetyBUS p
- Co-ordinates the entire process data traffic

Supply voltage modules:

- Consist of an electronic module and a base module
- Are available for various functions

Input/output modules:

Input/output modules are available in different designs:

- Electronic module and base module
- Compact module

The input/output modules are available for a wide range of input/output functions.

Designs:

Electronic modules and base modules:

The electronic modules determine the function of the supply voltage or input/output module.

- Electronic modules
  - Are plugged into the base modules
  - Communicate with the head module via the module bus

4.1 Structure of a PSSu system

The base modules are the carrier units for the electronic modules.

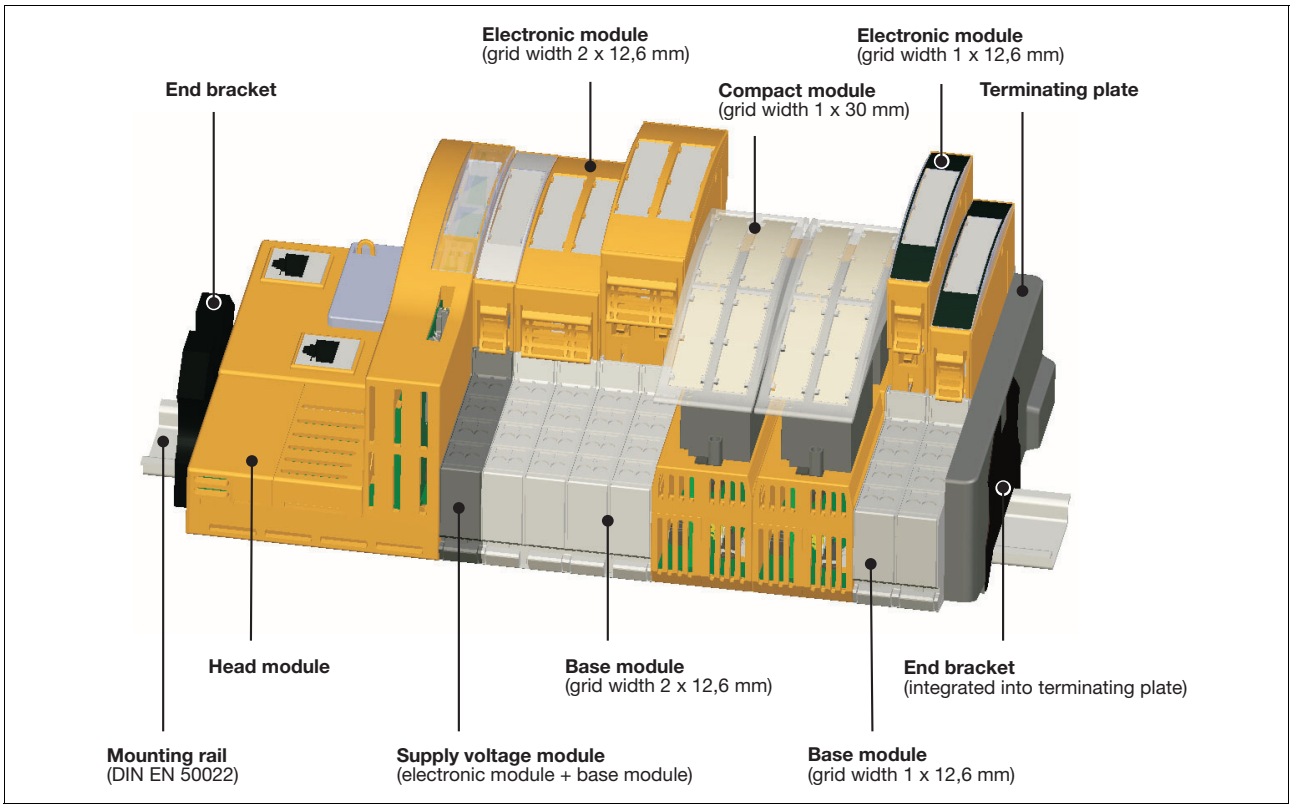
- Base modules
  - Are used to connect the field wiring
  - Are available with the following connection types:
    Cage clamp terminals or screw terminals

Compact modules:

The compact modules combine the function unit (inputs and/or outputs) and connection levels in one housing. Wiring is via multi-pin connectors with spring-loaded terminals, which are plugged into the connector strips on the module.

Compact modules

- Do not need base modules
- Are used to connect the field wiring
- Communicate with the head module via the module bus



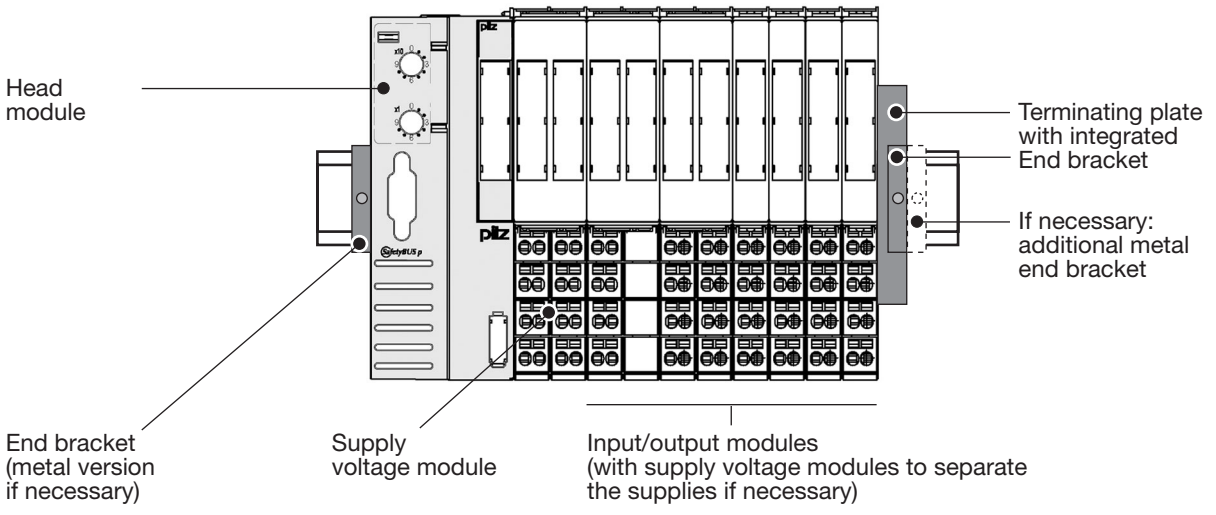
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4.2 Module layout

- The first module on a PSSu system is always a head module.
- A supply voltage module is always connected to the right of the head module
  - To provide the module supply (supply for the head module and the input/output modules)
  - To provide the periphery supply (supply for the sensors and actuators)
  - On the head module for an InduraNET p remote system, the supply voltage is already integrated. There is no need for a supply voltage module.
- Input/output modules for FS and ST applications may follow on to the right:
  - The input/output modules may be installed in any order.
  - Input/output modules for FS applications and ST applications may be combined as required.
  - If modules of the same function are combined into groups it makes things clearer and simplifies the wiring.
  - Base modules with screw terminals cannot be mixed in one PSSu system with base modules with cage clamp terminals.
  - A base module with screw terminals may not be installed to the left of a compact module.
  - The maximum number of input/output modules is determined by the system limits.
  - Input/output modules for FS applications may not be used with head modules that are only designed for ST applications.
- Additional supply voltage modules may be required in order to refresh the module supply or periphery supply.
- Supply groups require an additional voltage supply module at the start of each group. The modules belonging to the supply group will then follow to the right.
- The final element in a PSSu system is always a terminating plate containing the terminating resistors for the module bus.
- The system is attached to the mounting rail using fastening elements at the start and end of the system. The following end brackets are available, depending on vibration and shock stress:
  - Plastic version (standard)
  - Metal version (where there is increased stress)

4.2 Module layout

Layout of the fastening elements:



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4.3 Module descriptions

The module descriptions provide information on their function. The descriptions are made up of multi-level combinations of letters and numbers. All module names begin with **PSSu**. This is followed by:

- **H** for head modules
  e. g.: PSSu **H** SB DP
- **E** for electronic modules, followed by:
  - **S** for standard module,
    e.g.: PSSu **E S** 4DI
  - **F** for failsafe module,
    e.g.: PSSu **E F** 4DI
- **K** for compact modules, followed by:
  - **S** for standard module,
    e.g.: PSSu **K S** 16DI
  - **F** for failsafe module,
    e.g.: PSSu **K F** 16DI
- **B** for base modules,
  e.g.: PSSu **B**P 1/8S

Base modules	Basic function	Size	Connection type	Additional function
PSSu B...	PSSu **BP**... – Base module for periphery (input/output) PSSu **BP-C**… – Base module for periphery with C-rail PSSu **BS**... – Base module for power supply PSSu **BS-R**... – Base module for refreshing the power supply	PSSu BP-C **1/8...** – 1 x grid width, 8 connections PSSu BP-C **1/12...** – 1 x grid width, 12 connections PSSu BP-C **2/16…** – 2 x grid width, 16 connections PSSu BP-C **2/8...** – 2 x grid width, 8 connections	PSSu BP-C 1/8**C** – Cage clamp terminals PSSu BP-C 1/8**S** – Screw terminals	PSSu BP 1/8S-**J** – Integrated cold junction compensation

Link modules have individual letter codes, depending on their application, e. g.:

- PSSu **W**B S IDN, PSSu **W**R S IDN (for wireless communication with InduraNET p)
- PSSu **X**B F-T, PSSu **X**R F-T
  (for cable-based subdivision)

The accessories of the PSSu systems are designated **PSSu A...** .

PSSu modules are available which are suitable for use in applications with increased environmental requirements on temperature and humidity. These are called coated versions of PSSu modules. The functionality of the coated versions of PSSu modules is no different from that of un-

4.3 Module descriptions

coated modules. They are identified by a "**-T**" at the end of the product name, e.g.: PSSu E F DI OZ 2**-T.**

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4.4 Module bus

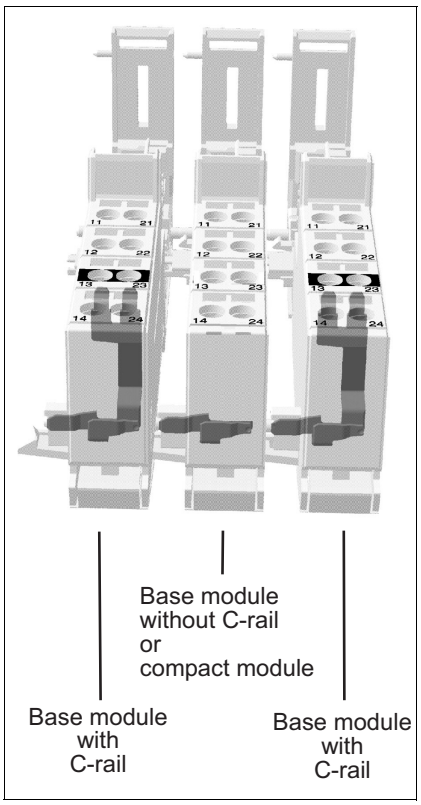
The module bus supplies the modules of a PSSu system with voltage and transfers data between the head module and the electronic/compact modules. The module bus is formed by arranging the base modules/compact modules together and connecting them via a mechanical latch.

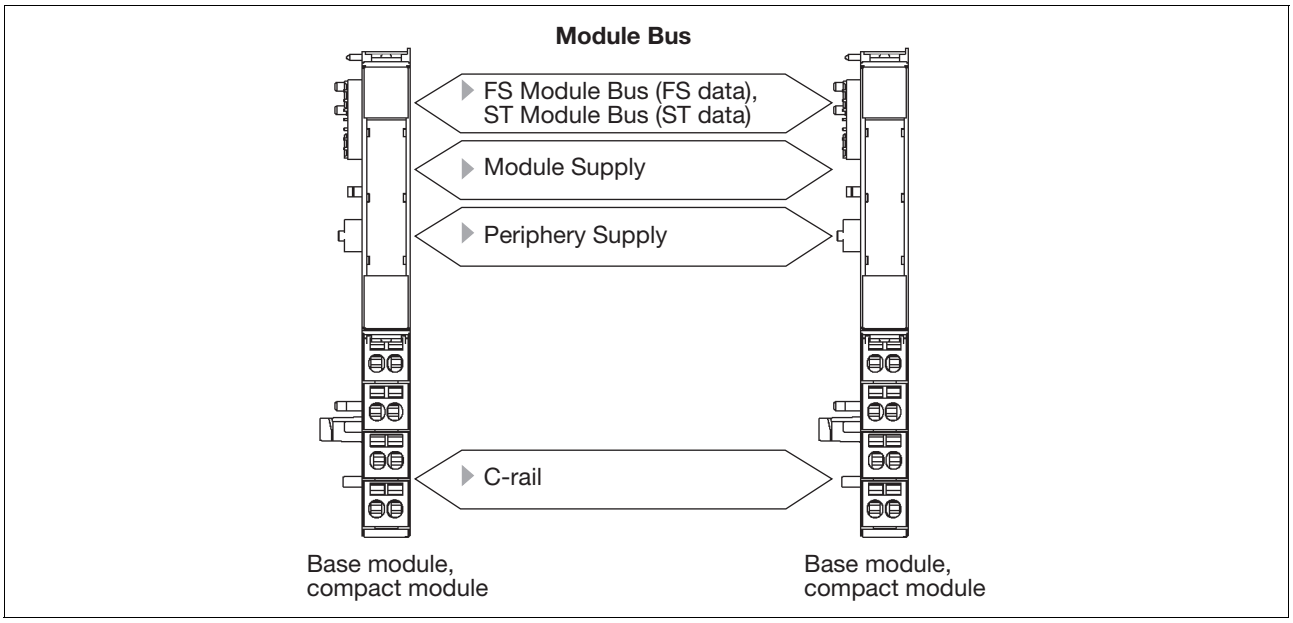
The module bus is structured as follows:

- Data bus
  two separate bus systems for failsafe data (FS module bus) and standard data (ST module bus).
- Supply voltage for:
  - Module supply
    The module supply is the internal supply voltage for the head module and electronic modules.
  - Periphery Supply
    The periphery supply supplies 24 VDC to the sensors and actuators on digital input/outputs on electronic modules. On compact modules, the supply for the inputs is generated from the periphery supply; the supply for the outputs must be fed to the module terminals. The connection on the module bus can be disconnected in order to form supply groups.
- C-rail ("cross connection")
  The C-rail is an additional, free power rail. Access to the C-rail is available via base modules that contain the letter "**-C**" in their description (e.g. PSSu BP**-C** 1/8 S, PSSu BP**-C** 1/8 C).
  The C-rail supply must belong to the same circuit as the other base module connections. Connecting PE to the C-rail provides a simple

4.4 Module bus

form of shield. On the compact modules, the C-rail is only looped through and is not available at the terminals.





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4.5 Connections on the base modules

The connections on the base modules are divided into connection levels and connection columns. The connections have a two-digit number.

- The first digit denotes a base module's connection column (e.g.: connection **2**3 is in the second column).
- The second digit denotes a base module's connection level (e.g.: connection 2**3** is in the third level).

The function of the base module connections depends on the electronic module.

