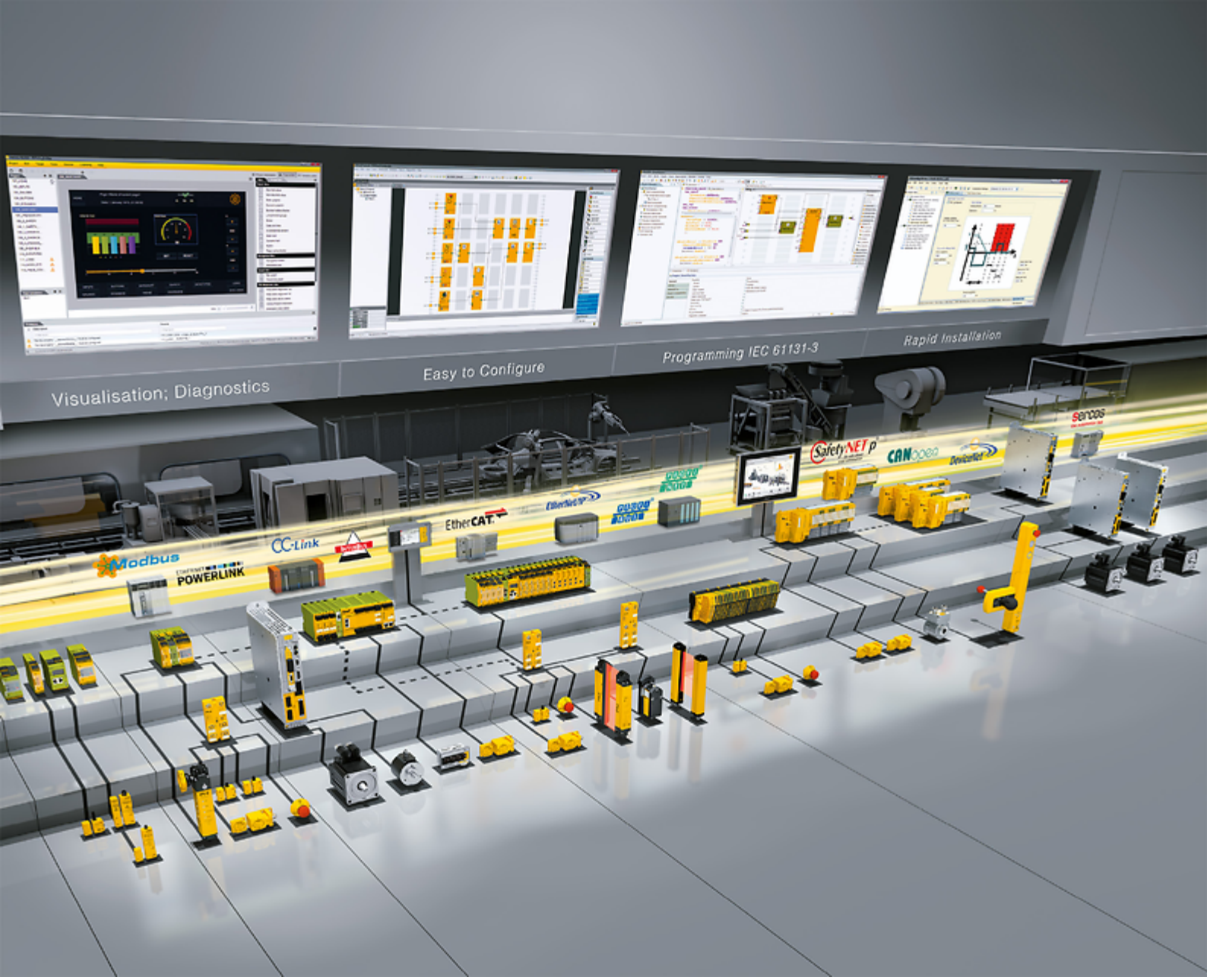


PSS u2 ES 4DO R 8A

PILZ
THE SPIRIT OF SAFETY

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

Operating Manual-1004548-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 4DO R 8A hardware version 02 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 4DO R 8A:

Electronic module with relay outputs for standard applications

The product has the following features:

- 4 relay contacts
  - N/O contact
  - Volt-free
  - Current load capacity per output: See chapter Service life graphs [📖 25]
- Energy-saving functions
- LEDs for:
  - Switch status of each output
  - Module error

3 Safety

3.1 Intended use

The module provides relay outputs. It may be used to switch:

- Resistive loads
- Inductive loads

The module PSS u2 ES 4DO R 8A may be used in conjunction with the following terminal block:

- 8-pin terminal block

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.

