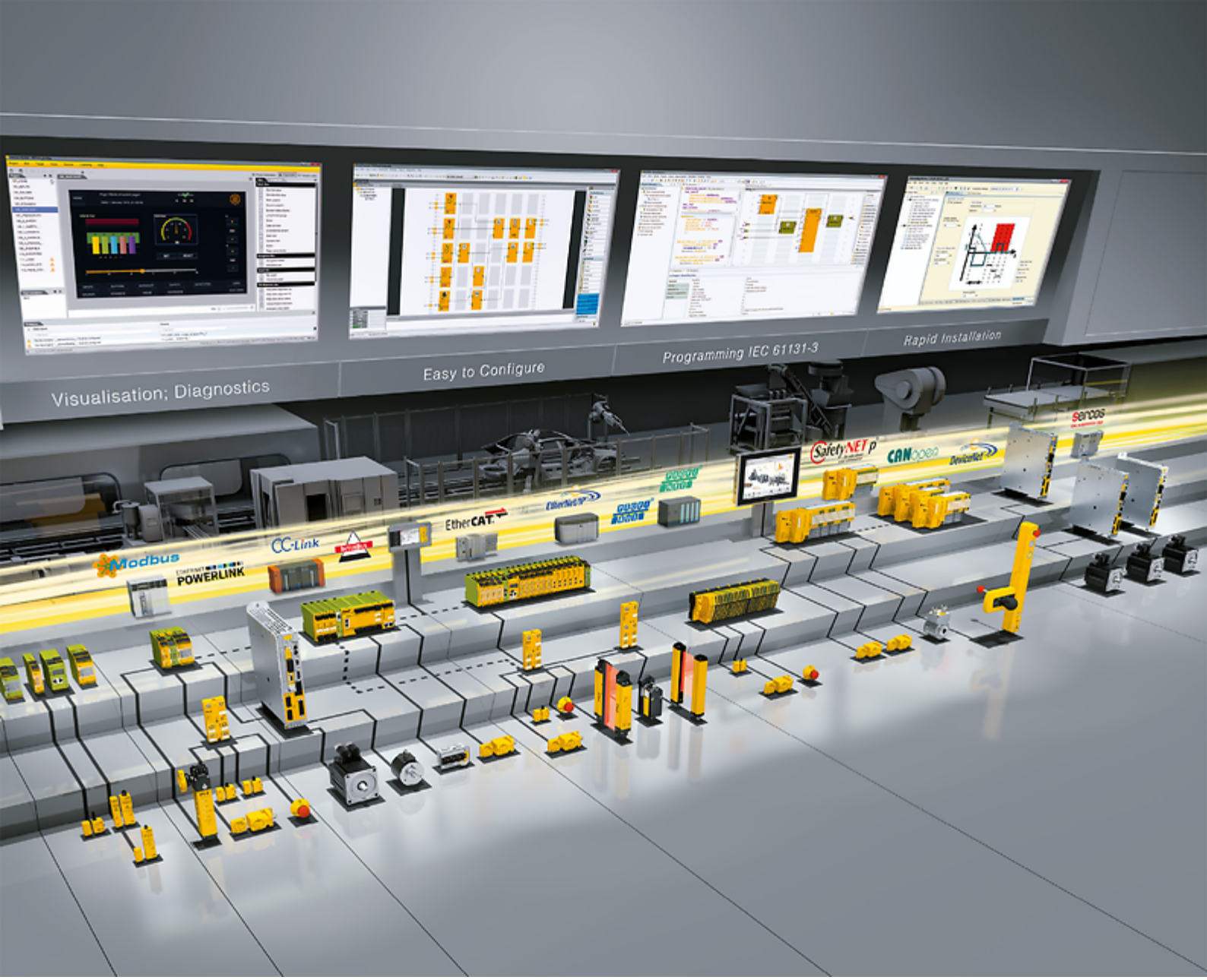


PSS u2 ES 4DID

PILZ
THE SPIRIT OF SAFETY

- Control system PSS u2
- Remote I/O system PSS u2

Operating Manual-1003611-EN-03

This document is the original document.

Where unavoidable, for reasons of readability, the masculine form has been selected when formulating this document. We do assure you that all persons are regarded without discrimination and on an equal basis.

1 Introduction

1.1 Validity of documentation

This operating manual explains the function and operation, describes the installation and provides guidelines on how to connect the product.

This documentation is valid for the product PSS u2 ES 4DID hardware version 01 or higher. It is valid until new documentation is published.

1.2 Using the documentation

This document is intended for instruction. Only install and commission the product if you have read and understood this document. The document should be retained for future reference.

Please refer to the PSS u2 Installation Manual.

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. It also highlights areas within the text that are of particular importance.

INFORMATION

This gives advice on applications and provides information on special features.

2 Overview

Module structure:

A module consists of

- an electronic module,
- a terminal block with cage clamp terminals and
- a module carrier

The electronic modules are plugged into the backplane and determine the function. The backplane is used for communication between the head module and the electronic modules and forms the carrier unit for the electronic modules. The terminal block is plugged into the electronic modules and is used to connect the field wiring.

Details of the terminal blocks that can be used are available under "Intended Use".

2.1 Module features

Application of the product PSS u2 ES 4DID:

Electronic module with digital inputs and expanded diagnostics for standard applications.

The product has the following features:

- 4 type 3 digital inputs in accordance with IEC 61131-2
- Configurable input filter time: 0 … 25.5 [ms]
- Configurable pulse stretching: 0 … 255 [ms]
- 2 Voltage outputs
- Current load capacity per output: 0,25 A
  - Short circuit-proof
  - Overload-proof
- Energy-saving functions
- The module provides advanced diagnostic data:
  - Overload
  - Short circuit
  - Undervoltage
- LEDs for:
  - Status of inputs
  - Status of voltage outputs
  - Module error
  - Operating status

3 Safety

3.1 Intended use

The module provides standard type 3 inputs in accordance with IEC 61131-2 and may be used for standard applications in the PSS u2 system.

