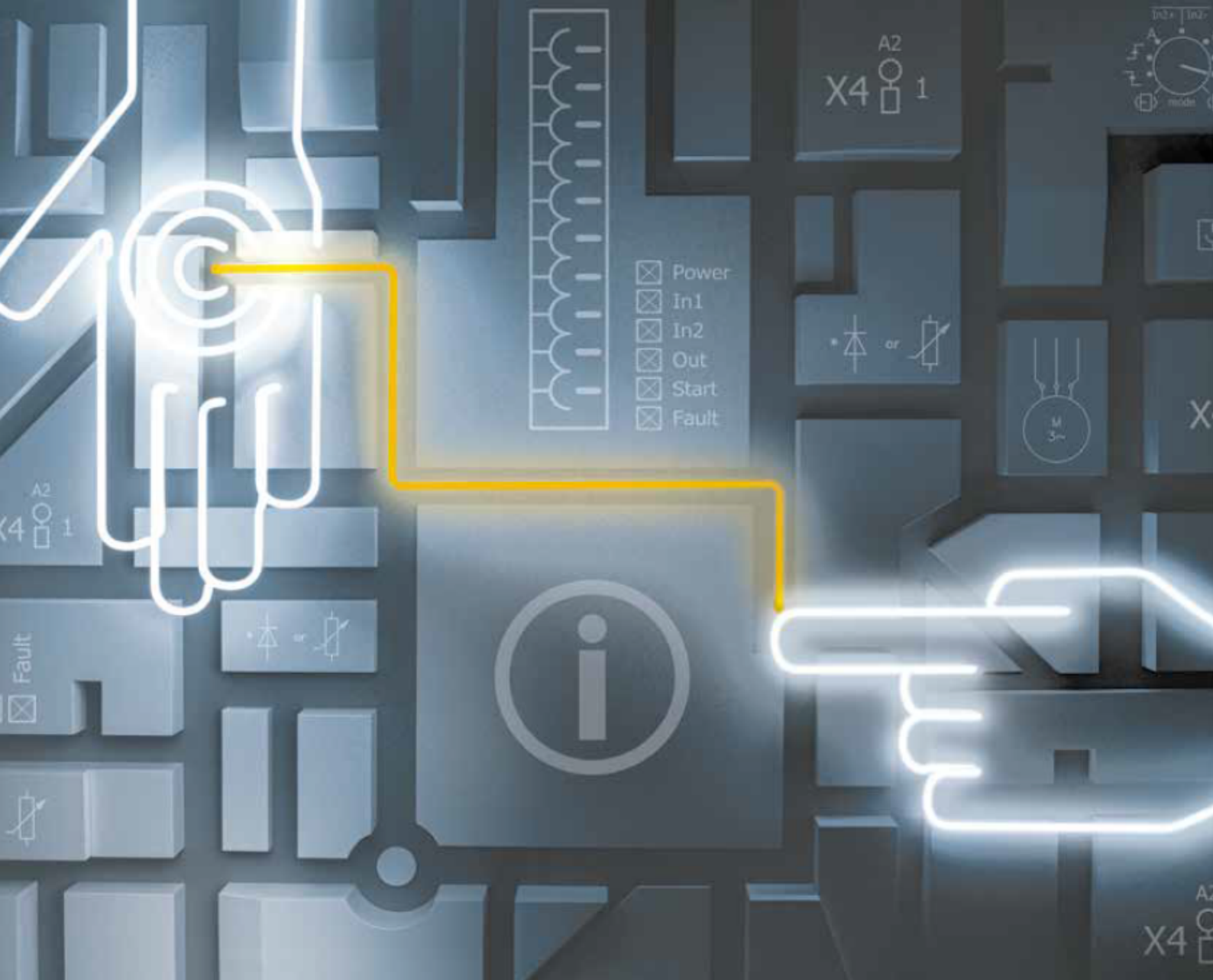




► Modular safety relay myPNOZ

PILZ
THE SPIRIT OF SAFETY

Operating Manual-1005377-EN-05

- Safety relays



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SD means Secure Digital

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1 Introduction

1.1 Validity of documentation

This documentation is valid for the product myPNOZ. The versions from which this documentation is valid can vary from module to module and so the version is stated in the operating manual at the appropriate points.

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

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.

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 Safety

2.1 Intended use

The modular safety relay myPNOZ provides a safety-related interruption of a safety circuit.

The modular safety relay myPNOZ meets the requirements of EN 60947-5-1 and EN 60204-1 and may be used, for example, in applications with:

- ▶ Safety switches with normally closed (NC) or normally open (NO) contacts, such as E-STOP pushbuttons or safety gate switches
- ▶ Safety switches with OSSD, such as light curtains
- ▶ Two-hand pushbuttons in accordance with EN ISO 13851 Type III A or III C

The following is deemed improper use in particular

- ▶ Any component, technical or electrical modification to the product,
- ▶ Use of the product outside the areas described in this document,
- ▶ Use of the product outside the technical details (see chapter entitled [Technical Details](#) [ 92]).



NOTICE

EMC-compliant electrical installation

The product is designed for use in an industrial environment. The product may cause interference if installed in other environments. If installed in other environments, measures should be taken to comply with the applicable standards and directives for the respective installation site with regard to interference.

2.1.1 Third-party manufacturer licence information

The products contain open source software, whose terms of use could further limit the products' application area. It is essential that you observe the third-party manufacturer licence information.

Further information is available in the document "Third-party manufacturer licence information myPNOZ head module" (document number 1005617) and "Third-party manufacturer licence information myPNOZ expansion module" (document number 1005618) at www.pilz.com.

2.2 Safety regulations

2.2.1 Safety assessment

Before using a product, a risk assessment in accordance with the Machinery Directive is required.

The product as an individual component fulfils the functional safety requirements in accordance with EN/IEC 61508, EN ISO 13849-1/2 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.

It is the responsibility of the user/operator to carry out a risk assessment for their application, in which they consider the impact of assumed errors in the wiring and take appropriate measures to control or avoid these errors.

2.2.2 Use of qualified personnel

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

2.2.3 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.).

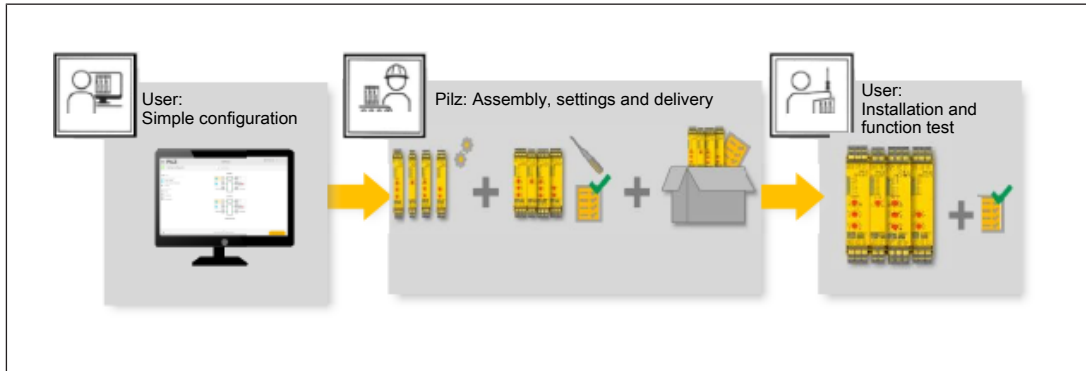
2.2.4 Disposal

- ▶ In safety-related applications, please comply with the mission time T_M stated 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

Overview

myPNOZ is a modular safety relay, which can be used to implement various safety functions without the need for programming. A safety function can be achieved through the combination, settings and wiring of the respective myPNOZ components. With myPNOZ, safety functions can be implemented up to PL e of EN ISO 13849-1/2, SIL 3 of EN IEC 62061 and SIL 3 of EN/IEC 61508.



You can create your individual myPNOZ yourself or easily with the support of the web application **myPNOZ Creator** (<http://mypnoz.com/creator>). All you need to do is define the required safety functions and how they are linked.

Once ordered, Pilz will assemble your myPNOZ from the various modules, before setting it up and testing it.

Your myPNOZ arrives "ready-to-install". All you need to do is install myPNOZ in the control cabinet, wire it up and test the safety functions, then your myPNOZ is ready for operation.



INFORMATION

An example in the Getting Started manual "Modular safety relay myPNOZ" describes how to configure and commission in practice a myPNOZ that has been adapted to individual requirements.

4 Structure of myPNOZ

myPNOZ is used to implement safety functions on applications with, for example:

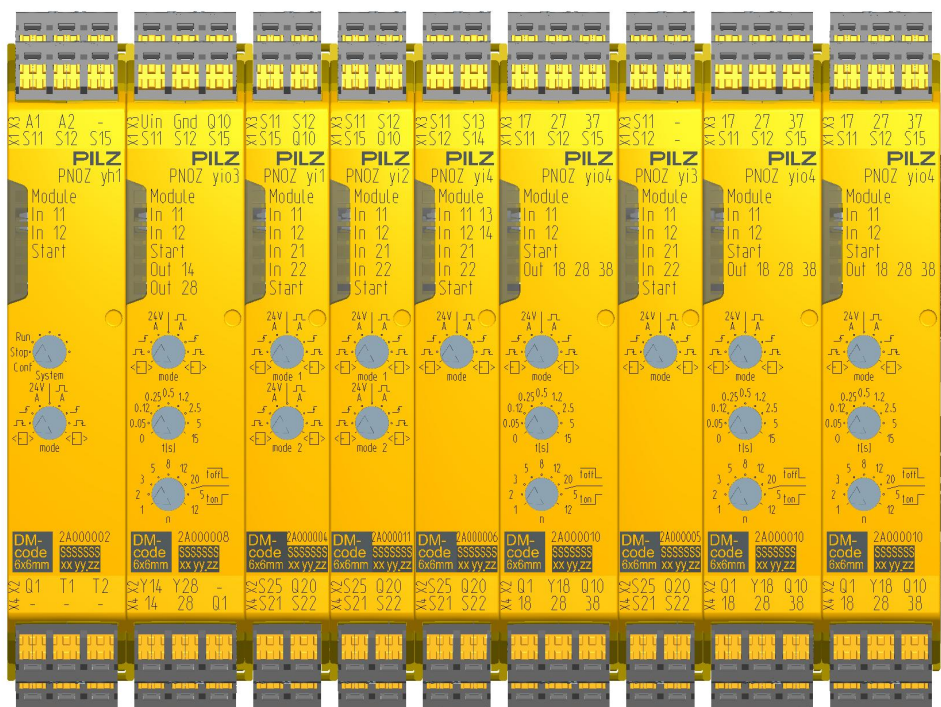
- ▶ E-STOP pushbuttons
- ▶ Safety gate switches
- ▶ Light curtains
- ▶ Two-hand pushbuttons

myPNOZ consists of modules that are linked together via internal logic. In this way, various applications can be implemented through the expansion module's plug-in sequence alone. Rotary switches can be used to make additional settings, such as various start types for individual applications for example. The configuration is stored in the head module. It consists of the plug-in sequence of the expansion modules, the respective type of expansion module and the position of the rotary switches. The sensors and command devices connected to the inputs are monitored; incoming signals are evaluated and the outputs switched accordingly.

Properties:

- ▶ A modular safety relay myPNOZ consists of a head module and one or more expansion modules.
- ▶ Up to 8 expansion modules can be added.
- ▶ The head module and expansion modules are connected via bus connectors.
- ▶ The modules have safe inputs, safe outputs using relay or semiconductor technology, plus signal outputs.
- ▶ The logic connection of the inputs and the switching of the outputs are determined via the expansion modules, via the:
 - Plug-in sequence
 - Type
 - PNOZ yi5, PNOZ yi8: selection of the function
- ▶ Integrated test pulse outputs enable detection of shorts across contacts and short circuits.
- ▶ The following can be set using rotary switches:
 - Start types
 - Delay times
 - Test pulse evaluation
 - PNOZ yi5, PNOZ yi8: the functions
 - PNOZ yi7: the guard locking function
- ▶ The LEDs on the head module and expansion modules indicate the status and errors on the myPNOZ.
- ▶ A rotary switch on the head module is used to save the configuration, protecting it from being changed accidentally.

Sample myPNOZ: Head module with expansion modules



4.1

Product overview

Module Order number	Function		Semicon- ductor		Relay	
		I ^[1]	O ^[2]	O t ^[3]	O ^[4]	O t ^[5]
Head module						
PNOZ yh1 2DI 24VDC 2A000002	Global safety function, test pulse outputs	1	-	-	-	-
Input modules						
PNOZ yi1 4DI 2A000004	Input functions are AND-linked	2	-	-	-	-
PNOZ yi2 4DI OR 2A000011	Input functions are OR- linked	2	-	-	--	
PNOZ yi3 2DI T3A 2A000005	Two-hand pushbutton Type III A	2	-	-	-	-
PNOZ yi4 2DI T3C 2A000006	Two-hand pushbutton Type III C	2	-	-	-	-

Module Order number	Function		Semicon- ductor		Relay	
		I ^[1]	O ^[2]	O t ^[3]	O ^[4]	O t ^[5]
PNOZ yi5 8DI variable 2A000016	Input functions are vari- ably AND or OR-linked	4	-	-	-	-
PNOZ yi6 4DI bypass 2A000017	Bypass previous safety link	2	-	-	-	-
PNOZ yi7 lock 2A000018	Guard locking manage- ment function for safety locking device	2	2	-	-	-
PNOZ yi8 4DI NO/NC 2A000020	Input functions are vari- ably AND or OR-linked for antivalent contacts or single-channel safety functions	2/3/4	-	-	-	-
Output modules						
PNOZ yo1 2SO 2A000012	Semiconductor outputs	-	2	-	-	-
PNOZ yo2 3NO 2A000014	Relay outputs	-	-	-	3	-
PNOZ yo3 1SO 1SO t 2A000007	Semiconductor outputs with selectable delay time	-	1	1	-	-
PNOZ yo4 3NO t 2A000009	Relay outputs with se- lectable delay time	-	-	-	-	3
PNOZ yo5 2NO 2NO t 2A000019	Relay outputs with se- lectable delay time	-	-	-	2	2
Input/output modules						
PNOZ yio1 2DI 2SO 2A000013	Input/output function	1	2	-	-	-
PNOZ yio2 2DI 3NO 2A000015	Input/output function	1	-	-	3	-
PNOZ yio3 2DI 1SO 1SO t 2A000008	Input/output function	1	1	1	-	-
PNOZ yio4 2DI 3NO t 2A000010	Input/output function	1	-	-	-	3

I^[1] Safe input functionO^[2] Output function with safe semiconductor output, instantaneousO t^[3] Output function with safe semiconductor output, delayedO^[4] Output function with safe relay output, instantaneousO t^[5] Output function with safe relay output, delayed

4.2 Compatibility overview

Module Order number	Hardware version ^[1]	Head module Firmware version ^[2]
Input modules		
PNOZ yi1 4DI 2A000004	01	From 01.00
	02	From 02.00 ^[3]
PNOZ yi2 4DI OR 2A000011	01	From 01.00
	02	From 02.00 ^[3]
PNOZ yi3 2DI T3A 2A000005	01	From 01.00
	02	From 02.00 ^[4]
PNOZ yi4 2DI T3C 2A000006	01	From 01.00
	02	From 02.00 ^[4]
PNOZ yi5 8DI variable 2A000016	All	From 03.00
PNOZ yi6 4DI bypass 2A000017	All	From 03.00
PNOZ yi7 lock 2A000018	All	From 04.00
PNOZ yi8 4DI NO/NC 2A000020	All	From 03.00
Output modules		
PNOZ yo1 2SO 2A000012	All	From 01.00
PNOZ yo2 3NO 2A000014	All	From 01.00
PNOZ yo3 1SO 1SO t 2A000007	All	From 01.00
PNOZ yo4 3NO t 2A000009	All	From 01.00
PNOZ yo5 2NO 2NO t 2A000019	All	From 03.00
Input/output modules		
PNOZ yio1 2DI 2SO 2A000013	01	From 01.00
	02	From 02.00 ^[5]
PNOZ yio2 2DI 3NO 2A000015	01	From 01.00
	02	From 02.00 ^[5]

Module Order number	Hardware version ^[1]	Head module Firmware version ^[2]
PNOZ yio3 2DI 1SO 1SO t 2A000008	01	From 01.00
	02	From 02.00 ^[5]
PNOZ yio4 2DI 3NO t 2A000010	01	From 01.00
	02	From 02.00 ^[5]

^[1] The positioning of the hardware version is described under "Expansion modules", "Front view".

^[2] The positioning of the head module firmware version is described under "Head modules", "Front view".

^[3] With the head module firmware version 01.00, the signal outputs Q10 and Q20 do not work.

^[4] With the head module firmware version 01.00, the signal output Q20 does not work.

^[5] With the head module firmware version 01.00, the signal output Q10 does not work.

4.3 Product features

The modules are described in detail under [Head modules](#)  89 and [Expansion modules](#)  97.

The modules' product features are listed below.

