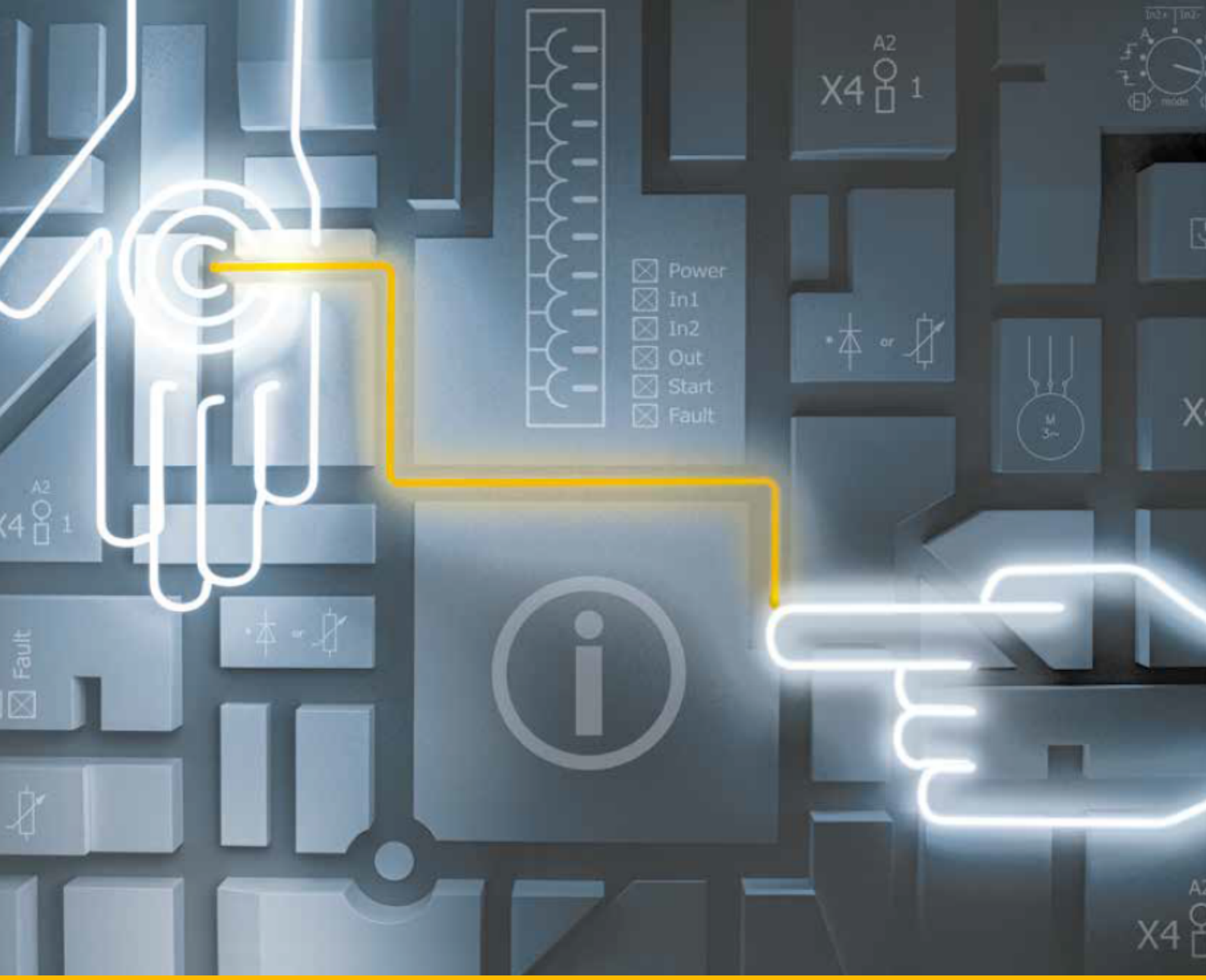


PSSu E AI SHT1

PILZ
THE SPIRIT OF SAFETY

Operating Manual-1001465-EN-07

- Decentralised system PSSuniversal I/O




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 documentation is valid for the products PSSu E AI SHT1 and PSSu E AI SHT1-T. It is valid until new documentation is published.

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

1.1.1 Retaining the documentation

This documentation is intended for instruction and should be retained for future reference.

1.1.2 Terminology: System environment A and B

The PSSu system can be used in two different system environments. The module's application area is described in the chapter "Intended Use" of the manual.

The distinction is made between

- PSSu in system environment A
- PSSu in system environment B

The distinction is based on the application area of the PSSu system.

PSSu in system environment A may be used in the

- Decentralised system PSSu I/O
- **Not** in the automation system PSS 4000

PSSu in system environment B may be used 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

1.2 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

2.1 Module structure

A module consists of

- Electronic module and
- Base module with
  - – Screw terminals or
  - – Cage clamp terminals

The base modules are the carrier units for the electronic modules and are used to connect the field wiring. The electronic modules are inserted on to the base modules and determine the module's function.

Details of the base modules that can be used are available in the chapter entitled “Intended Use”.

2.2 Module features

The product has the following features:

- 1 analogue current input

  Current range:

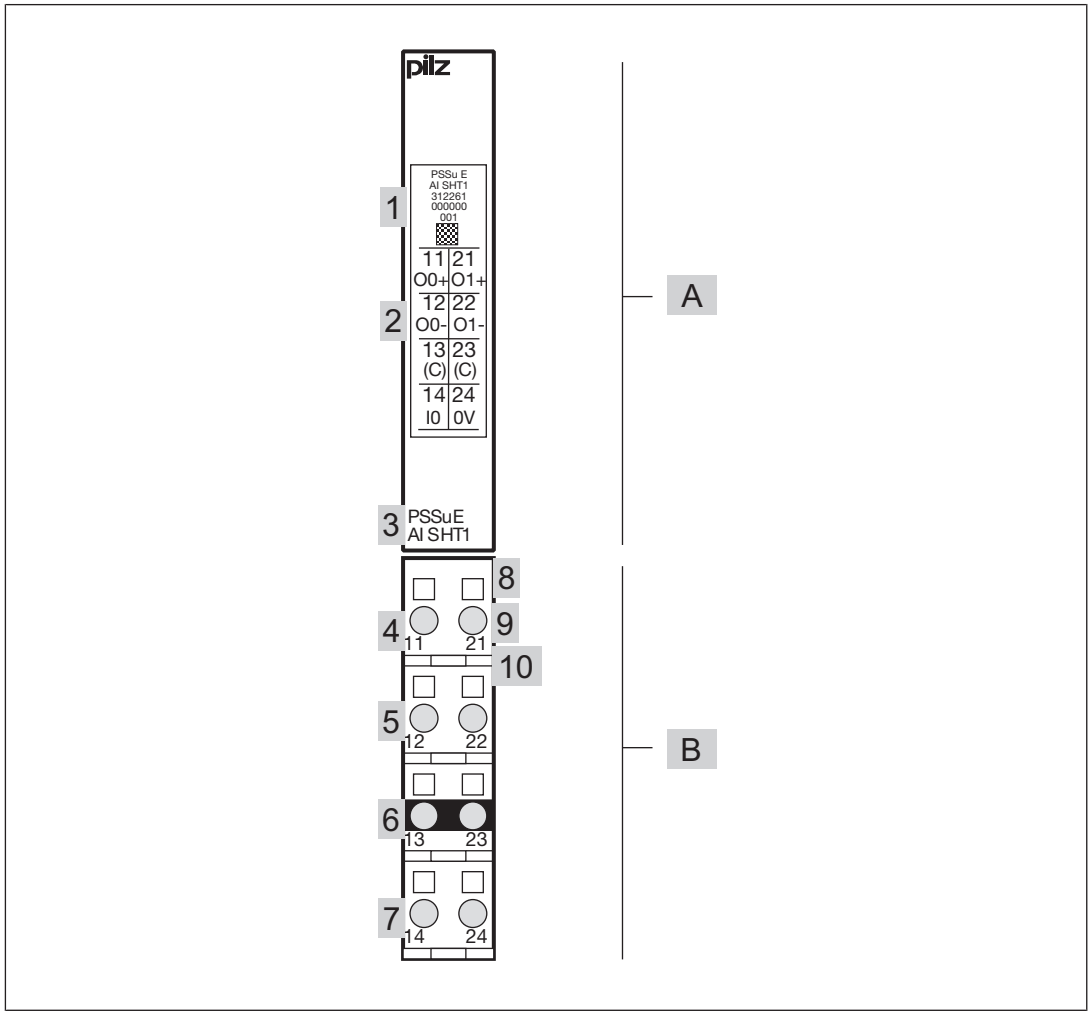
  0 ... 0.6 A, single-pole, referenced to earth
- 2 analogue current outputs

  Current range:

  0 .. 20 mA, single-pole, referenced to earth
  - – Scaling of input current 1:100 and 1:200
  - – Evaluation via analogue input module with an input resistance = 115 Ohm, (e.g. PSSu E F AI I), order no.: 312 260)
- For standard and failsafe applications in system environment A and B
- T-type:

  PSSu E AI SHT1-T: for increased environmental requirements

2.3 Front view



Legend:

- A: Electronic module
- B: Base module
- 1: Labelling strip with:
  - – Name of electronic module
  - – Order number
  - – Serial number
  - – Hardware version number
  - – 2D code
- 2: Labelling strip for the terminal configuration on the base module
- 3: Name of electronic module
- 4: Connection level 1
- 5: Connection level 2
- 6: Connection level 3
- 7: Connection level 4

- 8: Square mounting holes (connection levels 1, 2, 3 and 4)
  - With screw to loosen/tighten the screw terminal on base modules with screw terminals
  - With mechanism to operate the cage clamp on base modules with cage clamp terminals
- 9: Round connection holes (connection levels 1, 2, 3 and 4) for connecting the signal lines
- 10: Mounting slot for colour marker to label the connection level (connection levels 1, 2, 3 and 4)

3 Safety

3.1 Intended use

INFORMATION

If the module name is not explicitly named, the details apply to all the variants of the module.

Use in a PSSu system

The module may be used in a PSSu system in system environment A and B.

The head module establishes in what system environment a PSSu system can be used.

- System environment A
  A PSSu system in system environment A is a decentralised system PSSu I/O with a fieldbus, but without SafetyNET p interface. The automation system PSS 4000 does **not** belong to the system environment A.
- System environment
  A PSSu system in system environment B is a PSSu system in the h automation system PSS 4000. The PSSu system can belong to one of the following performance classes:
  - Decentralised system PSSu I/O (with SafetyNET p)
  - Control system PSSu PLC
  - Control system PSSu multi

Module's function

The module provides shunts to scale the current for analogue inputs. The module may be used in conjunction with analogue current inputs (e.g. PSSu E F AI I, order no.: 312 260).

Standard applications

The module may be used for standard applications.

Particular application areas

- Increased environmental requirements

  The module PSSu E AI SHT1-T is suitable for use where there are increased environmental requirements (see Technical details [📖 26]).

EMC-compliant installation

Intended use includes making the electrical installation EMC-compliant. Please refer to the guidelines stated in the "PSSuniversal Installation Manual". The module is intended for use in an industrial environment. Interference may occur if used within a domestic environment.

Improper use

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 operating manual,
- Any use of the module that is not in accordance with the technical details.

Software tools

The module is supported by:

- PSSuniversal Configurator and PSSuniversal Assistant
- PAS4000

INFORMATION

We recommend that you always use the latest version of the software tool (download from www.pilz.com).

Base modules

The PSSu E AI SHT1 module may be used in conjunction with the following base modules:

- PSSu BP 1/8 S
- PSSu BP 1/8 C
- PSSu BP 1/12 S
- PSSu BP 1/12 C
- PSSu BP-C 1/8 S
- PSSu BP-C 1/8 C
- PSSu BP-C 1/12 S
- PSSu BP-C 1/12 C

The module PSSu E AI SHT1-T may be used in conjunction with the following base modules:

- PSSu BP 1/8 S-T
- PSSu BP 1/8 C-T
- PSSu BP 1/12 S-T
- PSSu BP 1/12 C-T
- PSSu BP-C 1/8 S-T
- PSSu BP-C 1/8 C-T
- PSSu BP-C 1/12 S-T
- PSSu BP-C 1/12 C-T

3.2 Safety regulations

3.2.1 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. In order to inspect, assess and handle products, devices, systems, plant and machinery, this person must be familiar with 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.

