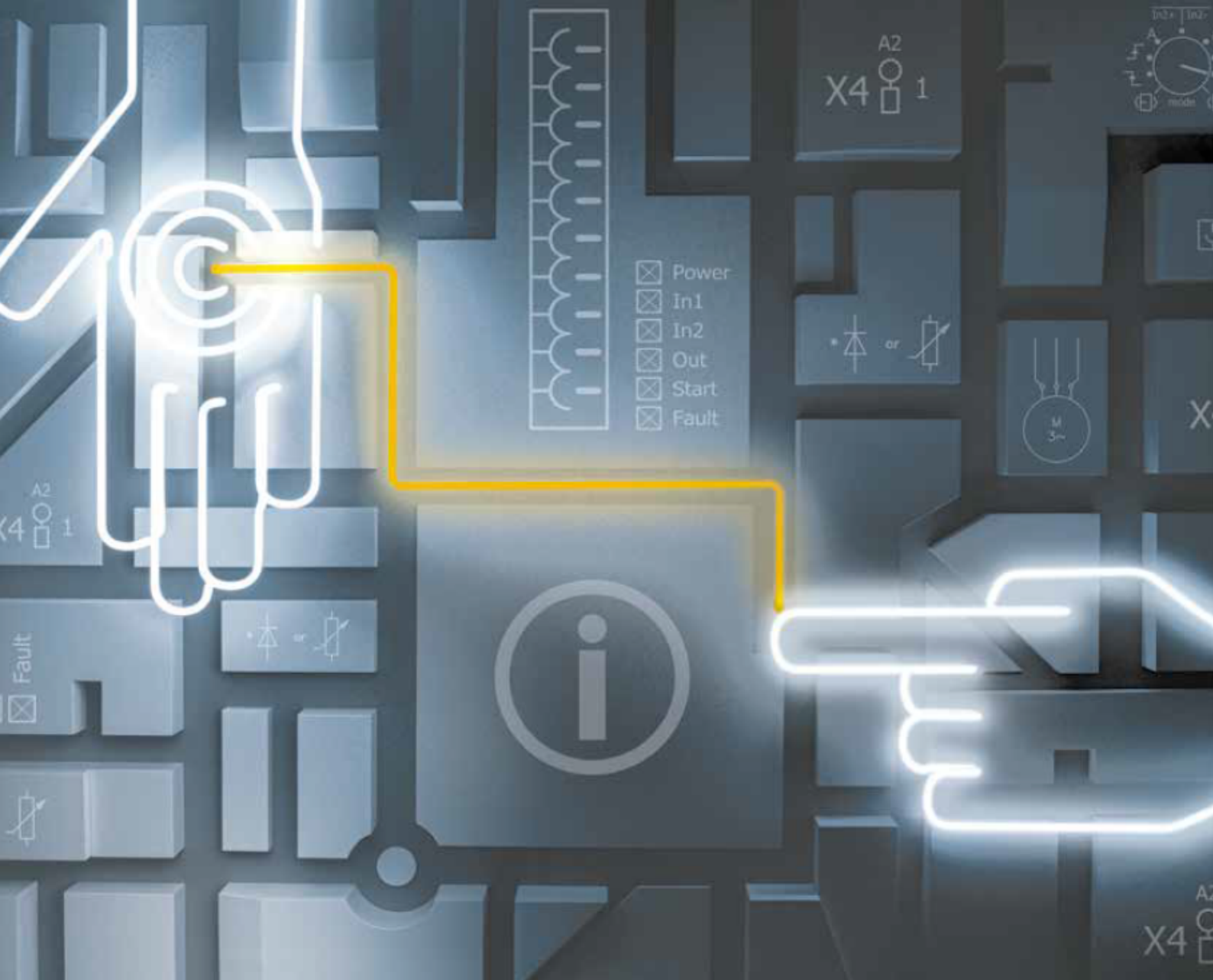




► PSS u2 EF 4DO 2A (-R)

PILZ
THE SPIRIT OF SAFETY

Operating Manual-1003623-EN-04

- PSS u2 in the automation system PSS 4000
- Remote I/O system PSS u2



This document is the original document.

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SD means Secure Digital

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1 Introduction

1.1 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.

1.2 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 EF 4DO 2A from Version HW 01.01, FW 01.02.00. It is valid until new documentation is published.

The documentation is valid for the product PSS u2 EF 4DO 2A -R from Version HW 01.00, FW 01.02.00. It is valid until new documentation is published.

1.3 Terminology

PSS u2 system

System from a PSS u2 head module and PSS u2 electronic modules.

Remote I/O system PSS u2

PSS u2 system without control functionality that provides I/Os. The I/Os can be controlled via a fieldbus.

The configuration is performed in the tool PASconfig.

PSS u2 in the automation system PSS 4000

PSS u2 system with control functionality that can be used in the automation system PSS 4000. A PSS u2 system is a 2nd generation device in the automation system PSS 4000.

The configuration is performed in the tool PAS4000.

1.4 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.

1.5 Third-party manufacturer licence information

This product includes Open Source software with various licenses.

Further information is available in the document "Third-party manufacturer licence information PSS u2 EF 4DO 2A (-R)" (document number 1006611) at www.pilz.com.

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 EF 4DO 2A (-R):

Electronic module with digital single-pole outputs for failsafe applications

The product has the following features:

- ▶ 4 digital outputs
 - Semiconductor technology
 - Single-pole
 - Positive-switching
 - Current load capacity per output: 2 A
 - Short circuit-proof
 - Overload-proof
 - Configurable switch-off delay
 - Configurable on/off tests
 - Configurable repetition time of the on tests
- ▶ Energy-saving functions
- ▶ LEDs for:
 - Switch status of each output
 - Module error
- ▶ **R-type:**
 - For railway applications (increased environmental requirements)