4.3.1 Head module

4.3.1.1 PNOZ yh1 2DI 24VDC

- ▶ Head module for safe applications of the myPNOZ
- ▶ Communication with expansion modules
- ▶ Supply voltage for myPNOZ
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 2 test pulse outputs to detect shorts across contacts and short circuits
- ▶ 1 signal output Q1 as status indicator for input function (S11, S12)
- ▶ 1 **System** rotary switch to select the functions: save system configuration, system stop, system running
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input

4.3.2 Input modules

4.3.2.1 PNOZ yi1 4DI

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 2 input functions to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ Input functions are AND-linked
- ▶ 2 signal outputs (from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
- ▶ 1 **mode 1** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **mode 2** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input

4.3.2.2 PNOZ yi2 4DI OR

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 2 input functions to connect safety gate switch or light curtain and start button, for example
- ▶ Input functions are OR-linked
- ▶ 2 signal outputs (from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
- ▶ 1 **mode 1** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **mode 2** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input

4.3.2.3 PNOZ yi3 2DI T3A

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 1 input function to connect a two-hand pushbutton (Type III A)
- ▶ Input functions are AND-linked
- ▶ 1 signal output Q20 (from hardware version 02) as status indicator for input function (S21, S22)
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S21, S22)

- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input

4.3.2.4 PNOZ yi4 2DI T3C

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 1 input function to connect a two-hand pushbutton (Type III C)
- ▶ Input functions are AND-linked
- ▶ 1 signal output Q20 (from hardware version 02) as status indicator for input function (S21, S22)
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input

4.3.2.5 PNOZ yi5 8DI variable

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Variable input functions:
 - 4 input functions with autostart function (S11/S12, S21/S22, S31/S32 and S41/S42), to connect E-STOP pushbutton, safety gate switch or light curtain, for example, when the input functions are AND-linked
 - or
 - 3 input functions (S11/S12, S21/S22 and S31/S32) to connect E-STOP pushbutton, safety gate switch or light curtain and start button (S41), for example, when the input functions are AND-linked
 - or
 - 3 input functions (S11/S12, S21/S22 and S31/S32) to connect E-STOP pushbutton, safety gate switch or light curtain and start button (S41), for example, when the input functions are OR-linked
 - or
 - 3 input functions (S11/S12, S21/S22 and S31/S32) to connect E-STOP pushbutton, safety gate switch or light curtain and start button (S41), for example, when the input functions are 2oo3-linked
- ▶ 4 signal outputs as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
 - Q30 for input function (S31, S32)

- Q40 for input function (S41, S42)
- 1 **function** rotary switch to select functions
- 1 **mode** rotary switch to set the start type and test pulse evaluation
- LED display for:
 - Module status
 - State of the inputs
 - State of the start input

4.3.2.6 PNOZ yi6 4DI bypass

- Expansion module for safe applications of the myPNOZ
- 2 input functions to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- Input functions are AND-linked
- Module input result is OR-linked with the logic result of the left-hand inputs from the same zone
- 2 signal outputs as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
- 1 **mode 1** rotary switch to set the start type and test pulse evaluation (S11, S12)
- 1 **mode 2** rotary switch to set the start type and test pulse evaluation (S21, S22)
- LED display for:
 - Module status
 - State of the inputs
 - State of the start input

4.3.2.7 PNOZ yi7 lock

- Expansion module for safe applications of the myPNOZ
- Supply voltage connection for the semiconductor outputs
- 1 guard locking management function to connect one safety locking device, one safe risk-free monitoring device (e.g. standstill monitor) and 2 pushbuttons to operate the safety locking device
- 1 signal output Q10 as status indicator for input function (S11, S12)
- 1 **mode** rotary switch for start type and test pulse evaluation of safe guard locking (S11, S12)
- 1 **safe state** rotary switch for test pulse evaluation of safe risk-free monitoring (S21, S22), e.g. standstill monitor
- 1 **out** rotary switch for configuration of the guard locking function
- LED display for:
 - Module status
 - State of the inputs
 - State of the start input

- Switch state of the outputs

4.3.2.8 PNOZ yi8 4DI NO/NC

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Variable input functions:
 - Normally open/normally closed (NO/NC) input function (S11/S12) AND-linked to the normally open/normally closed (NO/NC) input function (S21/S22)
or
 - Normally open/normally closed (NO/NC) input function (S11/S12) OR-linked to the normally open/normally closed (NO/NC) input function (S21/S22)
or
 - Normally open/normally closed (NO/NC) input function (S11/S12) AND-linked to the normally open/normally open (NO/NO) input function (S21/S22)
or
 - Normally open/normally closed (NO/NC) input function (S11/S12) OR-linked to the normally open/normally open (NO/NO) input function (S21/S22)
or
 - 2 single-channel input functions (S11/S12) AND-linked to 2 single-channel input functions (S21/S22)
or
 - 2 single-channel input functions (S11/S12) AND-linked to normally open/normally open (NO/NO) input function (S21/S22)
or
 - 2 single-channel input functions (S11/S12) OR-linked to normally open/normally open (NO/NO) input function (S21/S22)
- ▶ 2 signal outputs as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
- ▶ 1 **function** rotary switch to select functions
- ▶ 1 **mode 1** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **mode 2** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input

4.3.3 Output modules

4.3.3.1 PNOZ yo1 2SO

- ▶ Expansion module for safe applications of the myPNOZ

- Supply voltage connection for the semiconductor outputs
- 2 output functions, each with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop
- 1 signal output Q1 as status indicator for output function
- LED display for:
 - Module status
 - Switch state of the outputs

4.3.3.2 PNOZ yo2 3NO

- Expansion module for safe applications of the myPNOZ
- 1 output function with 3 safe relay outputs, positive-guided, instantaneous, and 1 input for feedback loop
- 1 signal output Q1 as status indicator for output function
- LED display for:
 - Module status
 - Switch state of the outputs

4.3.3.3 PNOZ yo3 1SO 1SO t

- Expansion module for safe applications of the myPNOZ
- Supply voltage connection for the semiconductor outputs
- 1 output function with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop
- 1 output function with 1 safe semiconductor output, delayed, and 1 input for feedback loop
- 1 signal output Q1 as status indicator for output function without delay time
- 1 **t[s]** rotary switch to set the delay time
- 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- LED display for:
 - Module status
 - Switch state of the outputs

4.3.3.4 PNOZ yo4 3NO t

- Expansion module for safe applications of the myPNOZ
- 1 output function with 3 safe relay outputs, positive-guided, delayed, and 1 input for feedback loop
- 1 signal output Q1 as status indicator for output function without delay time
- 1 **t[s]** rotary switch to set the delay time
- 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- LED display for:
 - Module status
 - Switch state of the outputs

4.3.3.5 PNOZ yo5 2NO 2NO t

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 output function
 - with 2 safe relay outputs, positive-guided, delay-on terminal 29, 38 and 1 input for feedback loop Y38
 - and
 - with 2 safe relay outputs, positive-guided, delay-off terminal 18, 28 and 1 input for feedback loop Y18

Only one of the two outputs at a time can be used with a time delay, the other output then always reacts instantaneously.

- ▶ 1 signal output Q1 as status indicator for output function without delay time
- ▶ 1 **t[s]** rotary switch to set the delay time
- ▶ 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- ▶ LED display for:
 - Module status
 - Switch state of the outputs

4.3.4 Input/output modules

4.3.4.1 PNOZ yio1 2DI 2SO

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Supply voltage connection for the semiconductor outputs
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 2 output functions, each with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop
- ▶ 2 signal outputs (Q10 from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q1 for output function
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input
 - Switch state of the outputs

4.3.4.2 PNOZ yio2 2DI 3NO

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example

- 1 output function with 3 safe relay outputs, positive-guided, instantaneous, and 1 input for feedback loop
- 2 signal outputs (Q10 from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q1 for output function
- 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- LED display for:
 - Module status
 - State of the inputs
 - State of the start input
 - Switch state of the outputs

4.3.4.3 PNOZ yio3 2DI 1SO 1SO t

- Expansion module for safe applications of the myPNOZ
- Supply voltage connection for the semiconductor outputs
- 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- 1 output function with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop
- 1 output function with 1 safe semiconductor output, delayed, and 1 input for feedback loop
- 2 signal outputs (Q10 from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q1 for output function without delay time
- 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- 1 **t[s]** rotary switch to set the delay time
- 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- LED display for:
 - Module status
 - State of the inputs
 - State of the start input
 - Switch state of the outputs

4.3.4.4 PNOZ yio4 2DI 3NO t

- Expansion module for safe applications of the myPNOZ
- 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- 1 output function with 3 safe relay outputs, positive-guided, delayed, and 1 input for feedback loop
- 2 signal outputs (Q10 from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)

- Q1 for output function without delay time
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **t[s]** rotary switch to set the delay time
- ▶ 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input
 - Switch state of the outputs

4.4 Application logic

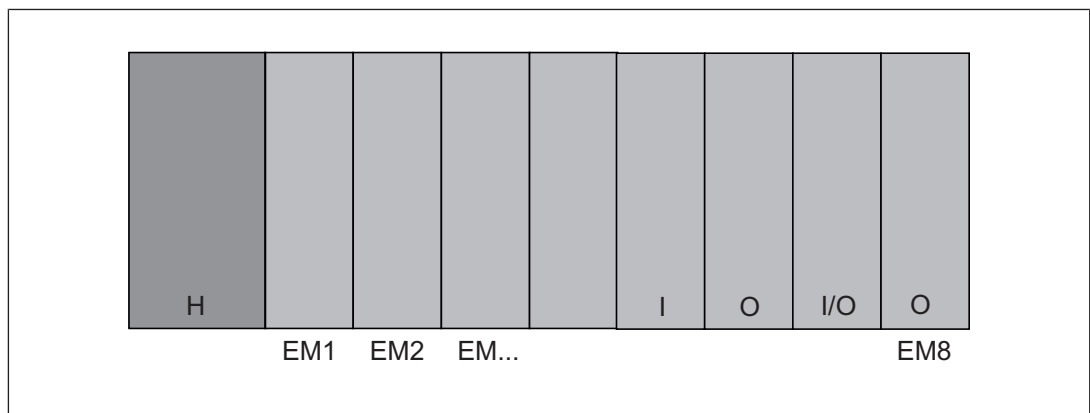
The logic connection of the inputs and the switching of the outputs are determined via the:

- ▶ Expansion module's plug-in sequence
- ▶ Respective type of expansion module
- ▶ PNOZ yi5, PNOZ yi8: selection of the function

The plug-in sequence also enables several logic functions to be implemented, which are called zones.

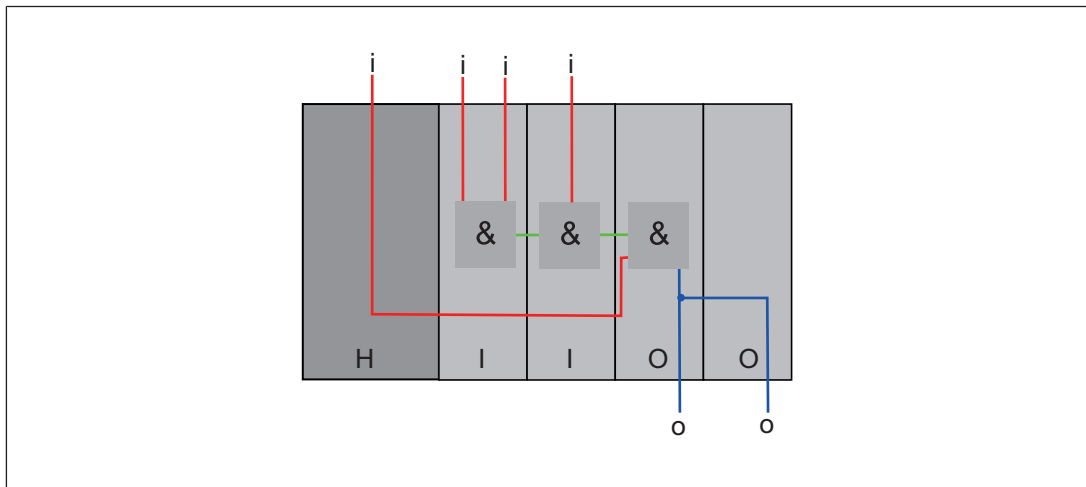
The zones are displayed in the STOP state by the LEDs flashing in different ways (see [Status and error messages](#) [ 78]).

4.4.1 General



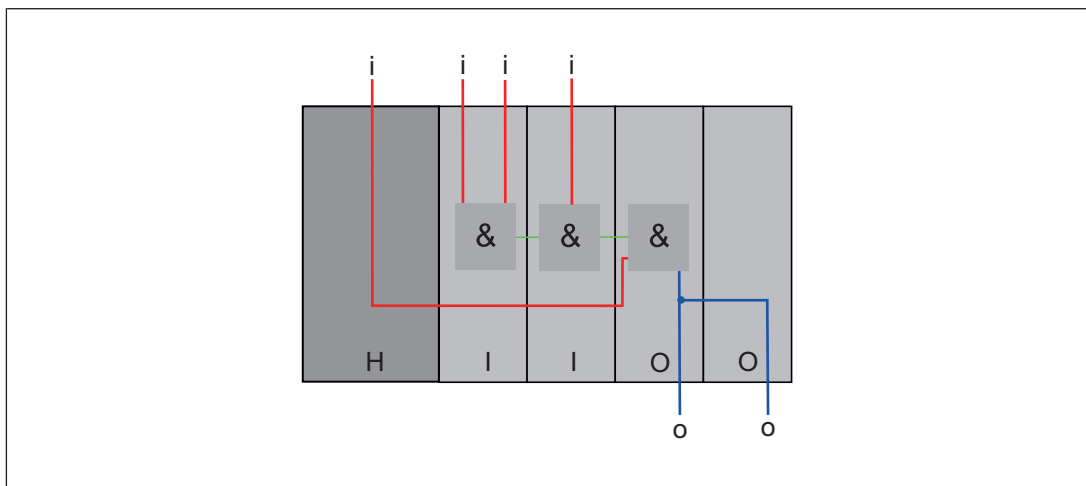
- ▶ A myPNOZ always begins with the head module (H), on the left-hand side.
- ▶ The expansion modules (EM) are inserted to the right of the head module (H).
- ▶ A myPNOZ may consist of a maximum of 8 expansion modules (EM).
- ▶ The expansion modules (EM) provide inputs and outputs:
 - Input modules (I)
 - Output modules (O)
 - Input/output modules (I/O)
- ▶ The last expansion module on a myPNOZ must always have an output, i.e. an output module (O) or must be a combined input/output module (I/O).

4.4.2 Global functions



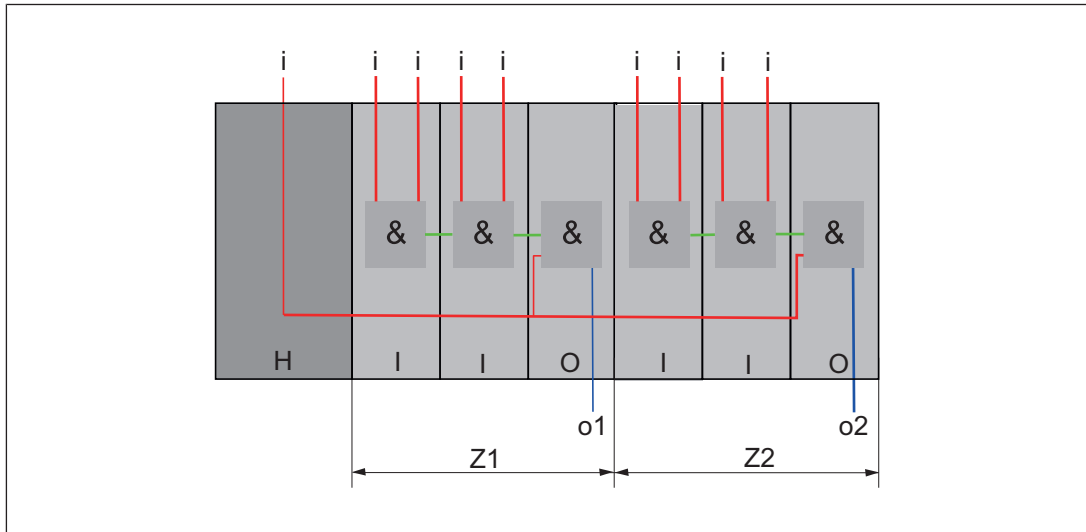
- ▶ The input signal (i) on the head module (H) is AND-linked to the input modules (I).
- ▶ The input signal (i) on the head module (H), e.g. E-STOP, affects all output modules (O) and leads to the output signals (o).

4.4.3 All inputs are AND-linked



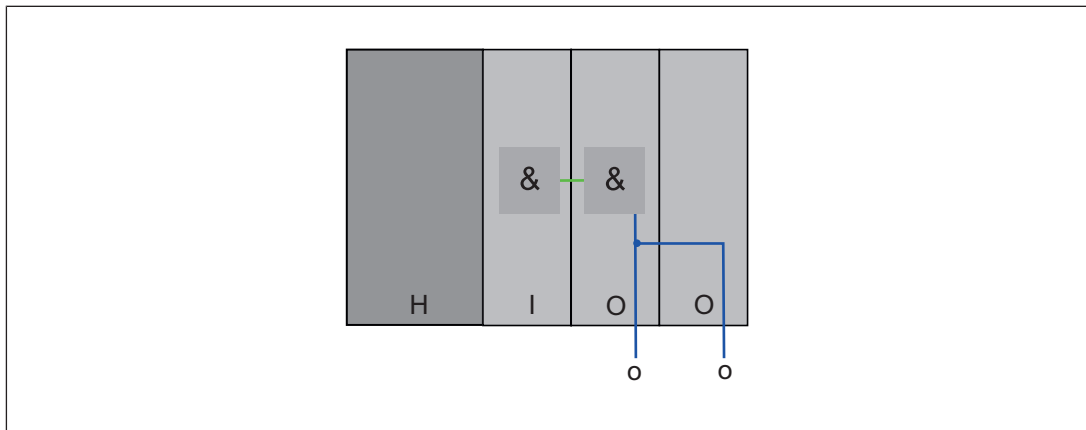
- ▶ The input signals (i) on the input modules (I) are generally AND-linked and switch the subsequent output modules (O).
There may be exceptions to this rule on special modules.