4.5.1 Connection levels on input/output modules

On input/output modules, the connection levels are typically arranged as follows:

- Connection level 1 and 4
  Input and output connections
- Connection levels 2 and 3
  Connections for the common supplies (periphery supply, analogue inputs/outputs or screening)

Many input/output modules may have two more connection levels:

- Connection level 5 and 6
  Connections for the common supplies (periphery supply, analogue inputs/outputs or screening)

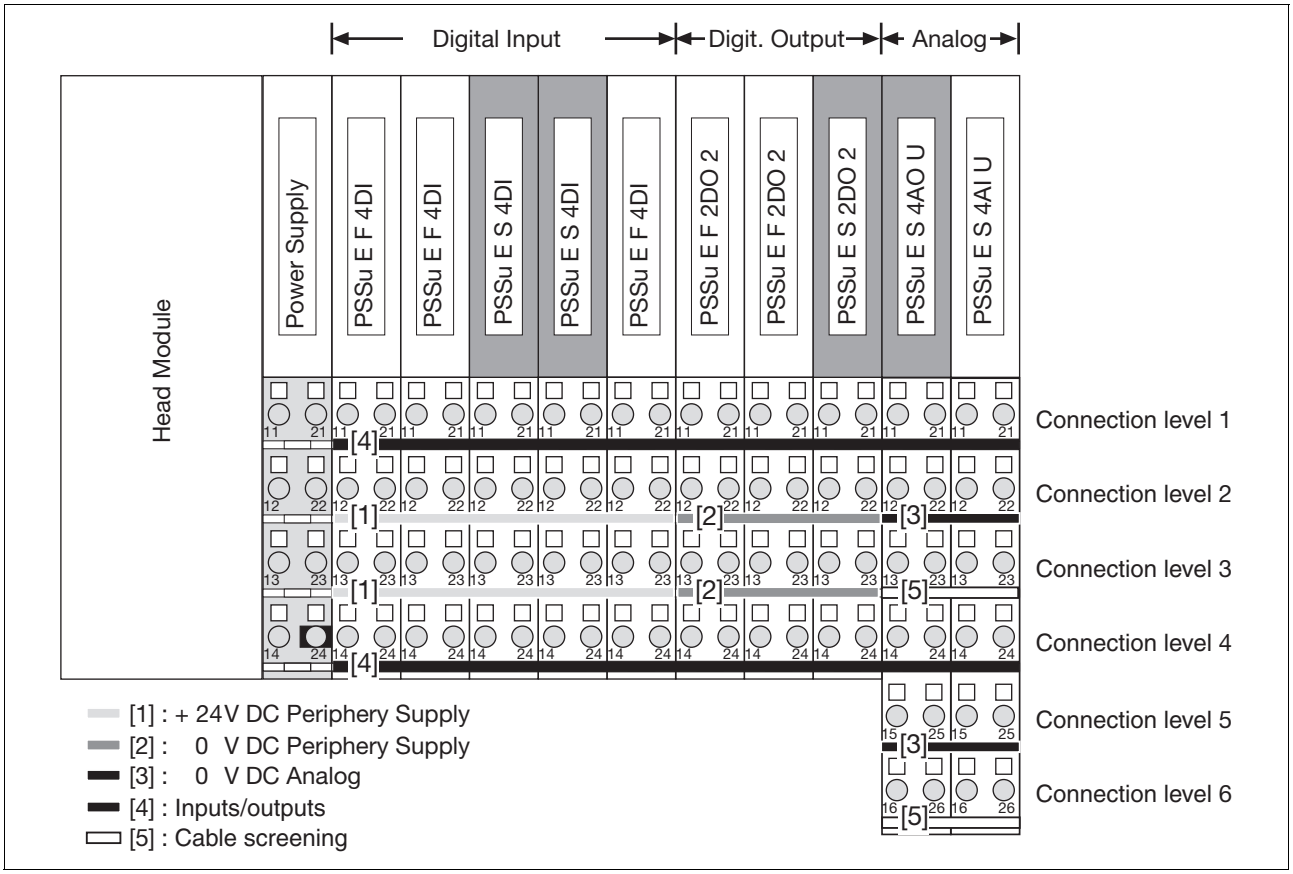
Input/output modules can be installed in any order. However, for the connection diagram to be consistent it makes sense to arrange input/output modules of the same type into groups and not have them interrupted by compact modules (see example).

4.5 Connections on the base modules

4.5.2 Colour marking on the connection levels

The colour marking on the connection levels is a wiring aid. Various colour markers are available for labelling. The colour markers can be used to label different supplies. This way the connection levels remain clearly visible, even after wiring.

Example:



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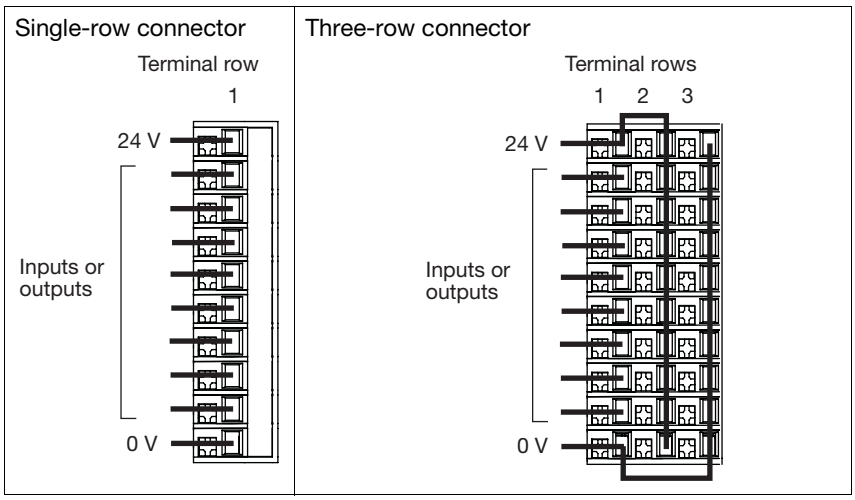
4.6 Connections on the compact modules

The connections on the compact modules are divided into terminal rows. Single or three-row connectors with spring-loaded terminals can be plugged into the device's single-row 10-pin connector strip.

The function of the connections depends on the compact module.

- Terminal row 1
  Connection of the inputs and outputs, periphery supply (24 V and 0 V).
- Terminal row 2
  All connections are linked; bridged to the 24 V periphery supply connection from the first connection level
- Terminal row 3
  All connections are linked; bridged to the 0 V periphery supply connection from the first connection level

Input/output modules can be installed in any order. However, for the connection diagram to be consistent it makes sense to arrange input/output modules of the same type into groups.



4.7 Maximum system expansion

The system software provides support in assembling a PSSu system. It checks the system limits as the data is entered. Once the system is assembled, the system software can be used to generate a requirement list, which you can use for system documentation and for an order form.

The expansion of a PSSu system is limited by the following values

- Number of modules
- Number of failsafe modules
- Number of failsafe inputs/outputs
- Number of standard inputs/outputs
- Current load of module bus

The number of PSSu systems may also be limited by the fieldbus that is used or by a network (e.g. number of SafetyBUS p subscribers in a SafetyBUS p network).

The system limits are listed and explained below.

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4.7 Maximum system expansion

4.7.1 SafetyBUS p and standard bus systems

SafetyBUS p

If the PSSu system is used as a bus subscriber within a SafetyBUS p network, the system limits of SafetyBUS p must be taken into account.

A maximum of 64 bus subscribers can be addressed within a SafetyBUS p network (device address 32 ... 95 for SafetyBUS p 0 or 132 ... 195 for SafetyBUS p 1). The specifications of the "SafetyBUS p Installation Manual" and "SafetyBUS p System Description" apply for a PSSu system.

Possible addresses for the PSSu system within a SafetyBUS p network:

Bus subscriber within the SBp network	Device address (per PSSu system)	Input addresses SafetyBUS p	Output addresses SafetyBUS p
1 in SBp 0	32	E32.00 … E32.31	A32.00 … A32.31
...			
64 in SBp 0	95	E95.00 … E95.31	A95.00 … A95.31
1 in SBp 1	132	E132.00 … E132.31	A132.00 … A132.31
...			
64 in SBp 1	195	E195.00 … E195.31	A195.00 … A195.31

Standard bus systems

If the PSSu system is used as a bus subscriber within a standard bus system, the system limits of that standard bus system must be taken into account.

4.7 Maximum system expansion

4.7.2 Number of modules and number of inputs/outputs on a PSSu system

- Absolute number of modules per PSSu system
  Internally, a PSSu system can address a maximum of **64 modules**. The head module and passive junction modules (e.g. PSSu E PD, PSSu E PD1) are not counted. The following modules should be taken into account for the absolute number of modules:
  – Supply voltage modules
    (identifier: PSSu E F PS...)
  – Standard modules
    (identifier: PSSu E S..., PSSu K S…)
  – Failsafe modules
    (identifier: PSSu E F…, PSSu K F…)
- A PSSu system can have a maximum of **32 FS modules**. The following system limits also apply:
  – A maximum of 16 modules of type PSSu E F DI OZ 2 may be used.
  – A maximum of 24 modules of type PSSu E F BSW may be used.
- Maximum number of FS input/output bits per PSSu system:
  In each PSSu system it is possible to address via SafetyBUS p a maximum of:
  – 32 FS input bits
  – 32 FS output bits
  – Please also note the number of FS input/output bits per module.
- Maximum number of ST input/output bits per PSSu system:
  A PSSu system may have a maximum of **240 ST input bits and 240 ST output bits**. This system limit applies irrespective of the fieldbus. Please also note the number of ST input/output bits per module. The following system limits also apply:
  – A maximum of 6 modules of type PSSu E S RS232 may be used.
  – A maximum of 6 modules of type PSSu E S RS485 may be used.

INFORMATION
The maximum number of ST input/output bits on a module are documented in the relevant operating manual. An overview of the modules' bit requirement can be found in the section entitled "Addressing the modules".

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4.7 Maximum system expansion

4.7.3 Maximum current load

4.7.3.1 Maximum current load capacity on the supply voltage modules

Maximum current load capacity of the supply voltage modules:

System supply	Max. current load
Module supply when supplied via - PSSu E F PS(-T)	1.5 A
Module supply when supplied via - PSSu E F PS1(-T)	2 A
Periphery supply	10 A
C-rail	10 A

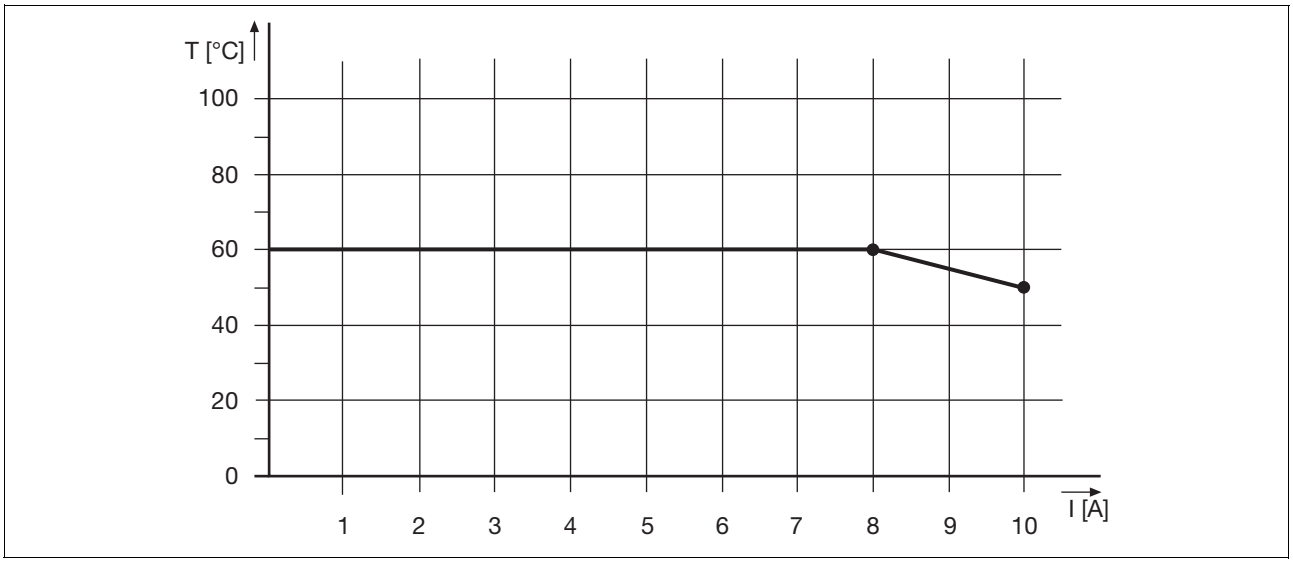
- Module supply?
  The module supply's current load is the total current consumption resulting from the electronic modules and compact modules. If the total current consumption is higher than the supply module's current load capacity, the module supply must be refreshed with an additional supply module (see modules' technical details). The system software takes this into account.
- Periphery supply
  Maximum current load: 10 A
  The current load of the periphery supply is the sum of the current consumption of the sensors and actuators supplied via the input/output modules. If the current load is higher, the periphery supply must be refreshed with an additional supply module to prevent overload. Please refer to the derating diagram.
- C-rail
  Maximum current load: 10 A
  If the current load is higher, the C-rail must use a different supply to prevent overload. Please refer to the derating diagram.

4.7 Maximum system expansion

4.7.3.2 Maximum current load capacity based on temperature

The maximum current load capacity of the module bus with regard to the periphery supply and C-rail can only be achieved if the max. permitted ambient temperature is adhered to.

Derating diagram for periphery supply and C-rail: Temperature T dependent on load current I



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4.8 Device description files

A device description file is fieldbus-dependent. It contains the manufacturer's ID, the device ID and any functions supported by the field device. The manufacturer of a fieldbus system specifies the content and format of a device description file. The device description file is needed in order to include an unknown field device in the respective fieldbus configuration tool and in order to configure the plant-specific requirements.

With PSSuniversal, a distinction is made between the following device description files:

- Global device description file
- Device description file that is generated using the Pilz system software (also "dynamic device description file")

On PSSuniversal, the global device description file contains all the characteristic data of all the PSSu modules that are currently available. Characteristic data includes information on assembly types, module configuration types and details of the assignment of bytes in the process image to modules in a PSSu system.
Pilz provides global device description files for all supported fieldbus systems (e.g. CANopen, DeviceNET, PROFIBUS-DP, PROFINET). The global device description file is supported by the configuration tools of all manufacturers and is the preferred option to use.

The Pilz system software can be used to create a PSSu-specific device description file for PSSu systems with PROFIBUS-DP or DeviceNET interface; i.e. the device description file already contains the individual configurations for the PSSu system. When the device description file is created in this way it can only be used for this PSSu system or for PSSu systems that are identical in every detail.
This type of device description file is only to be recommended in special cases, as it is not supported by the configuration tools of various manufacturers.

4.8 Device description files

INFORMATION

Please note:

- The configuration tools of many manufacturers do not support a device description file created for a PSSu system using Pilz system software (see online help).
- Pilz system software cannot be used to create a device description file for PSSu systems with CANopen or PROFINET interface.
- For PSSu systems with INTERBUS interface it is not necessary to create a device description file using the Pilz system software.

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4.9 Local enable principle

In safety technology, the FS section is usually separated from the ST section without feedback. The local enable principle enables the ST section to have write access to the FS section. A standard bus system can use the local enable principle to switch FS outputs on the PSSu system.
The local enable principle requires the following:

- An FS output on the PSSu system
- An FS signal on the PSSu system, e.g. an FS signal on SafetyBUS p
- An ST signal on the PSSu system, e.g. a signal on a standard bus system

Procedure:

- The FS output is configured for the local enable principle in the PSSuniversal Configurator.
- The FS signal serves as an enable input. This FS signal issues the safety enable for the FS output.
- The ST signal switches the FS output.