Intended use includes making the electrical installation EMC-compliant. The module is designed for use in an industrial environment. Interference may occur if used in other areas.

The following is deemed improper use in particular

- Any component, technical or electrical modification to the module,
- Use of the module outside the areas described in this manual,
- Any use of the module that is not in accordance with the technical details.

The module PSS u2 ES 4DID may be used in conjunction with the following terminal block:

- 8-pin terminal block

3.2 System requirements

INFORMATION

The module is supported by

- PASconfig from version 1.0.0
  - We recommend that you always use the latest version (download from www.pilz.com).

3.3 Safety regulations

3.3.1 Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by persons who are competent to do so.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. To be able to inspect, assess and operate devices, systems and machines, the person has to be informed of the state of the art and the applicable national, European and international laws, directives and standards.

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 information provided in the section entitled Safety
- Have a good knowledge of the generic and specialist standards applicable to the specific application.

3.3.2 Warranty and liability

All claims to warranty and liability will be rendered invalid if

- The product was used contrary to the purpose for which it is intended,
- Damage can be attributed to not having followed the guidelines in the manual,
- Operating personnel are not suitably qualified,
- Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering work etc.).

3.3.3 Disposal

- When decommissioning, please comply with local regulations regarding the disposal of electronic devices (e.g. Electrical and Electronic Equipment Act).

4 Function description

4.1 Block diagram

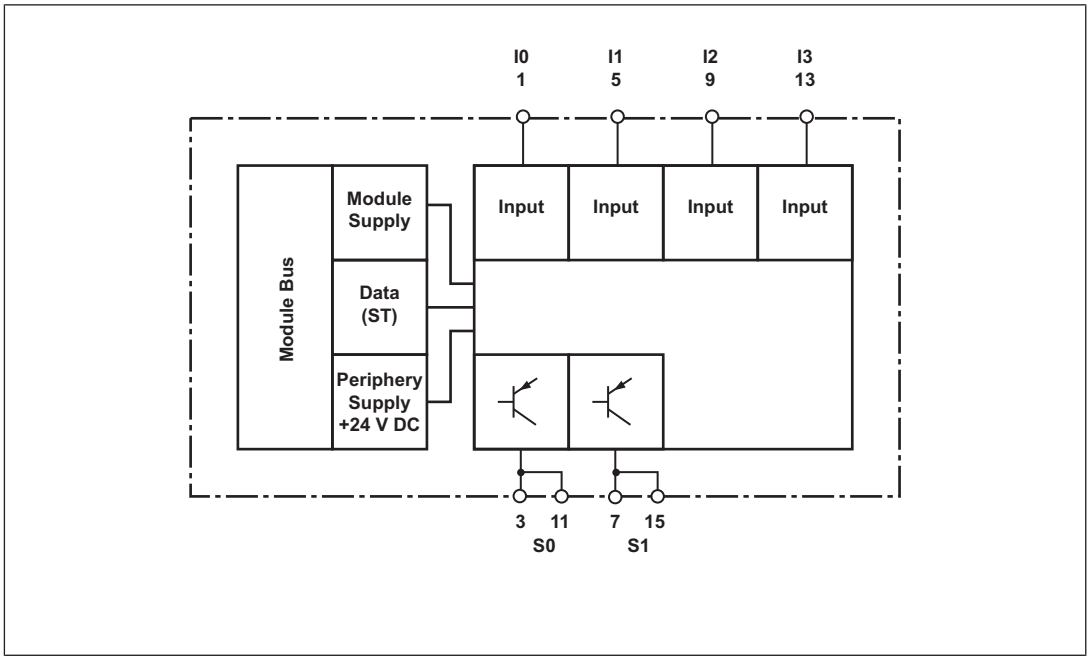


Fig.: Block diagram PSS u2 ES 4DID

4.2 Supply

- The module is supplied with voltage via the head module.
- The periphery supply provides the voltage outputs with voltage

When the supply voltage for the periphery supply is interrupted, the periphery supply is buffered for 20 ms. The buffering is designed for the input currents.

4.3 Inputs

- The status of the inputs is signalled to the head module via the module bus.
- The inputs are fitted with a configurable software filter.
- Pulse stretching can be configured for the inputs.
- Any signals that are shorter than the signal suppression time t_{pulse_sup} are filtered out. The signal suppression time depends on the configured software filter time.

  $t_{pulse\_sup} = t_{filter} - 300\ \mu s$
- The module detects any signals that are present at the input for longer than the minimum signal time t_{signal_min}.

  $t_{signal\_min} = t_{filter} + t_{ProcIM}$

  t_{ProcIM}: Input processing time (see Technical details [📖 24]).

- A signal is always detected and signalled to the head module's PII if it is present for longer than the sum of the following times:
  - Minimum signal time t_{signal_min}
  - ST scan time

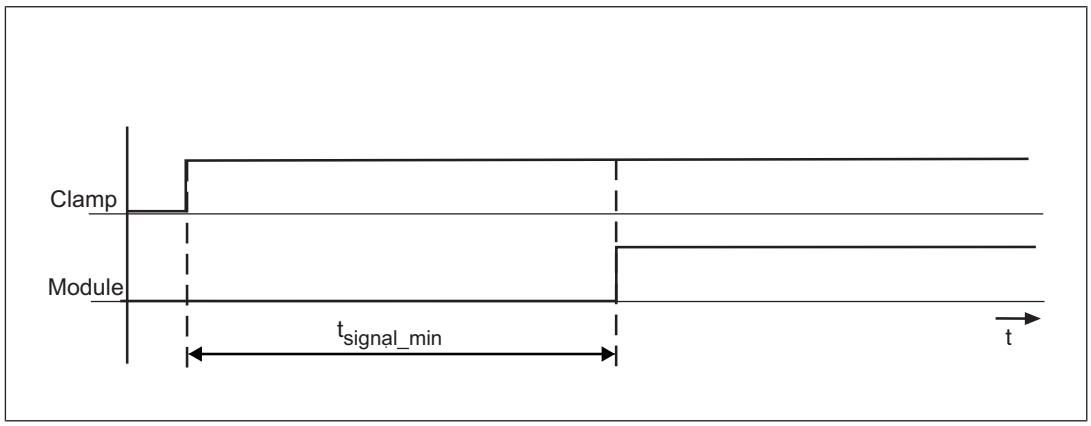


Fig.: Software filter

Legend

Clamp	Signal at the terminal
Module	Filtered signal in the module
t_{signal_min}	Time for which a signal must be present at the input in order to be detected

Pulse stretching:

The module stretches a 1-signal or 0-signal at the input terminals to the configured pulse stretch time $t_{stretch.}$ If the signal is longer than the pulse stretch time, then it is not stretched any further.