4.4.4 Formation of zones



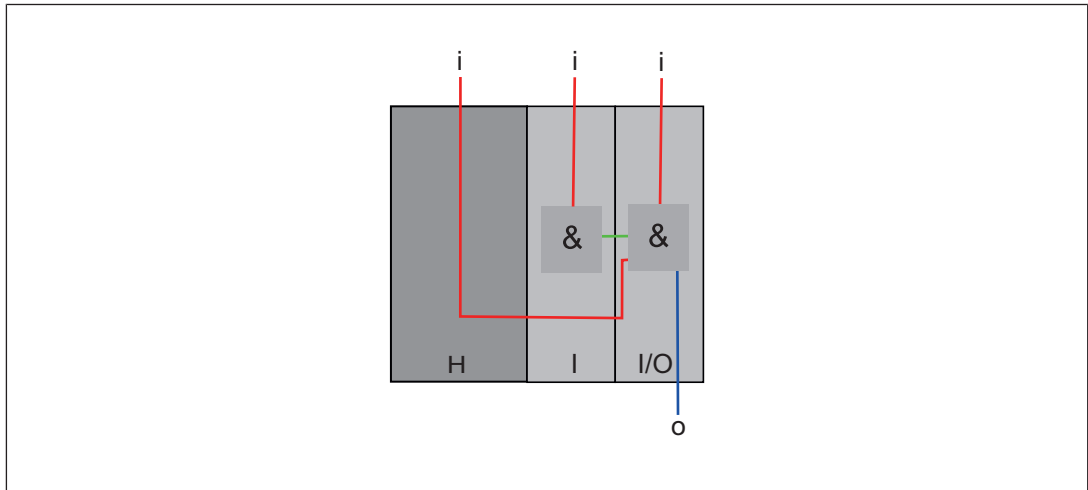
- ▶ Each zone (Z1), (Z2) ends with an output module (O).
- ▶ A new zone (Z2) begins when an input module (I) or an input/output module (I/O) is inserted directly after an output module (O).
- ▶ Each zone (Z1) works independently from the other zones (Z2).
- ▶ Each zone has its own output signal:
 - Zone (Z1) has the output signal (o1).
 - Zone (Z2) has the output signal (o2).

4.4.5 Output expansion



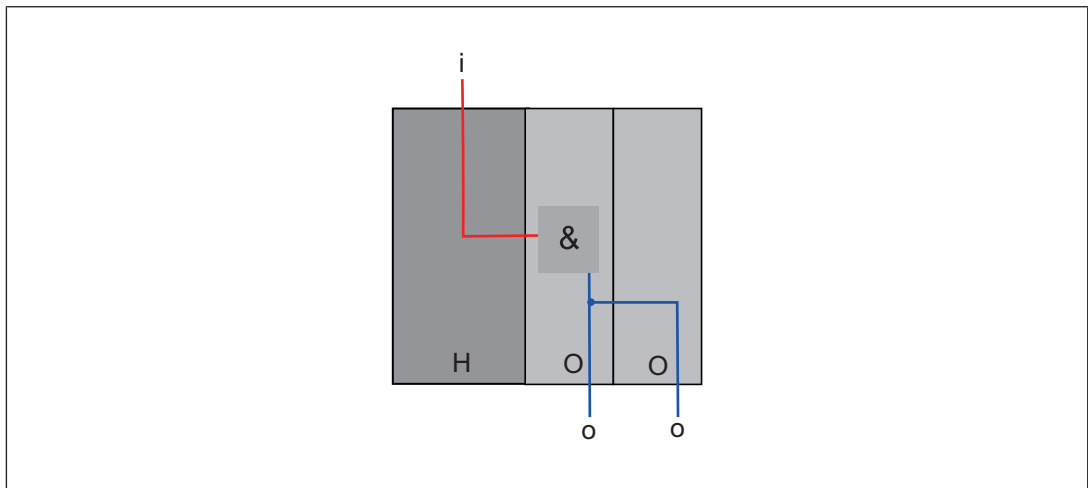
- ▶ If a module with outputs (O) is followed by another pure output module (O), control of the outputs is adopted. The specific delay times for the two modules are retained in the process.

4.4.6 Combined modules



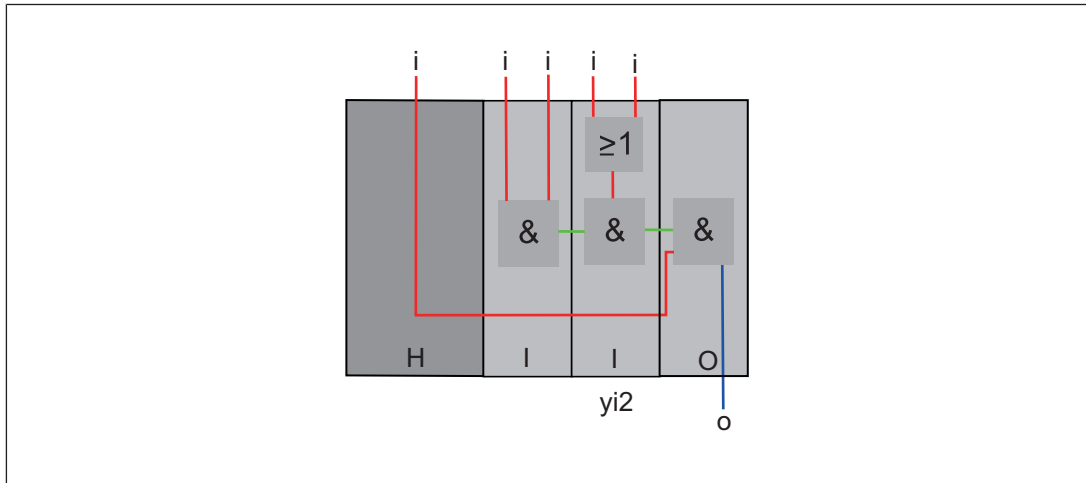
- Combined input/output modules (I/O) act like an input module (I) followed by an output module.

4.4.7 Output module on the head module



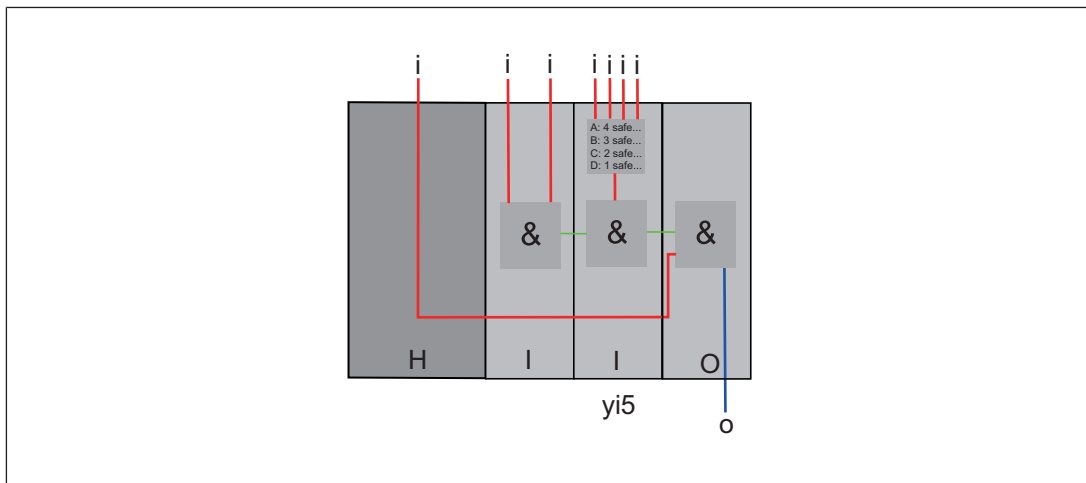
- Output modules (O) that are arranged directly after a head module (H) form a zone. This zone is only influenced by the head module (H).

4.4.8 PNOZ yi2 4DI OR



- ▶ The input signals (i) of the PNOZ yi2 are OR-linked first.
- ▶ The result of the OR-link of the PNOZ yi2 is then AND-linked with the other input signals (i) in this zone.

4.4.9 PNOZ yi5 8DI variable



- ▶ The relevant input signals (i) of the PNOZ yi5 are linked to the configured function first.
- ▶ The result of the configured function of the PNOZ yi5 is then AND-linked with the other input signals (i) in this zone.

The configurable logic functions are set using the **function** rotary switch. The following functions are possible:

function rotary switch to position **A** and **mode** rotary switch to automatic start position **A**:

- ▶ 4 input functions with autostart function (S11/S12, S21/S22, S31/S32 and S41/S42), to connect E-STOP pushbutton, safety gate switch or light curtain, for example, when the input functions are AND-linked

function rotary switch to position **B**:

- ▶ 3 input functions with start signal (S11/S12, S21/S22 and S31/S32) to connect E-STOP pushbutton, safety gate switch or light curtain and start button (S41), for example, when the input functions are AND-linked

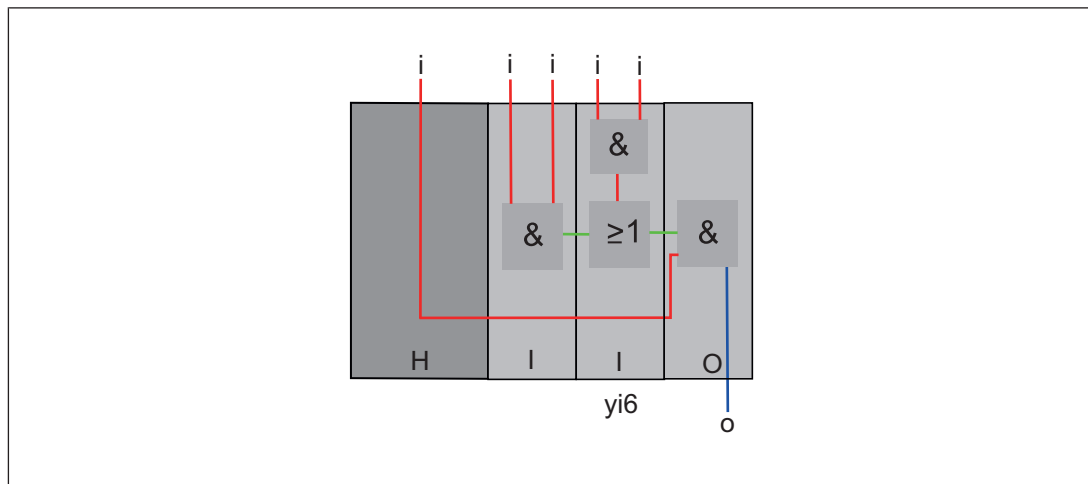
function rotary switch to position **C**:

- ▶ 3 input functions with start signal (S11/S12, S21/S22 and S31/S32) to connect E-STOP pushbutton, safety gate switch or light curtain and start button (S41), for example, when the input functions are OR-linked

function rotary switch to position **D**:

- ▶ 3 input functions with start signal (S11/S12, S21/S22 and S31/S32) to connect E-STOP pushbutton, safety gate switch or light curtain and start button (S41), for example, when the input functions are 2oo3-linked

4.4.10 PNOZ yi6 4DI bypass



- ▶ The input signals (i) of the PNOZ yi6 are AND-linked first.
- ▶ The result of the AND-link of the PNOZ yi6 is then OR-linked with the result of the left-hand input signals (i) in this zone.

4.4.11 PNOZ yi8 4DI NO/NC

- ▶ A sensor with one normally open and one normally closed contact can be connected to a normally open/normally closed (NO/NC) input function.
- ▶ Two single-channel safety functions can be connected to the 2 single-channel input functions.
- ▶ If only one of the two single-channel safety functions is used, the other safety function must be wired to 24 V or to the corresponding test pulse.

The configurable logic functions are set using the **function** rotary switch. The following functions are possible:

function rotary switch to position **A**:

- ▶ Normally open/normally closed (NO/NC) input function (S11/S12) AND-linked to the normally open/normally closed (NO/NC) input function (S21/S22)

function rotary switch to position **B**:

- ▶ Normally open/normally closed (NO/NC) input function (S11/S12) OR-linked to the normally open/normally closed (NO/NC) input function (S21/S22)

function rotary switch to position **C**:

- ▶ Normally open/normally closed (NO/NC) input function (S11/S12) AND-linked to the normally open/normally open (NO/NO) input function (S21/S22)

function rotary switch to position **D**:

- ▶ Normally open/normally closed (NO/NC) input function (S11/S12) OR-linked to the normally open/normally open (NO/NO) input function (S21/S22)

function rotary switch to position **E**:

- ▶ 2 single-channel input functions (S11/S12) AND-linked to 2 single-channel input functions (S21/S22)

function rotary switch to position **F**:

- ▶ 2 single-channel input functions (S11/S12) AND-linked to normally open/normally open (NO/NO) input function (S21/S22)

function rotary switch to position **G**:

- ▶ 2 single-channel input functions (S11/S12) OR-linked to normally open/normally open (NO/NO) input function (S21/S22)

4.5 Signal outputs

- ▶ The head module's signal output (Q1) reports the result of the head module's input function.
- ▶ The output modules' signal output (Q1) reacts like an instantaneous output.
- ▶ The input modules' signal outputs (Q10, Q20, Q30, Q40) report the results of the input functions.

Module	Signal outputs	For input or output functions
Head module		
PNOZ yh1 2DI 24VDC	Q1	S11, S12
Input modules		
PNOZ yi1 4DI	Q10	S11, S12
	Q20	S21, S22
PNOZ yi2 4DI OR	Q10	S11, S12
	Q20	S21, S22
PNOZ yi3 2DI T3A	Q20	S21, S22
PNOZ yi4 2DI T3C	Q20	S21, S22
PNOZ yi5 8DI variable	Q10	S11, S12
	Q20	S21, S22
	Q30	S31, S32
	Q40	S41, S42
PNOZ yi6 4DI bypass	Q10	S11, S12
	Q20	S21, S22
PNOZ yi7 lock	Q10	S11, S12

Module	Signal outputs	For input or output functions
PNOZ yi8 4DI NO/NC	Q10	S11, S12
	Q20	S21, S22
Output modules		
PNOZ yo1 2SO	Q1	14, 24
PNOZ yo2 3NO	Q1	14, 24, 34
PNOZ yo3 1SO 1SO t	Q1	14
PNOZ yo4 3NO t	Q1	In accordance with the output function without delay time
PNOZ yo5 2NO 2NO t	Q1	In accordance with the output function without delay time
Input/output modules		
PNOZ yio1 2DI 2SO	Q10	S11, S12
	Q1	14, 24
PNOZ yio2 2DI 3NO	Q10	S11, S12
	Q1	14/24/34
PNOZ yio3 2DI 1SO 1SO t	Q10	S11, S12
	Q1	14
PNOZ yio4 2DI 3NO t	Q10	S11, S12
	Q1	In accordance with the output function without delay time

The following expansion modules are only equipped with signal outputs from hardware version 02:

- ▶ Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4
- ▶ Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4

5 Configuration with myPNOZ Creator

The required safety functions and how these are linked together are the basis of the configuration. On this basis you can determine the configuration, taking the application logic into account.

The web application myPNOZ Creator enables configuration to be carried out based on a logic plan or by manually combining the modules. The web application myPNOZ Creator automatically assembles an individual myPNOZ based on this configuration. It selects the required modules, defines the plug-in sequence and defines the position of the rotary switches. The result is a pre-configured myPNOZ, which can be ordered directly.



NOTICE

The safety functions should be checked after initial commissioning and each time the plant/machine is changed. The safety functions may only be checked by qualified personnel.

Configuration with the web application myPNOZ Creator involves 4 steps:

1. Define the type and number of safe input functions.
2. Determine how the safe input functions are to be logically connected.
3. Open the web application myPNOZ Creator (<http://mypnoz.com/creator>) and map out the safe input functions and their logic connections. Alternatively you can map out the hardware configuration.
4. When you have entered your application, you can add this directly to the basket in the E-Shop and place the order.

Once you've ordered you'll receive a fully configured and tested myPNOZ. All you need to do then is install myPNOZ in the control cabinet, wire it up and test the safety functions. myPNOZ is then ready for operation.

There is a QR code on the left-hand side of the head module so that you can change or re-order the configuration at a later date. The QR code leads directly to the myPNOZ configuration, in the web application myPNOZ Creator.

The **System** rotary switch on the head module can have an adhesive seal applied so that any unauthorised changes to the saved configuration will be detected. If the adhesive seal is destroyed, the configuration may have been changed. The adhesive seals are accessories and can be ordered separately (see Accessories).

6 Configuration on the modules

The required safety functions and how these are linked together are the basis of the configuration. On this basis you can determine the configuration, taking the application logic into account.

The head module can be exchanged, and the expansion modules can be exchanged, removed or added. The settings on the rotary switches can be changed. Always refer to the rules for the structure of the myPNOZ (see [Structure of myPNOZ](#)  16]).

Procedure

The **System** rotary switch on the head module can have an adhesive seal applied so that any unauthorised changes to the saved configuration will be detected. If the adhesive seal is destroyed, the configuration may have been changed. The adhesive seals are accessories and can be ordered separately (see Accessories).

When carrying out the configuration, make sure that all required rotary switches are correctly engaged (see [Checking that the rotary switches are correctly engaged](#)  39]).

1. If necessary: exchange the head module first (see [Remove/exchange modules](#)  61]).
2. On the head module, set the **System** rotary switch to **Conf.**
All the outputs are switched off.
3. If necessary: exchange, remove or insert the relevant expansion modules (see [Remove/exchange modules](#)  61]).
4. Carry out the necessary settings. For example, set the
 - Start type (see [Set start type and test pulse evaluation](#)  43]), valid for the following modules:
 Head module: PNOZ yh1
 Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi7, PNOZ yi8
 Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4
 - Delay time (see [Set delay time](#)  44]), valid for the following modules:
 Output modules: PNOZ yo3, PNOZ yo4, PNOZ yo5
 Input/output modules: PNOZ yio3, PNOZ yio4
 - Variable input function (see [Set variable input function](#)  47]), valid for the following modules:
 Input module: PNOZ yi5, PNOZ yi8
 - Feedback from safety locking devices (see [Set activation of safety locking device](#)  50]), valid for the following module:
 Input module: PNOZ yi7
 - Risk-free monitoring area (see [Set risk-free monitoring area](#)  47]), valid for the following modules:
 Input module: PNOZ yi7
5. Switch on the supply voltage, if this is still switched off.