3.2.2 Warranty and liability

All claims to warranty and liability will be rendered invalid if

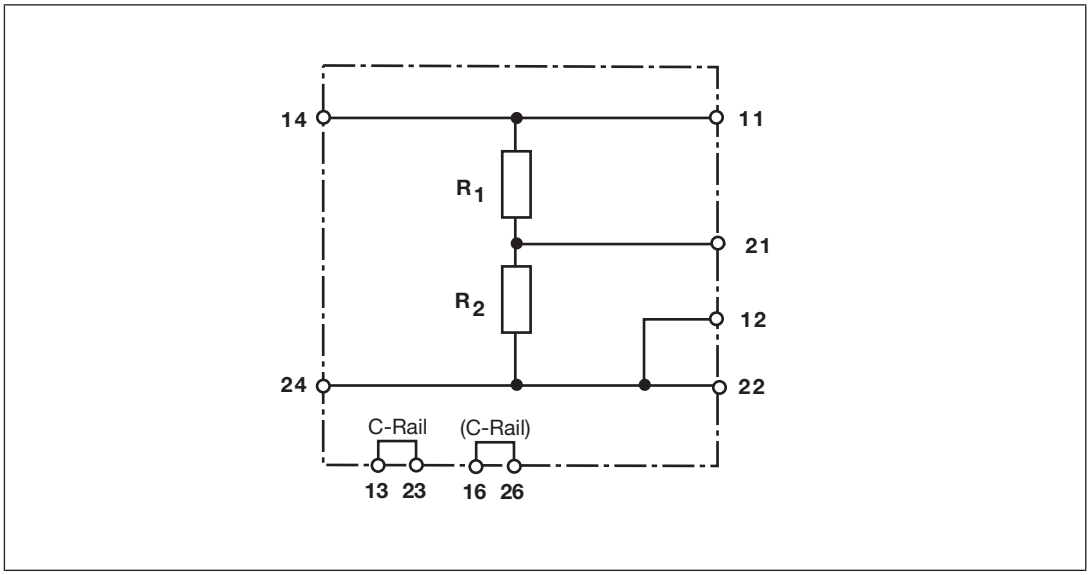
- The product was used contrary to the purpose for which it is intended,
- Damage can be attributed to not having followed the guidelines in the manual,
- Operating personnel are not suitably qualified,
- Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering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

3.2.3 Disposal

- In safety-related applications, please comply with the mission time T_M in the safety-related characteristic data.
- 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



4.2 Module features

4.2.1 Functions

The electronic module PSSu E AI SHT1 contains two shunts for scaling an input current I_{I0} (connection I0). The two current outputs I_{O0} (connection O0+) and I_{O1} (connection O1+) are evaluated by analogue current inputs.

Scaling is applied during evaluation via an analogue input module with an input resistance of 115 Ohm, (e.g. PSSu E F AI I)

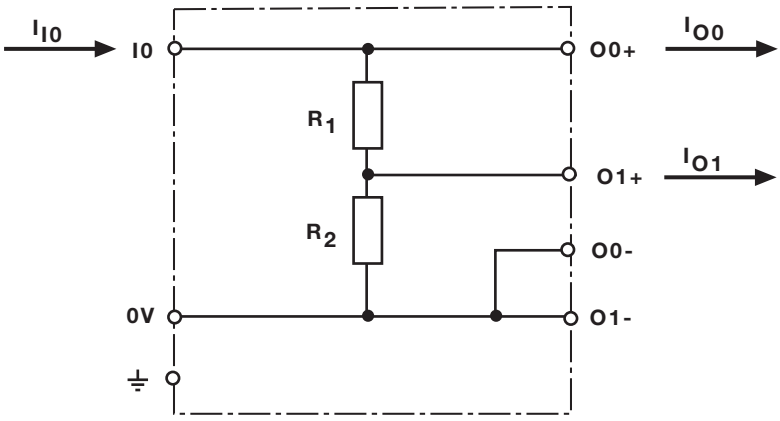
- Scaling factor with resistance $R_1 + R_2$ = 1,163 Ohm (connections O0+/O0-):

  $I_{O0} : I_{I0} = 1:100$
- Scaling factor with resistance R_2 = 0,583 Ohm (connections O1+/O1-):

  $I_{O1} : I_{I0} = 1:200$

Example:

- Input current I_{I0} = 500 mA
- Output current I_{O0} at R_1 + R_2 = 5 mA
- Output current I_{O1} at R_2 = 2.5 mA