Signal requirements at the terminals:

The 0-signal and the subsequent 1-signal together must be present at the input for longer than twice the configured pulse stretch time $t_{stretch}$.

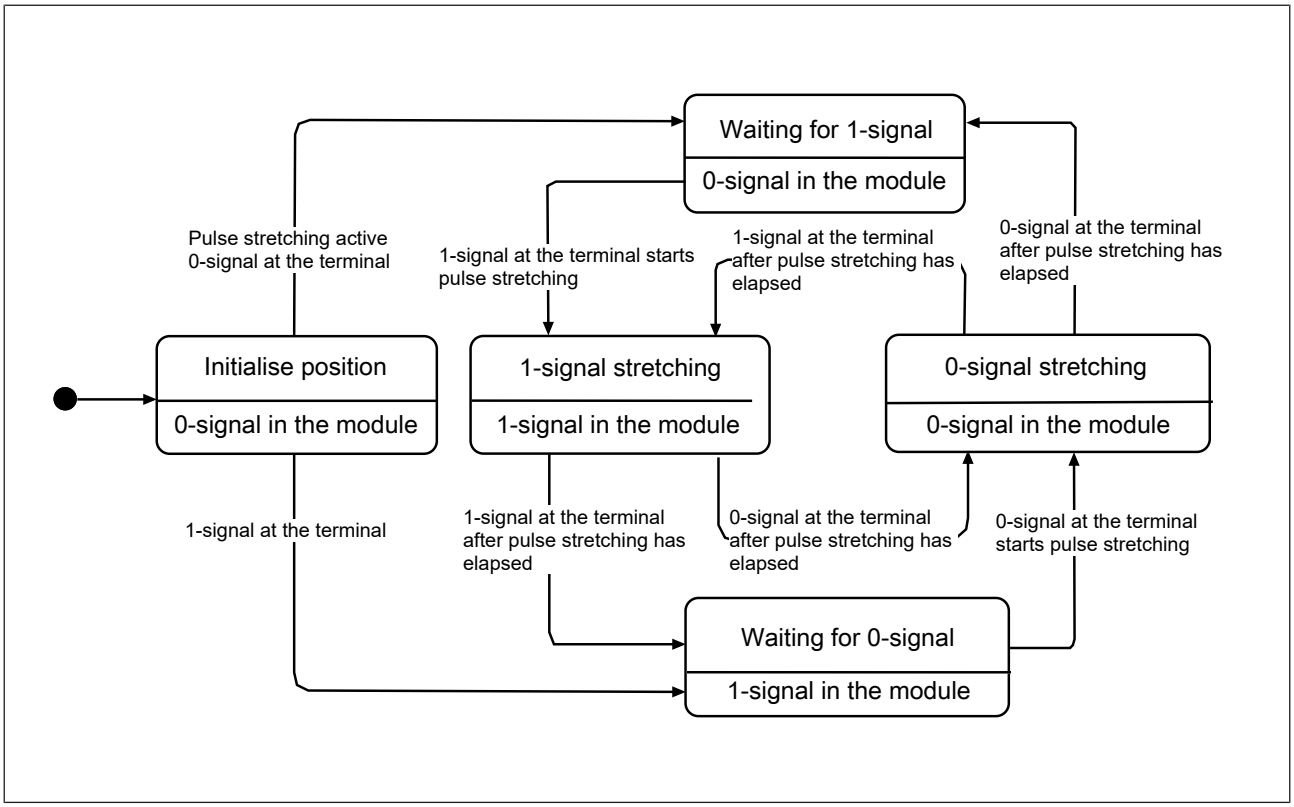


Fig.: States for pulse stretching

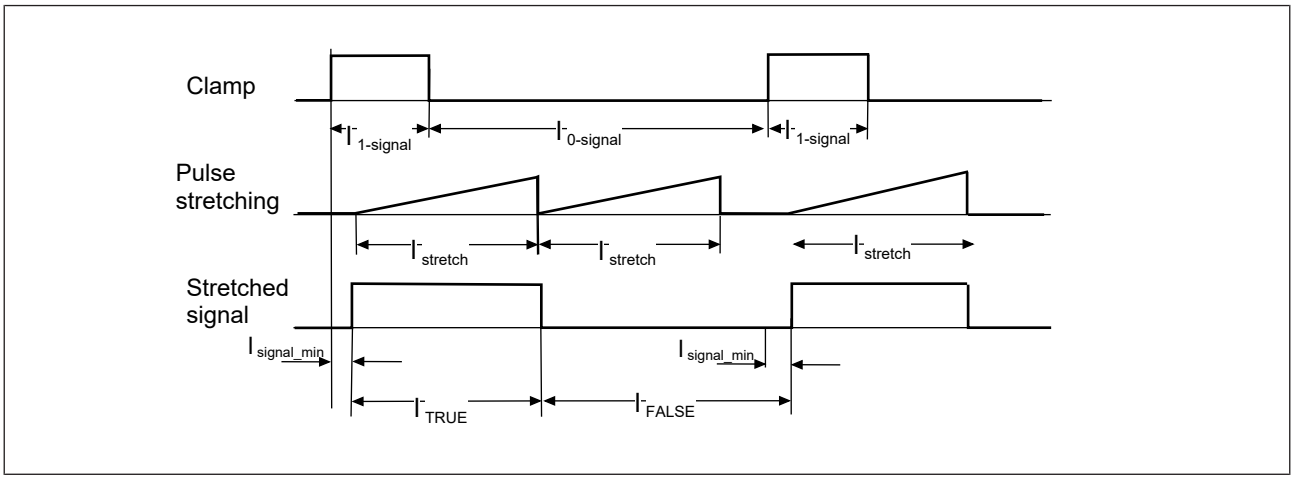


Fig.: Timing diagram: pulse stretching > signal duration of 1-signal

Legend

Clamp	Signal at the terminal
Pulse stretching	Pulse stretching
Stretched signal	Stretched signal
$t_{1\text{-signal}}$	Duration of 1-signal
$t_{stretch}$	Duration of pulse stretching
t_{signal_min}	Time for which a signal must be present at the input in order to be detected
t_{TRUE}	Stretched 1-signal in the module
t_{FALSE}	Stretched 0-signal in the module