6. Save configuration: once the last setting/change has been made, wait approx. 5 s; the **System** rotary switch on the head module must be set to **Conf**.

If the configuration is correct:

all the LEDs flash briefly. The settings are then stored. Afterwards the LEDs switch to the function display that is currently valid.

If the configuration is faulty:

All the **Module** LEDs flash orange-green and the function LEDs indicate the reason for the faulty configuration (see [Status and error messages](#) [ 78]). The configuration was not saved. Correct the configuration and save it again.

7. Set the **System** rotary switch to **Run** and check the safety functions, such as the E-STOP pushbutton, safety gate switch, for example.



NOTICE

The safety functions should be checked after initial commissioning and each time the plant/machine is changed. The safety functions may only be checked by qualified personnel.



INFORMATION

When the "Off delay" is set, the output may switch off before the delay time has elapsed, if

- the configuration is being saved or
- an error occurs.

6.1

Checking that the rotary switches are correctly engaged

Valid for all modules with rotary switches.



NOTICE

Always carry out the following steps before the unit is set for the first time and each time you change the rotary switches.

Procedure

1. Turn the rotary switch as far as it will go to the left and right.
2. Check the click sound and "click feel" in each individual position.

When you bring the rotary switch to the desired position, make sure that the rotary switch locks in position (click feel). The actual lock-in position may vary slightly from the labelling, as there are minor manufacturing tolerances.

6.2 Function: Start types

Valid for the following modules:

- ▶ Head module: PNOZ yh1
- ▶ Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi7, PNOZ yi8
- ▶ Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4

The start types determine the condition under which the state of an input circuit is forwarded as the result of the input function. The start types are set using the **mode** rotary switch (see [Set start type and test pulse evaluation](#) [ 43]).

The following start types are available:

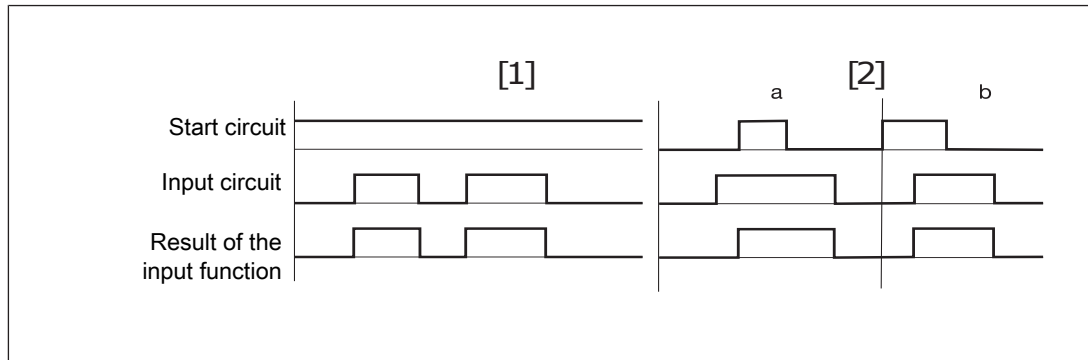
- ▶ A
 - Automatic start:
The state of the input circuit is forwarded as the result of the input function once the input circuit has been closed.
 - Manual start:
The state of the input circuit is forwarded as the result of the input function when the input circuit and start circuit have been closed.
- ▶  Monitored start with rising edge:
The state of the input circuit is forwarded as the result of the input function when the input circuit is closed, and after that the start circuit is closed.
- ▶  Monitored start with rising and falling edge:
The state of the input circuit is forwarded as the result of the input function when the input circuit is closed, and after that the start circuit is closed and re-opened.
- ▶  Start with start-up test:
After the supply voltage is applied, the module checks whether the input circuit is opened and then closed again (e.g. closed safety gates are opened and then closed again). Only then is the state of the input circuit forwarded as the result of the input function. After the start-up test, the start type reacts as described under "automatic/manual start".

The following applies to all start types:

- ▶ The input circuit must be deactivated at least for the duration of the recovery time (see technical details [Head module](#) [ 89] and [Expansion modules](#) [ 97]).
- ▶ All of a zone's off-delay times must have elapsed.
- ▶ All feedback loops must be closed.

6.2.1 Timing diagram for automatic and manual start

- ▶ [1]: Automatic start
- ▶ [2]: Manual start
 - a: Input circuit closes before start circuit
 - b: Start circuit closes before input circuit



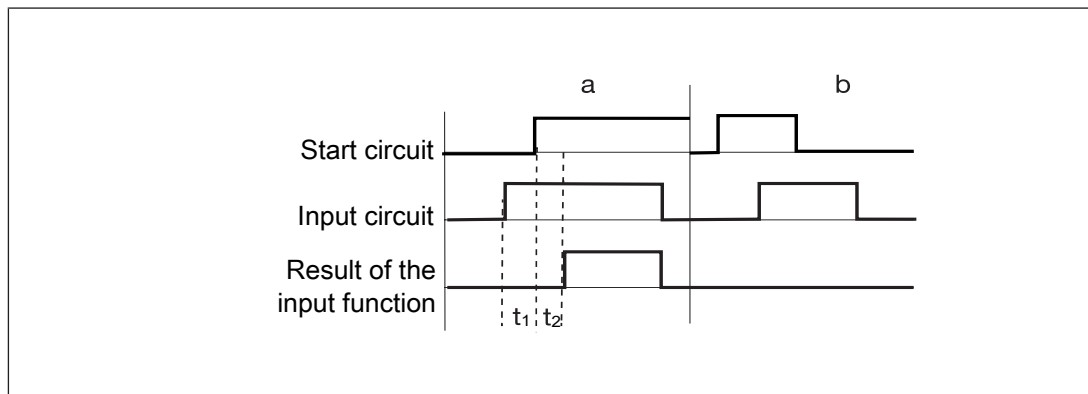
Legend

- ▶ Input circuit: State of the operation or switching element on the input
- ▶ Result of the input function: Signal that is forwarded after evaluation of the start circuit and input circuit

6.2.2

Timing diagram for monitored start with rising edge

- ▶ a: Input circuit closes before start circuit
- ▶ b: Start circuit closes before input circuit



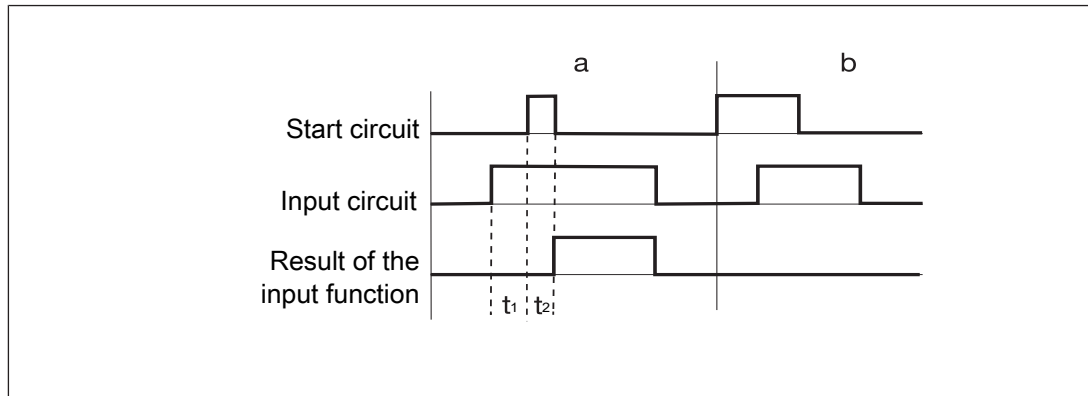
Legend

- ▶ t_1 : Waiting time on monitored start (see module's technical details)
- ▶ t_2 : Start pulse duration on monitored start (see module's technical details)
- ▶ Input circuit: State of the operation or switching element on the input
- ▶ Result of the input function: Signal that is forwarded after evaluation of the start circuit and input circuit

6.2.3

Timing diagram for monitored start with rising and falling edge

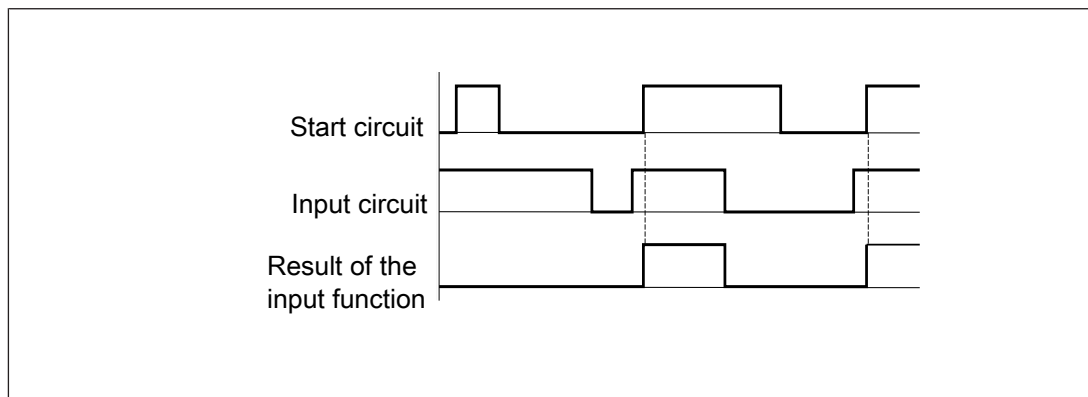
- ▶ a: Input circuit closes before start circuit
- ▶ b: Start circuit closes before input circuit



Legend

- ▶ t_1 : Waiting time on monitored start (see module's technical details)
- ▶ t_2 : Start pulse duration on monitored start (see module's technical details)
- ▶ Input circuit: State of the operation or switching element on the input
- ▶ Result of the input function: Signal that is forwarded after evaluation of the start circuit and input circuit

6.2.4 Timing diagram for start with start-up test



Legend

- ▶ Input circuit: State of the operation or switching element on the input
- ▶ Result of the input function: Signal that is forwarded after evaluation of the start circuit and input circuit

6.3 Function: Test pulse evaluation

Valid for the following modules:

- ▶ Head module: PNOZ yh1
- ▶ Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi7, PNOZ yi8
- ▶ Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4

Test pulses are used to detect shorts across contacts and short circuits. They are connected to the inputs on the operation or switching elements ([Connect control or switching elements to the inputs](#) [65]). If detection of shorts across contacts is not necessary or is implemented via a sensor with OSSD, there is no need to connect the test pulses.

Externally connected devices may delay the test pulses by a maximum of 4 ms.

6.4 Set start type and test pulse evaluation

Valid for the following modules:

- ▶ Head module: PNOZ yh1
- ▶ Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi7, PNOZ yi8
- ▶ Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4

The start type is set on the **mode** rotary switch on the head module or expansion module. The setting options are explained under [Function: Start types](#) [40].

Prerequisite

- ▶ myPNOZ is configured and in operation.

Procedure

1. Please note the steps under "Procedure" in the chapter entitled [Configuration of the modules](#) [38], with the following additional step.
2. Set the required start type on all modules using the **mode** rotary switch, see table below, "Selectable start types".

Selectable start types

mode rotary switch	Automatic or manual start	Monitored start, rising edge	Monitored start, rising and falling edge	Automatic start with start-up test
Without test pulse evaluation				
With test pulse evaluation				

6.5 Function: Delay times

Valid for the following modules:

- ▶ Output modules: PNOZ yo3, PNOZ yo4, PNOZ yo5
- ▶ Input/output modules: PNOZ yio3, PNOZ yio4

On some expansion modules, the delay time of the safe outputs can be set using the rotary switches **t[s]** and **n**.

The delay time is the result of multiplying the set time value **t[s]** by the set factor **n**.

The **n** rotary switch is also used to select between the on-delay (t_{on} range) and the off-delay (t_{off} range).

**INFORMATION**

The overall time required to switch an output results from:
Reaction time (Reaction times) + Delay time + 1.5 % tolerance of the delay time

**INFORMATION**

The output can switch off before the configured delay time has elapsed if

- The configuration is being saved or
- An error occurs.

6.6 Set delay time

Valid for the following modules:

- ▶ Output modules: PNOZ yo3, PNOZ yo4, PNOZ yo5
- ▶ Input/output modules: PNOZ yio3, PNOZ yio4

Prerequisite

- ▶ myPNOZ is configured and in operation.

Procedure

1. Please note the steps under "Procedure" in the chapter entitled [Configuration of the modules](#) [38], with the following additional steps.
2. Set the required time value on all modules with the **t[s]** rotary switch. See the following tables, "Off-delay time (t_{off}) in seconds" and "On-delay time (t_{on}) in seconds".
3. Set the required factor on all modules with the **n** rotary switch. Select between an on-delay or an off-delay.

Selectable delay times:**Off-delay time (t_{off}) in seconds**

Time t[s]	Factor n						
	1	2	3	5	8	12	20
0	0 s	0 s	0 s	0 s	0 s	0 s	0 s
0.05	0.05 s	0.1 s	0.15 s	0.25 s	0.4 s	0.6 s	1 s
0.12	0.12 s	0.24 s	0.36 s	0.6 s	0.96 s	1.44 s	2.4 s
0.25	0.25 s	0.5 s	0.75 s	1.25 s	2 s	3 s	5 s
0.5	0.5 s	1 s	1.5 s	2.5 s	4 s	6 s	10 s
1.2	1.2 s	2.4 s	3.6 s	6 s	9.6 s	14.4 s	24 s
2.5	2.5 s	5 s	7.5 s	12.5 s	20 s	30 s	50 s

Time t[s]	Factor n						
5	5 s	10 s	15 s	25 s	40 s	60 s	100 s
15	15 s	30 s	45 s	75 s	120 s	180 s	300 s

Example

The required off-delay time (t_{off}) should be **20 s**:

► Settings:

$$t[s] = 2.5 \text{ s}$$

$$n = 8$$



► Calculation of the off-delay time (t_{off}):

$$2.5 \text{ s} \times 8 = 20 \text{ s}$$

On-delay time (t_{on}) in seconds

Time t[s]	Factor n	
	5	12
0	0 s	0 s
0.05	0.25 s	0.6 s
0.12	0.6 s	1.44 s
0.25	1.25 s	3 s
0.5	2.5 s	6 s
1.2	6 s	14.4 s
2.5	12.5 s	30 s
5	25 s	60 s
15	75 s	180 s

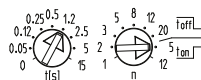
Example

The required on-delay time (t_{on}) should be **6 s**:

► Settings:

$$t[s] = 1.2 \text{ s}$$

$$n = 5$$



► Calculation of the on-delay time (t_{on}):

$$1.2 \text{ s} \times 5 = 6 \text{ s}$$

6.7 Two-hand function

Valid for the following input modules:

- ▶ PNOZ yi3, PNOZ yi4

There is no need for a separate setting in the configuration for the two-hand function.

Before the two-hand pushbutton is operated, in the same zone:

- ▶ All other safety functions must be activated
- ▶ The outputs' off-delay time must have elapsed

When using several two-hand functions in one zone:

- ▶ Before a two-hand function can be re-activated, all two-hand functions in the zone must be deactivated

6.8 Function: Variable input functions

6.8.1 PNOZ yi5

Four different input functions can be selected and implemented using the **function** rotary switch.

Variable input functions:

- ▶ **A:** Four input functions with autostart, AND-link
- ▶ **B:** Three input functions with common start function, AND-link
- ▶ **C:** Three input functions with common start function, OR-link
- ▶ **D:** Three input functions with common start function, 2oo3-link

6.8.2 PNOZ yi8

Seven different input functions can be selected and implemented using the **function** rotary switch.

Variable input functions:

- ▶ **A:** Normally open/normally closed (NO/NC) input function (S11/S12) AND-linked to the normally open/normally closed (NO/NC) input function (S21/S22)
- ▶ **B:** Normally open/normally closed (NO/NC) input function (S11/S12) OR-linked to the normally open/normally closed (NO/NC) input function (S21/S22)
- ▶ **C:** Normally open/normally closed (NO/NC) input function (S11/S12) AND-linked to the normally open/normally open (NO/NO) input function (S21/S22)
- ▶ **D:** Normally open/normally closed (NO/NC) input function (S11/S12) OR-linked to the normally open/normally open (NO/NO) input function (S21/S22)
- ▶ **E:** 2 single-channel input functions (S11/S12) AND-linked to 2 single-channel input functions (S21/S22)
- ▶ **F:** 2 single-channel input functions (S11/S12) AND-linked to normally open/normally open (NO/NO) input function (S21/S22)
- ▶ **G:** 2 single-channel input functions (S11/S12) OR-linked to normally open/normally open (NO/NO) input function (S21/S22)

6.9 Set variable input function

Valid for the following input module:

- ▶ PNOZ yi5, PNOZ yi8

Prerequisite

- ▶ myPNOZ is configured and in operation.

Procedure

1. Please note the steps under "Procedure" in the chapter entitled [Configuration of the modules](#)  38], with the following additional steps.
2. Use the **function** rotary switch to set the required input function, see:
 - PNOZ yi5  46]
 - PNOZ yi8  46]

6.10 Function: Risk-free monitoring area

Valid for the following input module:

- ▶ PNOZ yi7

You can use the **safe state** rotary switch to select whether risk-free monitoring is to be carried out with or without test pulse evaluation. Test pulses are used to detect shorts across contacts and short circuits.

6.11 Set risk-free monitoring area

Valid for the following input module:

- ▶ PNOZ yi7

Prerequisite

- ▶ myPNOZ is configured and in operation.

Procedure

1. Please note the steps under "Procedure" in the chapter entitled [Configuration of the modules](#)  38], with the following additional steps.
2. Use the **safe state** rotary switch to set test pulse evaluation of safe risk-free monitoring (standstill monitor):
 - 24V: Risk-free monitoring is carried out without test pulse evaluation.
 - : Risk-free monitoring is carried out with test pulse evaluation.