2.2 Side view right

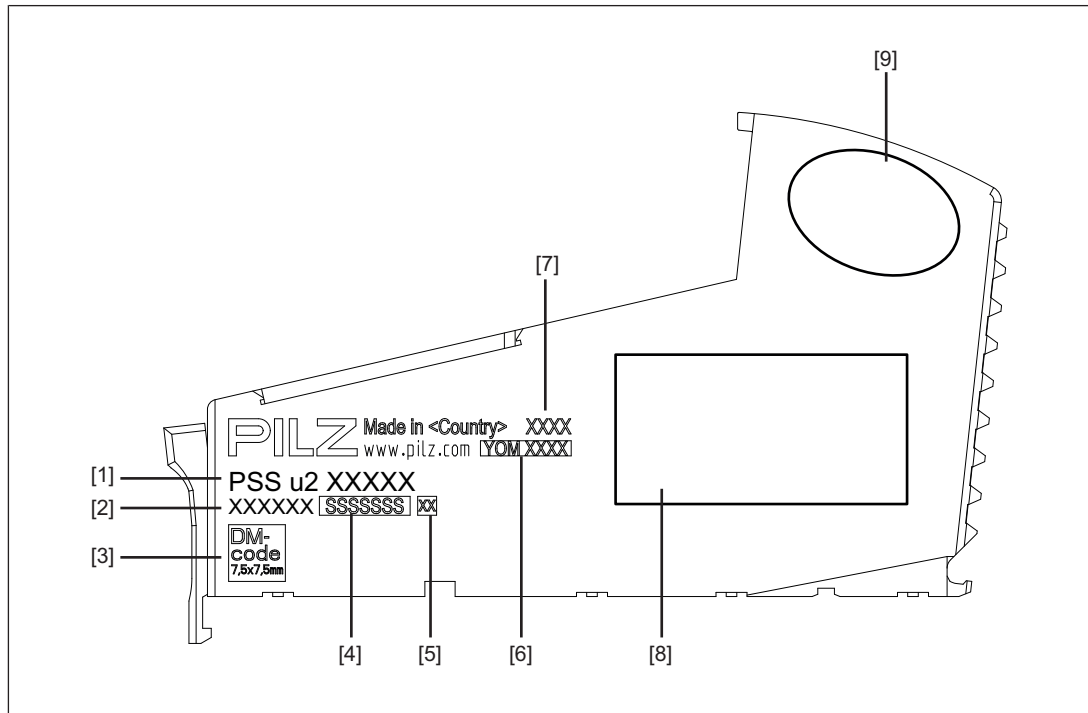


Fig.: Electronic module without terminal block, side view

Legend

[1]	Product Name
[2]	Order number
[3]	2D code product information
[4]	Serial number
[5]	Hardware version
[6]	"YOM" year of manufacture
[7]	Production site
[8]	Placeholder for block diagram
[9]	Placeholder for approval tags

3 Safety

3.1 Intended use

The module PSS u2 EF 4DO 2A (-R) provides failsafe outputs and may be used for failsafe applications in the PSS u2 systems (see [Terminology \[5\]](#)):

- ▶ Remote I/O system PSS u2
- ▶ PSS u2 in the automation system PSS 4000 (generation 2)

The outputs may be used to switch:

- ▶ Resistive loads
- ▶ Inductive loads
- ▶ Capacitive loads

Install the module/the safety controller in a protected environment. Example: Protected inside space or control cabinet with protection class see [Technical details \[32\]](#). Make sure that only authorised personnel have access to the safety controller.

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 EF 4DO 2A (-R) may be used in conjunction with the following terminal block:

- ▶ 8-pin terminal block

Module for applications in an industrial environment

Module PSS u2 EF 4DO 2A

The module meets the requirements of EN IEC 61508 up to SIL 3 and EN ISO 13849-1 up to PL e.

Module for railway applications R-type

Module PSS u2 EF 4DO 2A -R

- ▶ The module is suitable for use in railway applications (where there are increased environmental requirements) (see [Technical details \[32\]](#)).
- ▶ Condensation during operation is permitted for the module.
- ▶ The module must only be installed on the carrier module PSS u2 B 4 -R.
- ▶ Depending on the selected railway architecture (see system description Safety architectures for railway applications (1006614)) the requirements of EN 50129 up to SIL 3 or SIL 4.

With reference to the standard IEC 61131-2 the values stated in the technical details for ambient temperature are reduced at heights >2000 m operating height above sea level (see [Supplementary data \[36\]](#)).

3.2 System requirements (remote I/O system PSS u2)



INFORMATION

The module is supported by

- ▶ PASconfig from Version 3.0.0
 - We recommend that you always use the latest version (download from www.pilz.com).

3.3 System requirements (PSS u2 in automation system PSS 4000)



INFORMATION

The module is supported by

- ▶ PAS4000, from Version 1.25.0
 - We recommend that you always use the latest version (download from www.pilz.com).

3.4 Safety regulations

3.4.1 Additional documents that apply

Please read and take note of the following documents:

- ▶ Installation Manual remote I/O system PSS u2 (1004152)
- ▶ Installation Manual PSS u2 in the automation system PSS 4000 (1006253)
- ▶ System Description PSS 4000 (1001467)
- ▶ Safety Manual PSS 4000 (1001468)

With railway applications it also important to note:

- ▶ System description safety architectures for railway applications (1006614)

You will need to be conversant with the information in these documents in order to fully understand this operating manual.

3.4.2 Safety assessment in an industrial environment (remote I/O system PSS u2)

Before using a device, a safety assessment in accordance with the Machinery Directive is required.

The product as an individual component fulfils the functional safety requirements in accordance with EN ISO 13849 and EN IEC 62061. However, this does not guarantee the functional safety of the overall plant/machine. To achieve the relevant safety level of the overall plant/machine's required safety functions, each safety function needs to be considered separately.

3.4.3 Safety assessment in railway applications (PSS u2 in the automation system PSS 4000)

Before using a device, a safety assessment with risk assessment and risk analysis is required.

Using the architectures defined in the system description "Safety architectures for railway applications", the product fulfils the functional safety requirements in accordance with EN 50126/EN 50129. However, this does not guarantee the functional safety of the overall railway application/plant. To achieve the relevant safety level of the overall railway application's/plant's required safety function, each safety function needs to be considered separately.

3.4.4 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.

3.4.5 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.).

3.4.6 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).

3.5 Actuators

The module PSS u2 EF 4DO 2A (-R) **does not detect** the failure of the actuator (e.g. loss of switchability).

Therefore, the user must

- ▶ select an actuator whose safety characteristic data reach the required safety characteristic data of the application. Depending on the application, the operator must be required to perform a regular function test of the actuator OR
- ▶ provide a second actuator and detect the failure of an actuator using feedback loop monitoring in the user program and switch off the other actuator.

4 Security

To secure plants, systems, machines and networks against cyberthreats it is necessary to implement (and continuously maintain) an overall industrial security concept that is state of the art.

Perform a risk assessment in accordance with VDI/VDE 2182 or IEC 62443-3-2 and plan the security measures with care. If necessary, seek advice from Pilz Customer Support.

4.1 Security (remote I/O system PSS u2)

Further information on Security can be found in the operating manuals of the relevant head modules.

4.2 Security (PSS u2 in the automation system PSS 4000)

Further information on Security can be found in the system description PSS 4000 (1001467).