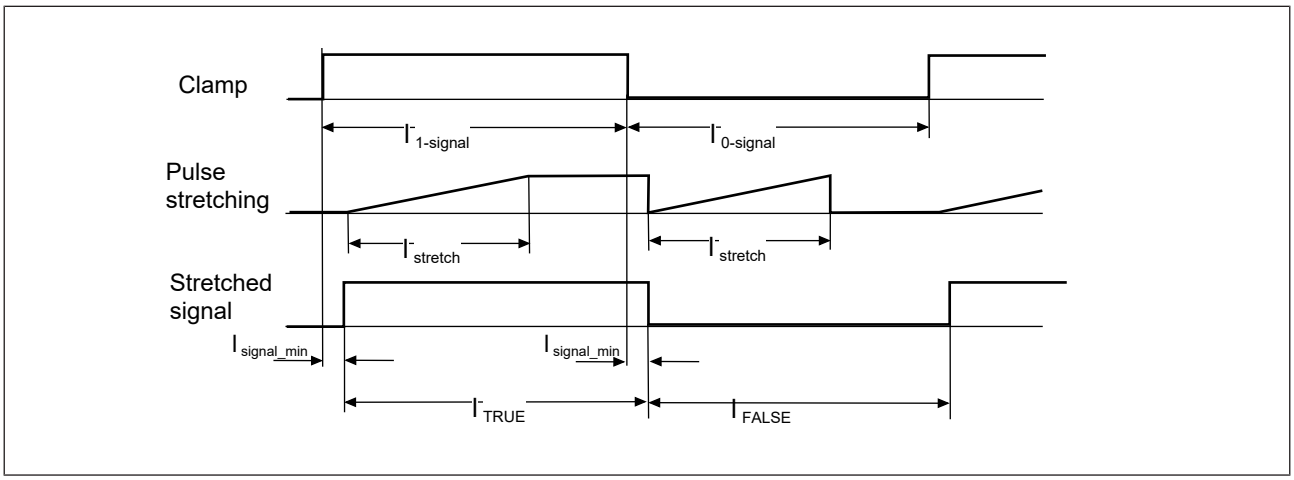


Fig.: Timing diagram: pulse stretching ≤ signal duration of 1-signal

Legend

Clamp	Signal at the terminal
Pulse stretching	Pulse stretching
Stretched signal	Stretched signal
$t_{1\text{-signal}}$	Duration of 1-signal
$t_{stretch}$	Duration of pulse stretching

t_{signal_min}	Time for which a signal must be present at the input in order to be detected
t_{TRUE}	Stretched 1-signal in the module
t_{FALSE}	Stretched 0-signal in the module

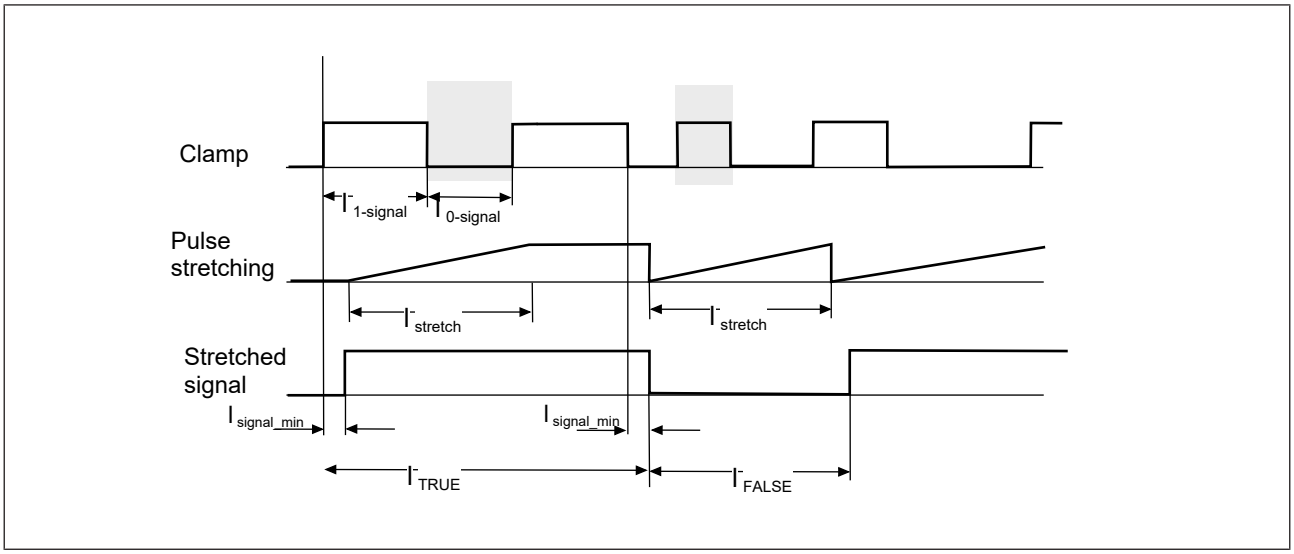


Fig.: Timing diagram: pulse stretching with variable signal duration

Legend

Clamp	Signal at the terminal
Pulse stretching	Pulse stretching
Stretched signal	Stretched signal
$t_{1\text{-signal}}$	Duration of 1-signal
$t_{stretch}$	Duration of pulse stretching
t_{signal_min}	Time for which a signal must be present at the input in order to be detected
t_{TRUE}	Stretched 1-signal in the module
t_{FALSE}	Stretched 0-signal in the module
Grey shaded area	Signals that are not detected during stretching

4.4 Voltage outputs

- The periphery supply is available at the voltage outputs.
- The voltage outputs supply the sensors at the inputs.
- The voltage outputs are protected against overload and short circuit.