6.12 Function: Activation of safety locking device

Valid for the following input module:

► PNOZ yi7

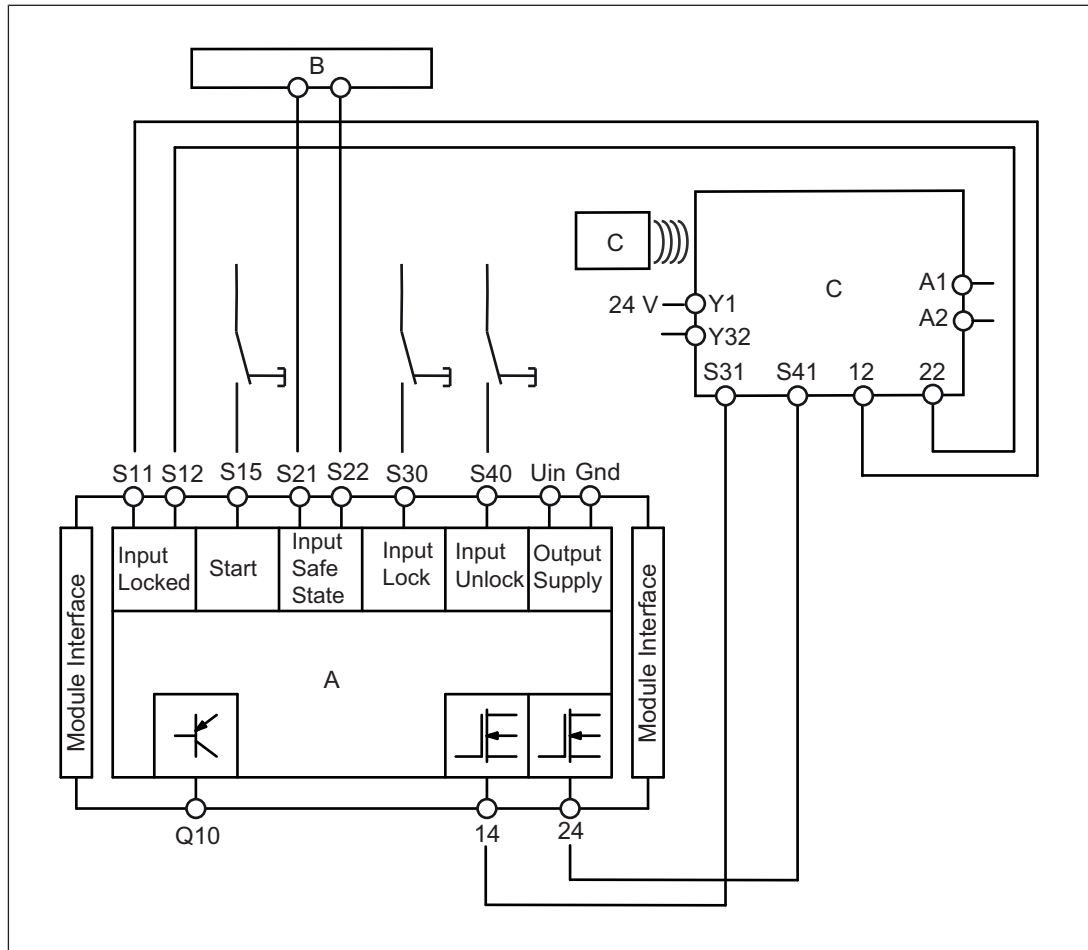


Fig.: Wiring, using PSENmlock as an example

Legend

A PNOZ yi7

C Safety locking device PSENmlock

B Risk-free monitoring

Activate/deactivate safety locking device

The safety locking device is activated when the lock request is detected with the rising edge at input S30 "Input Lock" and the "Safe State" is activated. To do this, press the "Input Lock" button.

The safety locking device is deactivated when the open request is detected with the rising edge at input S40 and "Safe State" is activated (safe state achieved). To do this, press the "Input Unlock" button.

When using a PILZ PSENmlock in hardware version 01, the safety locking device is activated or deactivated (toggled) depending on the previous state, regardless of whether a rising edge is detected at input S30 or S40.



INFORMATION

The lock and open request can also be wired to just one button. In this case, the safety locking device is activated or deactivated, depending on the state.

To activate, press the "Input Lock" button. To deactivate, press the "Input Lock" button again.

The following settings can be selected using the *out* rotary switch:



WARNING!

With the "Power to Lock" function, the safety locking device is opened automatically in the event of a power loss, regardless of whether the secured area can be entered safely. As a result, people can enter the danger zone of a plant/machine that is potentially overrunning.

They, and others, can be hit by the overrunning machine. There is an increased risk of injury or threat to life!

- Do not use the "Power to Lock" function on plant/machinery on which the hazardous state is not shut down immediately in the event of a power loss.

► **ml:** Activation of the safety locking device PSENmlock from PILZ, 2 edges

This activation is only required for PSENmlock. The PSENmlock mini is activated with "Power to Unlock".

Switch on safety locking device: Output 14 is switched on first with 24 V, followed by output 24 after a delay. Then both outputs 14, 24 are switched off.

Switch off safety locking device: Output 24 is switched on first with 24 V, followed by output 14 after a delay. Then both outputs 14, 24 are switched off.

► **PU0:** Power to Unlock 24 V and 0 V output

Switch on safety locking device: Outputs 14, 24 are switched off.

Switch off safety locking device: Outputs 14, 24 are switched on. The voltage at output 14 is 24 V and the voltage at output 24 is 0 V.

► **PU24:** Power to Unlock 2 x 24 V outputs

Switch on safety locking device: Outputs 14, 24 are switched off.

Switch off safety locking device: Outputs 14, 24 are switched on. The voltage at outputs 14, 24 is 24 V.

► **PL24:** Power to Lock 2 x 24 V outputs

Switch on safety locking device: Outputs 14, 24 are switched on. The voltage at outputs 14, 24 is 24 V.

Switch off safety locking device: Outputs 14, 24 are switched off.

► **PL0:** Power to Lock 24 V and 0 V output

Switch on safety locking device: Outputs 14, 24 are switched on. The voltage at output 14 is 24 V and the voltage at output 24 is 0 V.

Switch off safety locking device: Outputs 14, 24 are switched off.

6.13 Set activation of safety locking device

Valid for the following input module:

- ▶ PNOZ yi7

Prerequisite

- ▶ myPNOZ is configured and in operation.

Procedure

1. Please note the steps under "Procedure" in the chapter entitled [Configuration of the modules](#)  38], with the following additional steps.
2. Use the **out** rotary switch to set the configuration for activation of the safety locking device, see [Function: Activation of safety locking device](#)  48].

7 Reaction times

If the state at a module input changes, e.g. an E-STOP pushbutton is operated, it takes a certain time for the signal to arrive at the output and for the output to switch. This time is the reaction time.

The reaction time is due to the internal processing times and delay times on the components.

The different reaction times depend on the:

- ▶ Status change at the module input
- ▶ Output type of the module
- ▶ Number of modules

7.1 Reaction time of a safe relay output, when a dual-channel input function is used

The reaction time of a safe relay output is the time needed for a relay output to switch off or on when the state at the module input changes.

yo2, yio2, yo4, yio4:

Number of expansion modules	Max. reaction time when switching off	Max. reaction time when switching off in the event of an internal error	Max. reaction time when switching on
1	32.5 ms	37.6 ms	57.0 ms
2	32.5 ms	37.6 ms	57.0 ms
3	32.5 ms	37.6 ms	57.0 ms
4	32.5 ms	37.6 ms	57.0 ms
5	33.1 ms	38.2 ms	58.5 ms
6	33.5 ms	38.6 ms	59.5 ms
7	34.0 ms	39.0 ms	60.5 ms
8	34.4 ms	39.4 ms	61.6 ms

yo5:

Number of expansion modules	Max. reaction time when switching off	Max. reaction time when switching off in the event of an internal error	Max. off reaction time on the instantaneous path, in the event of an internal error when using the off-delay	Max. reaction time when switching on
1	32.5 ms	37.6 ms	88.0 ms	57.0 ms
2	32.5 ms	37.6 ms	88.0 ms	57.0 ms
3	32.5 ms	37.6 ms	88.0 ms	57.0 ms

Number of expansion modules	Max. reaction time when switching off	Max. reaction time when switching off in the event of an internal error	Max. off reaction time on the instantaneous path, in the event of an internal error when using the off-delay	Max. reaction time when switching on
4	32.5 ms	37.6 ms	88.0 ms	57.0 ms
5	33.1 ms	38.2 ms	89.0 ms	58.5 ms
6	33.5 ms	38.6 ms	89.0 ms	59.5 ms
7	34.0 ms	39.0 ms	90.0 ms	60.5 ms
8	34.4 ms	39.4 ms	90.0 ms	61.6 ms

7.2 Reaction time of a safe semiconductor output, when a dual-channel input function is used

The reaction time of a safe semiconductor output is the time needed for a semiconductor output to switch off or on when the state at the module input changes.

yo1, yio1, yo3, yio3

Number of expansion modules	Max. reaction time when switching off	Max. reaction time when switching off in the event of an internal error	Max. reaction time when switching on
1	6.1 ms	14.3 ms	34.3 ms
2	6.1 ms	14.3 ms	34.3 ms
3	6.1 ms	14.3 ms	34.3 ms
4	6.1 ms	14.3 ms	34.3 ms
5	6.8 ms	14.9 ms	35.8 ms
6	7.2 ms	15.3 ms	36.8 ms
7	7.6 ms	15.7 ms	37.8 ms
8	8.0 ms	16.1 ms	38.8 ms

7.3 PNOZ yi8 reaction time, when a single-channel input function is used with test pulse evaluation

The reaction time of a safe semiconductor output is the time needed for a semiconductor output to switch off or on when the state at the module input changes.

When single-channel input functions are used with test pulse evaluation, the reaction time is extended as follows.

yi8:

Number of expansion modules	Max. reaction time when switching off with a safe semiconductor output	Max. reaction time when switching off with a safe relay output
1	20.1 ms	46.5 ms
2	20.1 ms	46.5 ms
3	20.1 ms	46.5 ms
4	20.1 ms	46.5 ms
5	20.8 ms	47.1 ms
6	21.2 ms	47.5 ms
7	21.7 ms	48.0 ms
8	22.0 ms	48.4 ms

7.4 Reaction time of a signal output (not safety-related)

The reaction time of a signal output is the time needed for a signal output to switch off or on when the state at the module input changes.

Number of expansion modules	Max. reaction time when switching off	Max. reaction time when switching on, with the start type "Automatic start"
1	7.2 ms	32.6 ms
2	7.2 ms	32.6 ms
3	7.2 ms	32.6 ms
4	7.2 ms	32.6 ms
5	7.8 ms	34.2 ms
6	8.2 ms	35.2 ms
7	8.6 ms	36.2 ms
8	9.0 ms	37.2 ms

8 Calculating the probability of failure of a safety function

When calculating the probability of failure of a safety function, the safety-related characteristic data of the myPNOZ must be taken into account:

- ▶ Input (sensor, e.g. light curtain)
- ▶ Logic input
- ▶ Logic
- ▶ Logic output
- ▶ Output (actuator, e.g. contactor)

The safety-related characteristic data

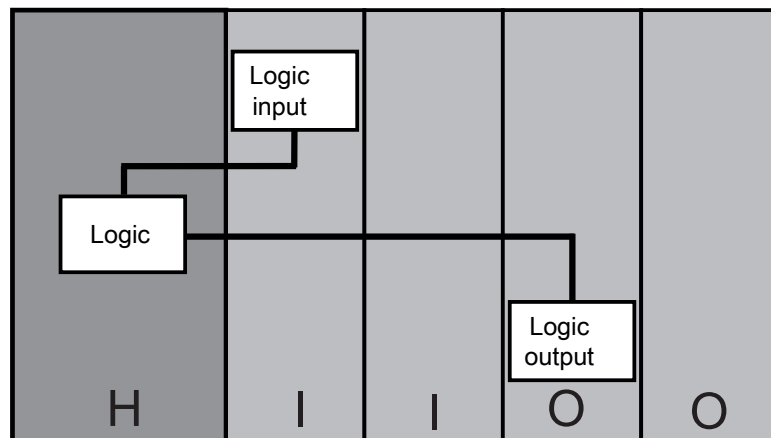
- ▶ of all logic inputs of the same type is identical.
- ▶ of all logic outputs of the same type is identical.
- ▶ of the logic is specified via the head module.
- ▶ of the head module at the logic input is evaluated as any other logic input of the same type.
- ▶ of each safety function is considered separately.
- ▶ is independent of a module's position.

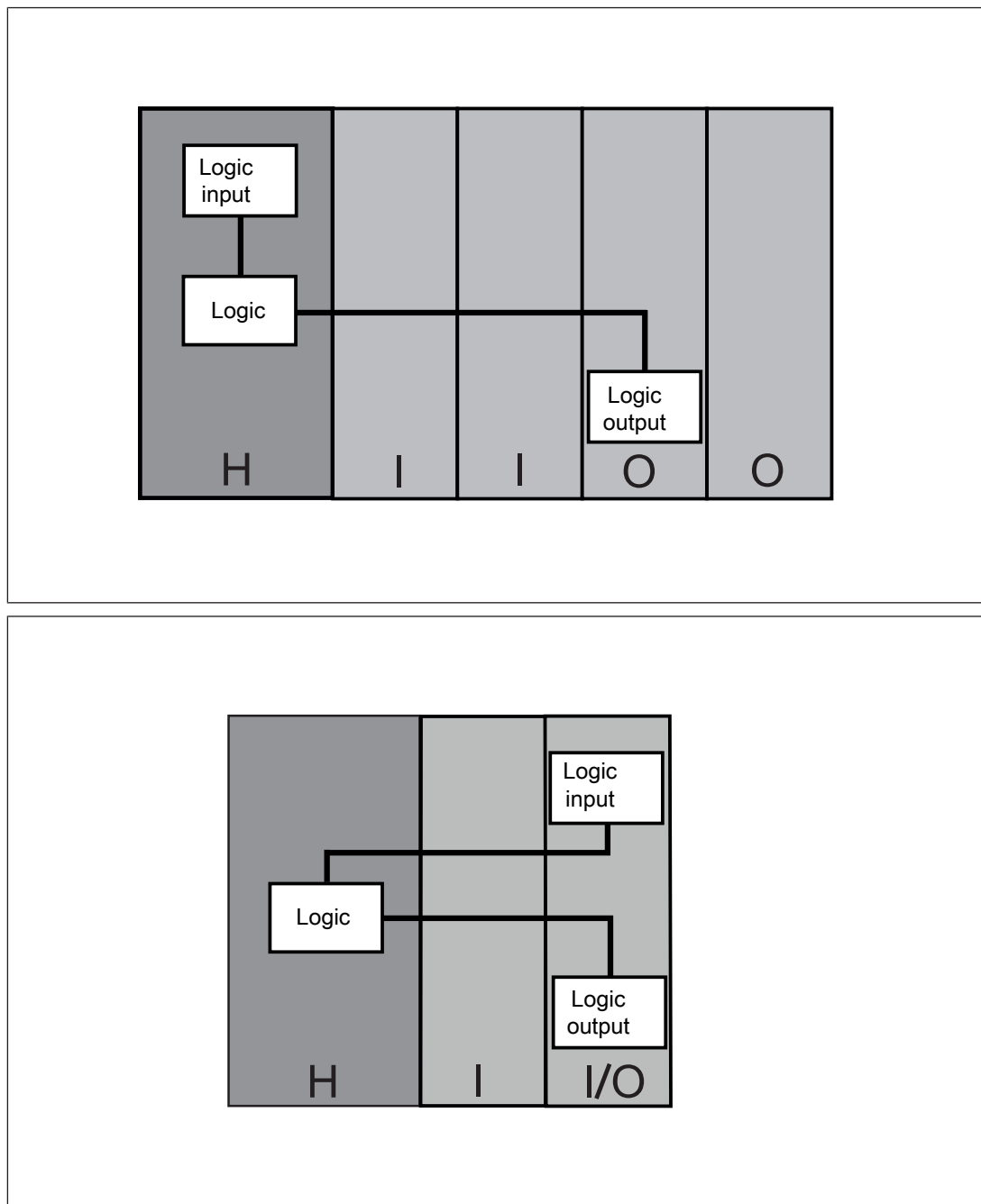
8.1 Calculating the probability of failure of the myPNOZ

The safety level of a specific safety function is irrespective of the position of the modules and is always calculated from the values for:

Logic input + Logic + Logic output

If all the logic inputs and logic outputs shown in the examples were of the same type, then the safety level of the safety function for all examples would also be identical.





8.1.1

Calculation example for an overall safety function

The overall PFH_D value of a safety function is calculated by adding the individual PFH_D values.