5 Function description

5.1 Block diagram

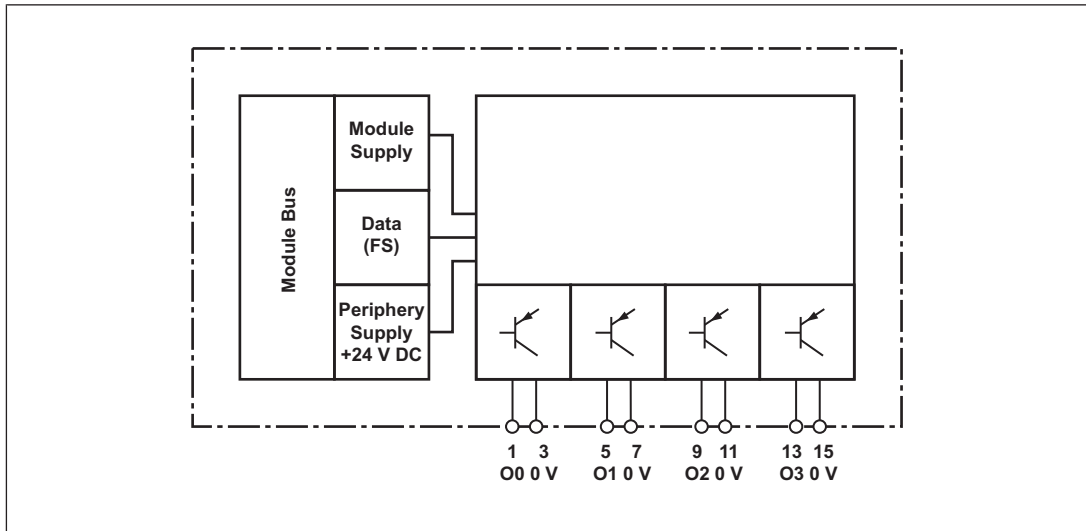


Fig.: Block diagram PSS u2 EF 4DO 2A (-R)

5.2 Supply

- ▶ The module is supplied with voltage via the head module/main voltage supply PSS u2 PS1 -R connected to the head module.
- ▶ The periphery supply provides the outputs with voltage.
- ▶ The module routes the periphery supply from the backplane to the terminal block.

5.3 Outputs

Signals at the output

- ▶ "0" signal (0 V) at the output:
 - Output is high impedance
 - No current to the load
- ▶ "1" signal (+24 V) at the output:
 - Output is low impedance
 - Current is supplied to the load

Output test

- ▶ Outputs that are switched on are checked via regular off tests.
 - Off tests are run in each test cycle
 - The maximum duration of the off test can be configured (default value: 3 ms)
 - Outputs that are switched on are switched off for the duration of the off test.
 - The load must not switch off because of the test.

- ▶ Outputs that are switched off are checked via regular on tests.
 - On tests are run based on the configured repetition time. If a repetition time has not been configured, then on tests are run in each test cycle.
 - The maximum duration of the on test can be configured (default value: 3 ms)
 - Outputs that are switched off are switched on for the duration of the on test.
 - The load must not switch on because of the test.

Exclude individual outputs from the output test:

- ▶ If a plant is particularly sensitive to the output test, the output test may be switched off for individual outputs.
- ▶ The test must be replaced by other measures, depending on the safety requirement.
- ▶ When output tests are switched off:
 - The correct switch state is always checked.
 - The output's ability to switch will not be detected until the next time the output is switched on/off. That is why the outputs must be switched regularly during normal operation, so that safety and characteristic safety values are not reduced.

Monitoring the maximum permitted test cycle time

- ▶ The duration of a test cycle depends on the number and type of modules. A maximum test cycle time can be configured. If the output test is not run within the configured cycle monitoring time, then an error is registered.

Testing for shorts

- ▶ The outputs are switched on individually in order to detect shorts across contacts.
- ▶ For applications in accordance with Category 4, PL e and SIL 3, detection of shorts between contacts must be guaranteed either via the on/off test or through other measures (e.g. asynchronous switching). A short between contacts must be simulated during commissioning.

Outputs

- ▶ The head module sets the output status via the module bus.
- ▶ The max. capacity at an output depends on the load (see characteristic). Connecting a higher capacity may lead to an error.
- ▶ Operation with electronic contactors has not been tested and may lead to errors. Please contact our Customer Support team if you are using electronic contactors.



WARNING!

When wiring an output with capacitance it is essential to note the pulse duration, repetition period and scan time of the power-up test, otherwise the load may switch on unintentionally.

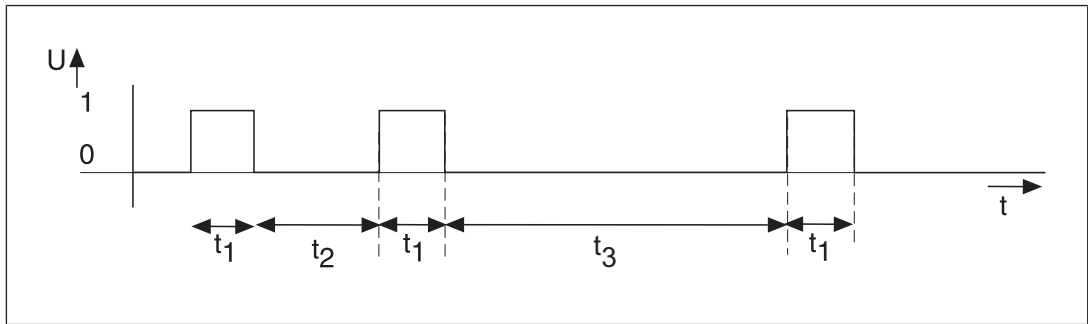


Fig.: On test for single-pole outputs

Legend

t_1 Configurable max. test duration (default value: 3 ms)

t_2 Configurable repetition time of on test in error-free operation
(Default value: test is run in each test cycle)

The test cycle time is not configurable and is determined by the head module. The configuration enables a longer repetition time to be set between the on tests.

t_3 Configurable repetition time of the on test in the event of an error (default value: 3 s)

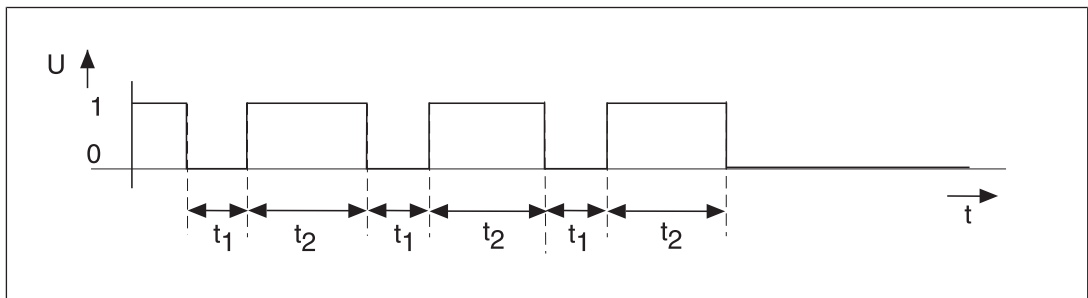


Fig.: Off test for single-pole outputs

Legend

t_1 Configurable max. test duration (default value: 3 ms)

t_2 Repetition of off test in each test cycle

Switch-off delay

FS outputs can be switched off with a delay. Even if the process image of outputs switches from "1" to "0", a "1" signal may remain at the output for the duration of the delay. If there is another "1" signal during the switch-off delay, the switch-off delay time is reset again and restarts at the next "0" signal.

In the event of external errors, e.g. if the connection to the controller is lost, the output is switched off after the set switch-off delay.

However, in the event of internal module errors, the switch-off delay cannot be guaranteed.

Default value: 0 ms (switch off immediately).