Each FS output that is configured for the local enable principle will also require a bit in the process image of ST inputs and ST outputs.

Basic principle:

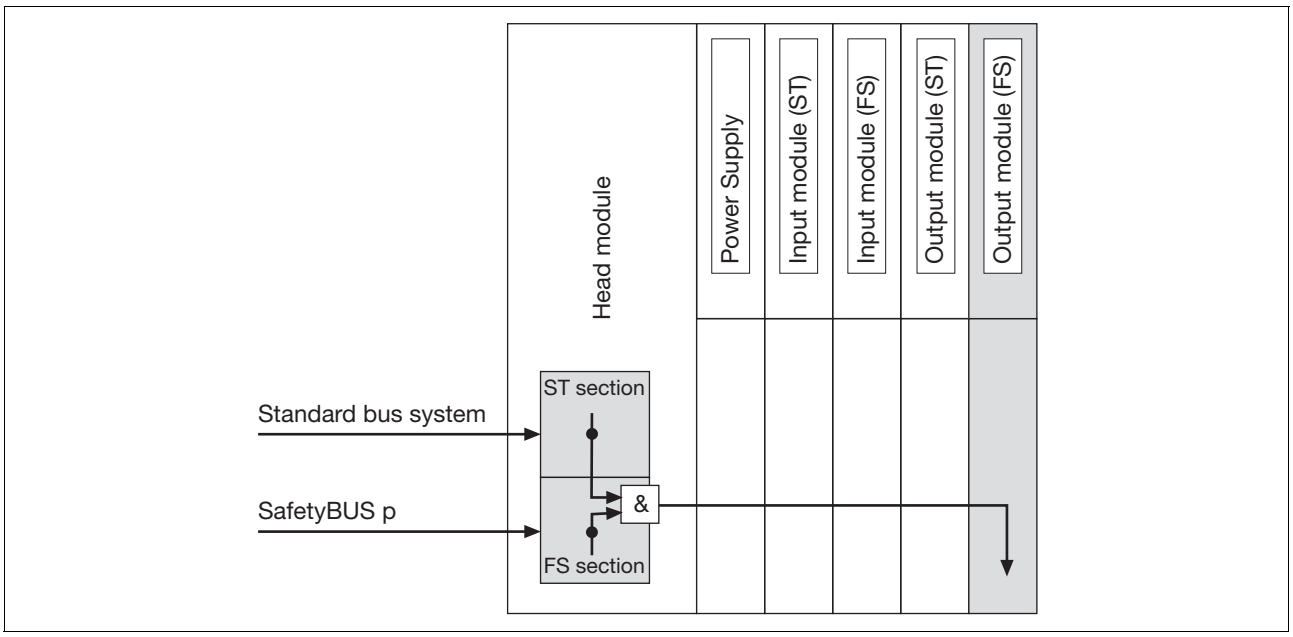
The ST signal and FS signal are logic AND-linked in the PSSu system. The result of the logic operation controls the FS output.

The FS output is only switched on if both signals are "1".

- While the FS signal is "1", the FS output can be switched on and off via the ST signal.
- As soon as the FS signal is "0" , the FS output is shut down safely. Activation via the ST signal is ignored.

4.9 Local enable principle

Local enable principle:



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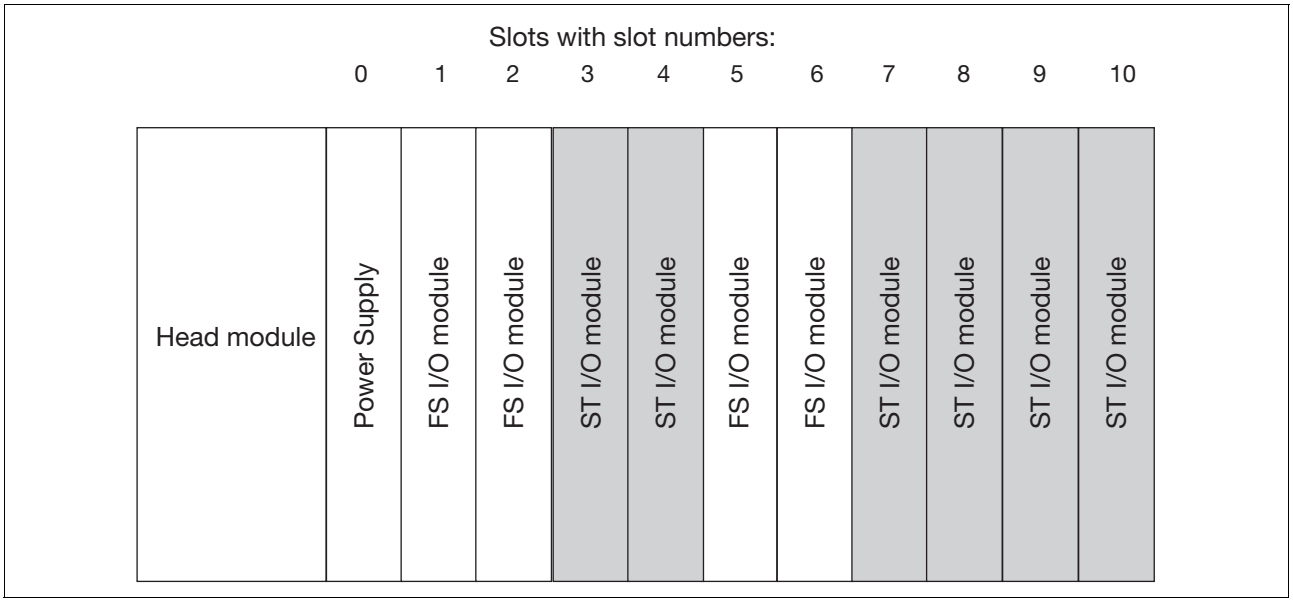
4.10 Slots on a PSSu system

The slot indicates the physical place at which a module is on a PSSu system.

The following applies for slot numbering:

- The counting sequence starts with the first module after the head module.
- The counting sequence starts with slot number 0.
- For the slot numbers, the modules are counted from left to right in ascending order.

Principle



4.11 Addressing the modules

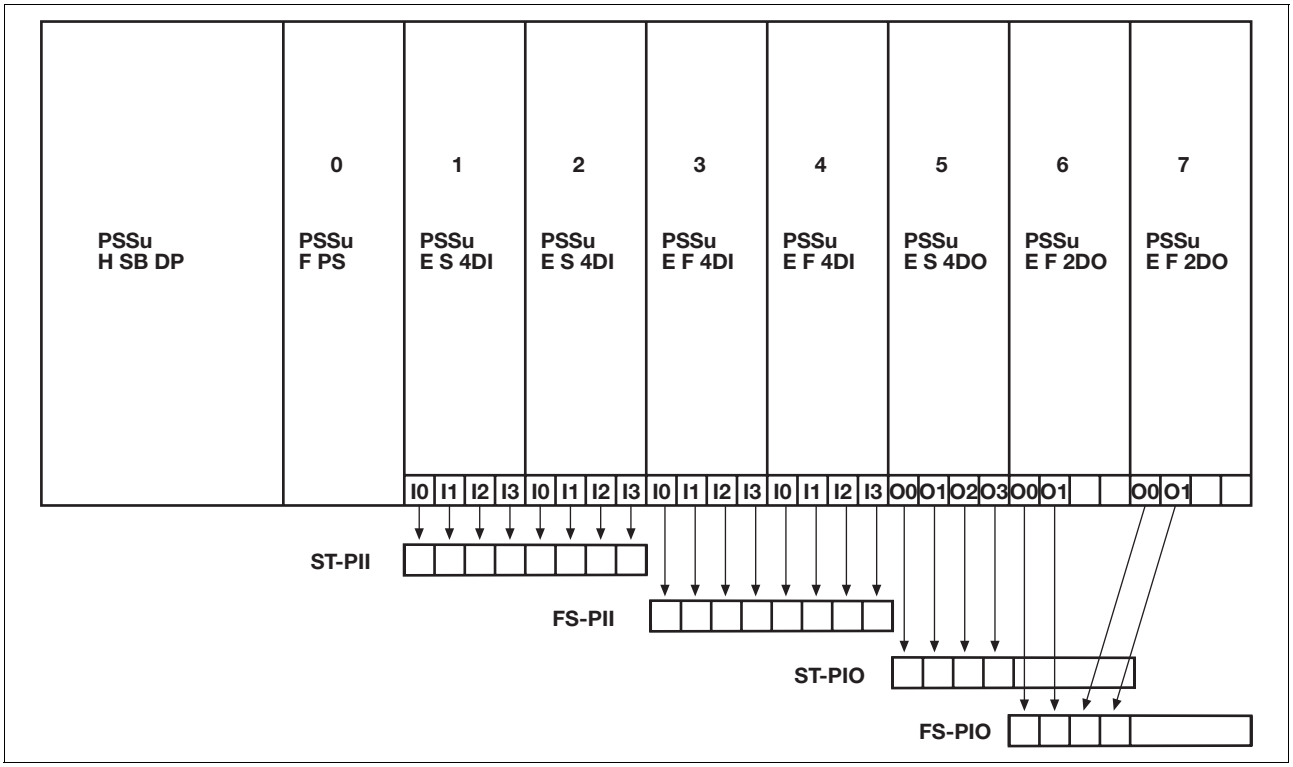
4.11.1 Addressing principle

The head module assigns addresses to the inputs and outputs on the electronic modules at each restart. The addresses are always assigned from left to right.

The FS section and ST section are addressed separately. As a result, a PSSu system with an ST and FS section will have the following process images:

- ST-PII
- ST-PIO
- FS-PII
- FS-PIO

The address of a specific input or output will depend on the position of the module (slot), the modules' bit requirement and the configuration of the input/output.



This address is also used to address the inputs and outputs on the field-bus systems.

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4.11 Addressing the modules

INFORMATION
The addressing method depends on the fieldbus system. Offsets etc. may need to be considered.

4.11.2 Addresses and bit requirement of a PSSu system

The addresses of the inputs and outputs and the addresses of various additional information are reflected in a PSSu system's process image. The address requirement in the process image and the associated bit requirement are dependent on various factors:

- Fieldbus used
  The ST bus system that is used is key in deciding whether the status bytes from modules can be downloaded to the ST control system (see system software's online help).
- Configuration to download the system status, module status, input status
  Various modules can download additional information to the ST control system via a status byte (see "Status bytes", page 4-24) . The configuration is made in the system software. In this case a module's status byte occupies an additional byte address (8 bits) in the PSSu system's ST process image (see system software's online help).
- Configuration for the local enable principle
  If FS outputs are configured for the local enable principle, each FS output will require an additional bit address in the ST-PIO and ST-PII. The system software automatically assigns the bit addresses in the ST process image (see system software's online help).
- Configuration for ST read access to FS inputs/outputs
  If the inputs/outputs on digital FS modules are to be read in the ST-PII, the relevant number of bit addresses should also be allocated in the ST-PII. The configuration is made in the system software (see system software's online help).
- Configuration of "Optimise address assignment"
  The address assignment of successive modules of an identical information class can be optimised for a PSSu system. Optimisation will reduce the bit requirement in the ST-PII/ST-PIO (see "Optimisation of module layout", page 4-32) .

Please note:
The module configuration can result in an additional bit requirement in the ST-PIO and ST-PII. This additional bit requirement must be taken into account when calculating the maximum system structure and system limits.

4.11 Addressing the modules

INFORMATION
You can view the process image of inputs and outputs in the system software.

4.11.3 Status bytes

Various modules can use a status byte to send additional information about their status to the ST control system. This refers to the following module types:

- Supply voltage modules on slot 0
  The status byte of a supply voltage module on slot 0 contains information about the PSSu system's whole module bus (system status).
  Download of the system status to the ST control system is configurable.
- Module for analogue input
  The status byte for these modules contains information on the current status of the inputs. The input status can contain information such as a value exceeding/falling below the input's limit value.
  Download of the input status to the ST control system is configurable.
- Counter modules
  The information in the status byte (counter status) depends on the module you are using (e.g. counter underflow/overflow, status information of the connected sensor, counter input active/passive).
  The counter status is always downloaded to the ST control system.
- Modules with a "-D" identifier in the module name (e.g. PSSu E S 4DI-D, PSSu E S 2DO 2-D, PSSu E S 4DO 0.5-D, PSSu E S PD-D)
  The status byte for these modules (module status) contains additional diagnostic data on the status of the inputs/outputs and of the module (e.g. overload on an output, temperature error on the module)
  Download of the module status to the ST control system is configurable.

Details on the assignment of the status byte can be found in the relevant operating manuals.

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4.11 Addressing the modules

4.11.4 Configurations that impact the address and bit requirement

There are configurations for various modules that impact the address and bit requirement of a PSSu system. The table overleaf contains an overview of these modules, including the corresponding configuration options, the validity of the configuration and the configuration's ID in a device description file.

Module types	Configuration	Validity of the configuration	ID in device description file
Supply voltage modules on slot 0 (e.g. PSSu E F PS, PSSu E F PS1)	Download system status	Whole PSSu system	R
Modules with a "-D" identifier in the module name (e.g. PSSu E S 4DI-D, PSSu E S 2DO 2-D, PSSu E S 4DO 0.5-D, PSSu E S PD-D)	Download module status	Configured module	S
Analogue input modules (e.g. PSSu E S 2AI U, PSSu E S 4AI U, PSSu E S 2AI se, PSSu E S 2AI RTD, PSSu E S 2AI TC)	Only download current input status	Configured module	
	Download current input value and input status	Configured module	X
Digital FS input/output modules (e.g. PSSu E F 4DI, PSSu E F 2DO 2, PSSu E F 4DO 0.5, PSSu E F DI OZ 2, PSSu E F 2DOR 8)	ST read access to an FS module	Configured FS module	R
Digital FS output modules (e.g. PSSu E F 2DO 2, PSSu E F 4DO 0.5, PSSu E F DI OZ 2, PSSu E F 2DOR 8)	ST read/write access to the outputs on an FS module (local enable principle)	Configured FS module	&
Digital input/output modules	Optimisation of the module addresses	Whole PSSu system	*

4.11 Addressing the modules

4.11.5 Overview of the modules' bit requirement

The table overleaf contains the modules' bit requirement. The bit requirement is illustrated in accordance with the address assignment in the process image (ST-PII/PIO, FS-PII/PIO). There are configurations for various modules that impact the address and bit requirement. The table overleaf uses the same identifier for these configuration options as is used in a device description file (see "Configurations that impact the address and bit requirement", page 4-25) .

Please note:
The table only shows a selection of the available modules. Module-specific information on the bit requirement and address assignment in the process image can be found in the module's operating manual.