4.5 Reaction times

Detailed information on the reaction times is available in the operating manual of the head modules.

4.6 Energy-saving functions

The energy-saving levels are controlled by the head module and are not configurable. The module supports the following energy-saving levels:

- Switching off the LEDs

  The LEDs have two energy-saving levels:

  – Switching off the LEDs to display the terminal status

  – Switching off the LEDs to display the module and terminal status

- Switching off the terminals

  – The module switches off the voltage at the voltage outputs.

  – Signal states at the digital inputs are signalled to the PII.

- Standby mode

  – All module functions are inactive.

  – The LEDs for displaying the module and terminal status are switched off.

5 Address assignment

The module occupies 2 Bytes in the process image.

PII		Meaning	State
Byte 0	Bit 0	Input data I0	0: "0"-signal (0 V) at the input 1: "1"-signal (+ 24 V) at the input
	Bit 1	Input data I1	
	Bit 2	Input data I2	
	Bit 3	Input data I3	
	Bit 4 - 7	None	Constant "0"
Byte 1	Bit 0	Valid bit of voltage output S0	0: Error at the voltage output 1: No error at the voltage output
	Bit 1	Valid bit of voltage output S1	
	Bit 2 - 7	None	Constant "0"

6 Installation

6.1 General installation guidelines

NOTICE

Damage due to electrostatic discharge!

Electrostatic discharge can damage components. Ensure against discharge before touching the product, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.

6.1.1 Dimensions

The dimensions include the backplane, electronic module and terminal block.