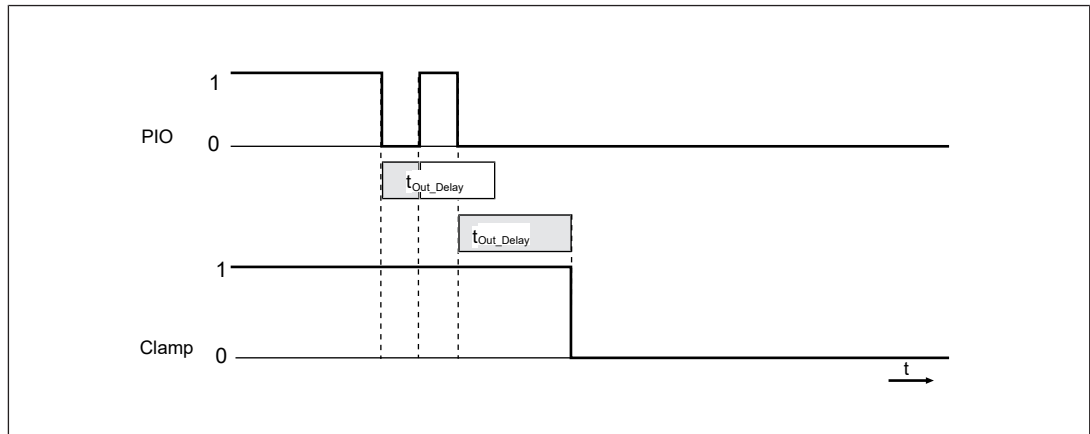


Fig.: Switch-off delay

Legend

PIO

Process image of outputs

t_{Out_Delay}

Configured switch-off delay time

If there is another "1" signal, the time is reset and restarts at the next "0" signal

Clamp

Signal at the terminal

5.4 Output capacitance C

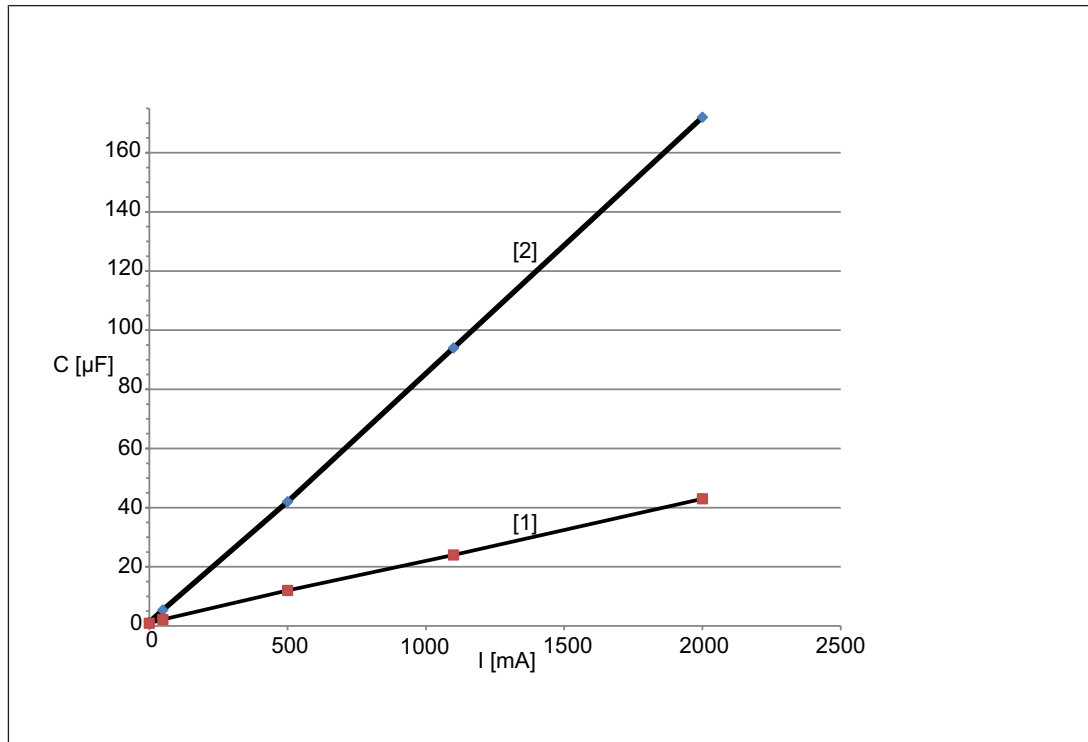


Fig.: Output capacitance C dependent on load current I

Legend

- [1] Max. test duration 1 ms
- [2] Max. test duration 3 ms

5.5 Integrated protection mechanisms

The module has the following protection mechanisms:

- ▶ Common second shutdown route, tested regularly
- ▶ Cyclical output tests
- ▶ Tests for shorts between the outputs

The module provides the following diagnostic data:

- ▶ Start-up error
- ▶ Configuration error
- ▶ FS communication error
- ▶ Temperature error: too warm
- ▶ Temperature error: too hot
- ▶ Output error

5.6 Energy-saving functions

The energy levels are supported by the head module and are not configurable. The module supports the following energy levels:

- Switching off the LEDs that display the module and terminal status
- Switching off the LEDs that display the terminal status

5.7 Reaction times

Calculation of the processing times for dual-channel signals.

Worst Case Delay Output

Calculation of the time between the signal being received at the module bus interface and the output switching:

$$\begin{aligned}t_{\text{ProcOM_wcd}} &= 250 \mu\text{s} + t_{\text{Out_Delay}} \\t_{\text{Out_Delay}} &= 0, \text{ when signal changes from 0 to 1, otherwise} \\&= \text{output's configured switch-off delay}\end{aligned}$$

One Fault Delay Output

Calculation of the time between the signal being received at the module bus interface and the output switching when a fault is present:

$$t_{\text{ProcOM_ofd}} = t_{\text{ProcOM_wcd}}$$

6 Structure of the process image Remote I/O (remote I/O system PSS u2)

When the electronic module is used in the remote I/O system, the data described below are available.

FS-PIO

The module occupies 1 Byte in the process image of outputs.

Byte	Bit	Meaning
0	0	Output data O0
0	1	Output data O1
0	2	Output data O2
0	3	Output data O3
0	4 ... 7	Not assigned

FS-P11

The module occupies 1 Byte in the process image of inputs.

Byte	Bit	Meaning
0	0	Valid bit of output O0
0	1	Valid bit of output O1
0	2	Valid bit of output O2
0	3	Valid bit of output O3
0	4 ... 7	Not assigned

7 I/O data of the module (PSS u2 in the automation system PSS 4000)

When the electronic module for PSS u2 is used in the automation system PSS 4000, the data described below are available.