Module	Configuration	ST-PII	ST-PIO	FS-PII	FS-PIO	Notes
PSSu E S PD-D	- - -	- - -	- - -	- - -	- - -	- - -
	S	8	- - -	- - -	- - -	1 status byte (module status)
PSSu E F PS	- - -	- - -	- - -	- - -	- - -	- - -
	R	8	- - -	- - -	- - -	1 status byte (system status) Configuration only possible on the first module after the head module
PSSu E F PS1	- - -	-	- - -	- - -	- - -	- - -
	R	8	- - -	- - -	- - -	1 status byte (system status) Configuration only possible on the first module after the head module
PSSu E F PS-P	- - -	- - -	- - -	- - -	- - -	- - -
PSSu E F BSW	- - -	- - -	- - -	- - -	1	- - -
	R	1	- - -	- - -	1	ST read access
PSSu E S 4DI	- - -	4	- - -	- - -	- - -	- - -
PSSu E S 4DI-D	- - -	4	- - -	- - -	- - -	4 bits
	S	12	- - -	- - -	- - -	4 bits + 1 status byte
PSSu E S 2DO 2	- - -	- - -	2	- - -	- - -	- - -
PSSu E S 2DO 2-D	- - -	- - -	2	- - -	- - -	2 bits
	S	8	2	- - -	- - -	2 bits (ST-PIO) + 1 status byte (ST-PII)
PSSu E S 4DO 0.5	- - -	- - -	4	- - -	- - -	- - -
PSSu E S 4DO 0.5-D	- - -	- - -	4	- - -	- - -	4 bits
	S	8	4	- - -	- - -	4 bits (ST-PIO) + 1 status byte (ST-PII)
PSSu E S 2DOR 2	- - -	- - -	2	- - -	- - -	- - -
PSSu E S 2DOR 10	- - -	- - -	2	- - -	- - -	- - -
PSSu K S 16DI	- - -	16	- - -	- - -	- - -	- - -
PSSu K S 16DO 0.5	- - -	- - -	16	- - -	- - -	- - -
PSSu K S 8DI 8DO 0.5	- - -	8	8	- - -	- - -	- - -

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4.11 Addressing the modules

Module	Configuration	ST-PII	ST-PIO	FS-PII	FS-PIO	Notes
PSSu E F 4DI	- - -	- - -	- - -	4	- - -	- - -
	R	4	- - -	4	- - -	ST read access
PSSu E F 2DO 2	- - -	- - -	- - -	- - -	2	- - -
	R	2	- - -	- - -	2	ST read access
	&	2	2	- - -	2	ST read/write access (local enable principle)
PSSu E F 4DO 0.5	- - -	- - -	- - -	- - -	4	- - -
	R	4	- - -	- - -	4	ST read access
	&	4	4	- - -	4	ST read/write access (local enable principle)
PSSu E F 2DOR 8	-	-	- - -	- - -	2	- - -
	R	2	- - -	- - -	2	ST read access
	&	2	2	- - -	2	ST read/write access (local enable principle)
PSSu E F DI OZ 2	- - -	- - -	- - -	2	1	Input I0: Connection terminal Input I1: Open circuit detection R: ST read access &: ST read/write access (local enable principle)
	R	3	- - -	2	1	
	&	3	1	2	1	
PSSu E S 2AI I se	- - -	32	- - -	- - -	- - -	2 x 2 bytes
	S	16	- - -	- - -	- - -	2 status bytes
	X	48	- - -	- - -	- - -	2 x 2 bytes + 2 status bytes
PSSu E S 2AI U	- - -	32	- - -	- - -	- - -	2 x 2 bytes
	S	16	- - -	- - -	- - -	2 status bytes
	X	48	- - -	- - -	- - -	2 x 2 Bytes + 2 status bytes
PSSu E S 4AI U	- - -	64	- - -	- - -	- - -	4 x 2 bytes
	S	32	- - -	- - -	- - -	4 status bytes
	X	96	- - -	- - -	- - -	4 x 2 bytes + 4 status bytes
PSSu E S 2AI RTD	- - -	32	- - -	- - -	- - -	2 x 2 bytes
	X	48	- - -	- - -	- - -	2 x 2 Bytes + 2 status bytes
PSSu E S 2AI TC	- - -	32	- - -	- - -	- - -	2 x 2 bytes
	X	48	- - -	- - -	- - -	2 x 2 Bytes + 2 status bytes
PSSu E S 2AO I	- - -	- - -	32	- - -	- - -	2 x 2 bytes
PSSu E S 2AO U	- - -	- - -	32	- - -	- - -	2 x 2 bytes
PSSu E S 4AO U	- - -	- - -	64	- - -	- - -	4 x 2 bytes
PSSu E S ABS SSI	- - -	40	- - -	- - -	- - -	4 bytes + 1 status byte
PSSu E S INC	- - -	72	40	- - -	- - -	**ST-PII:** 4 bytes counter data + 4 bytes latch value/period length + 1 status byte **ST-PIO:** 4 bytes (default) counter status + 1 control byte

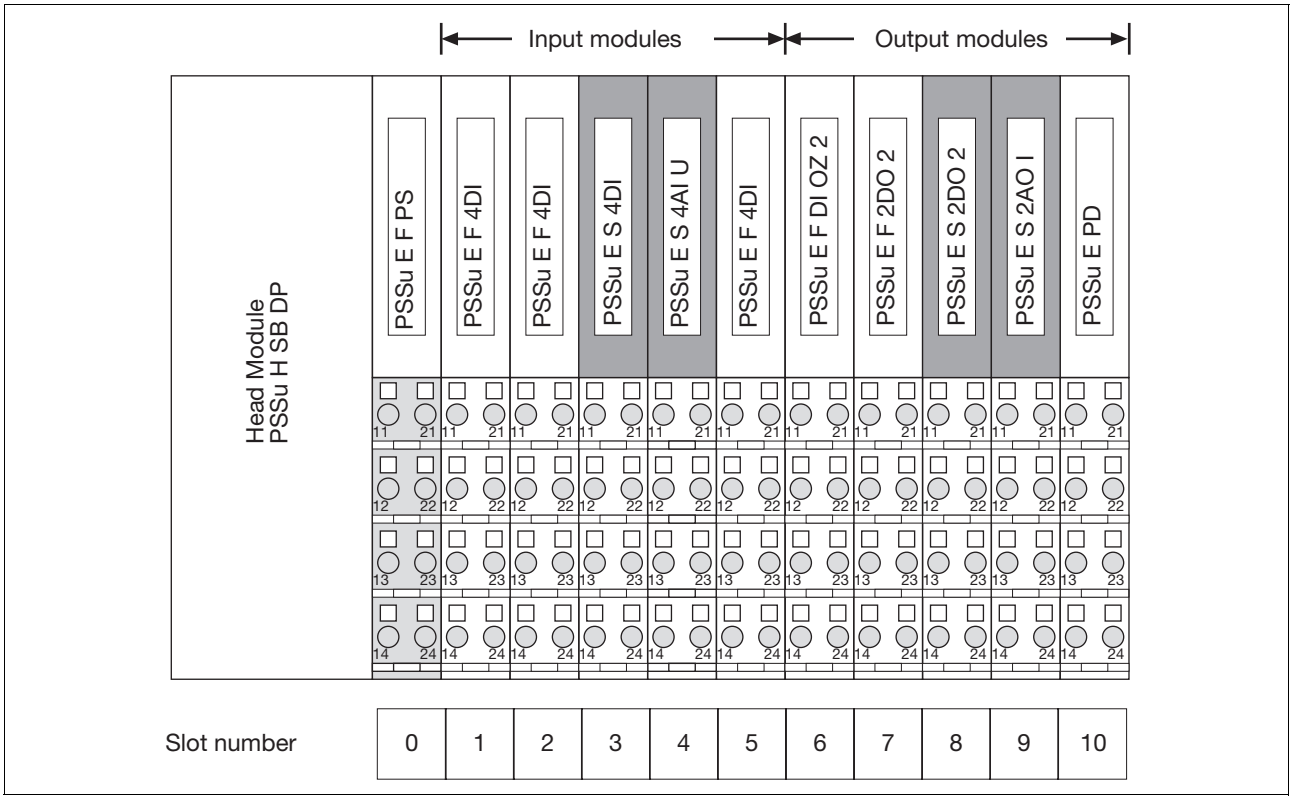
4.11 Addressing the modules

Module	Configuration	ST-PII	ST-PIO	FS-PII	FS-PIO	Notes
PSSu E S INC 24V se	- - -	72	72	- - -	- - -	**ST-PII:** 4 bytes counter data + 4 bytes latch value/period length + 1 status byte **ST-PIO:** 4 bytes (default) counter status + 4 bytes limit value + 1 control byte
PSSu E S RS232	- - -	80	80	- - -	- - -	**ST-PII:** 2 status bytes + 8 bytes receive data **ST-PIO:** 2 control bytes + 8 bytes send data
PSSu E S RS485	- - -	80	80	- - -	- - -	**ST-PII:** 2 status bytes + 8 bytes receive data **ST-PIO:** 2 control bytes + 8 bytes send data
PSSu XB-F	- - -	- - -	- - -	- - -	- - -	- - -
PSSu XR-F	- - -	- - -	- - -	- - -	- - -	- - -
PSSu WB S IDN	- - -	- - -	- - -	- - -	- - -	- - -
PSSu WR S IDN	- - -	- - -	- - -	- - -	- - -	- - -
PDP67 WR S 8DI 8DO 0.5 IDN	- - -	8	8	- - -	- - -	- - -
PSSu E AI SHT1	- - -	- - -	- - -	- - -	- - -	- - -
PSSu E PD	- - -	- - -	- - -	- - -	- - -	- - -
PSSu E PD1	- - -	- - -	- - -	- - -	- - -	- - -
PSSu E PS-P 5V	- - -	- - -	- - -	- - -	- - -	- - -
PSSu E PS P +/- 10V	- - -	- - -	- - -	- - -	- - -	- - -
PSSu E PS P +/- 15V	- - -	- - -	- - -	- - -	- - -	- - -

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4.11 Addressing the modules

4.11.6 Example: Bit requirement and addressing



Assignment of I/O connections to bit addresses in the ST-PII and ST-PIO in the example

4.11 Addressing the modules

Slot	Module	Configuration	Terminal Base module	Address ST process image		Address SB p	
				ST-PII	ST-PIO	Input	Output
0	Power supply	R ([1])	- - -	0 – 7			
1	PSSu E F 4DI	R ([2])	11	8		E40.00 ([6])	
			21	9		E40.01	
			14	10		E40.02	
			24	11		E40.03	
2	PSSu E F 4DI	- - -	11			E40.04	
			21			E40.05	
			14			E40.06	
			24			E40.07	
3	PSSu E S 4DI	- - -	11	12			
			21	13			
			14	14			
			24	15			
4	PSSu E S 4AI U	R ([3])	11 (Status)	16 – 23			
			21 (Status)	24 – 31			
			14 (Status)	32 – 39			
			24 (Status)	40 – 47			
			11 (Data)	48 – 63			
			21 (Data)	64 – 79			
			14 (Data)	80 – 95			
			24 (Data)	96 – 111			
5	PSSu E F 4DI	- - -	11			E40.08	
			21			E40.09	
			14			E40.10	
			24			E40.11	
6	PSSu E F DI OZ 2	- - -	11/21				A40.00 ([6])
			14			E40.12	
			Internal ([4])			E40.13	
7	PSSu E F 2DO 2	& ([5])	11	112	0		A40.01
			21	113	1		A40.02
8	PSSu E S 2DO 2	- - -	11		2		
			21		3		
9	PSSu E S 2AO I	- - -	11		4 – 19		
			21		20 – 35		
10	PSSu E PD	- - -	- - -				

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4.11 Addressing the modules

Explanation:

- (1) The first supply voltage module after the head module (slot 0) can be configured to transmit its status to the ST-PII. 8 bits are required for this.
- (2) The FS input module PSSu E F 4DI (slot 1) is configured for read access.
- (3) An ST module for analogue input can be configured so that each input transmits its status to the ST-PII. 8 bits per input are required for this, in addition to the 16 bits of input data.
- (4) The result of open circuit detection is transmitted using the internal input I1 on the module PSSu E F DI OZ 2 (slot 6).
- (5) Connection terminal 11 on the module PSSu E F 2DO 2 (slot 7) is configured for the local enable principle. Both of the module's outputs appear in the ST-PII and ST-PIO. It is only possible to write to the bit with address 0.
- (6) The device address of the PSSu system in SafetyBUS p is 40.

4.11 Addressing the modules

4.11.7 Optimisation of module layout

The bit requirement of digital modules can be optimised for a PSSu system.

Without optimisation, a digital module requires at least 8 bits (1 byte) in the ST process image (ST-PII/ST-PIO). This bit requirement exists irrespective of whether the module's inputs/outputs actually occupy these addresses.

Example for the bit requirement of two modules of type PSSu E S 4DI, without optimisation:
The slot numbers and byte numbers are examples.

Type	Configuration	Slot No.	Byte No.	Bit No.	Terminal No.
PSSu E S 4DI (Module 1)	PSSu E S 4DI	1	0	0	11
				1	21
				2	14
				3	24
				4	- - -
				5	- - -
				6	- - -
				7	- - -
PSSu E S 4DI (Module 2)	PSSu E S 4DI	2	1	0	11
				1	21
				2	14
				3	24
				4	- - -
				5	- - -
				6	- - -
				7	- - -

Optimisation reduces the bit requirement in the ST process image. Optimisation has the same impact on the bit requirement when downloading data to the ST control system.

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4.11 Addressing the modules

Example for the bit requirement of two modules of type PSSu E S 4DI, with optimisation:
The slot numbers and byte numbers are examples.

Type	Configuration	Slot No.	Byte No.	Bit No.	Terminal No.
PSSu E S 4DI (Module 1)	PSSu E S 4DI	1	0	0	11
				1	21
				2	14
				3	24
PSSu E S 4DI (Module 2)	PSSu E S 4DI*			4	11
				5	21
				6	14
				7	24

Various software can be used to configure optimisation, e.g.:
- Pilz system software
  (see system software's online help)
- Siemens software SIMATIC S7 – HW Config

Please note:
Optimisation does not change the module sequence in a PSSu system, nor does it suggest a more favourable sequence. It merely combines the assignment in the process image in the corresponding module sequence.

4.11 Addressing the modules

Optimisation rules

Optimisation is only effective when the following conditions are met:
- Optimisation can only be configured for the ST process image.
- Only the bit requirement of digital modules can be optimised. However, optimisation has no effect on compact, digital modules as these always occupy whole bytes.
- Only the addresses of successive modules of an identical information class can be optimised.

The ST process image (ST-PII) has the following information classes:
- Digital ST inputs
- Analogue ST inputs
- ST counter inputs
- Digital FS inputs that are configured for ST read access
- Digital FS outputs that are configured for ST read access
- Status bytes
- Specialist information, e.g. from modules with dual-pole outputs

The ST process image (ST-PIO) has the following information classes:
- Digital ST outputs
- Analogue ST outputs
- Digital FS outputs that are configured for the local enable principle
- Specialist information, e.g. dual-pole outputs

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4.11 Addressing the modules

Examples of the impact of optimisation

ST inputs and FS inputs with ST read access are **not** combined in one byte during optimisation because they belong to different information classes.

Outputs on modules of type PSSu E S 2DO 2 and PSSu E S 4DO 0.5 belong to the same information class and can be combined in one byte during optimisation.

Outputs on modules of type PSSu E S 2DOR 2 and PSSu E S 2DOR 10 belong to the same information class and can be combined in one byte during optimisation.

Modules with "specialist information" include modules of type PSSu E F DI OZ 2. Outputs on these modules can be combined in one byte during optimsiation if they are configured for ST read access. However, outputs on modules of type PSSu E F DI OZ 2 may **not** be combined with bits from other modules with specialist information.

The status bytes (system status, module status, input status) and the address assignment of the analogue inputs/outputs are always available as bytes, so optimisation has no effect on this information class.

4.11 Addressing the modules

Impact of module layout on optimisation

The layout of the modules on a PSSu system is key in deciding whether modules with an identical information class are placed next to each other and whether optimisation can be effective. With the same number of modules, therefore, the order in which modules are arranged makes a difference to the address requirement.

The following example shows two PSSu systems on which the module types, number of modules and module configuration all match, but the layout of the modules is different.