3.2 System requirements

INFORMATION

The module is supported by

- PASconfig from version 2.0.0
  - 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

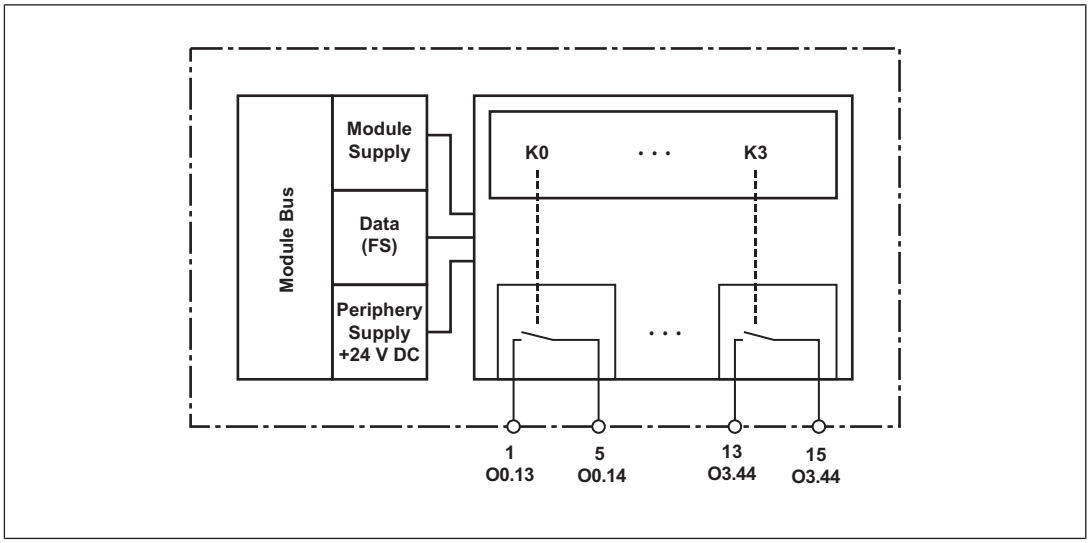


Fig.: Block diagram PSS u2 ES 4DO R 8A

4.2 Supply

- The module is supplied with voltage via the head module.

4.3 Integrated protection mechanisms

The module has the following protection mechanisms:

- Protective separation between both relay contacts (see Technical details [📖 23])
- Protective separation between both relay contacts and the periphery supply as well as the module supply, in accordance with DIN VDE 0110 overvoltage category 2 in a protected industrial network
- Temperature monitoring

The module provides the following diagnostic data:

- Start-up error
- Configuration error
- ST communication error
- Temperature warning: too warm
- Temperature error: too hot

4.4 Outputs

Outputs

- The head module sets the output status via the module bus.

If the module does not receive a process image of outputs from the head module, then substitute values are used for the process data. The value that is to be used as the substitute value can be configured.

Substitute values may be:

- Output switched off (default value)
- Output switched on
- Last valid value

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 that display the terminal status

  – Switching off the LEDs that display the module and terminal status
- Switching off the relay coils
- 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 1 Byte in the process image of outputs.