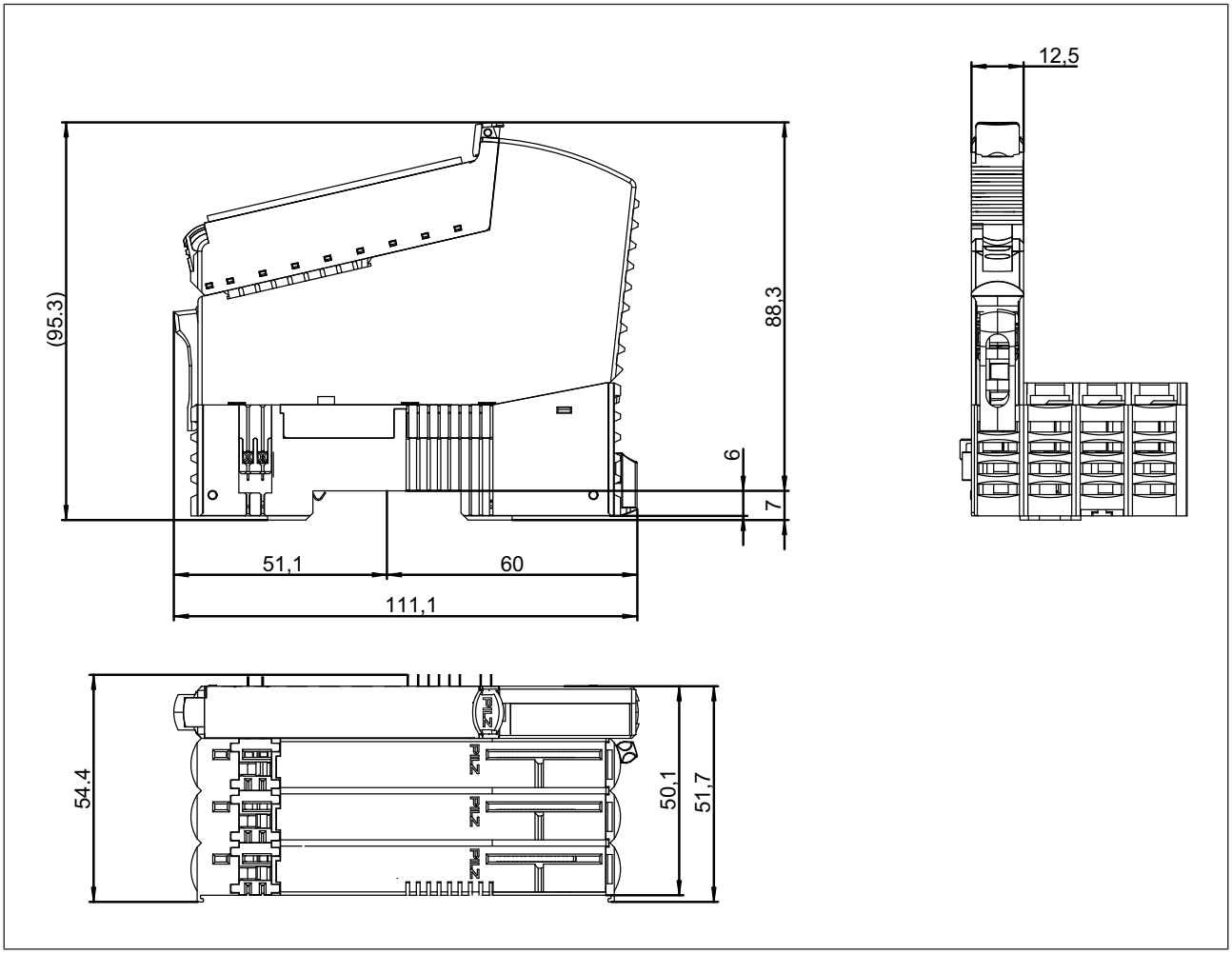


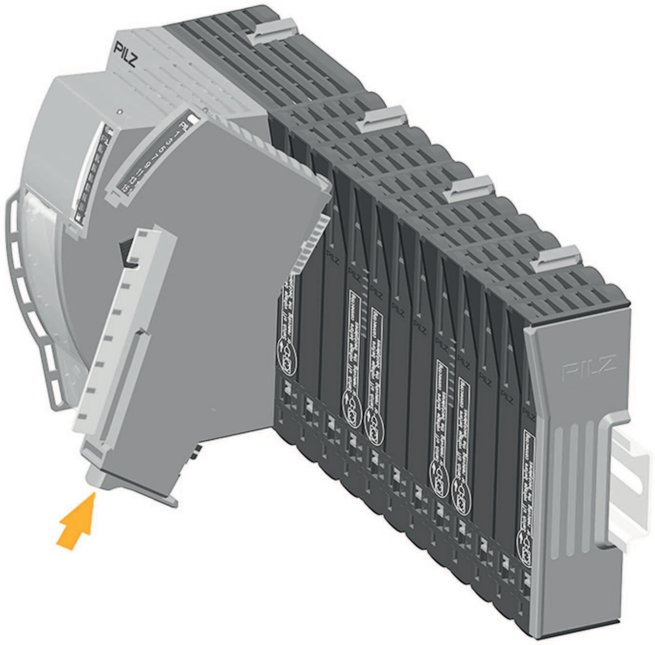
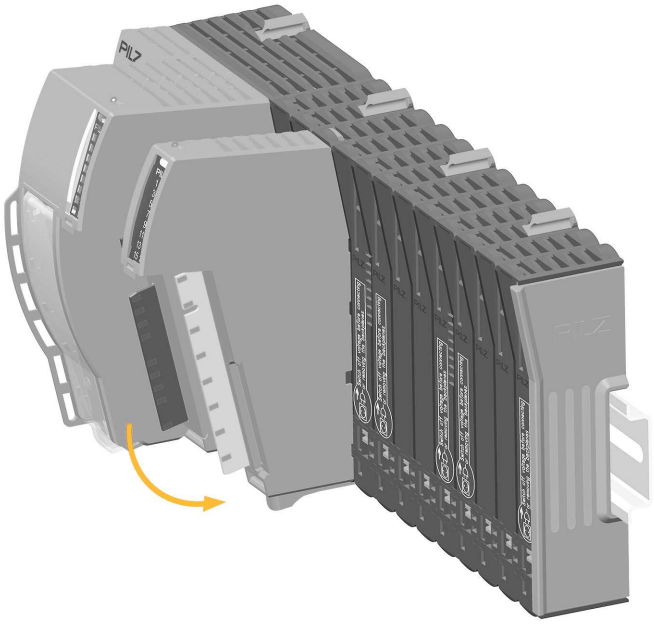
Fig.: Dimensions in mm, including backplane, electronic module and terminal block

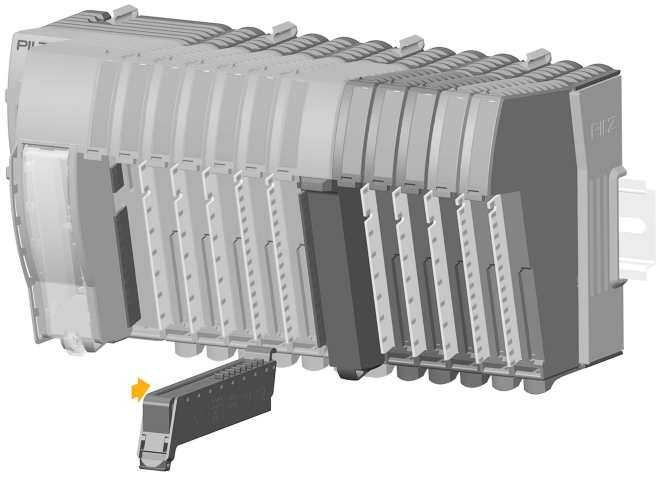
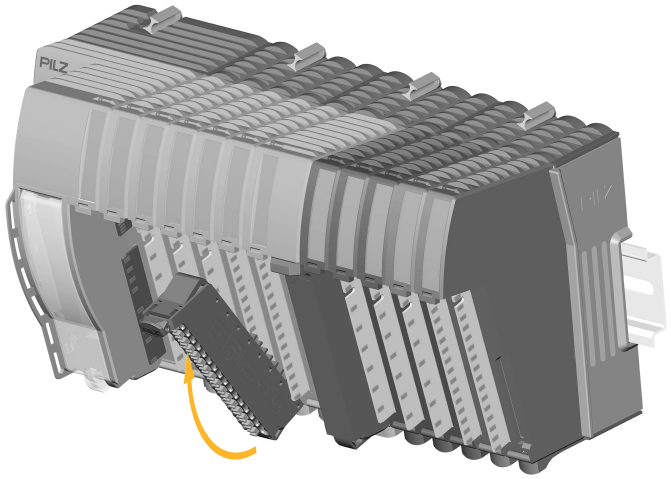
6.2 Inserting and removing an electronic module

Please note:

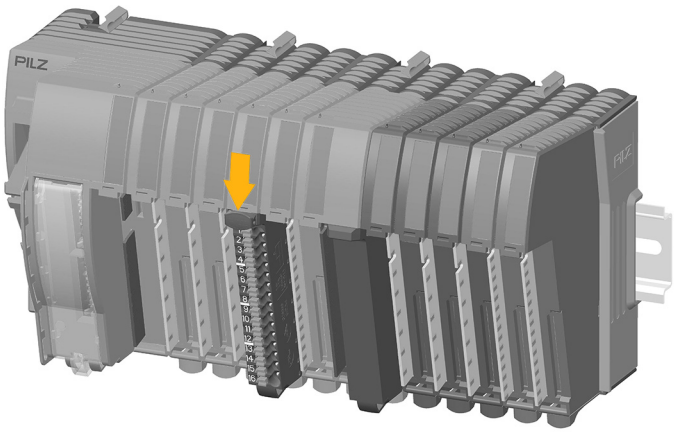
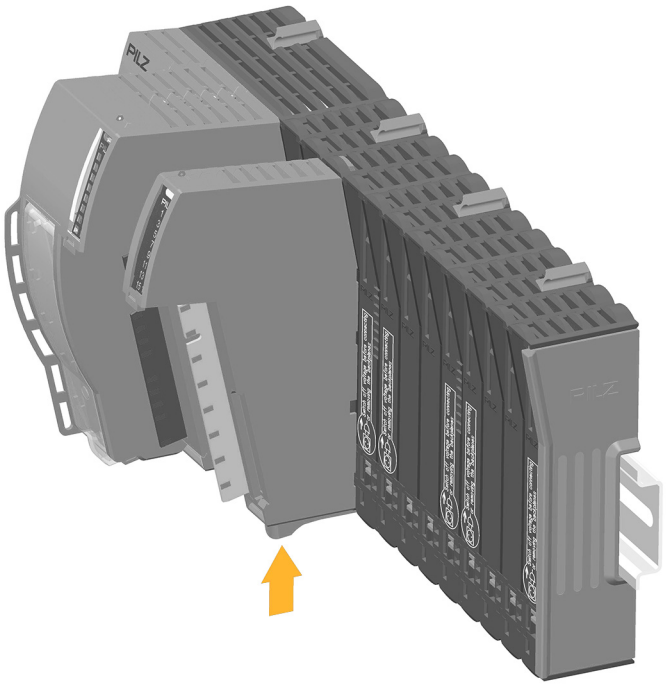
- Backplane must be installed first.
- Electronic modules may only be plugged or unplugged if the terminal block has been removed first.
- The mechanics of the electronic modules are designed for 20 plug in/out cycles.

6.2.1 Inserting an electronic module

1. Insert the electronic module into the suspension lug on the backplane.	
2. Swivel the electronic module downwards until you hear it click into place.	

3. Insert the terminal block into the suspension lug on the module.	
4. Swivel the terminal block upwards until you hear it click into place.	

6.2.2 Removing an electronic module

1. Press the unlocking mechanism on the terminal block that is shown by the arrow and pull off the terminal block forward.	
2. Press the unlocking mechanism that is shown by the arrow and pull off the electronic module upwards.	

6.2.3 Changing an electronic module during operation

An electronic module can be hot swapped.

Effects:

- Module bus communication between the other modules is not interrupted.
- The configuration data is retained.
- The module is detected automatically as soon as the module is re-inserted.

Procedure:

1. Removing an electronic module [19]
2. Inserting an electronic module [17]

A new electronic module can be inserted during operation.

Procedure:

- Inserting an electronic module [17]

Effects:

- Module bus communication between the other modules is not interrupted.
- To detect the new module the following steps can be necessary:
  - Creating a new configuration or changing an existing configuration
  - Download of the configuration to the head module
  - Restart of the head module. After a restart, the system behaves as after a warm reset using a reset pushbutton (see operating manual of the head module, chapter “Reset pusbutton", section "Carrying out a warm reset (restart)").

7 Wiring

7.1 General wiring guidelines

Please note:

- Signal lines do not have to be shielded.

7.1.1 Connection mechanism for terminal blocks

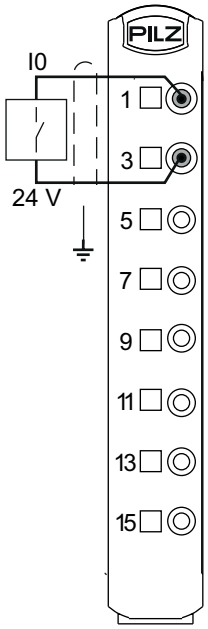
Please note:

- The minimum cable cross section for field connection terminals on the terminal blocks is 0.15 mm^2 (AWG26).
- The maximum cable cross section for field connection terminals on the terminal blocks is 1.5 mm^2 with ferrules (AWG14)
- Use copper wiring.

Procedure:

- Use a flat head screwdriver.
- Strip the wire back 9 mm.
- Feed the stripped cable as far as it will go into the opening for the spring-loaded terminal.
- Check that the cable is firmly seated.

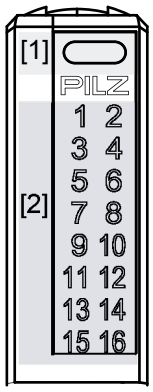
7.2 Terminal configuration

Terminal configuration	Connection example
1: Input I0 3: Voltage output S0 5: Input I1 7: Voltage output S1 9: Input I2 11: Voltage output S0 13: Input I3 15: Voltage output S1	1-channel sensor Sensors supplied via the voltage outputs S0 and S1 

8 Operation

The status of the module is displayed via a red and a green LED. The status of the terminals is displayed via a green LED. If there is a module error, the module status display will light up red. The error will be signalled to the head module and will be entered in the head module's diagnostic log.

8.1 Display elements and messages



Legend

[1] Module status display

[2] Terminal status display

The module can detect the following module states:

[1]	Colour [1]	[2]	Colour [2]	Meaning	Further information
●	--	●		Module not ready for operation	
◐	Green	●		Module ready for operation	
☼	Green	☼	Green	Module is in operation and there is a "1" signal at the relevant input or 24 V at the relevant voltage output	
☼	Green	●	--	Module is in operation and there is a "0" signal at the relevant input or 0 V at the relevant voltage output	
◐ϟ	Red	●	--	Configuration error Module was inserted in the wrong slot.	
☼	Red	●	--	Internal errors	See module's diagnostic log

[1]	Colour [1]	[2]	Colour [2]	Meaning	Further information
◐	Red	◐	Green	The module status display and both terminal status displays on the relevant voltage output flash synchronously Short circuit/overload/undervoltage	See module's diagnostic log
◐	Red	●	--	Temperature warning: Too warm (1)	See module's diagnostic log
◐	Red	◐	Green	The module status display and all terminal status displays flash synchronously Periphery supply is missing/temperature error: Too hot (1)	See module's diagnostic log

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

- Too warm:

  If the module temperature exceeds a threshold value, then:

  – a warning is sent to the head module.