Modules used	Configuration	Slots on the PSSu system with an unfavourable design	Slots on the PSSu system with an optimised design
PSSu H SB DP	- - -	- - -	- - -
PSSu E F PS	- - -	0	0
PSSu E S 4DI	- - -	1	1
PSSu E S 4DI	- - -	6	2
PSSu E F 4DI	R (read access)	2	3
PSSu E F 4DI	R (read access)	4	4
PSSu E S 4DO 0.5	- - -	5	5
PSSu E F 2DO 2	&R (read access, local enable for O0 only)	3	6
PSSu E F 2DO 2	&R (read access, local enable for O1 only)	7	7

On the example systems, the different layout of the modules has the following impact on the address requirement in the ST-PII and ST-PIO:

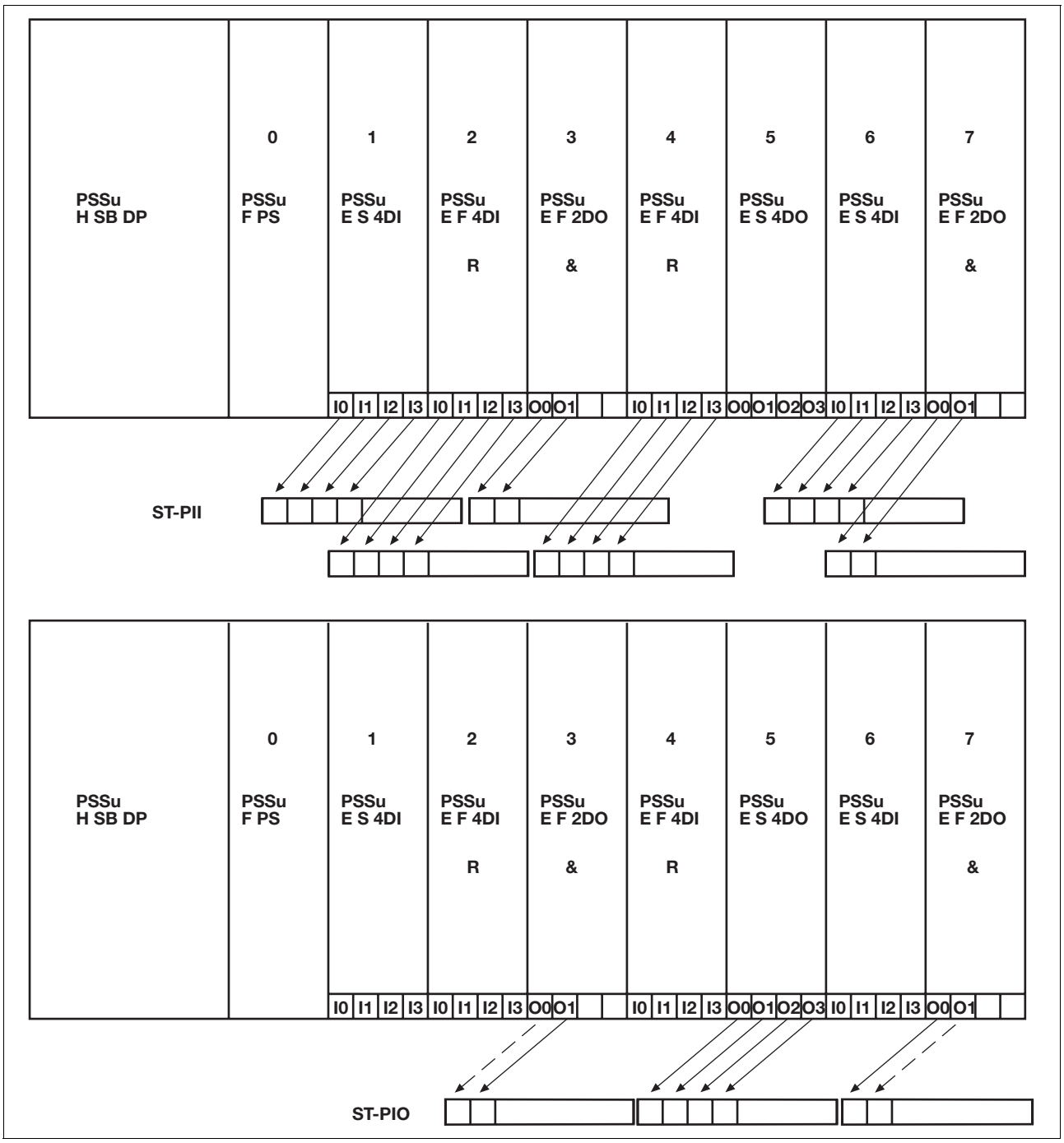
	PSSu system with unfavourable design	PSSu system with optimum design
Bytes in the ST-PII	6	3
Bytes in the ST-PIO	3	2

On the following pages, the drawings at the top show the inputs and the drawings at the bottom show the outputs for the two example systems.

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4.11 Addressing the modules

PSSu system with unfavourable design:

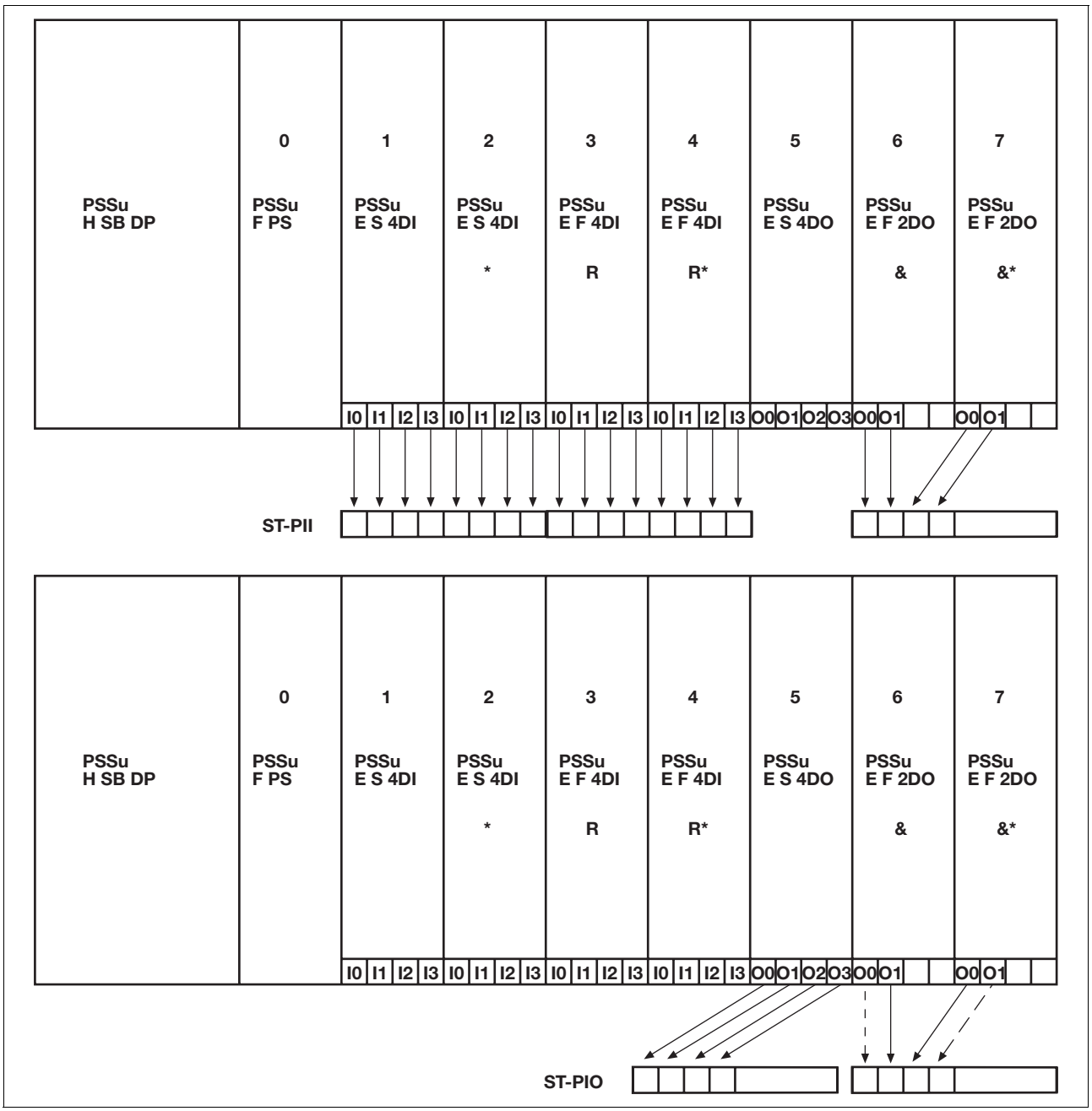


Key:

——→	**Full access: read in the PII, write in the PIO**
— — →	**Bit in the PIO cannot be written.**

4.11 Addressing the modules

PSSu system with optimum design



Key:

Full access: read in the PII, write in the PIO

Bit in the PIO cannot be written.

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4.12 Supply voltage and insulation

All PSSu systems voltages are provided via supply voltage modules. The voltages are distributed to the modules via the module bus.

- Module supply
  The module supply is the internal supply voltage for the head module, the compact modules and the electronic modules.
- Periphery supply
  The periphery supply supplies 24 VDC to the sensors and actuators on digital input/outputs on electronic modules. On compact modules, the supply for the inputs is generated from the periphery supply; the supply for the outputs must be fed to the module terminals.
  The connection on the module bus can be disconnected in order to form supply groups. On digital failsafe modules, the periphery supply is used to provide test pulses. Failsafe input/output modules will not start until the periphery supply is connected correctly. On analogue input/output modules, the periphery supply is galvanically isolated from the inputs/outputs.
- C-rail
  The C-rail is an additional, free power rail. Access to the C-rail is available via base modules that contain the letter "**-C**" in their description (e.g. PSSu BP**-C** 1/8 S, PSSu BP**-C** 1/8 C).
  The C-rail supply must belong to the same circuit as the other base module connections. Connecting PE to the C-rail provides a simple form of shield. On the compact modules, the C-rail is only looped through and is not available at the terminals. Permitted infeed at the C-rail:
  – PE
  – 0 V
  – Shield
  – - 30 VDC ... +30 VDC
  – - 48 VAC ... + 48 VAC
- Inputs/outputs on the analogue modules and counter modules
  The inputs and outputs on the analogue modules and counter modules are galvanically isolated from the periphery supply. On the base modules, the supply for the outputs is generated from the periphery supply.
- Earth (Ground)
  The module supply and periphery supply have separate connections for the respective earth potential (Ground).
- Functional earth
  A contact spring on the base modules and compact modules connects the modules' functional earth to the mounting rail.

4.12 Supply voltage and insulation

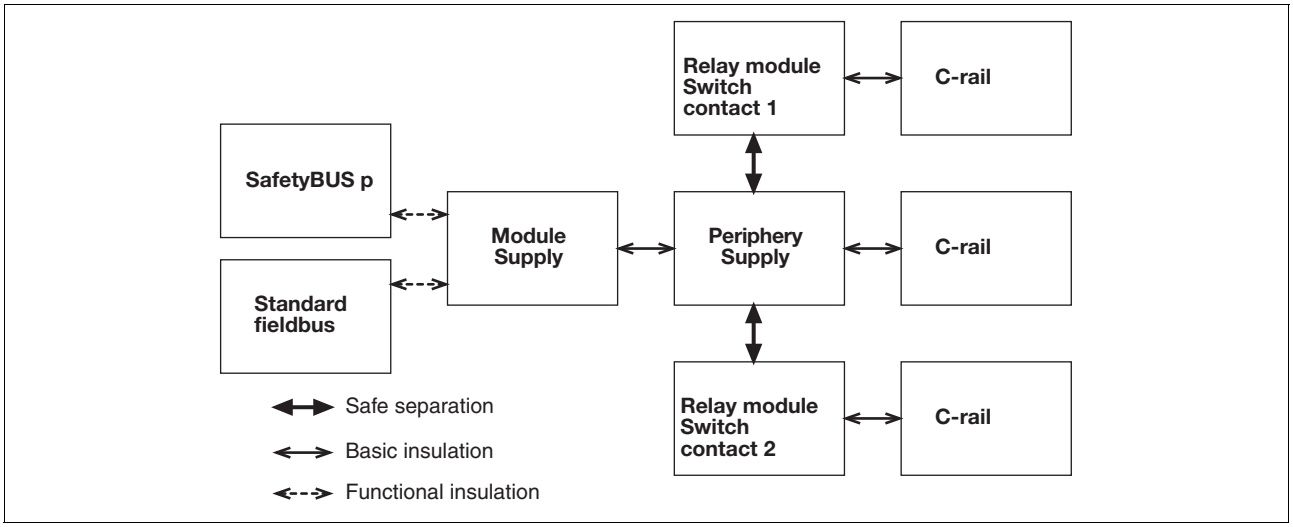
The supply voltages for module supply and periphery supply must be extra low voltages with safe electrical separation (PELV or SELV) in accordance with VDE 0100, Part 410. Further requirements of the power supplies can be found in the data sheets for the supply voltage modules or head modules.

When the voltages are fed separately using two power supplies, the module supply and periphery supply are galvanically isolated. If galvanic isolation is not required, a common power supply may be used for the periphery supply and module supply.

Separate power supplies for module supply and periphery supply increase availability: In the case of a short circuit in the periphery supply, the module supply is maintained and the head module can continue to exchange data with fieldbus systems, e.g. for diagnostic purposes.

WARNING!
Risk of electrocution!
Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
A base-insulated device with a supply voltage of more than 50 VAC or 120 VDC may not be connected parallel to the module supply.

Insulation of supplies in a PSSu installation:



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4.12 Supply voltage and insulation

WARNING!
Risk of electrocution!
If voltages higher than 50 VAC or 120 VDC are connected to the PSSuniversal, e.g. to switch contacts on relay modules, please note the following:

- Specific accident prevention regulations apply.
- The C-rail of the supply group should only be connected to the protective earth (PE).

INFORMATION
FS output circuits have been designed to guarantee maximum safety. Extensive tests are carried out internally for this purpose. If the supply voltage is interrupted during a test function, the relevant output will be deemed to be defective.
An error reaction is triggered: The FS section switches to a STOP condition, switches off all the FS outputs and issues a message.
Remedy: Use power supplies with a buffered supply voltage.

4.13 Supply groups

When used with the relevant base module, any electronic supply voltage module is suitable to separate supplies and form supply groups.

To separate supplies, the supply (periphery supply and C-rail supply) to the preceding (left-hand) modules is disconnected and a new supply provided for subsequent (right-hand) modules.

With a new supply group it is also possible to refresh the module supply by providing a new supply voltage. The 0 V supply on the module supply is never interrupted, but is always looped through across the whole module bus.