PIO	Meaning	State
Bit 0	Output data O0 N/O contact O0.13/O0.14	0: N/O contact is open 1: N/O contact closed
Bit 1	Output data O1 N/O contact O1.23/O1.24	
Bit 2	Output data O2 N/O contact O2.33/O2.34	
Bit 3	Output data O3 N/O contact O3.43/O3.44	
Bit 4-7	None	Permanently "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

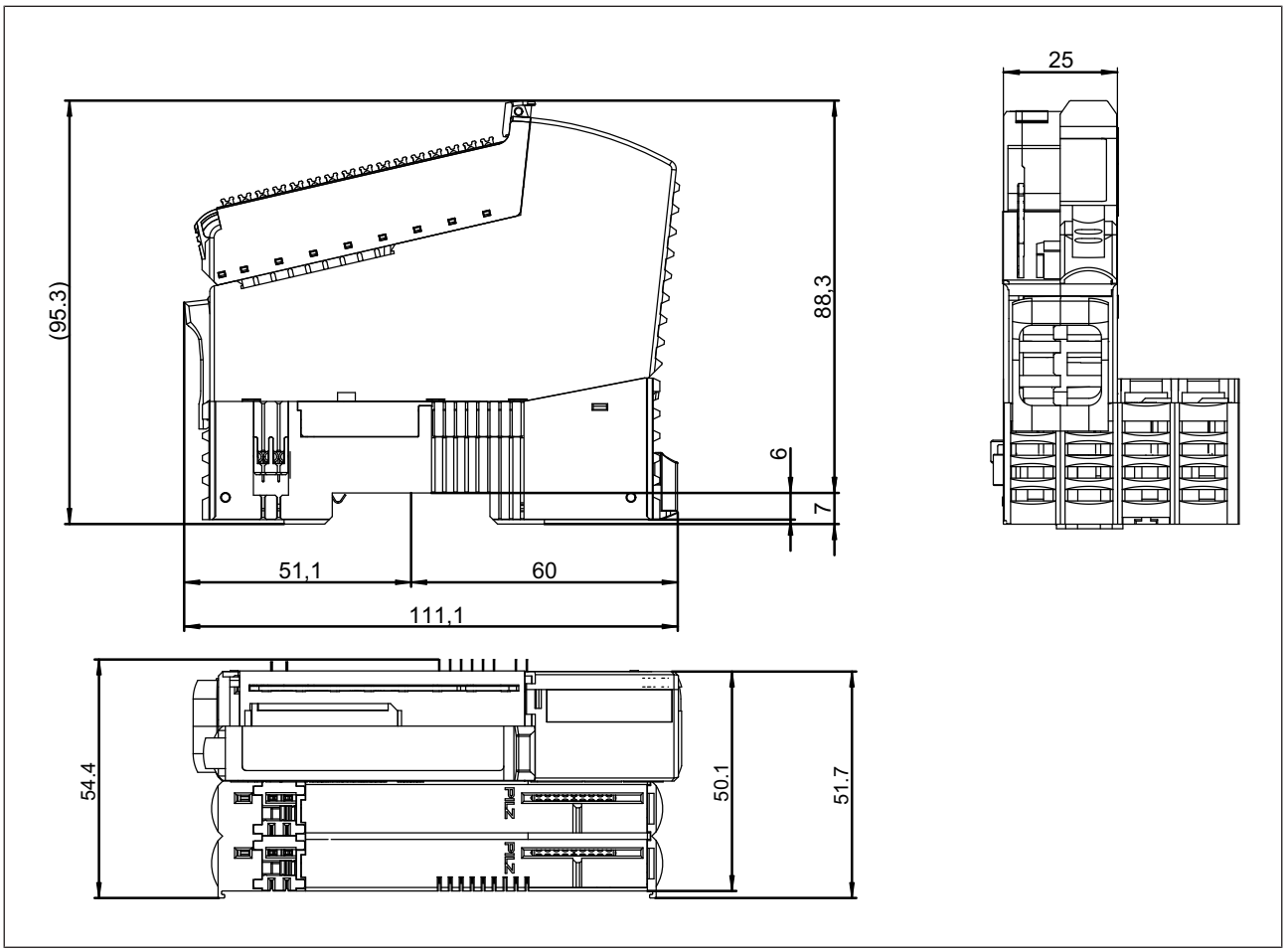
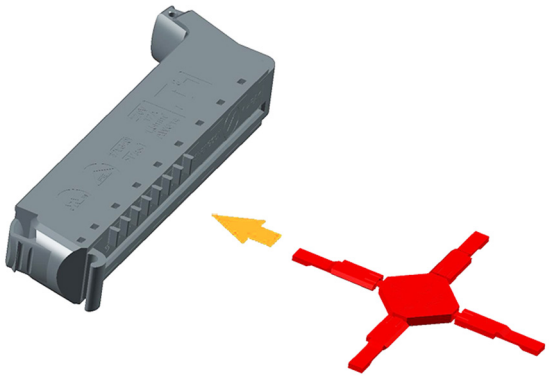
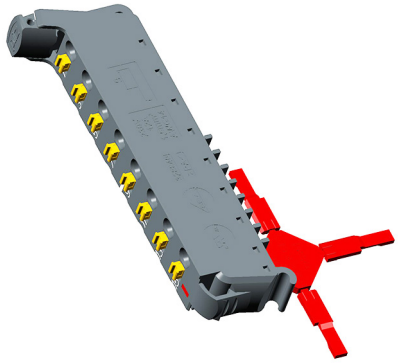
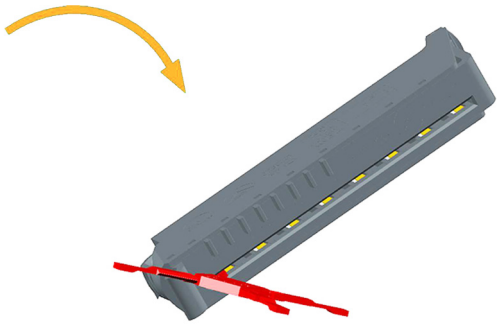
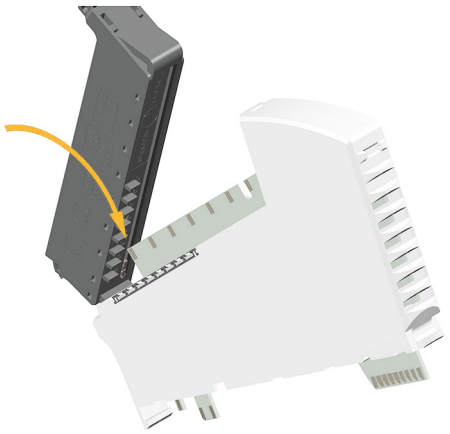