To calculate the overall PFH_D value

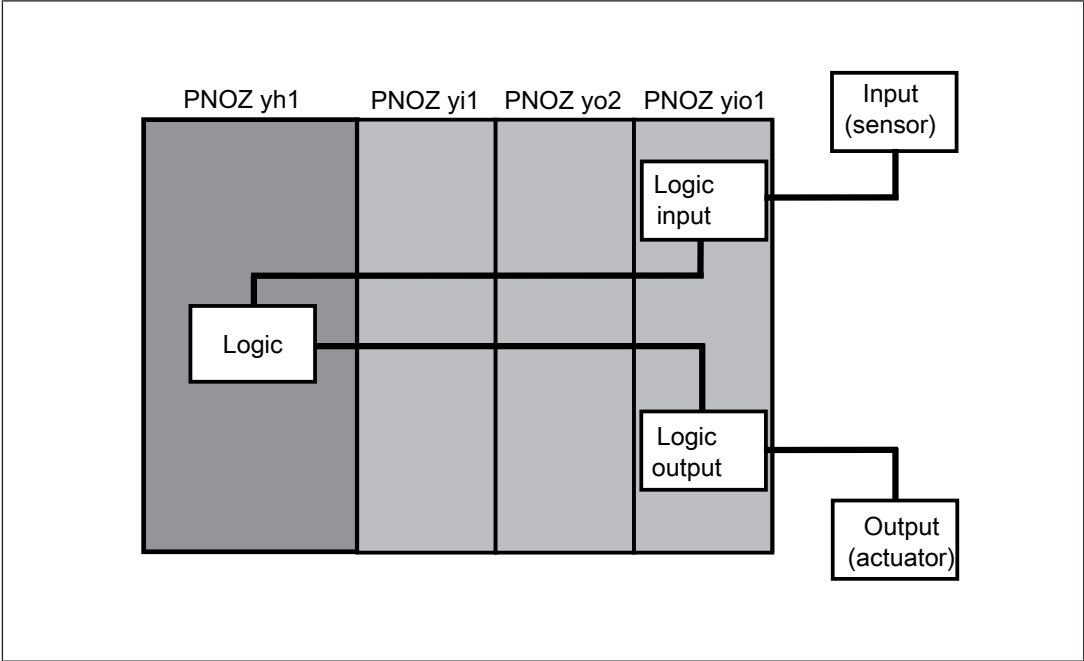
- The PFH_D values for the Pilz modules/components must be taken from the current data sheets.
- The PFH_D values for the third-party components must be taken from the current data sheets of the component manufacturer.

If no values are available, example values from the current applicable standard can be used, if appropriate.



INFORMATION

The following values serve only as an example and may vary from the actual values.



Safety characteristic data, input (sensor)

Value from the technical details of a light curtain (example)	
PFH _D light curtain PSEN op input (sensor)	7,89E-09 [1/h]

Safety characteristic data myPNOZ

Value from the technical details of the respective myPNOZ modules	
PFH _D PNOZ yio1 input logic	1,93E-10 [1/h]
PFH _D PNOZ yh1 logic	1,51E-10 [1/h]
PFH _D redundant PNOZ yio1 output logic	9,68E-10 [1/h]

Safety characteristic data, output (contactor)

Determine / calculate values for contactors, redundant with nominal load	
B10 _D , in accordance with Table C.1 from the standard EN ISO 13849-1, for "Contactors with nominal load"	1 300 000
n _{op} , number of operations is assumed	2 operations per hour x 24 hours per day x 365 days = 17 520 operations per year
MTTF _D	B10 _D / 0.1 x n _{op} = 1 300 000 / 0.1 x 17 520 = 742 years = ~ 680 years
PFH _D output (actuator), in accordance with Table K.1 from the standard EN ISO 13849-1	With "MTTF _D for each channel" ~ 680 years, "Cat.4, "DC _{avg} = high" = 3,37E-09 [1/h]

Safety characteristic data, total

PFH ^D light curtain PSEN op input (sensor)	7,89E-09 [1/h]
PFH _D PNOZ yio1 input logic	1,93E-10 [1/h]
PFH _D PNOZ yh1 logic	1,51E-10 [1/h]
PFH _D redundant PNOZ yio1 output logic	9,68E-10 [1/h]
PFH _D contactors redundant with nominal load output (actuator)	3,37E-09 [1/h]

Overall value PFH_D =

7,89E-09 [1/h] + 1,93E-10 [1/h] + 1,51E-10 [1/h] + 9,68E-10 [1/h] + 3,37E-09 [1/h] =
1,26E-8 [1/h]

Performance level (PL)

All subsystems involved meet PL e.

The overall PFH_D 1,26E-8 [1/h] $\triangleq$ **PL e** in accordance with the standard EN ISO 13849-1

9 Installation and removal

To install a myPNOZ, first connect the modules together (see [Connect modules](#)  59]). myPNOZ can then be installed on the mounting rail in the control cabinet (see [Install myPNOZ on the mounting rail](#)  61]). Please note the dimensions.

If a myPNOZ is already installed on the mounting rail, individual modules can be removed, exchanged or added without removing the remaining modules (see [Remove/exchange modules](#)  61]).

The expansion modules arranged to the right of the head module determine the logic connection of the inputs and the switching of the outputs (see Application logic).

Please refer to the section entitled [Structure of myPNOZ](#)  16] for details of the number of modules and module types that can be connected.

During installation and removal please note:



CAUTION!

Only install and remove modules when the supply voltage is switched off.



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.

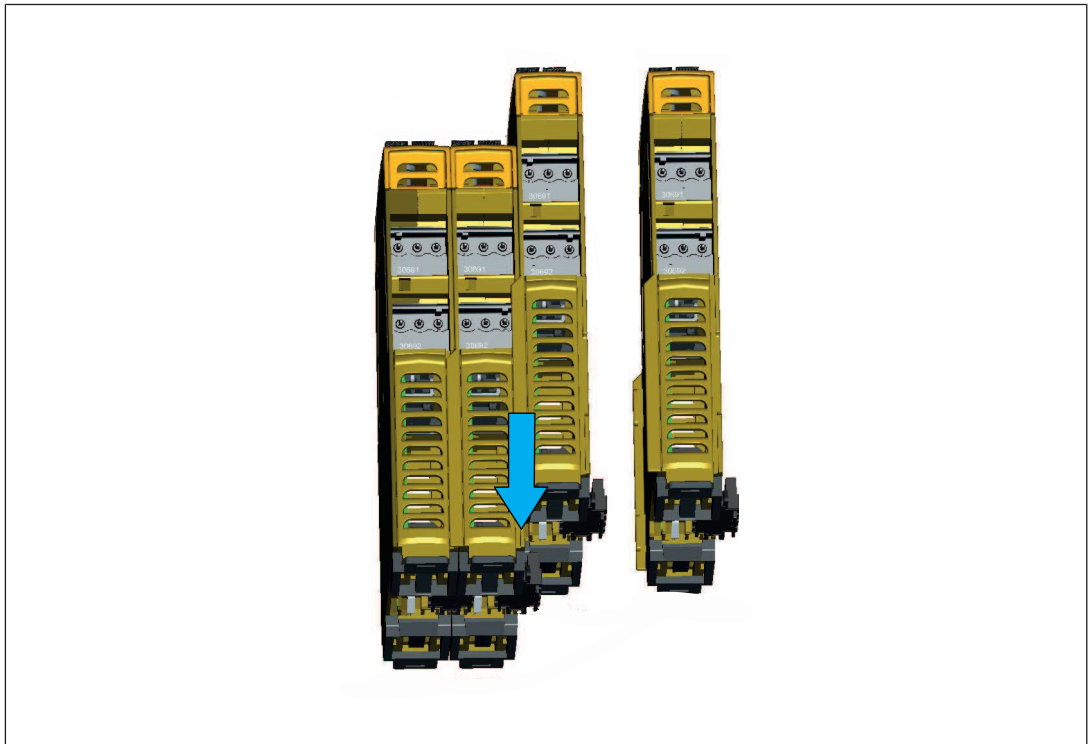
9.1 Connect modules

Prerequisites

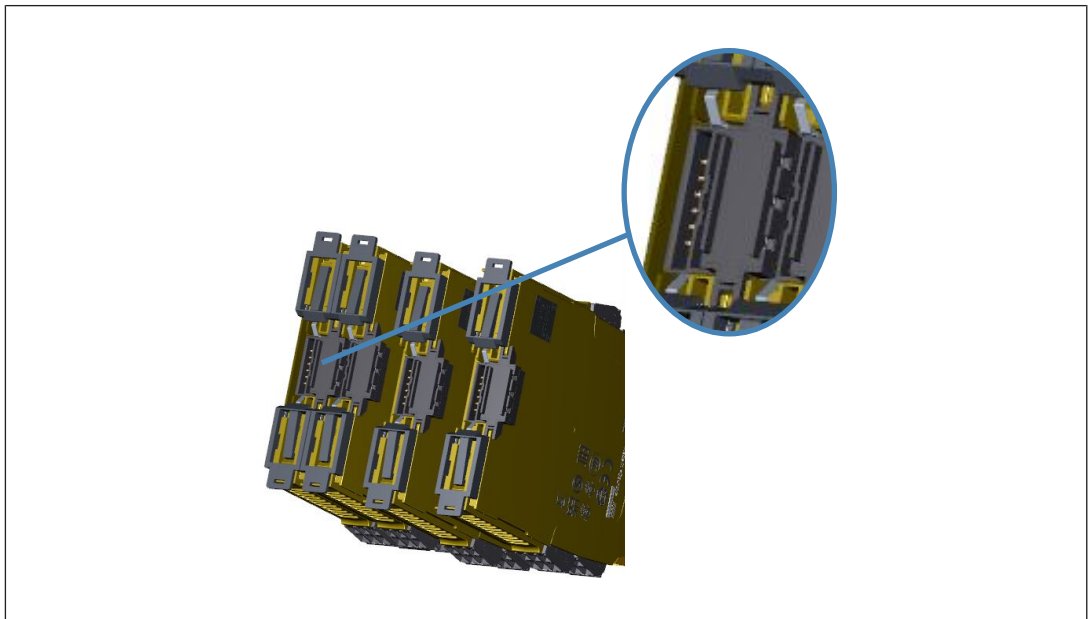
- The plug-in terminals on the modules are removed (see [Remove plug-in terminals](#) [62]).

Procedure

1. From above, push the module to be connected into the rail of the adjacent left-hand module.



2. Connect the modules using bus connectors.



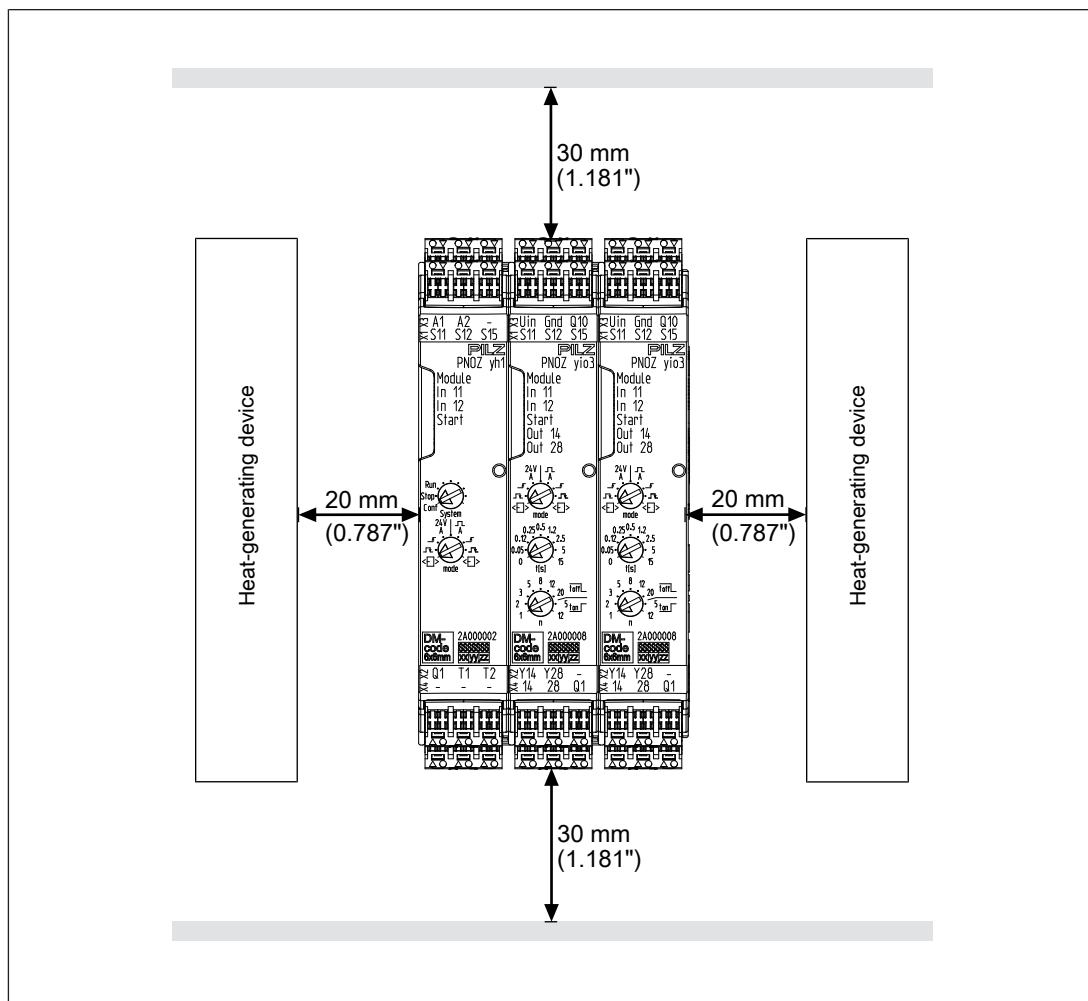
9.2 Mounting distances in the control cabinet

With control cabinet installation it is essential to maintain a minimum distance from the top and bottom, as well as to other heat-producing devices. See the diagram below, "Mounting distances". The values stated for the mounting distances are minimum specifications.

The ambient temperature in the control cabinet must not exceed the figure stated in the technical details (see [Technical details \[92\]](#)). Otherwise air conditioning is required. If the ambient temperature rises above the stated value, myPNOZ switches to an error state. This is then displayed via the LEDs on the modules (see [Status and error messages \[78\]](#)).

The venting slots on the modules must be free.

Mounting distances

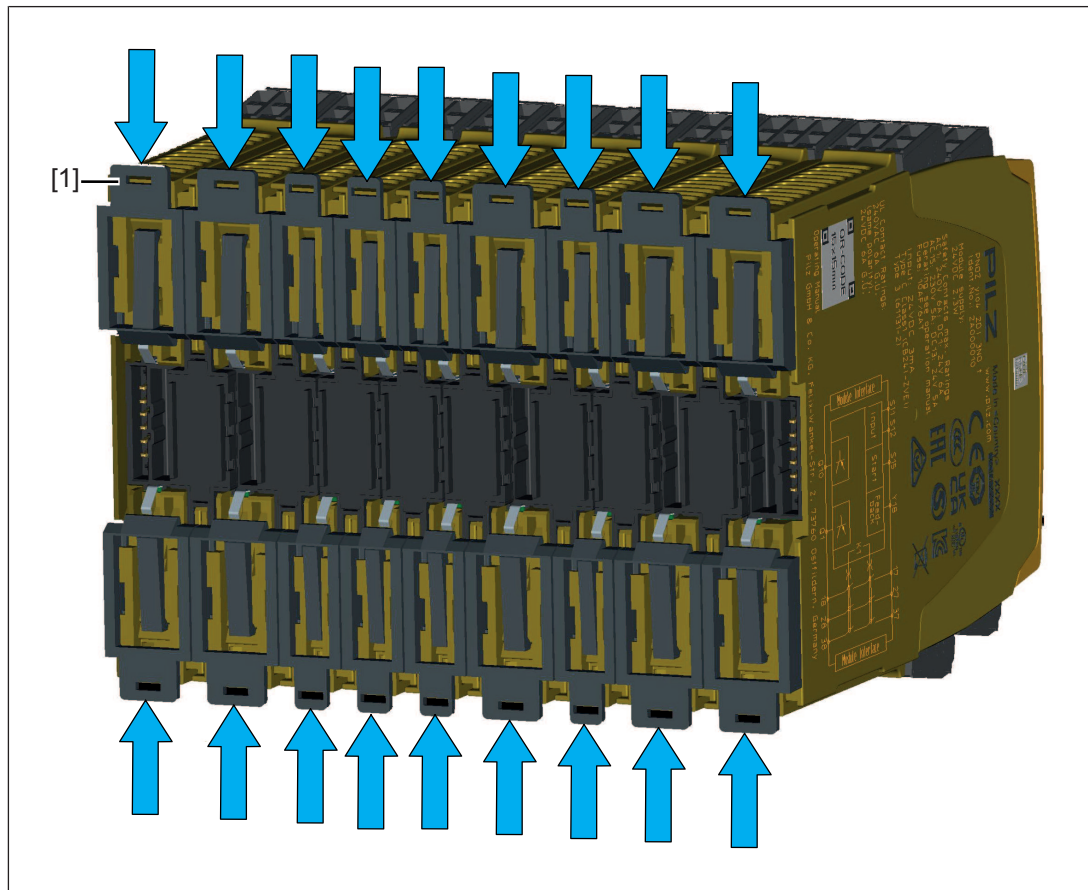


9.3 Install myPNOZ on the mounting rail

Prerequisites

- ▶ The modules are connected.
- ▶ The control cabinet must be at least protection type IP54.

Procedure



1. Ensure that all locking slides [1] are closed. If necessary, slide the locking slides [1] in the direction of the arrow until they click into place.
2. Place the connected modules on the mounting rail and press the modules towards the mounting rail until you hear the locking slides [1] click into place.
3. Check that all the locking slides [1] are still closed. If necessary, slide the locking slides [1] in the direction of the arrow until they click into place.
4. Install the retaining element.

When installed vertically or in environments exposed to heavy vibration, the myPNOZ should be secured using a retaining element (e.g. retaining bracket or end angle).

9.4 Remove/exchange modules

You can remove or exchange the complete myPNOZ or individual modules.

Prerequisites

- ▶ Plug-in terminals must be removed (see [Remove plug-in terminals](#) [ 62])
 - on the module that is to be removed
 - on the adjacent left-hand module

Procedure

1. Open the locking slides on the back of the module to be removed. To do this, push the locking slides outwards as far as they will go.
2. Pull the module forwards.
3. Insert the new module.
4. Close the locking slides.
5. Connect the terminals.

9.5 Remove plug-in terminals

Procedure

1. Insert a suitable screwdriver into the housing recess behind the terminal.
Do **not** remove the terminals by pulling the cables!
2. Use the screwdriver to carefully lever out the terminal.