7.1 Available I/O data in the I/O mapping

Data access is via pre-defined I/O data types:

I/O data name	I/O data type	Data element: Data type	Meaning
O0(1)	FS_O_DO	Data: SAFEBOOL	Output data O0
O1(5)	FS_O_DO	Data: SAFEBOOL	Output data O1
O2(9)	FS_O_DO	Data: SAFEBOOL	Output data O2
O3(13)	FS_O_DO	Data: SAFEBOOL	Output data O3
OutputValid (*)	FS_I_DI	Data: SAFEBOOL	Bit <i>OutputValid</i>
ReadyForReintegration (*)	FS_I_DI	Data: SAFEBOOL	Bit <i>ReadyForReintegration</i>
Reintegrate (*)	ST_O_DO	Data: BOOL	Bit <i>Reintegrate</i>

(*) Available only if the FS shutdown behaviour "Shutdown of all FS outputs on the electronic module" is configured for the PSS u2 system

7.2 Other I/O data

In addition to the I/O data available via I/O mapping, it is possible to access further I/O data in the user program:

- ▶ Valid bit of the *OutputValid* bit (*)
- ▶ Valid bit of the *ReadyForReintegration* bit (*)

(*) Available only if the FS shutdown behaviour "Shutdown of all FS outputs on the electronic module" is configured for the PSS u2 system

In the Multi programming, access is via the PSS 4000 system control block "Valid".

In IEC 61131 programming, access is via the variable extension "WITH VALID".

8 Installation

8.1 General installation guidelines



NOTICE

R-type electronic modules may only be installed on R-type backplanes.



CAUTION!

Risk of material damage

The incorrect ambient temperature during assembly/dismantling can lead to material damage.

- Comply with the permitted ambient temperature for assembly/dismantling: -20°C ... +45°C



CAUTION!

Risk of material damage

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 arm-band.

8.1.1 Dimensions in mm

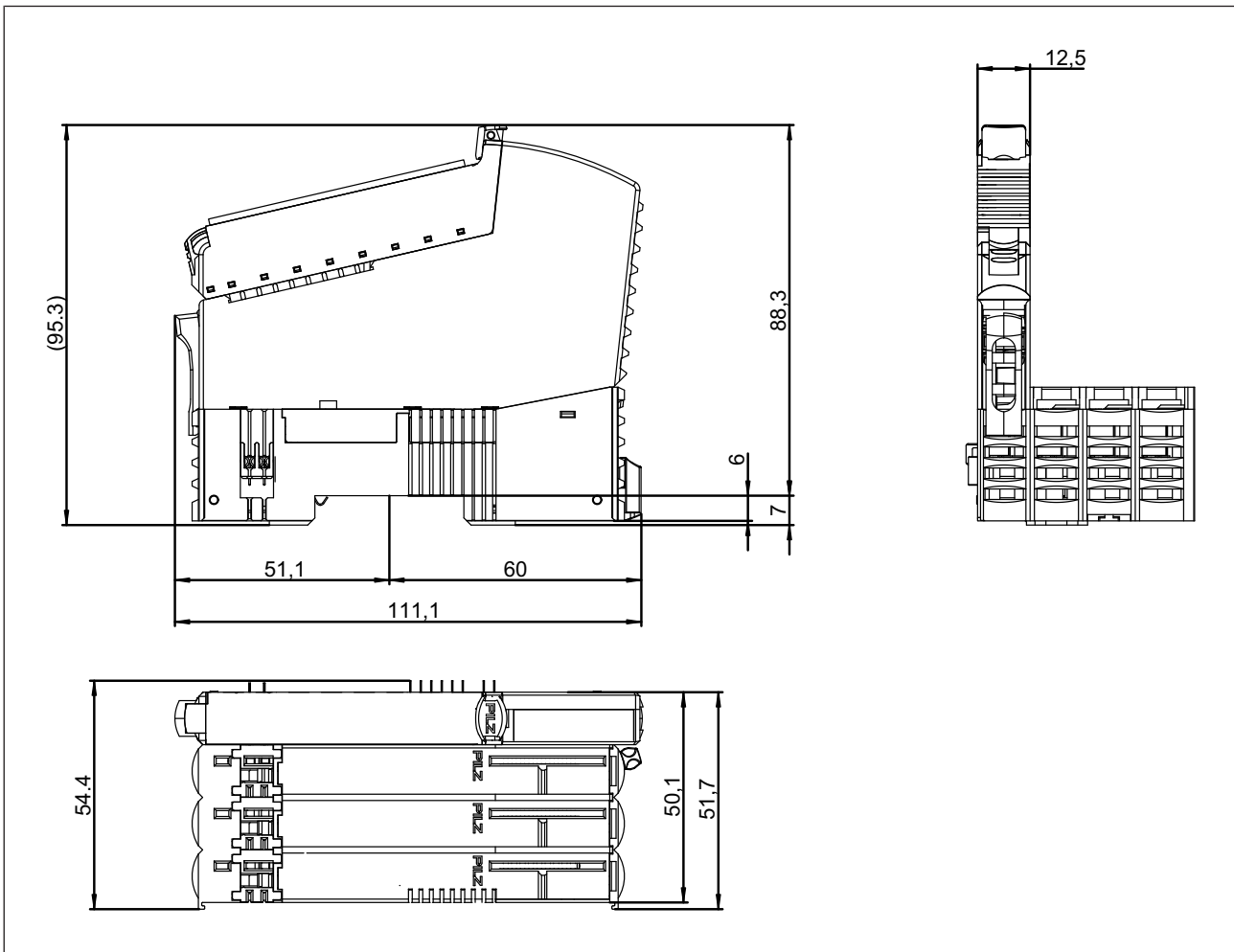


Fig.: Dimensions in mm, including backplane, electronic module and terminal block

8.2 Inserting and removing an electronic module

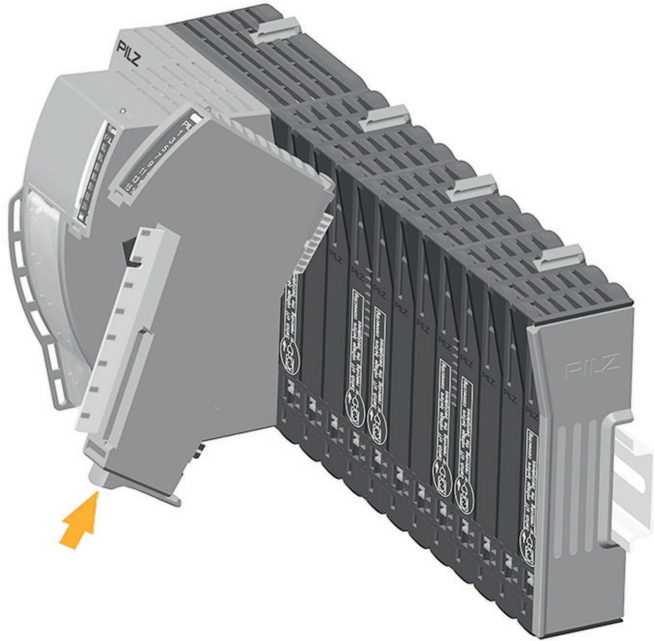
Please note:

- ▶ 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.
- ▶ 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.