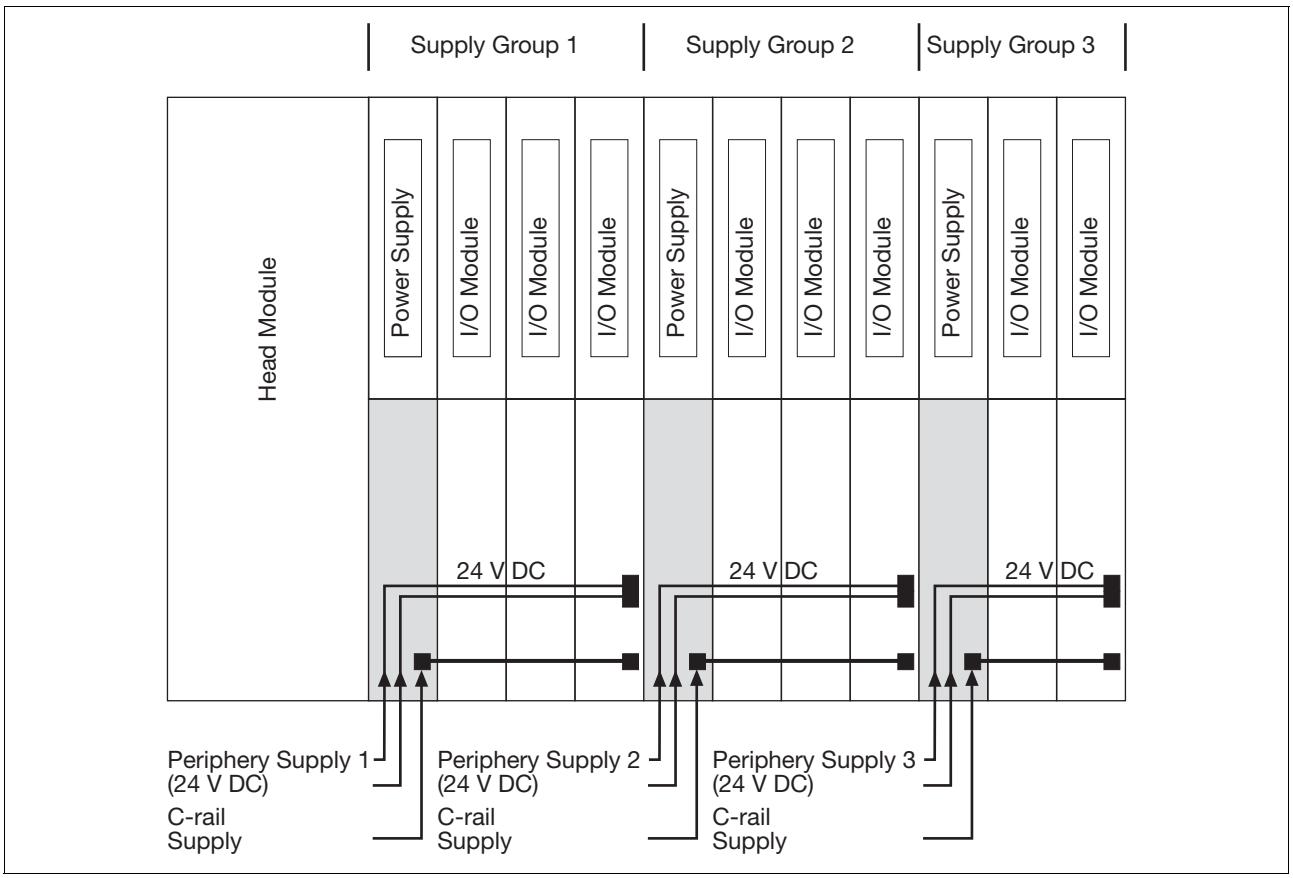
You should always refer to the description of the relevant electronic supply voltage module.

The following modules are suitable for separating supplies, for example:

Electronic module	Base module	Module supply	Periphery supply and C-rail
PSSu E F PS	PSSu BS-R 1/8 S PSSu BS-R 1/8 C	Refreshing (new supply voltage is provided, 0 V supply is not interrupted).	Supply of the left-hand modules is interrupted and a new supply is provided for the right-hand modules.
PSSu E F PS1	PSSu BS-R 2/8 S PSSu BS-R 2/8 C		
PSSu E F PS-P	PSSu BS 1/8 S PSSu BS 1/8 C	No refreshing (5 V is not separated).	
PSSu E F BSW	PSSu BS 2/8 S PSSu BS 1/8 C		

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4.13 Supply groups



The supply voltage for the first supply group can also be integrated within the head module.

4.14 Reaction times of the PSSuniversal

The reaction times refer exclusively to the inputs and outputs on a PSSu system. To determine the overall reaction times, the corresponding bus systems, InduraNET p radio links, periphery devices and controllers also need to be taken into account.

- Digital inputs:
  The reaction time of the digital inputs is the time a PSSu system needs for a bus telegram to be finalised or for some other reaction from the head module to occur, once a signal has changed at an input.
- Digital outputs:
  The reaction time of the digital outputs is the time a PSSu system needs to change a signal at the output once a bus telegram has been received.
- Analogue inputs:
  The reaction time of the analogue inputs is the time a PSSu system needs to read in a value at the input and to make it available within a bus telegram.
- Analogue outputs:
  The reaction time of the analogue outputs is the time a PSSu system needs to make the value available at the output once a bus telegram has been received.

An InduraNET p radio link causes an additional time delay for the inputs/outputs on the remote system. This delay is heavily dependent on the quality of the transmission.

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4.14 Reaction times of the PSSuniversal

4.14.1 Scan time of a PSSu system

The PSSu module bus transfers failsafe data and standard data independently from each other. This is why the FS scan time differs from the ST scan time.

$t_{FS\text{-}Scan}$

The FS scan time of the PSSuniversal is a constant 4 ms.

$t_{ST\text{-}Scan}$

The ST scan time of the PSSuniversal depends on the number of events that have occurred. The longest scan time will need to be considered when the maximum number of ST modules is configured and all the inputs/outputs are changing simultaneously.

- Typical: 1 ms
- Maximum: 4 ms

4.14.2 Input/output processing time

$t_{Processing\ In}$

$t_{Processing\ Out}$

The processing time is the time an input/output module needs internally for signal processing. It varies depending on the module.

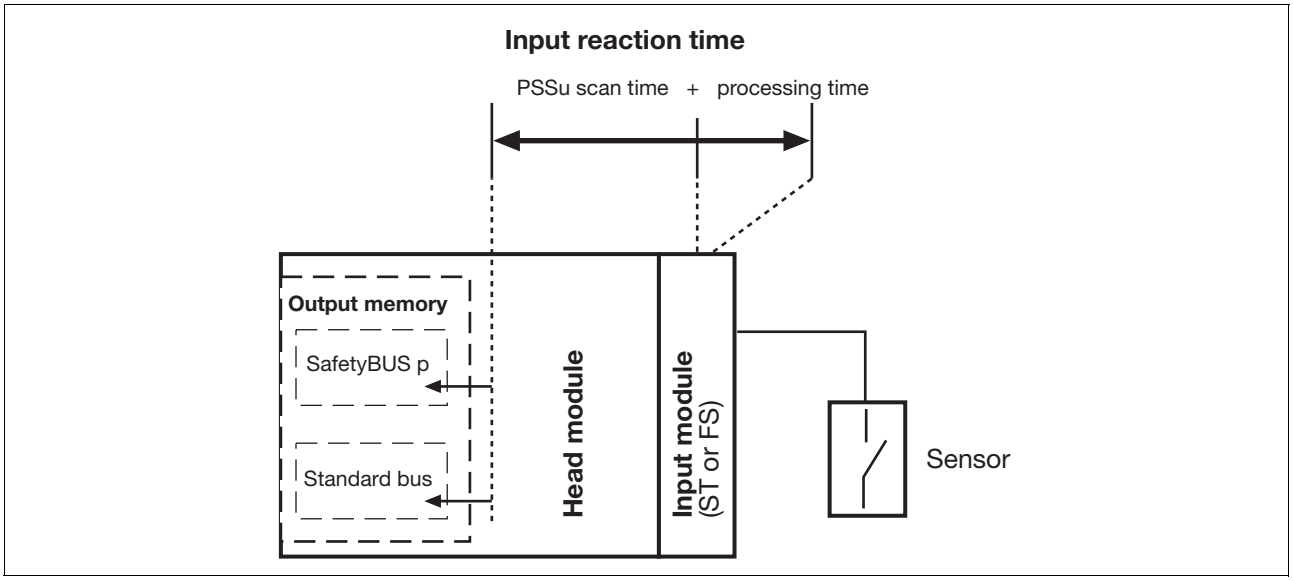
The processing time takes into account the input filter time and various influences such as internal run times, temperature drifts, spread of components, etc.

The processing times can be found in the technical details for the input/output modules.

4.14 Reaction times of the PSSuniversal

4.14.3 Input reaction time

Input		Reaction time	
Failsafe	Typical	$t_{FS\text{-}Reaction\ typ}$ **= (1.5 x** $t_{FS\text{-}Scan}$**) +** $t_{Processing\ In}$	**= 6 ms +** $t_{Processing\ In}$
	Maximum	$t_{FS\text{-}Reaction\ max}$ **= (2 x** $t_{FS\text{-}Scan}$**) +** $t_{Processing\ In}$	**= 8 ms +** $t_{Processing\ In}$
Stand-ard	Typical	$t_{ST\text{-}Reaction\ typ}$ **= (1.5 x** $t_{ST\text{-}Scan\ typ}$**) +** $t_{Processing\ In}$	**= 1.5 ms +** $t_{Processing\ In}$
	Maximum	$t_{ST\text{-}Reaction\ max}$ **= (2 x** $t_{ST\text{-}Scan\ max}$**) +** $t_{Processing\ In}$	**= 8 ms +** $t_{Processing\ In}$



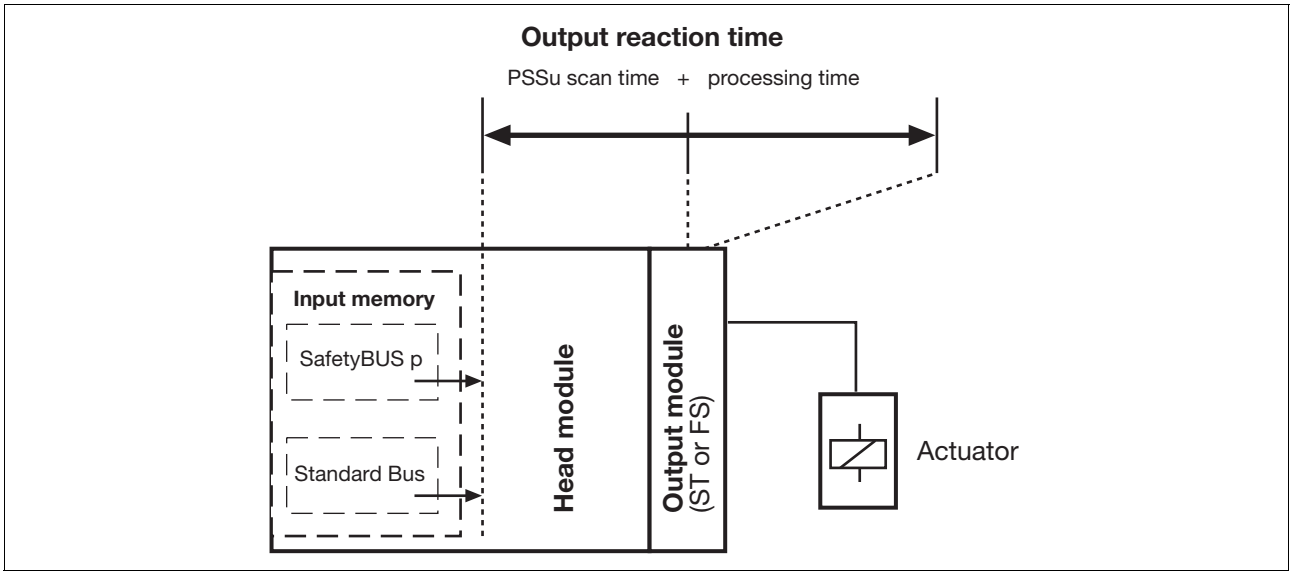
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4.14 Reaction times of the PSSuniversal

4.14.4 Output reaction time

Output		Reaction time	
Failsafe	Typical	$t_{FS\text{-}Reaction\ typ}$ = $t_{FS\text{-}Scan}$ + $t_{Processing\ Out}$	= 4 ms + $t_{Processing\ Out}$
	Maximum	$t_{FS\text{-}Reaction\ max}$ = (2 x $t_{FS\text{-}Scan}$) + $t_{Processing\ Out}$	= 8 ms + $t_{Processing\ Out}$
Failsafe with "&" ([1])	Typical	$t_{FS\text{-}Reaction\ typ}$ = $t_{FS\text{-}Scan}$ + 2 ms	= 6 ms
	Maximum	$t_{FS\text{-}Reaction\ max}$ = (2 x $t_{FS\text{-}Scan}$) + 2 ms	= 10 ms
Standard	Typical	$t_{ST\text{-}Reaction\ typ}$ = $t_{ST\text{-}Scan\ typ}$ + $t_{Processing\ Out}$	= 1 ms + $t_{Processing\ Out}$
	Maximum	$t_{ST\text{-}Reaction\ max}$ = (2 x $t_{ST\text{-}Scan\ max}$) + $t_{Processing\ Out}$	= 8 ms + $t_{Processing\ Out}$

([1]) Special case: Digital FS outputs that are driven via the local enable principle. The processing time is a constant 2 ms when the FS output is enabled.



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5.1 Configure PSSu for SafetyBUS p

Head modules with “SB” in their product name, e.g. PSSu H SB, can be connected to SafetyBUS p. So a SafetyBUS p-compatible PSS can drive the FS inputs and FS outputs on a PSSu system.

NOTICE
Please refer to the “SafetyBUS p Installation Manual” and “SafetyBUS p System Description”.

Connection to SafetyBUS p is via a male 9-pin D-Sub connector on the head module. Pilz fibre-optic couplers (e.g. PSS SB SUB-D-FO) can also be connected to the SafetyBUS p interface.

The device address must be set on the head module in order to operate the PSSu on SafetyBUS p; this is defined in the SafetyBUS p Configurator on the system software. Device addresses 32_D ... 95_D and 132_D ... 195_D are permitted when operating the PSSu with a Pilz PSS.

The SafetyBUS p Configurator on the system software must also be used to define the I/O-Groups to which FS inputs/outputs on the PSSu belong.

There are two options:
- All FS inputs and FS outputs belong to the same I/O-Group.
- FS inputs and FS outputs belong to different I/O-Groups. The PSSu is divided into sections A and B for this purpose. Section A and section B may belong to different I/O-Groups.
  - FS outputs always belong to section A.
  - FS inputs always belong to section B.

Membership of section A or B is used in conjunction with the device address to form the input and output addresses under which they can be addressed by the controlling PSS.
- The first output on a PSSu is addressed in the process image of the controlling PSS under device address and bit number 0. The bit number increases respectively on subsequent outputs.
- The first input is addressed under device address and bit number 0. The bit number increases respectively on subsequent inputs.

5.1 Configure PSSu for SafetyBUS p

Example:

The PSSu system has 8 FS inputs and 8 FS outputs. The device address is 36.

The SafetyBUS p addresses are therefore as follows:

PSSu output	**O0**	**O1**	**O2**	**O3**	**O4**	**O5**	**O6**	**O7**
SafetyBUS p output	A36.00	A36.01	A36.02	A36.03	A36.04	A36.05	A36.06	A36.07
PSSu input	**I0**	**I1**	**I2**	**I3**	**I4**	**I5**	**I6**	**I7**
SafetyBUS p input	E36.00	E36.01	E36.02	E36.03	E36.04	E36.05	E36.06	E36.07

To configure a PSSu system as a SafetyBUS p subscriber you will need the following Pilz software:

- PSSuniversal Configurator
  The PSSuniversal Configurator is part of the system software for PSSu systems. The FS configurations for a PSSu system are made in the PSSuniversal Configurator (e.g. configuration for the local enable principle).
- SafetyBUS p Configurator
  The SafetyBUS p Configurator is part of the PSS WIN-PRO system software. The SafetyBUS p Configurator is used to configure the SafetyBUS p subscribers.