10 Wiring

The function and description of inputs and outputs of the same type are identical on all modules. Any special features are described with the individual connections. The technical properties can be found with the respective modules (see [Head modules](#) [📖 89] and [Expansion modules](#) [📖 97]).

Note:

- ▶ It is essential to comply with the modules' technical details (see [Technical details](#) [📖 92]).
- ▶ Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads.



WARNING!

If the actuator cables are routed together with live cables, it is possible for the machinery to start up in an uncontrolled manner and for the safety functions to not work properly.

There is an increased risk of injury or even a threat to life!

- Always route the actuator cables separately from live cables, such as supply, test pulse or input cables for example.

- ▶ To prevent EMC interferences (particularly common-mode interferences) the measures described in EN 60204-1 must be executed. This includes the separate routing of cables of the control circuits (input, start and feedback loop) from other cables for energy transmission or the shielding of cables, for example.
- ▶ Use copper wiring with a temperature stability of 60/75 °C.
- ▶ When using screw terminals: use ferrules to connect stranded cables.

10.1 Connect the supply voltage

Valid for the following modules:

- ▶ Head module: PNOZ yh1
- ▶ Input module: PNOZ yi7
- ▶ Output modules: PNOZ yo1, PNOZ yo3
- ▶ Input/output modules: PNOZ yio1, PNOZ yio3

The head module and the expansion modules with safe semiconductor outputs can be supplied via one or more power supplies.

Please note when selecting the power supply:

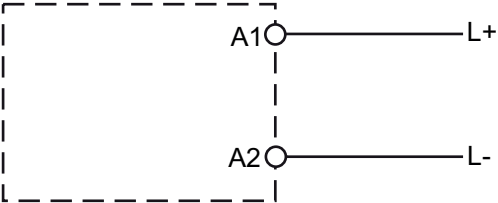
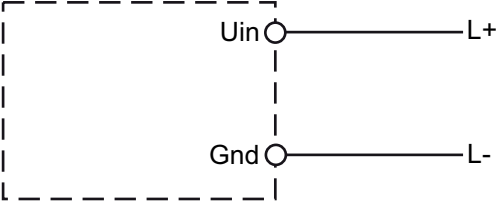
- ▶ The power supply must meet the regulations for extra low voltages with protective electrical separation (SELV, PELV).
- ▶ Output of external power supply:
To calculate the total output of the external power supply, add the information from
 - the technical details of the head module,

- the connected expansion modules and
- the load to be switched.

With the PNOZ yi7, note the following:

- Protect the module with an external fuse, see [Technical details](#)  148]. To do this, install the fuse before Uin.

Procedure

Supply voltage	
Valid for the following module: Head module: PNOZ yh1	
Valid for the following modules: Input module: PNOZ yi7 Expansion module with semiconductor output: Output modules: PNOZ yo1, PNOZ yo3 Input/output modules: PNOZ yio1, PNOZ yio3	



INFORMATION

If the head module and the expansion module are supplied from different power supplies, then the A2 connection and GND must be connected directly on the myPNOZ.

10.2 Connect control or switching elements to the inputs

Valid for the following modules:

- ▶ Head module: PNOZ yh1
- ▶ Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi8
- ▶ Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4

The operation or switching elements trigger the switching of the outputs. The wiring of the operation and switching elements is based on the application and required safety level.

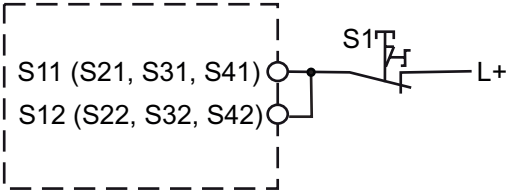
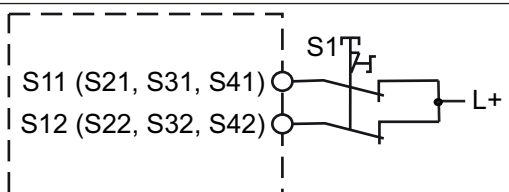
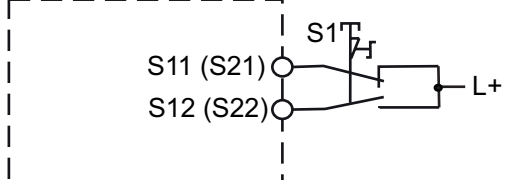
Note:

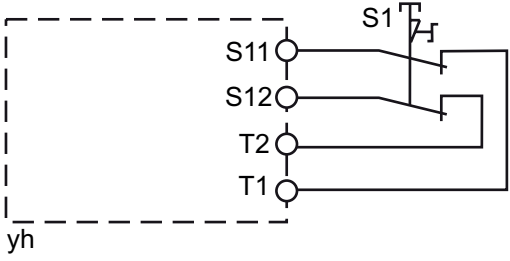
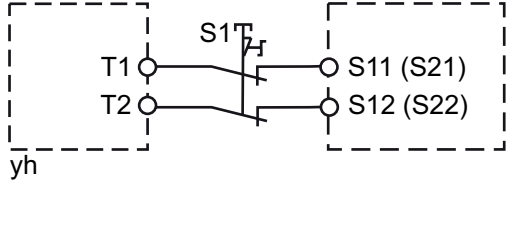
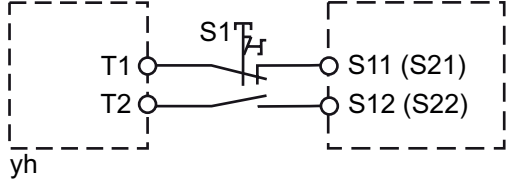
- ▶ Connect test pulse outputs to the operation or switching elements in order to detect shorts across contacts and short circuits.
- ▶ The test pulse outputs must not be connected if you are using sensors with OSSD.

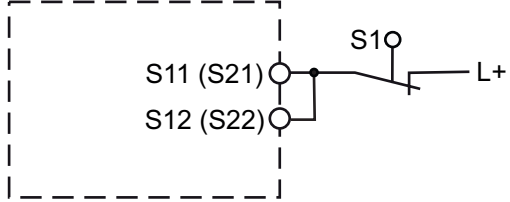
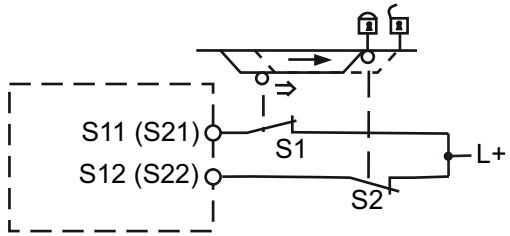
Prerequisites

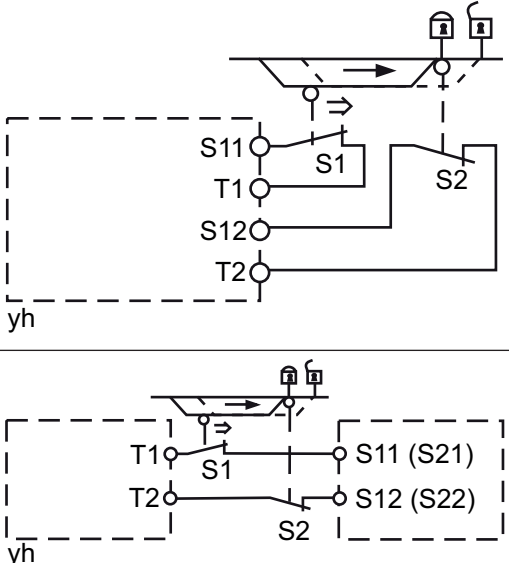
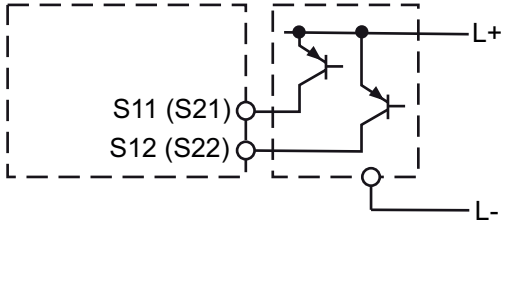
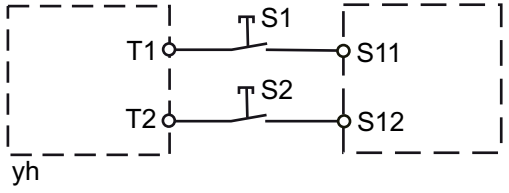
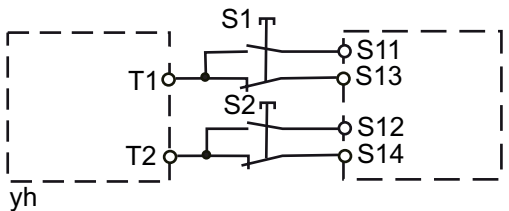
- ▶ You have defined the conditions for the wiring (e.g. detection of shorts across contacts required, single-channel or dual-channel)

Procedure

E-STOP without test pulse evaluation	
Valid for the following modules: Head module: PNOZ yh1 Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi8 Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4	Single-channel 
	Dual-channel 
Valid for the following module: PNOZ yi8	

E-STOP with test pulse evaluation	
Valid for the following module: Head module: PNOZ yh1	
Valid for the following modules: Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi8 Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4	
Valid for the following module: PNOZ yi8	

Safety gate switch without test pulse evaluation	
Valid for the following modules: Head module: PNOZ yh1 Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi8 Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4	Single-channel  Dual-channel 

Safety gate switch with test pulse evaluation	
Valid for the following modules: Head module: PNOZ yh1 Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi8 Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4	
Sensor technology with integrated detection of shorts across contacts (OSSD)	
Valid for the following modules: Head module: PNOZ yh1 Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi8 Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4	
Two-hand Type III A	
Valid for the following module: PNOZ yi3	
Two-hand Type III C	
Valid for the following module: PNOZ yi4	

Legend

S1/S2: E-STOP / safety gate switch, light curtain or two-hand pushbutton

↑↑: Operated element



: Gate open



: Gate closed

10.3 Connect start signal

Valid for the following modules:

- ▶ Head module: PNOZ yh1
- ▶ Input modules: PNOZ yi1, PNOZ yi2, PNOZ yi3, PNOZ yi4, PNOZ yi5, PNOZ yi6, PNOZ yi7, PNOZ yi8
- ▶ Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4

A start signal prevents a module from restarting automatically. The start type is defined using the **mode** rotary switch.



NOTICE

The device does not recognise short circuits or shorts across contacts in the start/feedback loop. Take suitable measures, such as fault exclusion through protected or separate installation.

Prerequisites

- ▶ You have defined the conditions for the wiring (e.g. start-up test required).

Procedure

Start type	
	Manual/monitored
	Automatic/automatic with start-up test

Legend

- ▶ S4: Start button

10.4 Wire outputs

Valid for the following modules:

- ▶ Output modules: PNOZ yo1, PNOZ yo2, PNOZ yo3, PNOZ yo4, PNOZ yo5
- ▶ Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4

The wiring of the relay outputs and semiconductor outputs can be single or dual-channel.

Note:

- Protect the relay outputs from welding with an external blow-out fuse.



NOTICE

If you wish to achieve SIL 3 of EN IEC 62061, PL e of EN ISO 13849-1/2 with a semiconductor output, you will need to use appropriate wiring to exclude shorts across contacts. The connected actuators must have a guaranteed dropout voltage of at least 2.4 V or actuators must be used that are certified to EN IEC 60947-4-1 with at least 24 V rated voltage.

2 Loads (e.g. contactor, relay) may be connected to an output for SIL 3/PL e applications under the following conditions:

- Short across contact and external supply are excluded (e.g. through separate sheathed cables).

Please note that, in the event of an error on the connected loads or in the feedback loop, myPNOZ switches to a safe state and shuts down all the outputs.

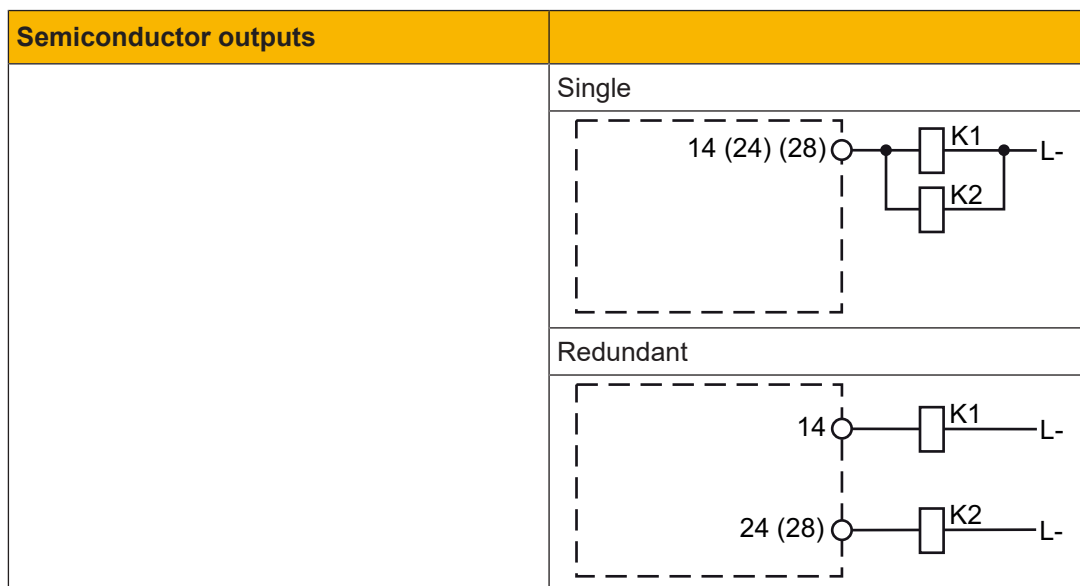
- Adequate protection circuit must be provided on all output contacts with capacitive and inductive loads.
- Do **not** use signal outputs for safe circuits.
- The signal outputs can be used for displays, for example.

Prerequisites

- You have defined the conditions for the wiring.

Procedure

Relay outputs Example wiring of 13 (17) and 14 (18)	
	Single Redundant

**Legend**

- K1/K2: Relay or contactor

10.5 Connect feedback loop

Valid for the following modules:

- Output modules: PNOZ yo1, PNOZ yo2, PNOZ yo3, PNOZ yo4, PNOZ yo5
- Input/output modules: PNOZ yio1, PNOZ yio2, PNOZ yio3, PNOZ yio4

The feedback loops are used to monitor the actuator technology, such as external contactors or relays, when a safety function is started.

24 V must be present at the feedback loop input before starting. If 24 V is not present, the connected plant or machine cannot be restarted. Normally closed contacts from external contactors or relays are usually used for this purpose.

Note:

- If feedback loop monitoring is not required, the feedback loop inputs must be connected to 24 VDC.
- On modules with multiple feedback loops, the assignment of the outputs to the feedback loops can be recognised by the name: the name of the feedback loop starts with a “Y”, followed by the two digits of the assigned output.
- When myPNOZ is switched on, 24 V must be present at all feedback loop inputs for a short self-test.

**NOTICE**

The device does not recognise short circuits or shorts across contacts in the start/feedback loop. Take suitable measures, such as fault exclusion through protected or separate installation.

Prerequisites

- You have defined the conditions for the wiring.

Procedure

Relay outputs	
	Feedback loop monitoring active Feedback loop monitoring inactive

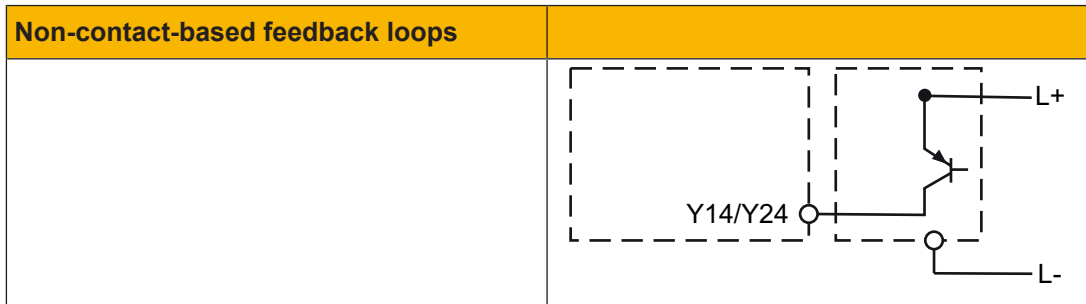
Legend

- K1/K2: Relay or contactor with N/C contacts

Semiconductor outputs	
	Feedback loop monitoring active Feedback loop monitoring inactive

Legend

- K1/K2: Relay or contactor with N/C contacts

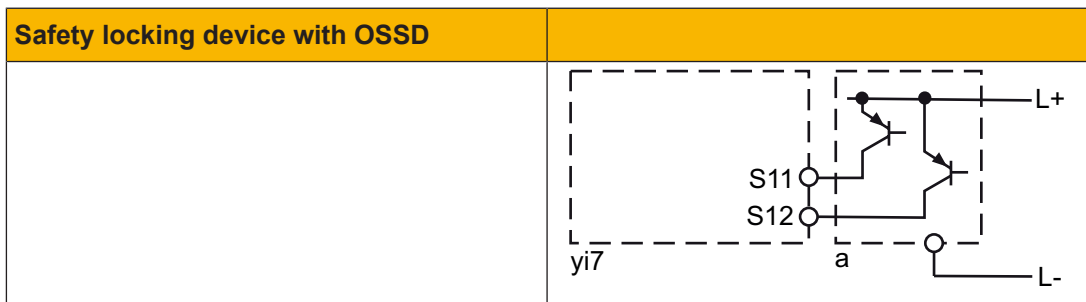
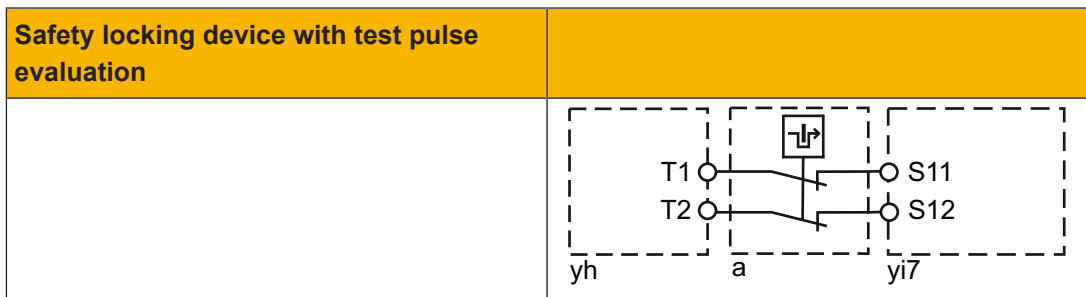


10.6 Connect PNOZ yi7 lock

10.6.1 Connect Locked Signal

The Locked signal provides feedback from the safety locking device as to whether the safety switch is activated.