Fig.: Dimensions in mm, including backplane, electronic module and terminal block

6.2 Protective coding on terminal block

If voltages over 50 VAC or 120 VDC are connected to a module's switch contacts, then protective coding must be used. Protective coding prevents the terminal block from being plugged into another module.

1. Insert the protective coding into the 8-pin terminal block	
2. The protective coding must be visible on the terminal side	
3. Rotate the protective coding until is embedded within the terminal block.	

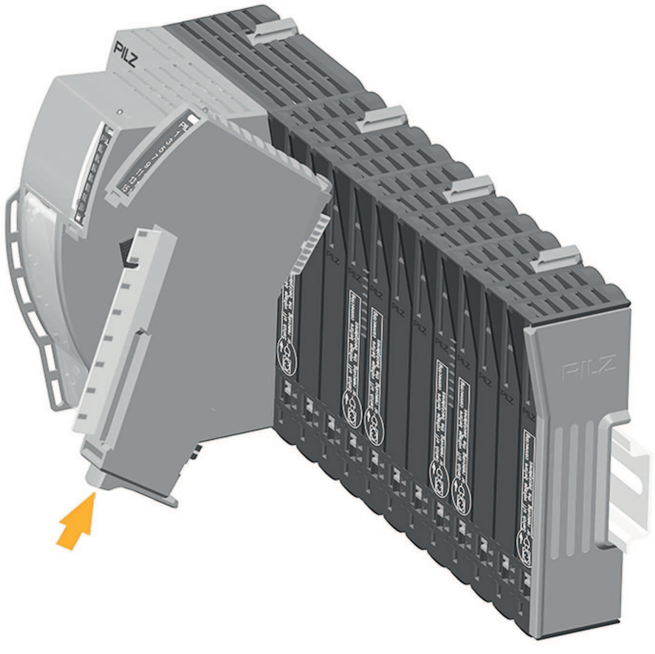
4. Plug the coded terminal block into the module.	