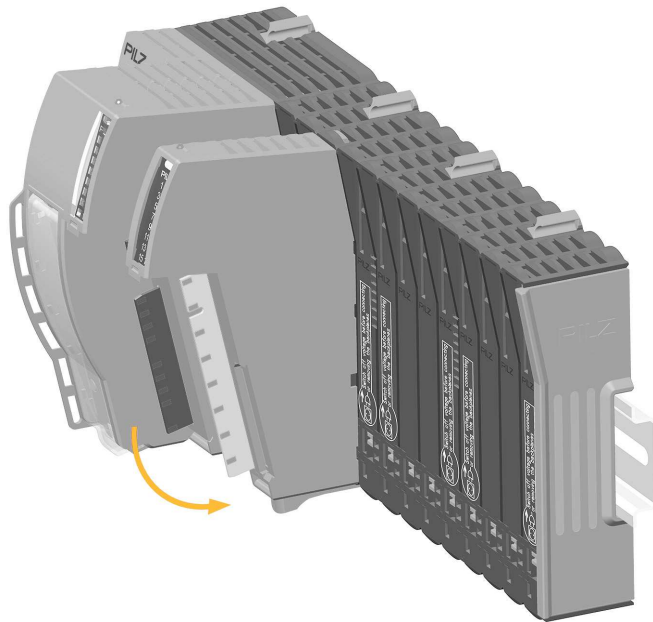
The following illustrations in chapters "Inserting an electronic module", "Removing an electronic module" and "Changing an electronic module during operation" are displayed as an example in the remote I/O system PSS u2 (see [Terminology](#) [5]).

8.2.1 Inserting an electronic module

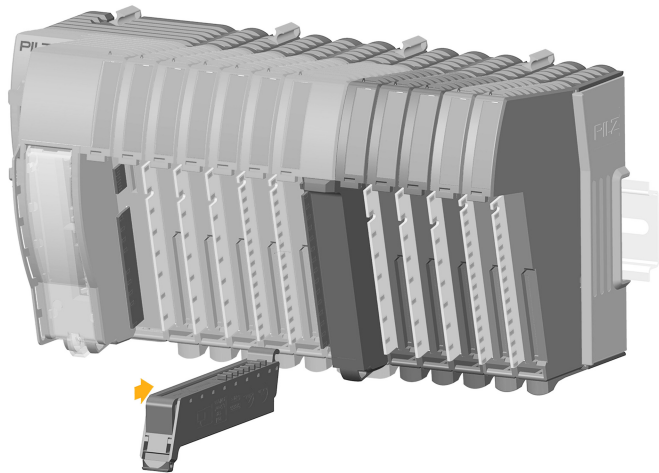
1. Insert the electronic module into the suspension lug on the back-plane.



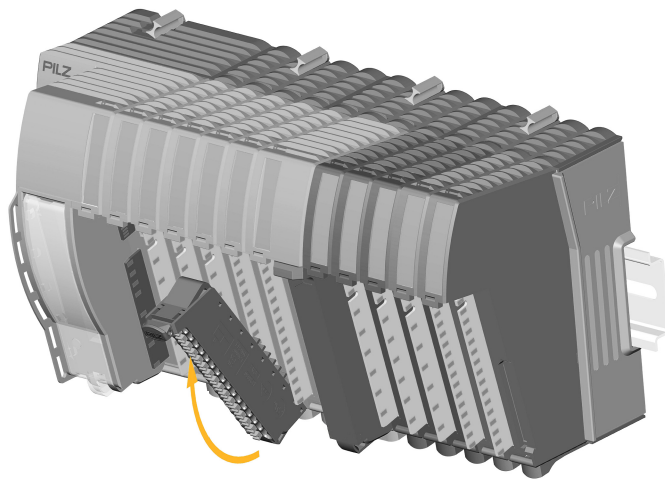
2. Swivel the electronic module downwards until you hear it click into place.



3. Insert the terminal block into the suspension lug on the module.

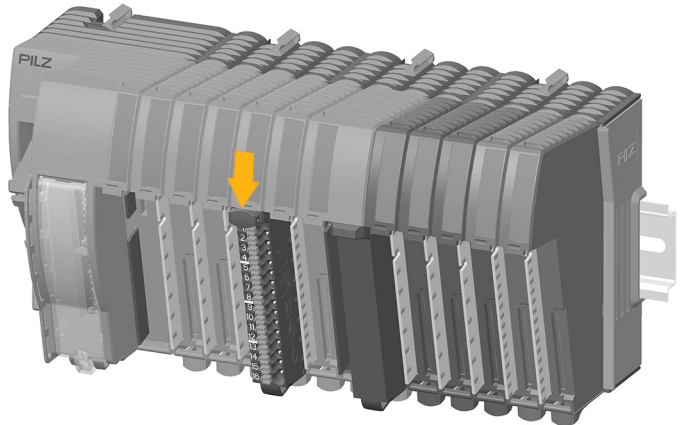


4. Swivel the terminal block upwards until you hear it click into place.

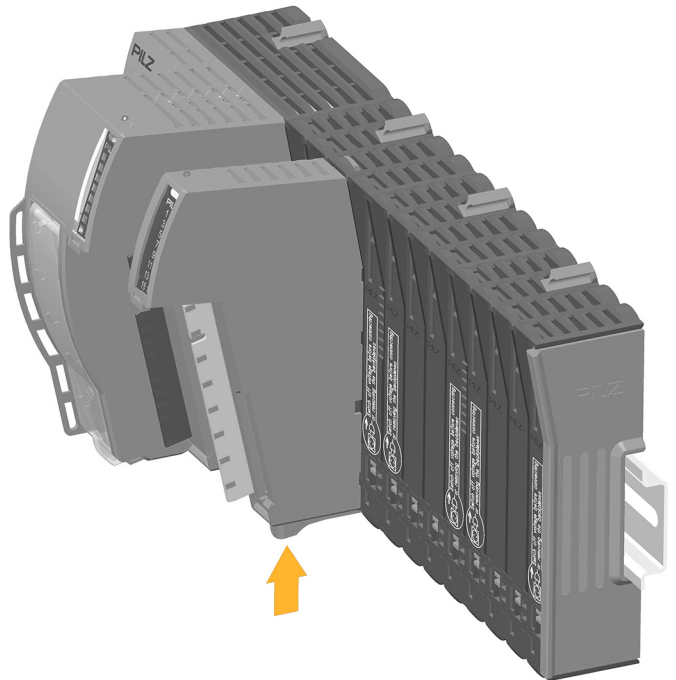


8.2.2 Removing an electronic module

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.



8.2.3 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 remain (exchange of an electronic module with identical order number).
- ▶ 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 with not identical order number)

- ▶ 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 (supply voltage on/off) or Warm Reset using the Reset pushbutton.