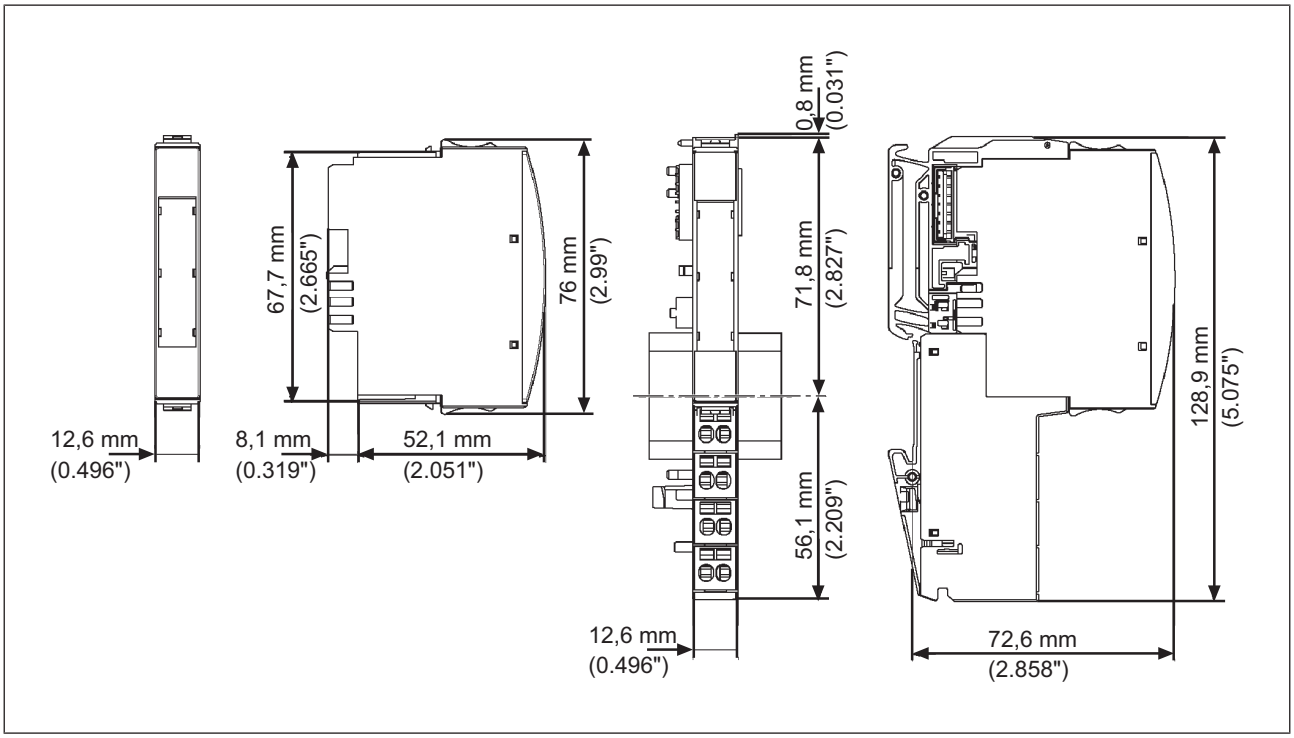
5 Installation

5.1 General installation guidelines

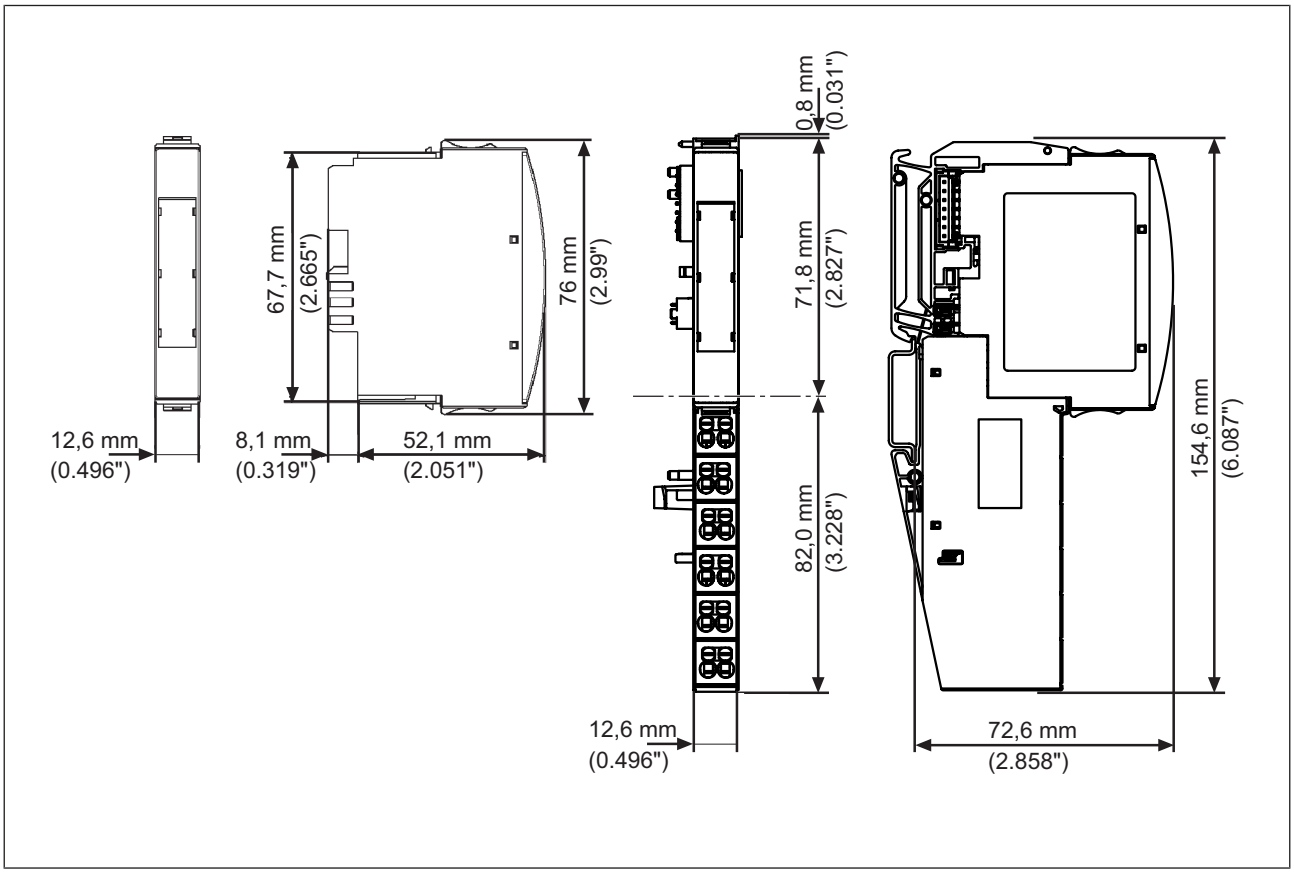
Please refer also to the PSSuniversal Installation Manual.

5.1.1 Dimensions

Base modules with four connection levels:



Base modules with six connection levels:



5.2 Installing the base module

Prerequisite:

- The head module must be installed.
- If the head module does not have an integrated power supply, a supply voltage module must be installed to the right of the head module.

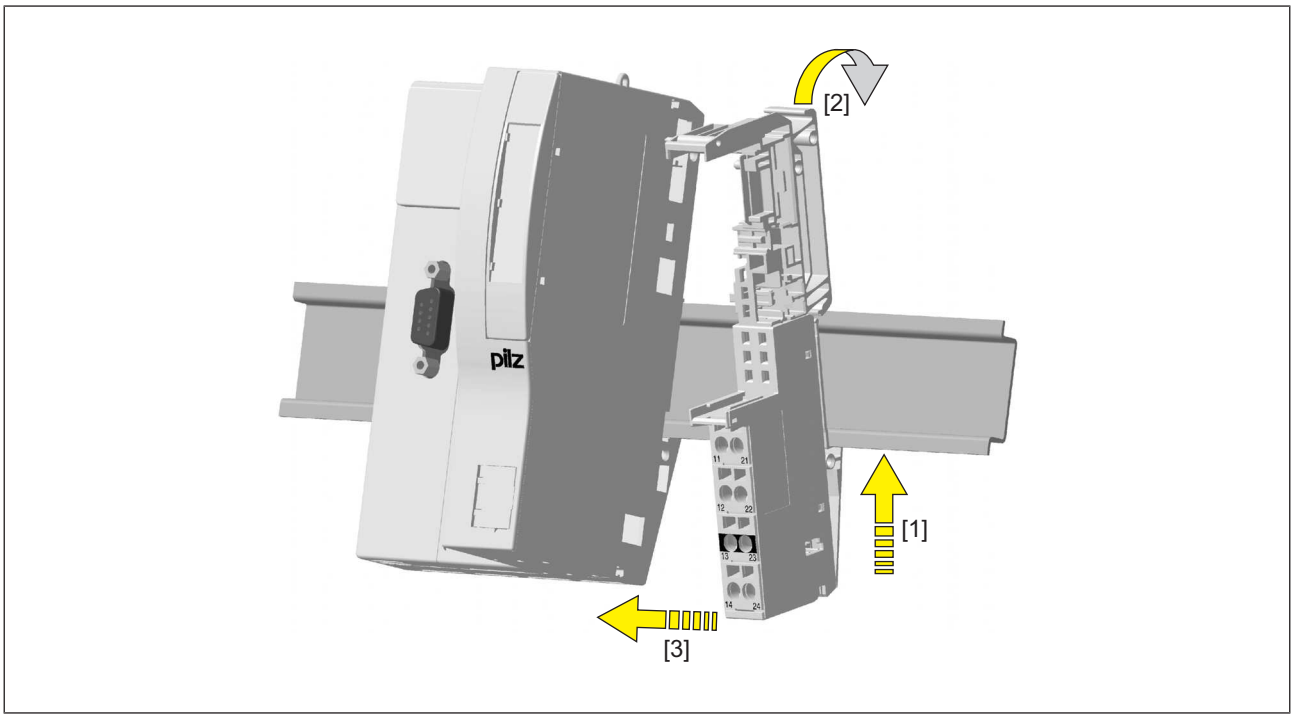
Please note:

- For mechanical reasons it is not possible to mix base modules with screw terminals and base modules with cage clamp terminals.
- All contacts should be protected from contamination.
- The mechanics of the base modules are designed for 50 plug in/out cycles.

Procedure:

- We recommend that you wire up the base modules before inserting the electronic modules.
- Slot the groove on the base module on to the mounting rail from below [1].
- Push the base module back [2] until you hear it lock into position.
- On the mounting rail, slide the base module to the left until you hear the two lateral mounting hooks on the adjacent module lock into position [3].

Schematic representation:



5.3 Inserting and removing an electronic module

Please note:

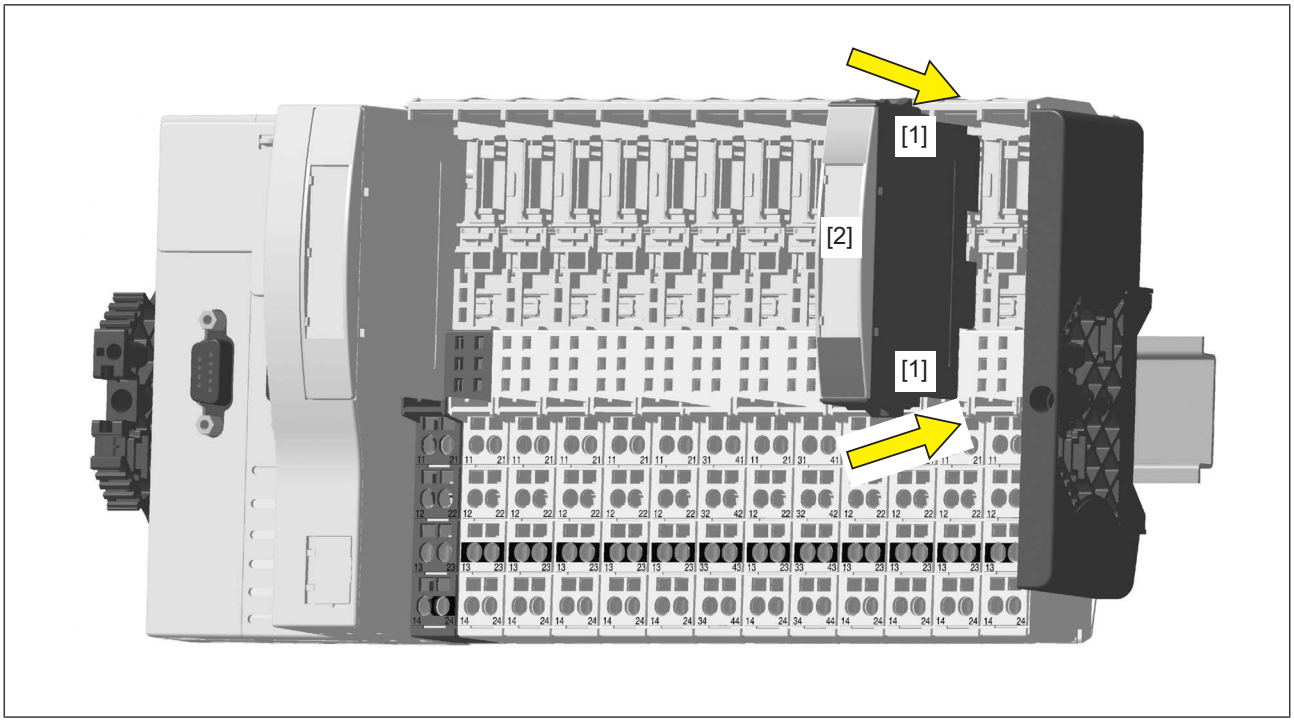
- Only insert on to base modules that are already installed.
- Preferably these base modules should be ready wired.
- Electronic modules with outputs may only be inserted and removed when the load is switched off. Unforeseeable error reactions may be triggered if modules are inserted and removed under load.
- When an electronic module is plugged into a base module for the first time, one part of the coding element remains on the electronic module, while its counterpart is fixed on to the base module. This is how the base module is coded.
- The mechanics of the electronic modules are designed for 50 plug in/out cycles.

5.3.1 Inserting an electronic module

Procedure:

- The electronic module must audibly lock into position [1].
- Mark the electronic module using the labelling strips [2].

Schematic representation:

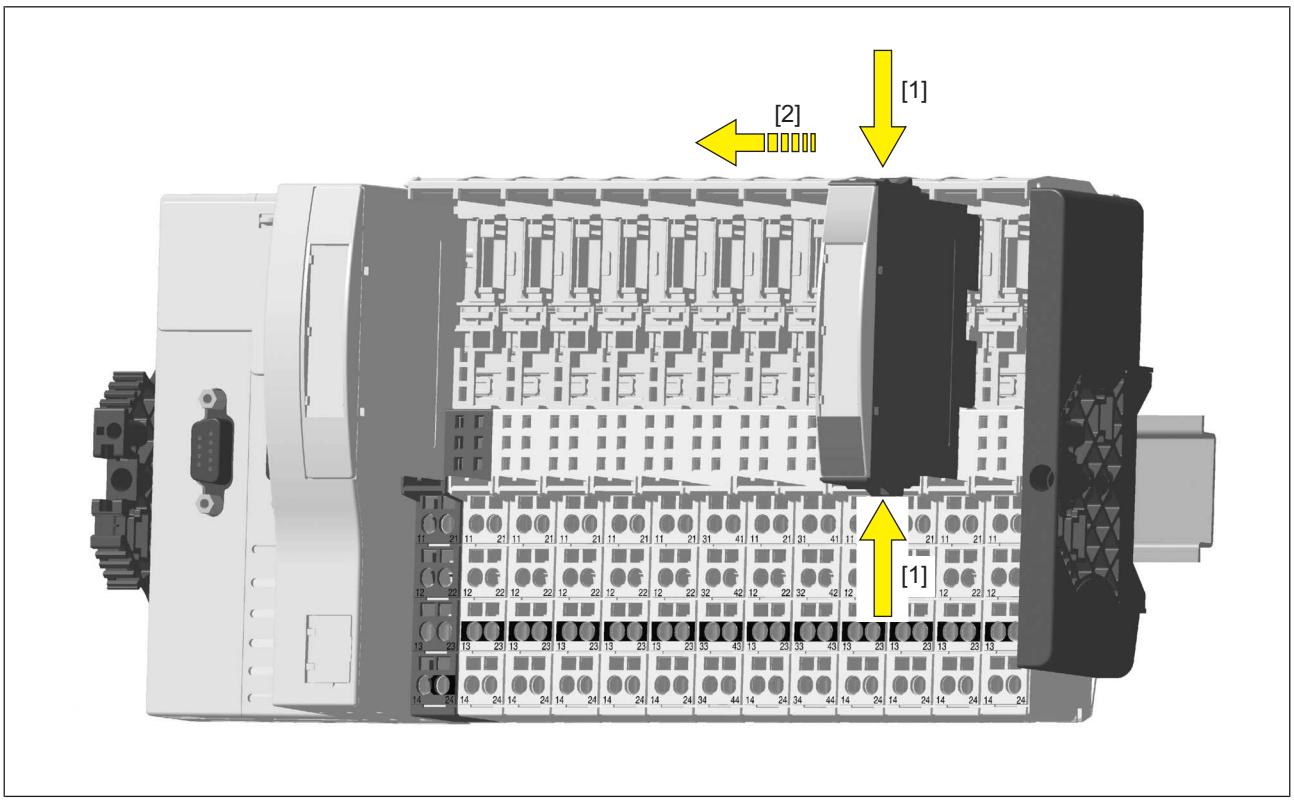


5.3.2 Removing an electronic module

Procedure:

- Press the locking mechanisms [1] together simultaneously.
- Pull out the electronic module [2].

Schematic representation:



5.3.3 Changing an electronic module during operation

It is possible to change an electronic module during operation. However, changing an electronic module during operation may cause an ST communication error. The configuration data is retained when a module is changed.

6 Wiring

6.1 General wiring guidelines

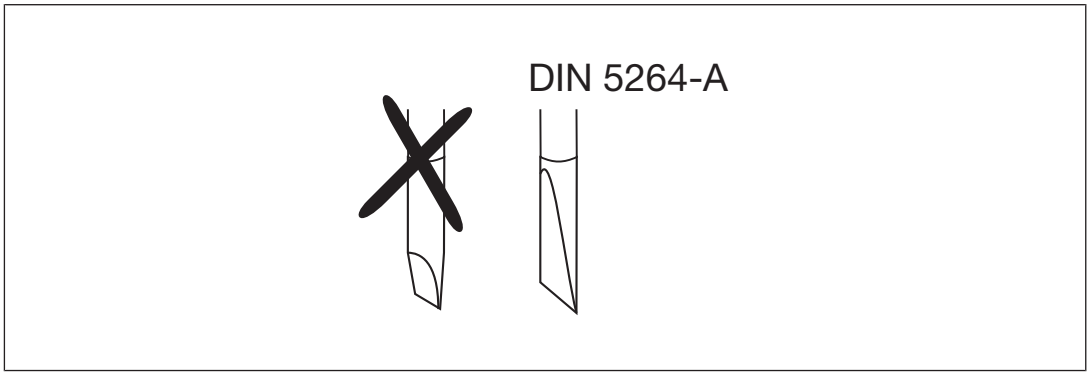
Please note:

- The supply voltages for actuators and sensors must be extra low voltages with protective electrical separation (PELV or SELV) in accordance with VDE 0100, Part 410. Failure to do so could result in electric shock.
- We recommend that you use shielded signal lines.
- On base modules with C-rail:
  - Connect the shield to the terminals on the C-rail.
  - Connect the C-rail with low impedance to the functional earth.
- On base modules without C-rail:
  - Connect the shield as shown in the terminal configuration section.
    The module connects the shield to the mounting rail.
  - Connect the mounting rail to the functional earth via an earthing terminal.
- In environments with strong EMC interference, base modules without a C-rail provide better protection if the shield is connected.
- Use copper wiring.
- The terminal configuration as stated on the front plate applies for base modules with C-rail. The terminal configuration as stated in the technical documentation applies for all other base modules.

6.1.1 Mechanical connection of the base modules

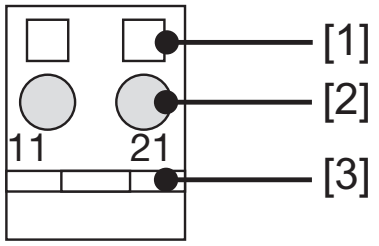
Procedure:

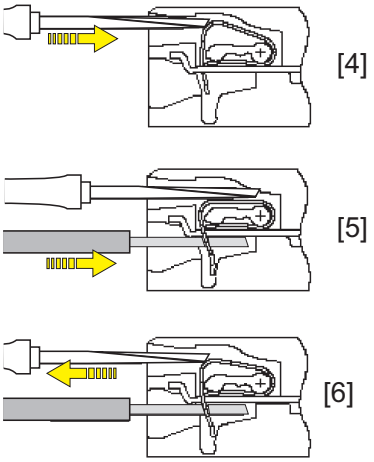
- Use a flat blade screwdriver (DIN 5264-A)!



- Strip the wire back 8 mm.
- If necessary, label the connection level with a colour marker [3].
- Base module with screw terminals:
  - Use a screwdriver to loosen the screw on the screw terminal [1]
  - Insert the stripped cable into the round fixing hole [2], as far as it will go.
  - Tighten up the screw on the screw terminal.
  - Check that the cable is firmly seated.

- Base module with cage clamp terminals:
  - Insert the screwdriver [4] into the square hole [1].
  - Insert the stripped cable into the round fixing hole [2], as far as it will go [5].
  - Pull out the screwdriver [6].
  - Check that the cable is firmly seated.