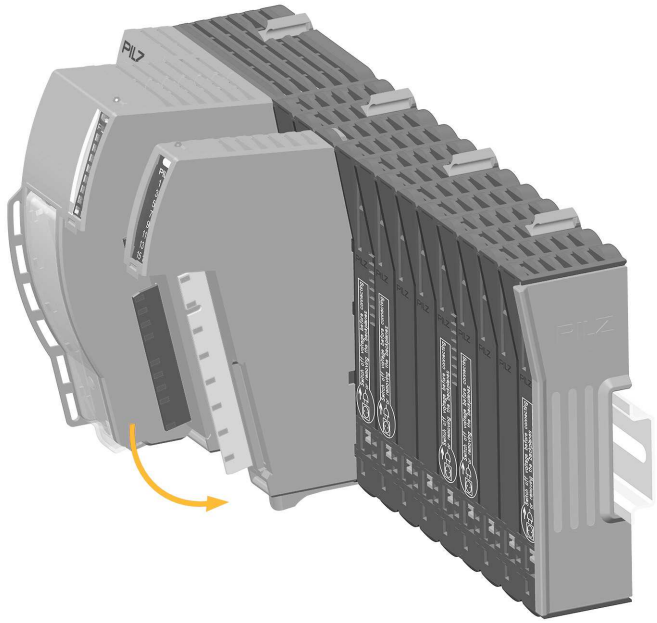
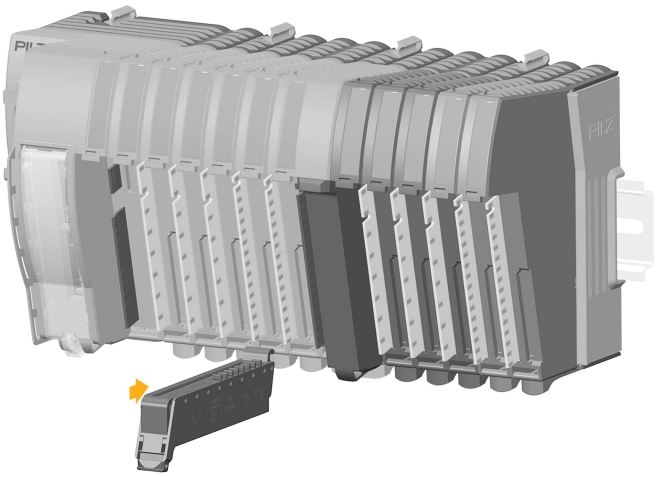
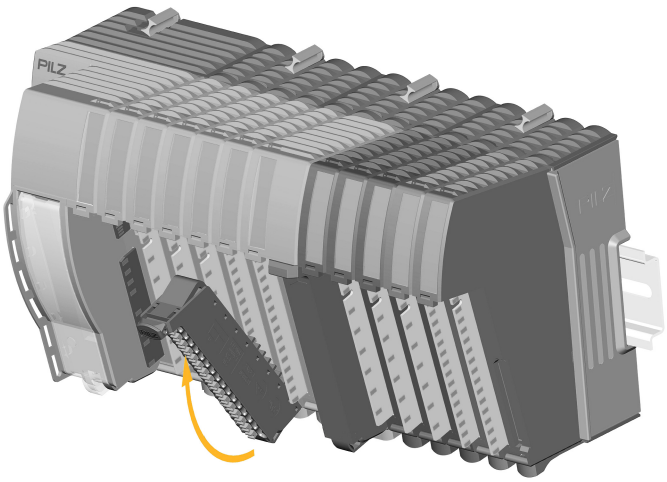
6.3 Inserting and removing an electronic module

Please note:

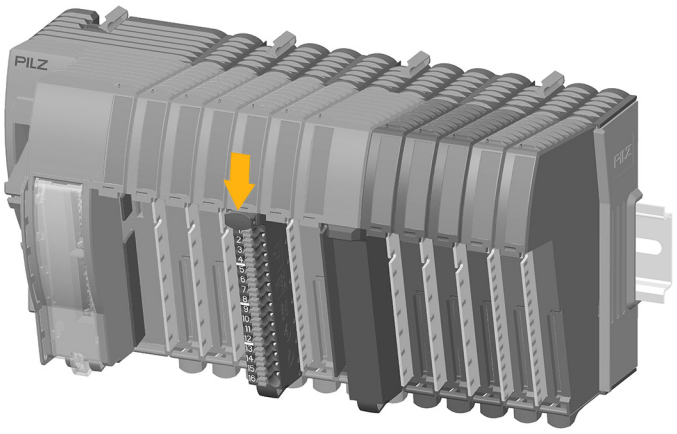
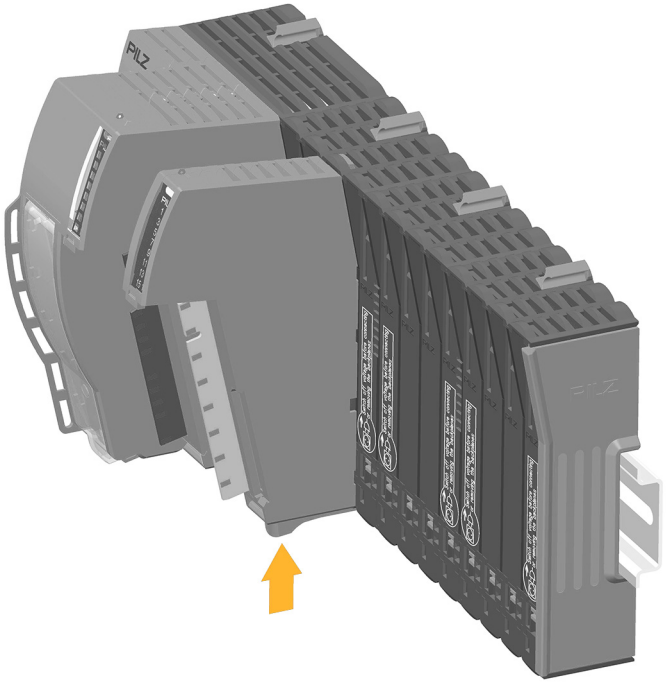
- Backplane must be installed first.
- Electronic modules may only be plugged or unplugged if the terminal block has been removed first.
- The mechanics of the electronic modules are designed for 20 plug in/out cycles.
- On electronic modules with outputs, the terminal block may only be inserted and removed when the load is switched off. Unforeseeable error reactions may be triggered if modules are inserted and removed under load.

6.3.1 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.	

6.3.2 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.	

6.3.3 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
2. Inserting an electronic module

A new electronic module can be inserted during operation.

Procedure:

- Inserting an electronic module

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)").
- On electronic modules with outputs, the terminal block 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.

7 Wiring

7.1 General wiring guidelines

Please note:

- The actuators may be connected using unshielded cables.
- To prevent contact welding, a fuse should be connected before the output contacts (see Technical details).
- With inductive loads, adequate protection must be provided on all output contacts.
- If voltages higher than 50 VAC or 120 VDC are connected to the relay contacts, please note the following:
  - Specific accident prevention regulations apply.
  - These voltages must only be applied at the upper terminals (Ox3), to guarantee protection against contact when removing the terminal blocks.
- Use copper wiring.

7.1.1 Connection mechanism for terminal blocks

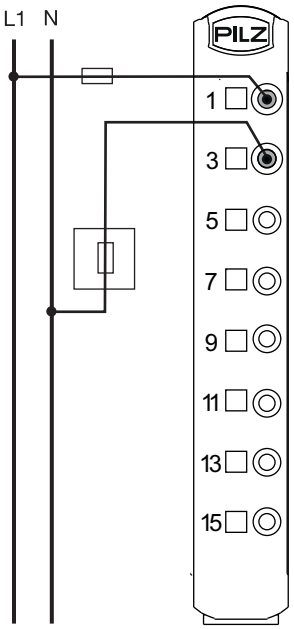
Procedure:

- 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.

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.