9 Wiring

9.1 General wiring guidelines

Please note:

- ▶ If short circuits occur between the cable from the output to the load and a supply line, it will no longer be possible to switch off the load. Possible remedies:
 - Exclude the error by using separate multicore cable for supply voltages
 - Use dual actuators, e.g. two contactors in series
 - Use an additional shutdown device such as a main contactor
- ▶ Use appropriate wiring to exclude short circuits between the outputs!
- ▶ The actuators may be connected using unshielded cables.
- ▶ The outputs do not need suppression for inductive loads.
- ▶ Use copper wiring.

9.1.1 Connection mechanism for terminal blocks

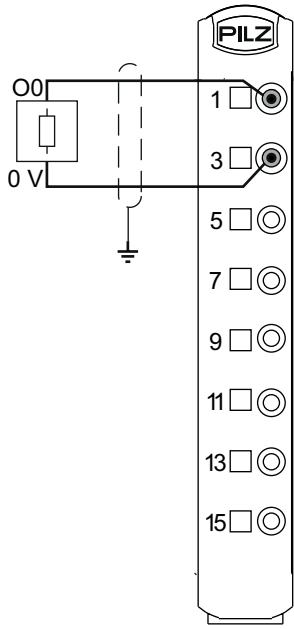
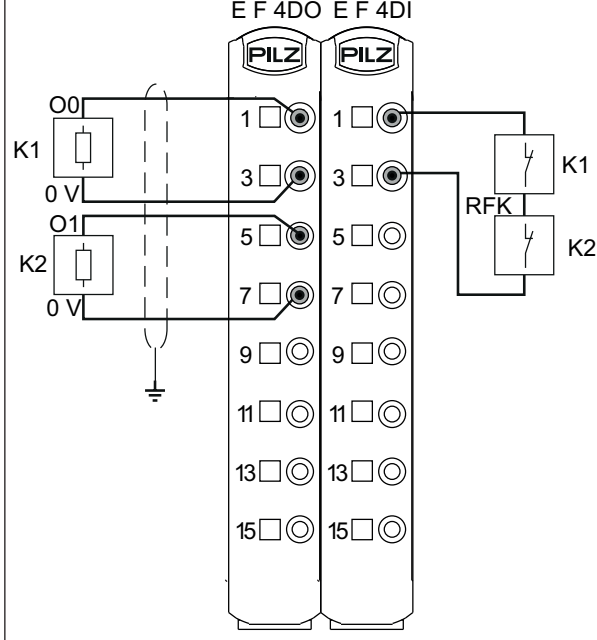
Procedure:

- ▶ 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 mm² (AWG26).
- ▶ The maximum cable cross section for field connection terminals on the terminal blocks is 1.5 mm² with ferrules (AWG14)
- ▶ Use copper wiring.

9.2 Terminal configuration

Terminal configuration	Connection examples	
1: Output O0 3: 0 V (Periphery Supply) 5: Output O1 7: 0 V (Periphery Supply) 9: Output O2 11: 0 V (Periphery Supply) 13: Output O3 15: 0 V (Periphery Supply)	1-channel actuator	2-channel actuator with feedback loop on the module PSS u2 EF 4DI
		

9.3 Function test during commissioning

An error must be simulated for each safety-related output during commissioning: The anticipated error reaction must occur when an output has an error against a supply voltage.



INFORMATION

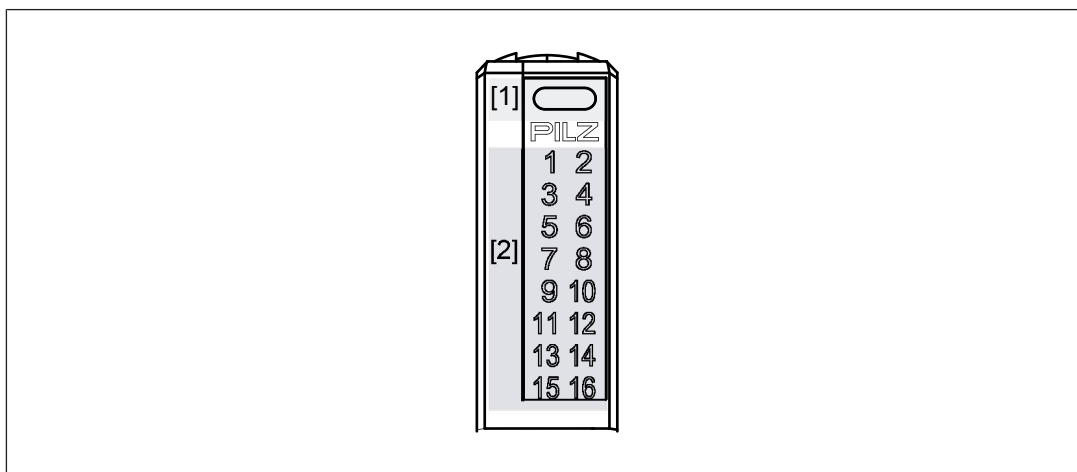
The safety-related test must be performed on the load and not on the output terminal.

10 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.

10.1 Display elements and messages

Only the terminal status displays 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 there is a "1"-signal at the output	
	Green		--	Module in operation and there is a "0"-signal at the output	
	Red		--	Configuration error Module was inserted in the wrong slot.	
	Red		--	Internal error/firmware update	See module's diagnostic log

[1]	Colour [1]	[2]	Colour [2]	Meaning	Further information
	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
	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

Legend

LED on



LED flashes



LED flashes



LED off

^[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.

11 Technical Details

General		
	328133	327133
Certifications	CE, EAC, KOSHA, TÜV, UKCA, cULus Listed	CE, TÜV
Application range	Failsafe	Failsafe
Module's device code	4047h	4C47h
Electrical data		
	328133	327133
Internal supply voltage (module supply)		
Module's power consumption	0,5 W	0,5 W
Periphery's supply voltage (periphery supply)		
Voltage range	16,8 - 30 V	16,8 - 30 V
Module's current consumption with no load	33 mA	33 mA
Module's power consumption with no load	1 W	1 W
Max. power consumption of a positive-switching single-pole semiconductor output	0,35 W	0,35 W
Max. power dissipation of module	2,9 W	2,9 W
Permitted loads	inductive, capacitive, resistive	inductive, capacitive, resistive
Process data remote IO system PSS u2		
	328133	327133
Number of FS input bytes (assigned bits)	1 (4)	—
Number of FS output bytes (assigned bits)	1 (4)	—
Process data PSS u2 in the automation system PSS 4000		
	328133	327133
Number of ST control bits	—	1
Number of FS output bits	—	4
Number of FS status bits	—	4
Semiconductor outputs		
	328133	327133
Number of positive-switching single-pole semiconductor outputs	4	4
Typ. output current at "1" signal and rated voltage of semiconductor output	2 A	2 A
Permitted current range	0,000 - 2,500 A	0,000 - 2,500 A
Residual current at "0" signal	0,02 mA	0,02 mA
Max. transient pulsed current	12 A	12 A
Max. internal voltage drop	175 mV	175 mV
Max. duration of on time during self test	100 - 12700 µs	100 - 12700 µs
Max. duration of off time during self test	100 - 12700 µs	100 - 12700 µs