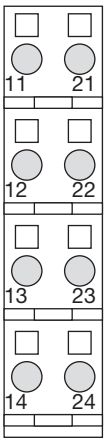


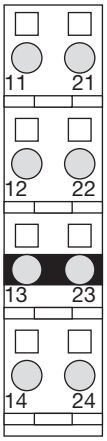
Please note:

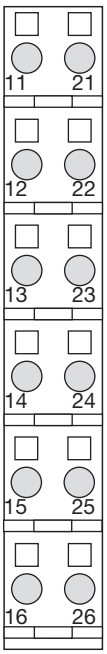
- The minimum cable cross section for field connection terminals on the base modules is 0.14 mm² (AWG26).
- The maximum cable cross section for field connection terminals is:
  - Digital inputs: 1.5 mm² (AWG16)
  - Digital outputs: 2.0 mm² (AWG14)
  - Inputs/outputs on the counter modules: 1.5 mm² (AWG16)
  - Analogue inputs/outputs: 1.5 mm² (AWG16)
  - Communication cables: 1.5 mm² (AWG16)
  - Test pulse outputs: 1.5 mm² (AWG16)
  - Power supply: 2.5 mm² (AWG12)
  - Functional earth: 2.5 mm² (AWG12)

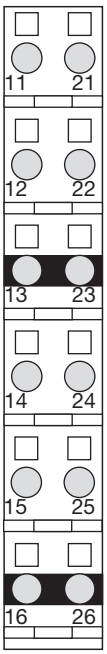
- On base modules with screw terminals:
  - If you use a multi-strand cable to connect the I/Os, it is recommended that you use ferrules conforming to Parts 1 and 2 of DIN 46228, 0.14 ... 1.5 mm², Form A or C, although this is not essential. To crimp the ferrules you can use crimp pliers (crimp form A or C) conforming to EN 60947-1, such as the PZ 1.5 or PZ 6.5 from Weidmüller, for example.
  - Maximum torque setting: 0.8 Nm
- Use copper wiring.

6.2 Terminal configuration

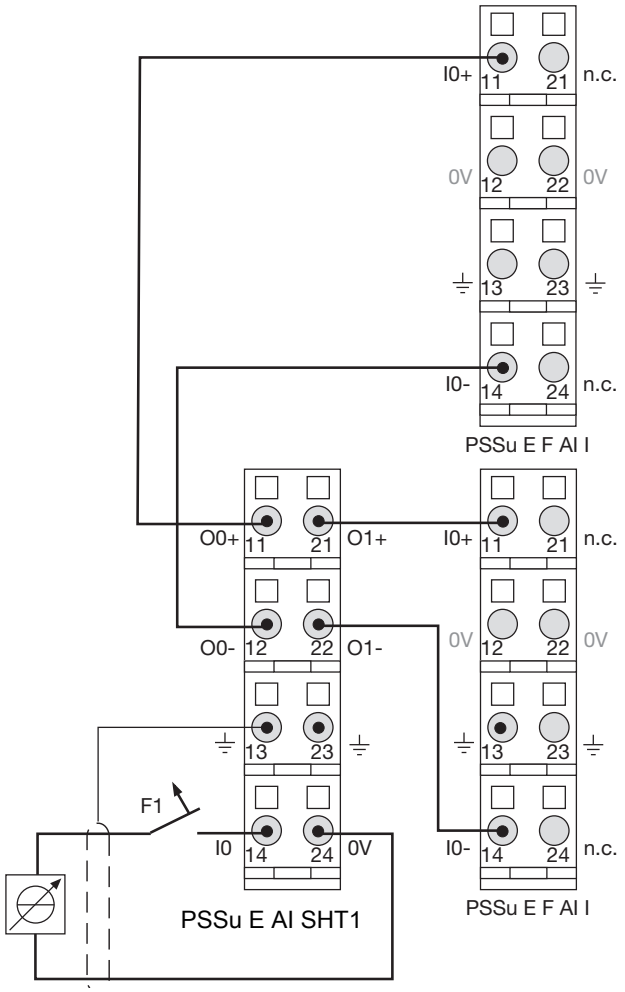
Base module	Terminal configuration	
Screw terminals: PSSu BP 1/8 S PSSu BP 1/8 S-T Cage clamp terminals: PSSu BP 1/8 C PSSu BP 1/8 C-T	Without C-rail: 11: Output O0+ 21: Output O1+ 12: Output O0- 22: Output O1- 13-23: Shield connection (13-23 linked within the base module) 14: Input I0 24: 0 V analogue	

Base module	Terminal configuration	
Screw terminals: PSSu BP-C 1/8 S PSSu BP-C 1/8 S-T Cage clamp terminals: PSSu BP-C 1/8 C PSSu BP-C 1/8 C-T	With C-rail: 11: Output O0+ 21: Output O1+ 12: Output O0- 22: Output O1- 13-23: C-rail supply, shield connection (13-23 linked within the base module) 14: Input I0 24: 0 V analogue	

Base module	Terminal configuration	
Screw terminals: PSSu BP 1/12 S PSSu BP 1/12 S-T Cage clamp terminals: PSSu BP 1/12 C PSSu BP 1/12 C-T	Without C-rail: 11: Output O0+ 21: Output O1+ 12: Output O0- 22: Output O1- 13-23: Shield connection (13-23-16-26 linked within the base module) 14: Input I0 24: 0 V analogue 15: Output O0- 25: Output O1- 16-26: Shield connection (13-23-16-26 linked within the base module)	

Base module	Terminal configuration	
Screw terminals: PSSu BP-C 1/12 S PSSu BP-C 1/12 S-T Cage clamp terminals: PSSu BP-C 1/12 C PSSu BP-C 1/12 C-T	With C-rail: 11: Output O0+ 21: Output O1+ 12: Output O0- 22: Output O1- 13-23: C-rail supply, shield connection (13-23-16-26 linked within the base module) 14: Input I0 24: 0 V analogue 15: Output O0- 25: Output O1- 16-26: C-rail supply, shield connection (13-23-16-26 linked within the base module)	

6.3 Connecting the module

Input circuit	
Current range 0 ... 0.6 A single-pole, referenced to earth	

NOTICE

Input I0 must be protected with a circuit breaker F1, 1 A, characteristic C.