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5.2 Circuit examples

5.2.1 1-channel actuator with feedback loop and local enable

Structure of the PSSu system

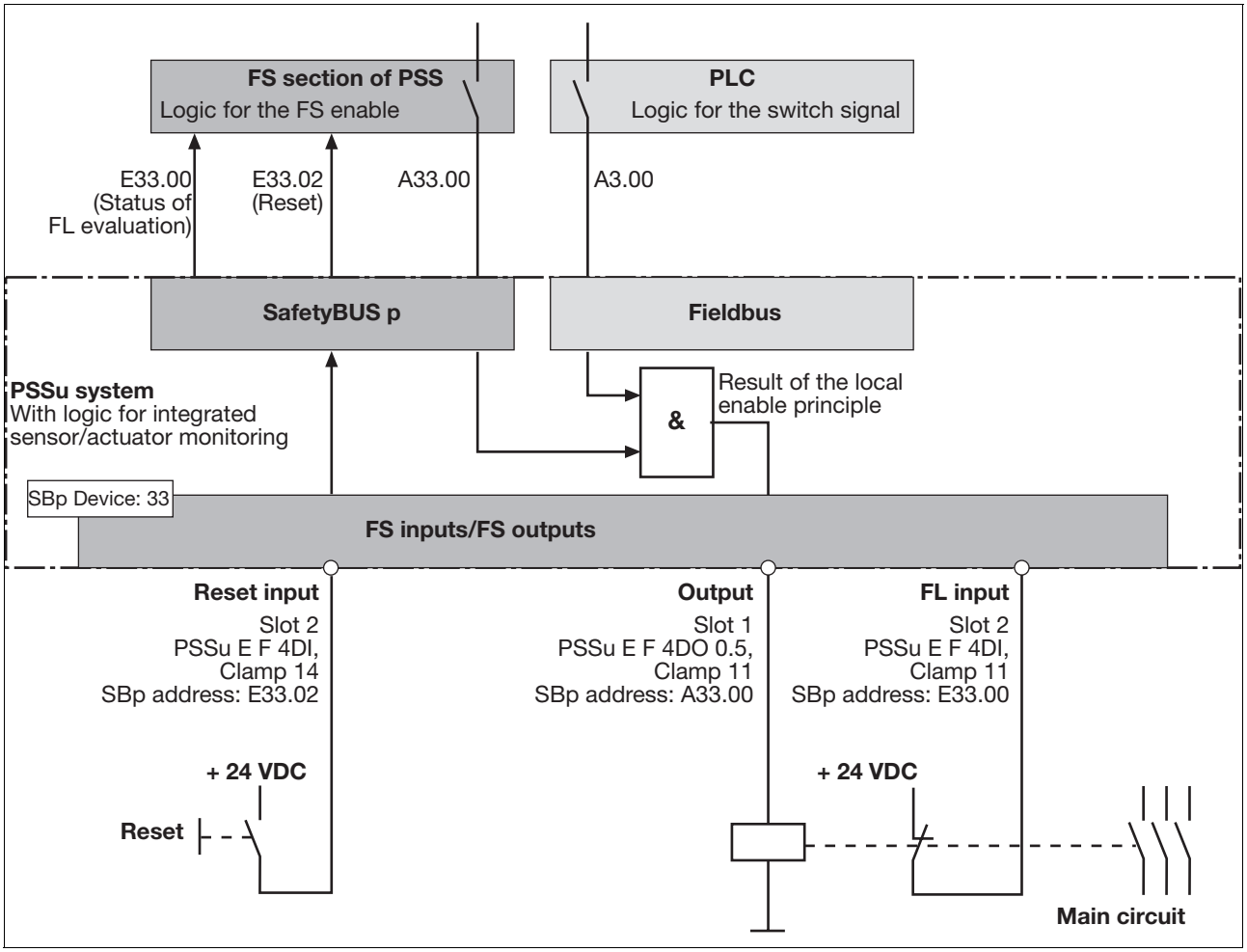
SafetyBUS p Device: 33				
Slot	**Module**	**Terminal**	**Input/output**	**SBp address**
Head module	PSSu H SB DP	- - -	- - -	- - -
0	PSSu E F PS	- - -	- - -	- - -
1	PSSu E F 4DO 0.5	11	O0	A33.00
		21	O1	A33.01
		14	O2	A33.02
		24	O3	A33.03
2	PSSu E F 4DI	11	I0	E33.00
		21	I1	E33.01
		14	I2	E33.02
		24	I3	E33.03

Configuration of read/write access to the FS section

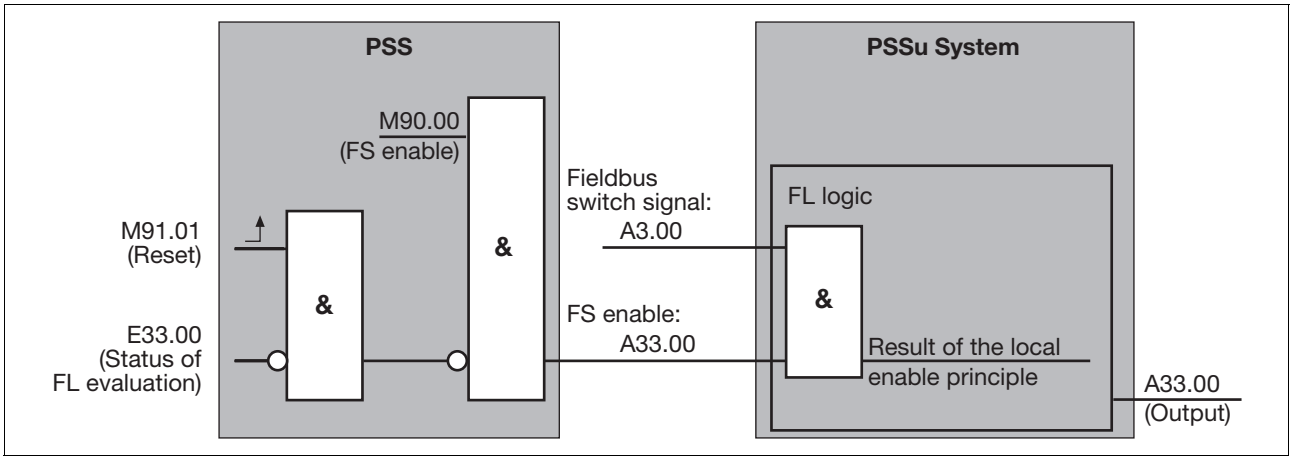
Module	**Input/output**	**ST read access**	**ST write access (local enable)**	**ID in the device description file (e.g. GSD file, EDS file)**
PSSu E F 4DO 0.5	O0	ja	Yes	&
PSSu E F 4DI	I0	Yes	- - -	R
	I1			

5.2 Circuit examples

Circuit design



Reset in the case of an error in the feedback loop



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5.2 Circuit examples

FS user program on the LD-PSS

. . .			
L	E	033.02	// Reset button
UN	M	091.00	// Auxiliary flag for pulse edge evaluation (0/1 pulse edge)
=	M	091.01	// Reset pulse
L	M	090.00	// FS enable (E-STOP circuit, safety gate etc.)
U(			
LN	M	91.01	// Reset pulse
O	E	033.00	// Status of FL evaluation ("1" means: no error in the FL)
)			
=	A	033.00	// FS enable (LED FS0 on PSSu E F 4DO 0.5)
L	E	033.02	// Reset button
=	M	091.00	// Auxiliary flag for pulse edge evaluation
BE			

INFORMATION
We recommend:
Flags that are used for reset should not be used for other tasks (temporary flags). This could lead to malfunctions.

5.2 Circuit examples

5.2.2 2-channel actuator with feedback loop and local enable

Structure of the PSSu system

SafetyBUS p Device: 33				
Slot	**Module**	**Terminal**	**Input/output**	**SBp address**
Head module	PSSu H SB DP	- - -	- - -	- - -
0	PSSu E F PS	- - -	- - -	- - -
1	PSSu E F 4DO 0.5	11	O0	A33.00
		21	O1	A33.01
		14	O2	A33.02
		24	O3	A33.03
2	PSSu E F 4DI	11	I0	E33.00
		21	I1	E33.01
		14	I2	E33.02
		24	I3	E33.03

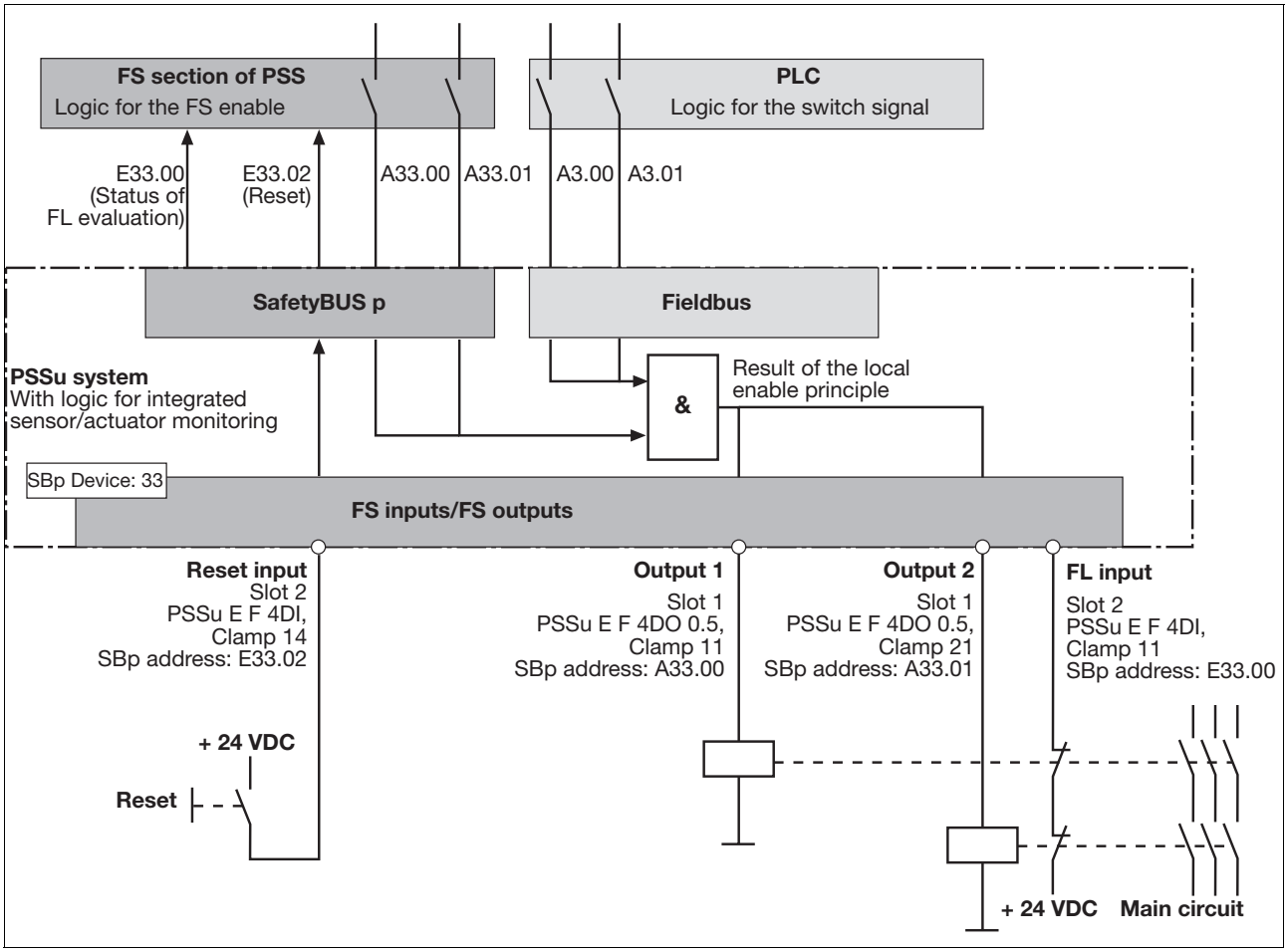
Configuration of read/write access to the FS section

Module	**Input/output**	**ST read access**	**ST write access (local enable)**	**ID in the device description file (e.g. GSD file, EDS file)**
PSSu E F 4DO 0.5	O0	Yes	Yes	&
	O1		Yes	&
PSSu E F 4DI	I0	Yes	- - -	R
	I1			

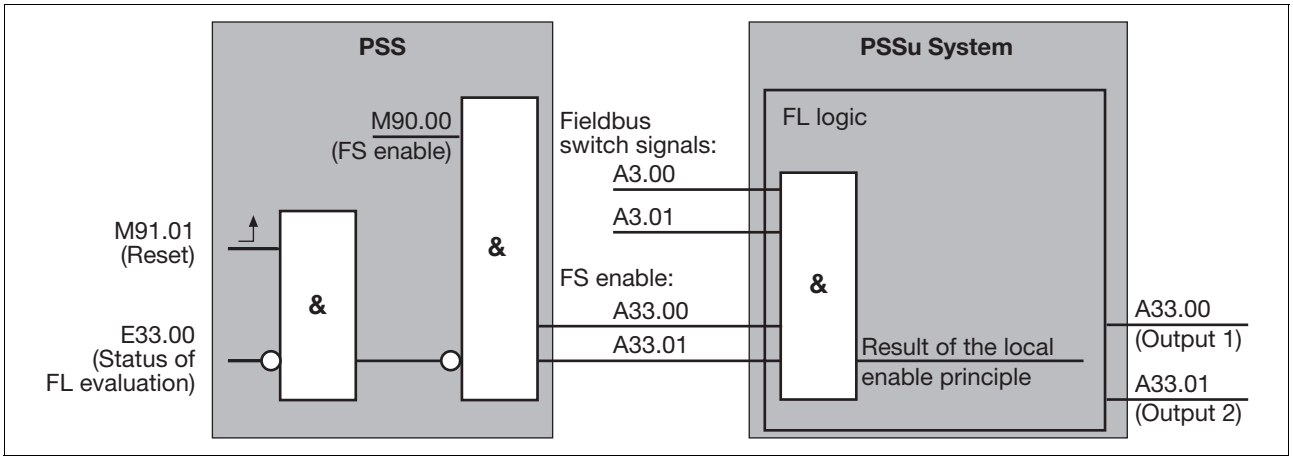
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5.2 Circuit examples

Circuit design



Reset in the case of an error in the feedback loop



5.2 Circuit examples

FS user program on the LD-PSS

. . .			
L	E	033.02	// Reset button
UN	M	091.00	// Auxiliary flag for pulse edge evaluation (0/1 pulse edge)
=	M	091.01	// Reset pulse
L	M	090.00	// FS enable (E-STOP circuit, safety gate etc.)
U(			
LN	M	91.01	// Reset pulse
O	E	033.00	// Status of FL evaluation ("1" means: no error in the FL)
)			
=	A	033.00	// FS enable (LED FS0 on PSSu E F 4DO 0.5)
=	A	033.01	// FS enable (LED FS1 on PSSu E F 4DO 0.5)
L	E	033.02	// Reset button
=	M	091.00	// Auxiliary flag for pulse edge evaluation
BE			

INFORMATION

We recommend:

Flags that are used for reset should not be used for other tasks (temporary flags). This could lead to malfunctions.

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6.1 Procedure

The following steps are required for commissioning:

- Assembly and configuration of the PSSu systems in the PSSuniversal Assistant
- SafetyBUS p configuration with the SafetyBUS p Configurator
- FS configuration with the PSSuniversal Configurator
- Programming via the PSS WIN-PRO system software.
- If required, configuration and programming of the standard fieldbus system
- Mechanical structure and electrical connections

The following documents apply for the mechanical structure and electrical connections: PSSu Installation Manual, SafetyBUS p Installation Manual and, if required, guidelines for installing the standard fieldbuses.