Semiconductor outputs		
	328133	327133
Potential isolation from system voltage	Yes	Yes
Short circuit-proof	Yes	Yes
Environmental data		
	328133	327133
Application site		
in accordance with the standard	–	EN 50125-3
Application site	–	Track area (1 m - 3 m)
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
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	95 % r. h. at 40 °C
Condensation during operation	Not permitted	EN 60068-2-30
Max. operating height above SL	2000 m	5000 m
EMC		
	EN 61131-2 (Zone B)	EN 50121-4, EN 61000-6-2, EN 61000-6-4, EN 61131-2 (Zone B)
Vibration		
in accordance with the standard	EN 60068-2-6	–
Frequency	8,4 - 150 Hz	–
Acceleration	10 m/s²	–
Broadband noise		
in accordance with the standard	–	EN 60068-2-64
Frequency	–	5 - 2.000 Hz
Acceleration	–	2,3 m/s² eff.
Shock stress		
in accordance with the standard	EN 60068-2-27	EN 60068-2-27
Number of shocks	6	6
Acceleration	150 m/s²	20 m/s²
Duration	11 ms	11 ms
Airgap creepage		
in accordance with the standard	–	EN 50124-1
Overvoltage category	–	OV2
Pollution degree	–	PD2
in accordance with the standard	EN 61131-2, UL/IEC 61010-2-201	EN 61131-2
Overvoltage category	II	II
Pollution degree	2	2

Environmental data	328133	327133
Protection type		
in accordance with the standard	EN 60529	EN 60529
Housing	IP20	IP20
Mounting area (e.g. control cabinet)	IP54	IP51
Potential isolation	328133	327133
Potential isolation between	Semiconductor output and module supply	Semiconductor output and module supply
Type of potential isolation	Functional insulation	Functional insulation
Rated surge voltage in operating heights up to max. 2000 m	2000 V	2000 V
Rated surge voltage in operating heights up to max. 5000 m	–	1500 V
Potential isolation between	Periphery supply and module supply	Periphery supply and module supply
Type of potential isolation	Functional insulation	Functional insulation
Rated surge voltage in operating heights up to max. 2000 m	2000 V	2000 V
Rated surge voltage in operating heights up to max. 5000 m	–	1500 V
Mechanical data	328133	327133
Material		
Housing	PC	PC
Mounting type	plug-in	plug-in
Dimensions		
Height	110,8 mm	110,8 mm
Width	12,5 mm	12,5 mm
Depth	72,5 mm	72,5 mm
Weight	34 g	34 g

Where standards are undated, the 2020-01 latest editions shall apply.

11.1 Safety-related characteristic data (remote I/O system PSS u2)



NOTICE

You must comply with the safety characteristic data in order to achieve the required safety level for your plant/machine.

Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN IEC 62061 SIL CL/ maximum SIL	EN IEC 62061 PFH _D [1/h]	EN/IEC 61511 SIL	EN/IEC 61511 PFD	EN ISO 13849-1: 2015 T _M [year]
1-channel	PL d	Cat. 2	SIL CL 2	1,32E-09	SIL 2	1,16E-04	20
2-channel	PL e	Cat. 4	SIL CL 3	1,99E-10	SIL 3	1,72E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ Safety characteristic data in accordance with EN IEC 62061 and EN/IEC 61511 was calculated based on EN/IEC 61508.
- ▶ T_M is the maximum mission time in accordance with EN ISO 13849-1. The value also applies as the retest interval in accordance with EN/IEC 61508-6 and EN/IEC 61511 and as the proof test interval and mission time in accordance with EN IEC 62061.

All the units used within a safety function must be considered when calculating the safety characteristic data.



INFORMATION

A safety function's SIL/PL values are **not** identical to the SIL/PL values of the units that are used and may be different. We recommend that you use the PAScal software tool to calculate the safety function's SIL/PL values.

The safety-related characteristic data (PFH, PFD) are mean values. They have been calculated at an average ambient component temperature of 40 °C.

11.2 Safety-related characteristic data (PSS u2 in the automation system PSS 4000)

Safety-related characteristics of the safety outputs

Safety-related characteristic data for railway applications must be considered for the overall system, see System description for railway applications (1006614).

The mission time of the module is T_M = 20 years.

12 Supplementary data

12.1 Permitted operating height

The values stated in the technical details apply to the use of the device in operating heights up to max. 2000 m above SL. When used at higher levels, restrictions of the ambient temperature (standard IEC 61131-2) must be taken into account.

Operating height above SL [m]	Multiplication factors for the devices' ambient temperature
0 ... 2000	1.0
3000	0.9
4000	0.8
5000	0.7

13 Order reference

13.1 Product

Product type	Features	Order no.
PSS u2 EF 4DO 2A	PSS u2, electronic module, failsafe, 4 outputs, semiconductor, 2 A, single-pole, switch-off delay, positive-switching, short circuit proof, overload-proof, 1-row, terminal block PSS u2 T 8 required (not supplied with the device).	328133
PSS u2 EF 4DO 2A -R	PSS u2, electronic module, failsafe, 4 outputs, semiconductor, 2 A, single-pole, switch-off delay, positive-switching, short circuit proof, overload-proof, 1-row, for increased environmental requirements and railway applications, terminal block PSS u2 T 8 required (not supplied with the device).	327133

13.2 Accessories

Terminal block

Product type	Features	Order no.
PSS u2 T 8 (1 pc.)	Terminal block 8-pin, scope of delivery: 1 piece	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.)	Label holder for electronic module 23.5 x 10.5 mm, scope of delivery: 10 pieces	328910
PSS u2 A LC E2 (10 pcs.)	Label holder 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	PSS u2, accessories, backplane, for electronic modules, 1 slot, width 12.6 mm, height 107 mm, note the mounting distances.	328811
PSS u2 B 4	PSS u2, accessories, backplane, for electronic modules, 4 slots, width 50.1 mm, height 107 mm, note the mounting distances.	328810
PSS u2 B 4 -R	PSS u2, accessories, backplane, for electronic modules, 4 slots, for increased environmental requirements and railway applications, width 50.1 mm, height 107 mm, note the mounting distances.	327810

14 EC declaration of conformity for PSS u2 EF 4DO 2A

This product/these products meet the requirements of the directive 2006/42/EC for machinery of the European Parliament and of the Council. The complete EC Declaration of Conformity is available on the Internet at www.pilz.com/downloads.

Authorised representative: Norbert Fröhlich, Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

15 UKCA-Declaration of Conformity for PSS u2 EF 4DO 2A

This product(s) complies with following UK legislation: Supply of Machinery (Safety) Regulation 2008.

The complete UKCA Declaration of Conformity is available on the Internet at www.pilz.com/downloads.

Representative: Pilz Automation Technology, Pilz House, Little Colliers Field, Corby, Northamptonshire, NN18 8TJ United Kingdom, eMail: mail@pilz.co.uk

► Support

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