7 Technical details

General	312261	314261
Certifications	**CE, EAC, KOSHA, TÜV, UKCA, cULus Listed**	**CE, EAC, KOSHA, TÜV, UKCA, cULus Listed**
Application range	**Standard**	**Standard**
Application in system environment A		
from ST firmware version, other head modules	**1**	**1**
from FS firmware version PSSu H F PN	**1**	**1**
from ST firmware version PSSu H S PN	**1**	**1**
Application in system environment B		
from FS firmware version, head modules	**1.0.0**	**1.0.0**
Electrical data	**312261**	**314261**
Max. power dissipation of module	**0,5 W**	**0,5 W**
Max. current		
for max.	**120 s**	**120 s**
Current	**2 A**	**2 A**
Analogue inputs	**312261**	**314261**
Number of analogue inputs	**1**	**1**
Type of analogue inputs	**Current**	**Current**
Input area	**0 ... 0.6 A**	**0 ... 0.6 A**
Measuring ranges		
Type	**Single-ended**	**Single-ended**
Analogue outputs	**312261**	**314261**
Number of analogue outputs	**2**	**2**
Type of analogue outputs	**Current**	**Current**
Output range	**0 .. 20 mA**	**0 .. 20 mA**
Scaling		
Analogue output O0	**1:100**	**1:100**
Analogue output O1	**1:200**	**1:200**
Internal resistance		
Connection O0+/O0-	**1,163 Ohm**	**1,163 Ohm**
Connection O1+/O1	**0,583 Ohm**	**0,583 Ohm**
Deviations from the measuring range limit value		
Output variable error at 25 °C	**1 %**	**1 %**
Environmental data	**312261**	**314261**
Climatic suitability	**EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78**	**EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78**

Environmental data	312261	314261
Ambient temperature		
in accordance with the standard	**EN 60068-2-14**	**EN 60068-2-14**
Temperature range	**0 - 60 °C**	**-40 - 70 °C**
Storage temperature		
in accordance with the standard	**EN 60068-2-1/-2**	**EN 60068-2-1/-2**
Temperature range	**-40 - 70 °C**	**-40 - 70 °C**
Climatic suitability		
in accordance with the standard	**EN 60068-2-78**	**EN 60068-2-78**
Humidity	**93 % r. h. at 40 °C**	**93 % r. h. at 40 °C**
Condensation during operation	**Not permitted**	**EN 60068-2-30, short-term**
Max. operating height above SL	**2000 m**	**5000 m**
Vibration		
in accordance with the standard	**EN 60068-2-6**	**EN 60068-2-6**
Frequency	**10 - 150 Hz**	**10 - 150 Hz**
Acceleration	**10 m/s²**	**10 m/s²**
Shock stress		
in accordance with the standard	**EN 60068-2-27**	**EN 60068-2-27**
Number of shocks	**6**	**6**
Acceleration	**150 m/s²**	**150 m/s²**
Duration	**11 ms**	**11 ms**
Airgap creepage		
in accordance with the standard	**EN 61131-2**	**EN 61131-2**
Overvoltage category	**II**	**II**
Pollution degree	**2**	**2**
Protection type		
in accordance with the standard	**EN 60529**	**EN 60529**
Housing	**IP20**	**IP20**
Terminals	**IP20**	**IP20**
Mounting area (e.g. control cabinet)	**IP54**	**IP54**
Mechanical data	**312261**	**314261**
Material		
Bottom	**PC**	**PC**
Front	**PC**	**PC**
Coding	**PA**	**PA**
Mounting type	**plug-in**	**plug-in**
Dimensions		
Height	**76 mm**	**76 mm**
Width	**12,6 mm**	**12,6 mm**
Depth	**60,2 mm**	**60,2 mm**
Weight	**30 g**	**29 g**
Mechanical coding		
Type	**E**	**E**
Colour	**Light grey**	**Light grey**

Where standards are undated, the 2022-01 latest editions shall apply.

8 Order reference

8.1 Product

Product type	Features	Order no.
PSSu E AI SHT1	Electronic module, base type	312261
PSSu E AI SHT1-T	Electronic module, T-type	314261

8.2 Accessories

Base modules

Product type	Features	Order no.
PSSu BP 1/8 S	Base module without C-rail with screw terminals	312600
PSSu BP 1/8 S-T	Base module without C-rail with screw terminals, T-type	314600
PSSu BP 1/8 C	Base module without C-rail with cage clamp terminals	312601
PSSu BP 1/8 C-T	Base module without C-rail with cage clamp terminals, T-type	314601
PSSu BP-C 1/8 S	Base module with C-rail and screw terminals	312610
PSSu BP-C 1/8 S-T	Base module with C-rail and screw terminals, T-type	314610
PSSu BP-C 1/8 C	Base module with C-rail and cage clamp terminals	312611
PSSu BP-C 1/8 C-T	Base module with C-rail and cage clamp terminals, T-type	314611
PSSu BP 1/12 S	Base module without C-rail with screw terminals	312618
PSSu BP 1/12 S-T	Base module without C-rail with screw terminals, T-type	314618
PSSu BP 1/12 C	Base module without C-rail with cage clamp terminals	312619
PSSu BP 1/12 C-T	Base module without C-rail with cage clamp terminals, T-type	314619
PSSu BP-C 1/12 S	Base module with C-rail and screw terminals	312620
PSSu BP-C 1/12 S-T	Base module with C-rail and screw terminals, T-type	314620
PSSu BP-C 1/12 C	Base module with C-rail and cage clamp terminals	312621
PSSu BP-C 1/12 C-T	Base module with C-rail and cage clamp terminals, T-type	314621

Support

Technical support is available from Pilz round the clock.

Americas
Brazil
+55 11 97569-2804
Canada
+1 888 315 7459
Mexico
+52 55 5572 1300
USA (toll-free)
+1 877-PILZUSA (745-9872)

Asia
China
+86 400-088-3566
Japan
+81 45 471-2281
South Korea
+82 31 778 3300

Australia and Oceania
Australia
+61 3 95600621
New Zealand
+64 9 6345350

Europe
Austria
+43 1 7986263-444
Belgium, Luxembourg
+32 9 3217570
France
+33 3 88104003
Germany
+49 711 3409-444
Ireland
+353 21 4804983
Italy, Malta
+39 0362 1826711
Scandinavia
+45 74436332
Spain
+34 938497433
Switzerland
+41 62 88979-32
The Netherlands
+31 347 320477
Türkiye
+90 216 5775552
United Kingdom
+44 1536 462203

You can reach our international hotline on:
+49 711 3409-222
support@pilz.com

Pilz develops environmentally-friendly products using ecological materials and energy-saving technologies. Offices and production facilities are ecologically designed, environmentally-aware and energy-saving. So Pilz offers sustainability, plus the security of using energy-efficient products and environmentally-friendly solutions.

BLUEcoMPETENCE Alliance Member
Partner of the Engineering Industry Sustainability Initiative

German Standards
BRAND OF THE CENTURY 2022

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.

Headquarters: Pilz GmbH & Co. KG, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, E-Mail: info@pilz.com, Internet: www.pilz.com

PILZ
THE SPIRIT OF SAFETY

1001465-EN-07, 2023-10 Printed in Germany