INFORMATION
Detailed instructions of the various work stages are provided in the software's online help. Step-by-step instructions can be found in the manual: "Getting Started: Full version of PSS WIN-PRO".

6.1 Procedure

6.1.1 Assembly of the PSSu systems in the PSSuniversal Assistant

Procedure:

- Start the PSSuniversal Assistant.
  To load information about new modules or new functions, you can update the PSSuniversal Assistant via the Internet.
- Create new project.
  Several PSSu systems can be combined in one project.
- Assemble hardware for each PSSu system.
  The PSSuniversal Assistant takes the system limits into account and triggers an error message if these are exceeded. The PSSuniversal Assistant also detects certain errors during assembly, e.g. no PSSu system with bus termination can be configured with a supply voltage module.
- Assign ST section with read access and write access to FS modules.
  The FS inputs/outputs can be transferred to the ST-PII. The FS outputs can also be transferred to the ST-PIO for the local enable principle. The ST process images can be optimised.
- Configuration of the analogue and counter modules
  On analogue and counter modules it is possible to configure parameters. On some modules the operating mode can also be configured.
- Save project.
  If the PSSu systems require FS configurations, they can undergo further processing in the PSSuniversal Configurator.
- Export device description file (e.g. GSD file, EDS file), if necessary
- You can now print an overview of the configuration plus an order list.

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6.1 Procedure

6.1.2 Programming in the SafetyBUS p Configurator

Procedure:

- Start PSS WIN-PRO and create a new project.
- Configure MD (PSS with hardware registry).
- Start SafetyBUS p Configurator.
- Enter SafetyBUS p basic data.
- Add SafetyBUS p subscribers.
- Import PSSu system from saved PSSu project
  The PSSuniversal Configurator will open. All the configuration data can be changed in the PSSuniversal Configurator.
- In PSS WIN-PRO, program the software for the SafetyBUS p project's MD.
- Save and build the SafetyBUS p project.
- Export device description file (e.g. GSD file, EDS file), if necessary
- Download the program to the MD.
  The MD always assigns the current configuration to the PSSu as the registered hardware. The PSSu compares the registered hardware with the actual hardware.

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7.1 Diagnostic data of electronic modules

The PSSu system provides many options for diagnostics, fault detection and communication with other control systems. The diagnostics of a PSSu system can be performed via

- The LEDs on the electronic/compact modules and head module,
- The local USB port on the head module,
- A PSS connected via SafetyBUS p,
- Standard fieldbus functions,
- PVIS expanded diagnostics.

Both FS modules and ST modules can be diagnosed via a standard fieldbus or via SafetyBUS p.

For visualisation we recommend PMIvisu/PMIopen type devices plus expanded diagnostics with the PVIS OPC Server.

The available diagnostic data will depend on the modules you are using. Different errors are detected depending on the electronic module (see operating instructions for the relevant module). Besides the error data, electronic/compact modules can also send messages about their status to the head module.

The table below lists some typical PSSu messages.

7.1 Diagnostic data of electronic modules

Module error	Statement	Remedy
Start-up error	Error as the PSSu system starts up	Change faulty module
Configuration error	Incorrect module type configured	The configured hardware registry does not match the actual hardware registry
FS communication error	Error during FS communication	Change faulty module
ST communication error	Error during ST communication	Change faulty module
Bus termination error	There is no terminating plate or there is a bad contact with the module bus	Install a terminating plate with integrated end bracket or insert the base modules together correctly
Temperature error: too warm ([1])	Ambient temperature too high: Error stack entry	Ensure there is sufficient ventilation in the control cabinet or prevent overload
Temperature error: too hot ([1])	Ambient temperature too high: Reset the module and stop the affected I/O-Groups (SafetyBUS p)	Ensure there is sufficient ventilation in the control cabinet or prevent overload
Output error	Error during cyclical output test for short circuit. Possible causes: Short circuit, or output defective	Rectify the short circuit or change the faulty module
Test pulse error	Possible causes: Short circuit between a test pulse and a supply voltage, or a defective module	Rectify the short circuit or change the faulty module
Relay control error	Error during cyclical monitoring test of the relay coils	Change faulty relay module
Relay error	A relay position is faulty; possible cause: Defective relay contact	Change faulty relay module
Block switching output error	Error during cyclical monitoring test of the relay contacts; possible external cause: Voltages being fed back to the relay contacts	Check the supply voltage and the wiring
Error in the feedback loop	FS input detects an error in the feedback loop or FS input is defective	Check FS input, check the configuration of the feedback loop, check the signals, or check the wiring and contacts
Error in the local enable principle	FS output has reacted incorrectly or unexpectedly	Check the configuration of the FS output, or check the fieldbus signals in the FS and ST section
Input error	Error during the cyclical input test; possible cause: Input defective	Change faulty module
Overload/short circuit	Load on output too high	Rectify overload or short circuit
Overload of the supply voltage for encoder	Supply voltage for encoder overloaded or short-circuited	Rectify overload or short circuit
Overvoltage error	A system voltage or infeed is too high	Stabilise the supply or change the faulty supply voltage module
Undervoltage error	A system voltage or infeed is too low	Stabilise the supply or change the faulty supply voltage module

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7.1 Diagnostic data of electronic modules

Module error	Statement	Remedy
Error in the overvoltage protection diodes	Overvoltage protection diodes are defective	Change faulty supply voltage module
Timeout error on the output	No data has been received for the output from the module bus for longer than 50 ms.	Check ST communication or configuration
Polarity error	Polarity of the periphery supply	Correct the polarity
Error in the periphery supply	Lower voltage limit exceeded on the periphery supply	Ensure there is a sufficient supply

([1]) There are two levels of overtemperature.

- Too warm:
  If a module's temperature exceeds a threshold value, the module sends a warning to the head module. If the temperature drops back below the threshold value, the module sends an all-clear.
- Too hot:
  If a module's temperature exceeds a further threshold value, the module sends an error message to the head module and triggers an I/O-Group stop.

Further information on PSSu error messages is available in the online help for the system software.

7.2 Head module's error stack

Certain events lead to an entry in the head module's error stack. An event is signalled once only and is not repeated cyclically. Entries in the error stack can be evaluated for diagnostic purposes. If the PSSuniversal system is connected to SafetyBUS p, many events will trigger a telegram, depending on the configuration. The entries in the head module's error stack are graded according to their priority.

How a PSSu system reacts to events and how the error stack entries are forwarded will depend on the head module, the configuration, the connected bus systems and the user programs. The entry in the error stack corresponds to the format used with SafetyBUS p subscribers.

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8.1 Glossary

Absolute encoder	Encoder that provides an absolute value for each position. The absolute value corresponds directly to the position of the detected machine component.
Base module	Carrier unit for an electronic module; used to connect the field wiring.
Base station	PSSu module that exchanges data from the PSSu with a remote station via wireless signals or cable connection.
Base system	PSSu subsystem that is connected to the remote system, e.g. via wireless signals or cable connection.
Certification	Procedure by which a product's compliance with the applicable regulations and standards is tested by a notified body; proven compliance is confirmed through the issue of a certificate.
Certification body	Notified body in accordance with Article 14 of the Directive 2006/42/EC Otherwise: Accredited institution, often a government body, which examines and confirms a product's compliance with applicable regulations and standards.
CFM	(Coexistence Frequency Management) Technology that prevents interference between InduraNET p and other wireless-based systems
Coated version	The coated versions of the modules are suitable for use where there are increased environmental requirements on temperature and humidity.
Cold start	A PSSu system performs a cold start when the module supply is applied.
Compact module	Combines the function unit (inputs or outputs) and connection levels in one housing.
Competent person	A person who, through training, experience and current professional activity, has acquired the necessary knowledge and authorisation to test, assess and handle devices, systems, plant and machinery in accordance with the general standards and guidelines for safety technology.
C-rail	Additional, available power rail.
Derating diagramm	Dependency of the maximum permitted current on the ambient temperature.
Diversely redundant	A piece of information is processed more than once and in different ways.
Download	Download of data from the PC to the device.

8.1 Glossary

Elektronic modules	Module that provides a function, e.g. input or output; plugged into the base module.
Failsafe	Abbreviation: FS Safety-related, failsafe; a failsafe system switches to a safe condition in the event of an error.
Fieldbus	Standard bus system that transfers process data between various bus subscribers, e.g. DeviceNet, PROFIBUS.
FIR filter	Filter with finite impulse response.
Gain	Amplification factor; signed value, which is multiplied by the transferred value in the event of a correction.
Gray code	Display format of binary figures, in which adjacent figures differ in only one single bit.
Grid width	Base modules and electronic modules have a grid width of 12.6 mm or an integer multiple thereof.
Head module	Module that co-ordinates process data traffic via standard fieldbus systems or SafetyBUS p.
IIR filter	Filter with infinite impulse response.
InduraNET p	Wireless system from Pilz, suitable for industrial use.
InduraNET p system	Base station in conjunction with the corresponding remote stations.
Incremental encoder	Sensor for detecting linear or rotational positional changes; path, speed and direction can be determined by evaluating the number of pulses, pulse frequency and phase position.
Input/output module	Electronic module with input or output function and base module with terminals for connecting the inputs or outputs.
Internal inputs/outputs	These do not have any connection terminals; they are used for internal data transfer between the head module and the electronic module.
Inverted signals	Each bit in a transmission is sent inverted on another line, i.e. "1" becomes "0" and "0" becomes "1".
Local enable principle	ST section has write access to the FS section; FS outputs can be switched via the ST section.
LSB	Least significant bit

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8.1 Glossary

Mechanical coding	Coding element on the electronic module, with its counterpart in the base module.
Module bus	Bus to supply voltage to the modules and transfer data between the head module and electronic modules.
Module supply	Internal supply voltage for the head module and electronic modules.
MSB	Most significant bit
Offset	Zero point compensation; constant, signed value, which is added to the transferred value in the event of a correction.
Periphery supply	Supply voltage for the sensors and actuators on input/output modules.
PSSuniversal	Abbreviation: PSSu; also: PSSu system; modular, programmable system for controlling plant and machinery.
Processing time	The time a module requires internally for processing signal changes.
Reaction time	Time it takes for a bus telegram to be finalised or for some other reaction from the head module to take place once a signal has changed at an input, or the time it takes the signal at an output to change once a bus telegram has been received.
Redundant antenna	Two offset antennas in one housing, which can compensate for local quenching, e.g. in mobile applications.
Remote station	EFirst module in a remote system, which exchanges data with the PSSu base station via wireless signals or cable connection.
Remote system	PSSu subsystem that is connected to the base system, e.g. via wireless signals or cable connection.
Resolution	Number of bits for the display of a numerical value.
Safe condition	Condition in which power is removed from the safety circuits.
Scaling	Setting for offset and gain on analogue modules.
Sign and magnitude representation	Display format of binary figures for positive and negative values. The MSB is the sign bit.
Single-pole, referenced to earth	Property of an earth (0 V) switching output; also: single ended.
SSI	Abbreviation for synchronous serial interface; interface for absolute encoder, used in the drive technology sector to transmit positional data.

8.1 Glossary

Standard	Abbreviation: ST Not safety-related, in contrast to failsafe.
Standard bus system	Non-safety-related bus system, e.g. DeviceNet or PROFIBUS, in contrast to SafetyBUS p or SafetyNET p from Pilz.
Status byte	Certain modules use the status byte to transfer information about their status to the head module.
Supply module	Consists of an electronic module and a base module; also: Supply voltage module.
System	A number of modules combined to form a functional unit.
System environment A	For use in ▸ Decentralised system PSSu I/O with SafetyBUS p ▸ Decentralised system PSSu I/O with ST fieldbuses such as CANopen, DeviceNet ▸ Not for use in the automation system PSS 4000
System environment B	For use in the automation system PSS 4000, e.g. with ▸ Decentralised system PSSu I/O with SafetyNET p ▸ Control system PSSu PLC ▸ Control system PSSu multi
Test pulse	Test pulse signal which is wired to an input in order to detect wiring errors in that input. These errors may be: open circuit, short circuit to 24 VDC or 0 V or shorts between between two inputs.
Two's complement	Display format of binary figures for positive and negative values. To form a negative figure, each bit of the positive figure is inverted and 1 is added.
Two-pole, differential	Property of a positive (+24 V) switching and earth (0V) switching output.

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8.2 Modules' hexadecimal code

Head modules	Hexadecimal module code
PSSu H CAN(-T)	0204_H
PSSu H DN(-T)	0202_H
PSSu H DP(-T)	0201_H
PSSu H IBSe	0203_H
PSSu H IBSo	0205_H
PSSu H SB(-T)	0220_H
PSSu H SB CAN(-T)	0224_H
PSSu H SB DN(-T)	0222_H
PSSu H SB DP(-T)	0221_H
PSSu H SB IBSe	0223_H
PSSu H SB IBSo	0225_H
PSSu H S PN	0206_H
PSSu H F PN	0226_H

Electronic modules	Hexadecimal module code
PSSu E S PD-D	$000A_H$
PSSu E F PS(-T)	0801_H
PSSu E F PS1(-T)	0800_H
PSSu E F PS-P(-T)	0802_H
PSSu E F BSW(-T)	$0C02_H$
PSSu E S 4DI(-T)	0200_H
PSSu E S 4DI-D	0210_H
PSSu E S 2DO 2(-T)	0400_H
PSSu E S 2DO 2-(T)D	0410_H
PSSu E S 4DO 0.5(-T)	0401_H
PSSu E S 4DO 0.5-(T)D	0411_H
PSSu E S 2DOR 2(-T)	0404_H
PSSu E S 2DOR 10(-T)	0403_H
PSSu K S 16DI	0230_H
PSSu K S 16DO 0.5	0430_H
PSSu K S 8DI 8DO 0.5	0630_H
PSSu E F 4DI(-T)	$0A00_H$
PSSu E F 2DO 2(-T)	$0C00_H$
PSSu E F 4DO 0.5(-T)	$0C01_H$
PSSu E F 2DOR 8(-T)	$0C03_H$
PSSu E F DI OZ 2(-T)	$0E00_H$
PSSu E S 2AI I se(-T)	0310_H
PSSu E S 2AI TC(-T)	0304_H
PSSu E S 2AI U	0300_H
PSSu E S 4AI U	0301_H
PSSu E S 2AI RTD(-T)	0303_H
PSSu E S 2AI TC(-T)	0304_H
PSSu E S 2AO I	0510_H
PSSu E S 2AO U	0500_H
PSSu E S 4AO U	0501_H

8.2 Modules' hexadecimal code

Electronic modules	Hexadecimal module code
PSSu E S ABS SSI	0320_H
PSSu E S INC	0321_H
PSSu E S INC 24V se(-T)	0322_H
PSSu E S RS232(-T)	0720_H
PSSu E S RS485(-T)	0721_H
PSSu XB F-T	- - -
PSSu XR F-T	- - -
PSSu WB S IDN	0005_H
PSSu WR S IDN	0006_H
PDP67 WR S 8DI 8DO 0.5 IDN	$000B_H$
PSSu E AI SHT1	- - -
PSSu E PD(-T)	- - -
PSSu E PD1(-T)	- - -
PSSu E PS-P 5V(-T)	- - -
PSSu E PS-P +/- 10V	- - -
PSSu E PS-P +/- 15V	- - -

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21256-EN-04, 2010-10 Printed in Germany
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