7.2 Terminal configuration

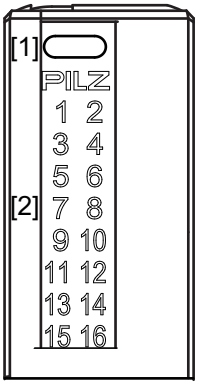
Terminal configuration	Connection examples
Output O0 Terminal 1 - 3 Contacts: O0.13 - O0.14 **Output O1** Terminal 5 - 7 Contacts: O1.23 – O1.24 **Output O2** Terminal 9 - 11 Contacts: O2.33 – O2.34 **Output O3** Terminal 13 - 15 Contacts: O3.43 – O3.44	1-channel actuator 

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

Only the LEDs at the terminals 1, 5, 9, 13 are active.



Legend

[1] Module status display

[2] Terminal status display

The module can detect the following errors:

[1]	Colour [1]	[2]	Colour [2]	Meaning	Further information
●	--	●	--	Module not ready for operation	
◐	Green	●	--	Module ready for operation	
☼	Green	☼	Green	Module in operation and the relay contacts are closed	
☼	Green	●	--	Module in operation and the relay contacts are open	
◐ϟ	Red	●	--	Configuration error: Module was inserted in the wrong slot.	
☼	Red	●	--	Internal error/firmware update	See module's diagnostic log
◐	Red	◐	Green	The module status display and the terminal status display on the relevant output flash synchronously Short circuit/overload/undervoltage	See module's diagnostic log.
◐	Red	● ☼	Green	Temperature error: too warm (1)/warning, e.g. undervoltage	See module's diagnostic log

[1]	Colour [1]	[2]	Colour [2]	Meaning	Further information
◐	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 outputs are switched off

  – The valid bits for the 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	**001Eh**
Number of ST output bits	**4**
Electrical data	
Internal supply voltage (module supply)	
Module's power consumption	**0,2 W**
Periphery's supply voltage (periphery supply)	
Voltage range	**16,8 - 30 V**
Module's current consumption with no load	**40 mA**
Module's power consumption with no load	**1,2 W**
Max. power dissipation of module	**1,4 W**
Permitted loads	**inductive, resistive**
Relay outputs	
Number of relay outputs	**4**
Max. processing time for relay output tProcOM when signal changes from "1" to "0"	**50 ms**
Max. processing time for relay output tProcOM when signal changes from "0" to "1"	**50 ms**
Contact material	**AgSnO2**
Environmental data	
Climatic suitability	**EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78**
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**

Environmental data	
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 60664-1**
Overvoltage category	**III**
In accordance with the standard	**EN 61131-2**
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	**Relay output and relay output**
Type of potential isolation	**Protective separation**
Rated surge voltage	**6000 V**
Potential isolation between	**Relay output and periphery supply**
Type of potential isolation	**Protective separation**
Rated surge voltage	**6000 V**
Potential isolation between	**Relay output and module supply**
Type of potential isolation	**Protective separation**
Rated surge voltage	**6000 V**
Potential isolation between	**Periphery supply and module supply**
Type of potential isolation	**Functional insulation**
Rated surge voltage	**2500 V**
Mechanical data	
Mechanical life	**50,000,000 cycles**
Material	
Housing	**PC**
Mounting type	**plug-in**
Dimensions	
Height	**110,8 mm**
Width	**25 mm**
Depth	**75,3 mm**

Where standards are undated, the 2017-05 latest editions shall apply.

9.1 Service life graphs

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.