  If the temperature drops back below the threshold value, the module sends an all-clear.

- Too hot:

  If the module temperature exceeds another threshold value, then:

  – an error message is sent to the head module

  – the voltage outputs are switched off.

  – the inputs continue to be read and appear in the ST-PII. The valid bits for the voltage outputs are set to "0".

  After the "too hot" message has been received, if the temperature drops back below the "too warm" threshold value, the module will switch to an error-free state.

Legend

☼	LED on
◐	LED flashes
◐ϟ	LED flashes briefly
●	LED off

9 Technical details

General	
Certifications	**CE, UKCA, cULus Listed**
Application range	**Standard**
Module's device code	**000Dh**
Number of ST input bits	**4**
Number of ST status bits	**2**
Electrical data	
Supply voltage	
Max. power consumption of an input	**0,11 W**
Internal supply voltage (module supply)	
Module's power consumption	**0,16 W**
Periphery's supply voltage (periphery supply)	
Module's power consumption with no load	**0,15 W**
Max. power consumption of a voltage output	**0,13 W**
Max. power dissipation of module	**1 W**
Permitted loads	**inductive, capacitive, resistive**
Inputs	
Number	**4**
Signal level at "0"	**-3 - +5 V DC**
Signal level at "1"	**11 - 30 V DC**
Voltage at inputs	**24 V DC**
Input type in accordance with EN 61131-2	**3**
Input current range	**3 - 3,5 mA**
Max. processing time of input when signal changes from "1" to "0"	**0,3 ms**
Max. processing time of input when signal changes from "0" to "1"	**0,3 ms**
Min. processing time of input when signal changes from "1" to "0"	**0,005 ms**
Min. processing time of input when signal changes from "0" to "1"	**0,005 ms**
Software filter time	**0 ms ... 25,5 ms**
Potential isolation	**yes**
Voltage outputs	
Number of outputs for periphery supply	**2**
Function of outputs for periphery supply	**Sensor supply**
Rated voltage	**24 V DC**
Max. output current at rated voltage	**0,25 A**
Short circuit-proof	**yes**
Potential isolation	**yes**
Environmental data	
Climatic suitability	**EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78**

Environmental data	
Ambient temperature	
In accordance with the standard	**EN 60068-2-14**
Temperature range	**0 - 60 °C**
Storage temperature	
In accordance with the standard	**EN 60068-2-1/-2**
Temperature range	**-40 - 70 °C**
Climatic suitability	
In accordance with the standard	**EN 60068-2-78**
Humidity	**93 % r. h. at 40 °C**
Condensation during operation	**Not permitted**
Max. operating height above sea level	**2000 m**
EMC	**EN 61131-2 (Zone B)**
Vibration	
In accordance with the standard	**EN 60068-2-6**
Frequency	**8,4 - 150 Hz**
Acceleration	**10 m/s²**
Shock stress	
In accordance with the standard	**EN 60068-2-27**
Acceleration	**150 m/s²**
Duration	**11 ms**
Airgap creepage	
In accordance with the standard	**EN 61131-2, UL/IEC 61010-2-201**
Overvoltage category	**II**
Pollution degree	**2**
Protection type	
In accordance with the standard	**EN 60529**
Housing	**IP20**
Mounting area (e.g. control cabinet)	**IP54**
Potential isolation	
Potential isolation between	**Input and module supply**
Type of potential isolation	**Functional insulation**
Rated surge voltage	**2500 V**
Potential isolation between	**Periphery supply and module supply**
Type of potential isolation	**Functional insulation**
Rated surge voltage	**2500 V**
Mechanical data	
Material	
Housing	**PC**
Mounting type	**plug-in**
Dimensions	
Height	**110,8 mm**
Width	**12,5 mm**
Depth	**72,5 mm**

Mechanical data	
Weight	**31 g**

Where standards are undated, the 2015-04 latest editions shall apply.

10 Order reference

10.1 Product

Product type	Features	Order no.
PSS u2 E S 4DID	Electronic module with expanded diagnostics	328310

10.2 Accessories

Terminal block

Product type	Features	Order no.
PSS u2 T 8 (1 pc.)	Terminal block 8-pin, scope of supply: 1 pieces	328840
PSS u2 T 8 (10 pcs.)	Terminal block 8-pin, scope of supply: 10 pieces	328841
PSS u2 T 8 (5 x 10 pcs.)	Terminal block 8-pin, scope of supply: 50 pieces	328842

Labelling bracket

Product type	Features	Order No.
PSS u2 A LC E1 (10 pcs.)	Labelling bracket for electronic module 23.5 x 10.5 mm, scope of delivery: 10 pieces	328910
PSS u2 A LC E2 (10 pcs.)	Labelling bracket for electronic module 103 x 10.5 mm, scope of delivery: 10 pieces	328911
PSS u2 A LA E1 (10 pcs.)	Labelling strips for electronic module 23.5 x 10.5 mm (10 x DIN A4 sheet)	328913
PSS u2 A LA E2 (10 pcs.)	Labelling strips for electronic module 103 x 10.5 mm (10 x DIN A4 sheet)	328914

Label holder for terminal block

Product type	Features	Order no.
PSS u2 A LC T3 (10 pcs.)	Label holder for terminal block 61 x 11.5 mm, scope of supply: 10 pieces	328912

Coding elements

Product type	Features	Order no.
PSS u2 A CE E (10 pcs.)	Coding elements for electronic modules, scope of supply: 10 pieces	328860

Backplanes

Product type	Features	Order no.
PSS u2 B 1	Backplane, 1 slot	328811
PSS u2 B 4	Backplane, 4 slots	328810

Support

Technical support is available from Pilz round the clock.

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Quality Management ISO 9001:2015 REG. NO. 2462
Environmental Management ISO 14001 REG. NO. 2462
Energy Management ISO 50001 REG. NO. 2462

We are represented internationally. Please refer to our homepage www.pilz.com for further details or contact our headquarters.

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