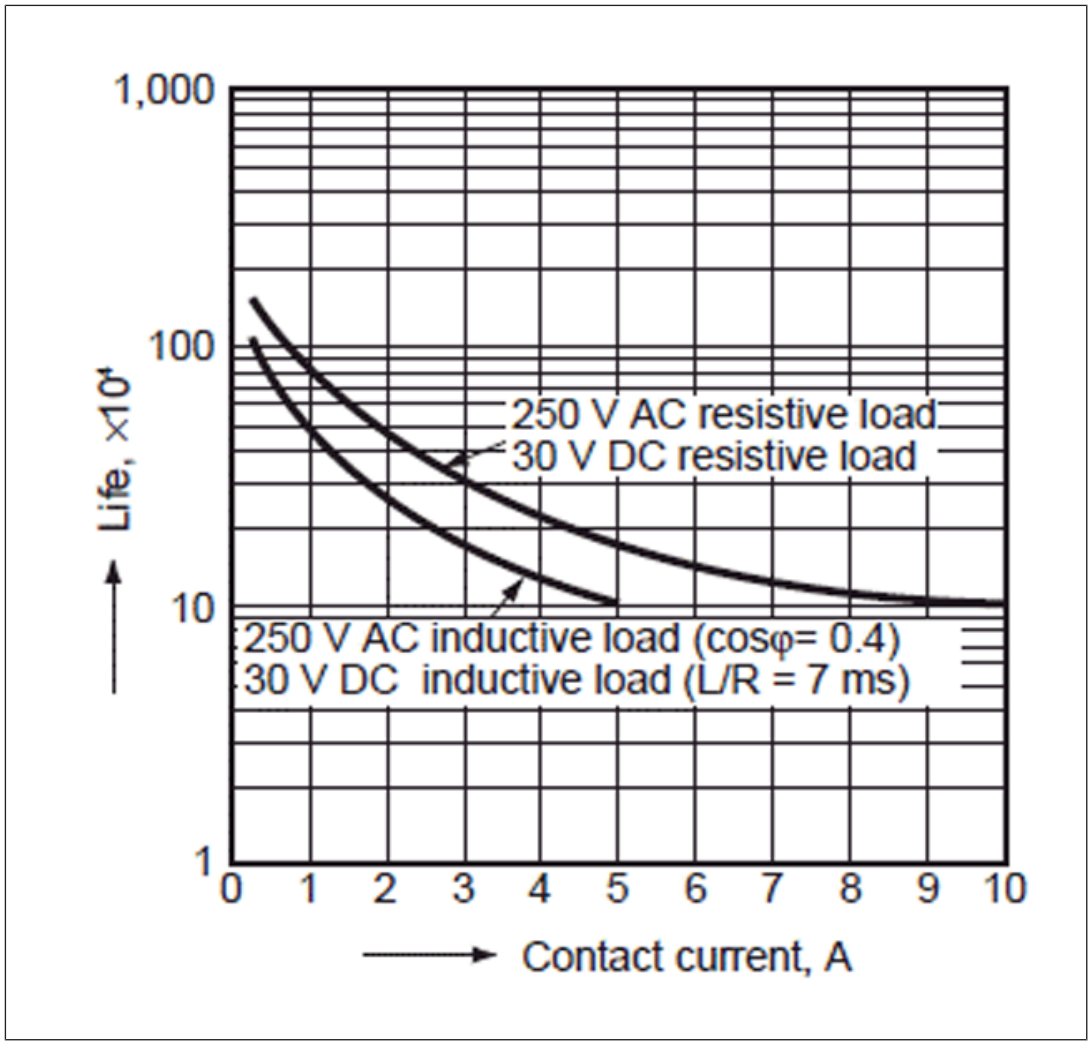


Fig.: Service life graph

We recommend you use semiconductor outputs to switch 24 VDC loads.

10 Order reference

10.1 Product

Product type	Features	Order no.
PSS u2 ES 4DO R 8A	Electronic module	328420

10.2 Accessories

Terminal block

Product type	Features	Order no.
PSS u2 T 8 (1 pc.)	Terminal block 8-pin, scope of delivery: 1 pieces	328840
PSS u2 T 8 (10 pcs.)	Terminal block 8-pin, scope of delivery: 10 pieces	328841
PSS u2 T 8 (5 x 10 pcs.)	Terminal block 8-pin, scope of delivery: 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 delivery: 10 pieces	328912

Coding elements

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

Protective coding for terminal block

Product type	Features	Order no.
PSS u2 A CE T (10 pc.)	Protective coding for terminal block, scope of delivery: 10 pieces	328861

Support

Technical support is available from Pilz round the clock.

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Scandinavia
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