Procedure



Legend

- a: Safety locking device

10.6.2 Connect start button

Procedure, see [Connect start signal](#) 69].

10.6.3 Connect Lock and Unlock

Procedure

Lock and Unlock	
The safety locking device is opened (S40) or closed (S30) via two signals, e.g. push-buttons.	Lock and Unlock via 2 pushbuttons
When wired to one pushbutton, the safety locking device is alternately opened or closed (S40), (S30) depending on the state.	Lock and Unlock via 1 pushbutton

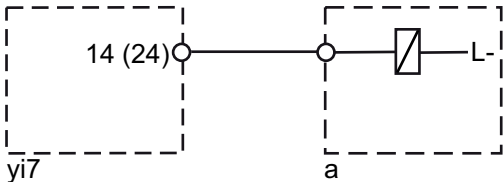
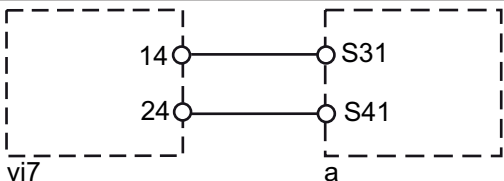
10.6.4 Connect the supply voltage

Procedure, see [Connect the supply voltage](#) [63].

10.6.5 Connect safety locking device

Procedure

Safety locking device	
out rotary switch to position PL24 or PU24 ► Terminal 14 = 24 V ► Terminal 24 = 24 V	Single-pole, dual-channel
out rotary switch to position PL0 or PU0 ► Terminal 14 = 24 V ► Terminal 24 = 0 V Note: The 0 V output must be operated together with the 24 V output.	Dual-pole, dual-channel

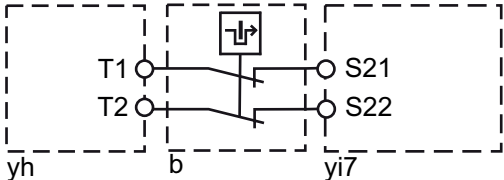
Safety locking device	
out rotary switch to position PL24 or PU24 ▶ Terminal 14 (24) = 24 V	Single-pole, single-channel 
out rotary switch to ml position	Activation of Pilz PSENmlock: single-pole, dual-channel 

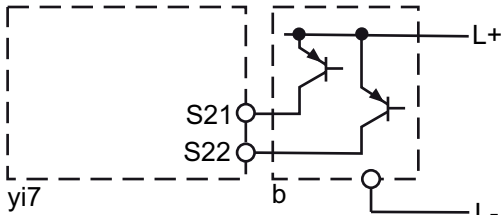
Legend

- ▶ a: Safety locking device

10.6.6 Connect risk-free monitoring

Procedure

Safe State with test pulse evaluation	
	

Safe State with OSSD	
	

Legend

- ▶ b: Risk-free monitoring

11 Commissioning

Prerequisites

- ▶ myPNOZ is configured and the configuration is saved.
- ▶ myPNOZ is installed and wired correctly.
- ▶ All input terminals are assigned.

Procedure

1. Switch on the supply voltage.
2. On the head module, set the **System** rotary switch to the **RunRun** position.

myPNOZ runs through an initialisation phase. It carried out self checks, establishes the connection between the modules and tests the configuration. The **Module** LED on the head module flashes green quickly.

Once initialisation is completed successfully, myPNOZ goes into operation and switches all the outputs in accordance with the configured logic. The **Module** LEDs light up green. Potential status and error messages can be found under Diagnostics.



NOTICE

The safety functions should be checked after initial commissioning and each time the plant/machine is changed. The safety functions may only be checked by qualified personnel.

12 Operation

In operation, myPNOZ checks the input states cyclically and switches the outputs in accordance with the configured logic. The **Module** LEDs light up green. The meaning of all the LEDs can be found under Diagnostics.

If there is an error, such as increased temperature or a low supply voltage for example, the **Module** LED lights up or flashes orange instead of green. The colour change from green to orange is a warning. myPNOZ remains operational. Only if there is an inadmissible deviation of temperature or supply voltage is an error triggered and all the outputs switched off.

myPNOZ may be in one of the following states:

- ▶ **Initialisation:** After supply voltage is switched on, myPNOZ runs through an initialisation phase.
If there are no errors present, and the **System** rotary switch on the head module is set to **Run**, myPNOZ automatically switches to a RUN state.
- ▶ **RUN:** Normal operation, all outputs react to the states of the inputs in accordance with the saved configuration. On the head module, the **System** rotary switch is set to the **Run position**.
- ▶ **STOP:** The states at the inputs are not processed, all safe outputs are switched off. This state occurs when errors in the Error category or configuration errors occur, or when the **System** rotary switch on the head module is no longer set to the **Run** position. In the event of a configuration error, set the **System** rotary switch to the **Stop** position and recover the error (see [Status and error messages](#) [78]). To return to a RUN state, the **System** rotary switch must be set to **Run** or the supply voltage must be switched off and on again.



NOTICE

The safety functions should be checked after initial commissioning and each time the plant/machine is changed. The safety functions may only be checked by qualified personnel.

13 Status and error messages

The LEDs on the head module and expansion modules indicate the status of the modules and report on operating states as well as external and internal errors. The **Module** LED indicates the status of the module; the function LEDs (**In**, **Out**, **Start**) indicate the status of the inputs and outputs.

Legend

- LED off
- ☼ LED on
- LED flashes in one colour (500 ms on, 500 ms off)
- LED flashes in two colours (500 ms in colour 1, 500 ms in colour 2)
- LED flashes quickly (50 ms on, 950 ms off)

13.1 Status messages

These messages provide information about the status of the myPNOZ and the inputs/outputs.

Status messages during initialisation

After the myPNOZ is started there is a brief initialisation phase.

Module LED	Function LED	Meaning
 Quickly flashes green	 All LEDs off	Initialisation

Status messages during operation (RUN)

During operation, where there are no errors present, the status of the inputs and outputs are displayed. The **Module** LED lights up green.

If the colour of the **Module** LED turns orange, one of the following errors is present:

- ▶ Supply voltage increased or low
- ▶ Supply voltage to semiconductor outputs increased or low
- ▶ Temperature increased or low
- ▶ Connection between modules disturbed by external influences

myPNOZ only switches to an error state when the error means that a limit value is exceeded. If the error is no longer present, the **Module** LED switches back to green.

Module LED	Function LED	Meaning
 Lights up green	 LED In , Locked or Safe State lights up green	Input active
	 LED In , Locked or Safe State off	Input inactive
	 LED In , Locked or Safe State flashes green	Depending on the module, one LED flashes or both LEDs flash alternately: ▶ Only one input was operated (partial operation) ▶ With two-hand control: simultaneity not maintained ▶ With two-hand control: not all contacts are deactivated ▶ Two-hand operated, but start condition is not met (e.g. E-STOP pushbutton operated or off-delay active) ▶ With several two-hand functions in one zone: not all the two-hand functions were deactivated ▶ Test pulse wired, but test pulse evaluation not configured These messages are reset by repeating the function correctly.
	 Lock Unlock LED flashes green	Guard locking ▶ Activation failed ▶ Deactivation failed ▶ Activated without request ▶ Deactivated without request
	 Start LED lights up green	One of the assigned start inputs is active.

Module LED	Function LED	Meaning
 Lights up green	 Start LED off	All start inputs inactive
	 Start LED flashes green	▶ One or more input functions can be started, waiting for start signal ▶ When starting with start-up test: start-up test not performed yet
	 Out LED lights up green	Output active
	 Out LED off	Output inactive
 Lights up orange		In addition to the meanings when the Module LED "lights up green", one of the following errors is present: ▶ Supply voltage to semiconductor outputs increased or low ▶ Supply voltage increased or low ▶ Temperature increased or low ▶ Connection between modules disturbed by external influences

Status messages in the STOP state

If myPNOZ is in a STOP state, the states of the inputs and outputs are displayed. All the **Module** LEDs in one zone flash identically. The **Module** LEDs in the following zone flash inversely.

If an error occurs, the **Module** LED switches colour from green to orange. Errors may be:

- ▶ Supply voltage increased or low
- ▶ Supply voltage to semiconductor outputs increased or low
- ▶ Temperature increased or low

If the error is no longer present, the **Module** LED switches back to green. If the error means that a limit value is exceeded, myPNOZ switches to an error state.

Module LED	Function LED	Meaning
 Flashes green	 LED <i>In</i> , <i>Locked</i> or <i>Safe State</i> lights up green	When several inputs are assigned: at least one input is active
	 LED <i>In</i> , <i>Locked</i> or <i>Safe State</i> off	Input inactive
	 <i>Start</i> LED lights up green	Start input active
	 <i>Start</i> LED off	Start input inactive
	 <i>Out</i> LED lights up green	Output active (delay time not yet elapsed)
	 <i>Out</i> LED off	Output inactive
 Flashes orange		In addition to the meanings when the Module LED "flashes green", one of the following errors is present: ▶ Supply voltage to semiconductor outputs increased or low ▶ Supply voltage increased or low ▶ Temperature increased or low Connection between modules disturbed by external influences

13.2 Error messages

The **Module** LED on the affected module displays various types of error messages. The function LEDs provide additional information about the cause of the error. If an error occurs on the head module, then all modules are affected by the error. If the error occurs on an expansion module, then only the zone to which the expansion module belongs is affected.

If several errors occur, only one error at a time is displayed. As soon as the error is rectified, the next error is displayed.

“Error” error messages

“Error” type error messages are mostly wiring errors or errors based on a failure to comply with the technical details.

With this error type

- ▶ All safe outputs are switched off within the reaction time.
- ▶ All instantaneous safe outputs that are affected by the error are switched off immediately.
- ▶ All delayed safe outputs are switched off once the delay time has elapsed.
- ▶ All signal outputs are switched off within the reaction time.

Once the error has been recovered:

- ▶ The **System** rotary switch must be set first to **Stop** and then to **Run**

or

- ▶ The supply voltage must be switched off and then on again.

Module LED	Function LED	Meaning	Remedy
 Flashes red	 No LED flashes	LED on the head module flashes red	
		▶ Supply voltage on the head module >28.8 V	▶ Keep within the permitted supply voltage range (see module's technical details).
		▶ Supply voltage on the head module <19.2 V	
		▶ System rotary switch in invalid intermediate position	▶ Correct the position of the rotary switch.
		LED on the head module or expansion module flashes red	
		▶ Temperature too high or too low	▶ Keep within the permitted temperature range (see module's technical details), otherwise air conditioning may be required.
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State</i> lights up green	When several inputs are assigned: at least one input is active	
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State</i> off	Input inactive	

Module LED	Function LED	Meaning	Remedy
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State 1</i> flashes green	Test pulse T1 not detected at the input	▶ Check the test pulse wiring for short circuits to 24 VDC and to other test pulses (shorts across contacts). ▶ Recover the error.
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State 2</i> flashes green	Test pulse T2 not detected at the input	
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State</i> flashes green	Test pulse not detected at the input	
 Flashes red	 Start LED lights up green	Start input is active	
 Flashes red	 Start LED off	Start input inactive	
 Flashes red	 Out LED lights up green	Output active (delay time not yet elapsed)	
 Flashes red	 Out LED off	Output inactive	

Module LED	Function LED	Meaning	Remedy
 Flashes red	 Out LED flashes green	Error at the output: one <i>Out</i> LED flashes or both <i>Out</i> LEDs flash simultaneously	
		▶ Feedback loop is not closed when starting or attempting to switch on	▶ Check the wiring of the feedback loop. ▶ Recover the error.
		▶ Output is switched off, but there is still voltage at the output	▶ Check the wiring at the output for short circuits. ▶ Recover the error.
		▶ Input capacitance of the connected device is too high	▶ Install a terminal block filter with Pilz order number 772290 or 772291, see operating manual under Accessories, "Terminal block filter".
		Error at the output: Both <i>Out</i> LEDs flash alternately	
		▶ Total current at a module's semiconductor outputs too high	▶ Reduce the total current on the I/O module, e.g. by installing an additional module.
		▶ Supply voltage at a module's semiconductor output too high	▶ Keep within the permitted supply voltage range (see module's technical details).
		▶ Total current at a module's semiconductor outputs briefly very high ▶ Short circuit between two semiconductor outputs on a module ▶ Short circuit between semiconductor output and GND	▶ Rectify the short circuit.

Configuration error messages

myPNOZ regularly checks the configuration. If any deviation from the saved configuration is established, myPNOZ signals a configuration error. Configuration errors generally arise due to an unsaved configuration. For example, the position of a rotary switch was changed, but the configuration was not saved afterwards.

With this error type

- ▶ All safe outputs are switched off.
- ▶ All signal outputs are switched off.

Once a configuration error has been recovered, the configuration must be re-saved and then the **System** rotary switch must be set to **Run** (see [Configuration on the modules \[38\]](#)). If the position of a rotary switch was changed accidentally, the position of the rotary switch must be corrected. It is not necessary to save the configuration again.

Module LED	Function LED	Meaning	Remedy
 Flash orange-green	 No LED flashes	When the configuration is saved: ▶ Module saved in the configuration, but not available	▶ Check that all modules are inserted in the right sequence. ▶ Check whether modules are indicating a communication error, Module LED flashes red-orange. ▶ Select the required configuration. ▶ Save the required configuration.
 Flash orange-green	 All LEDs on a module are quickly flashing green	When the configuration is saved ▶ Module type does not match the saved configuration ▶ More modules present than are saved in the configuration	▶ Check that all modules are inserted in the right sequence. ▶ Select the required configuration. ▶ Save the required configuration.
		When saving of the current configuration has failed ▶ Last module is not an output module (PNOZ yi) ▶ More than eight expansion modules inserted	
			▶ Ensure that an output module (PNOZ yo, PNOZ yio) is inserted as the last module.
			▶ Ensure that no more than eight expansion modules are inserted.
 Flash orange-green	 Both of a module's In LEDs flash green	Configuration error at the input When the configuration is saved: ▶ Position of the mode rotary switch does not match the saved configuration	▶ Correct the position of the rotary switch and save the configuration.
		When saving of the current configuration has failed: ▶ The mode rotary switch is in an invalid intermediate position	▶ Correct the position of the rotary switch.
 Flash orange-green	 PNOZ yi5, PNOZ yi8: all four In LEDs flash green	Incorrect function set on the function rotary switch or function rotary switch at position A but mode rotary switch not at automatic start A	Correct the position of the rotary switch.

Module LED	Function LED	Meaning	Remedy
 Flash orange-green	 PNOZ yi7: Locked LED flashes green	Configuration error at the input	
		When the configuration is saved: ▶ Position of the mode rotary switch does not match the saved configuration	▶ Correct the position of the rotary switch and save the configuration.
		When saving of the current configuration has failed: ▶ The mode rotary switch is in an invalid intermediate position	▶ Correct the position of the rotary switch.
 Flash orange-green	 PNOZ yi7: safe state LED flashes green	Configuration error at the input	
		When the configuration is saved: ▶ Position of the safe state rotary switch does not match the saved configuration	▶ Correct the position of the rotary switch and save the configuration.
		When saving of the current configuration has failed: ▶ The safe state rotary switch is in an invalid intermediate position	▶ Correct the position of the rotary switch.
 Flash orange-green	 Out LED lights up green	▶ Output active (delay time not yet elapsed)	
 Flash orange-green	 A module's Out LED flashes green	Configuration error at the output	
		▶ Position of the n rotary switch does not match the saved configuration	▶ Correct the position of the rotary switch and save the configuration.
		▶ Position of the t[s] rotary switch does not match the saved configuration	
		When saving of the current configuration has failed: ▶ Rotary switch n or t[s] in invalid intermediate position	▶ Correct the position of the rotary switch.

Internal error message

With this error type

- ▶ All safe outputs are switched off immediately.
- ▶ All signal outputs are switched off.
- ▶ Communication is interrupted and subsequent modules indicate a communication error.

Module LED	Function LED	Meaning	Remedy
 Lights up red		▶ Firmware version of head module and expansion module not compatible	▶ Check the compatibility of the firmware versions (head modules see Front view [90] and expansion modules see Product features [97]).
		▶ Internal error	▶ Restart the myPNOZ. ▶ If the error continues to occur, change the module or contact Pilz.

Communication error message

Communication errors occur when communication between the head module and expansion module is disrupted.

With this error type

- ▶ All safe outputs are switched off immediately.
- ▶ All signal outputs are switched off.

Once the connection is stable again and no further errors are present, myPNOZ switches to a STOP state. The **System** rotary switch must be set first to **Stop** and then to **Run**.

Module LED	Function LED	Meaning	Remedy
 Flashes red-orange		▶ No connection to the head module	▶ Ensure that the modules are firmly connected to the bus connectors. ▶ If the modules are firmly connected to the bus connectors: restart myPNOZ. ▶ If the error continues to occur, change the module or contact Pilz.

13.3 Errors on the safe outputs

- ▶ Malfunctions of the relay contacts: if the contacts have welded, reactivation will not be possible after the input circuit has opened.
- ▶ In the case of an error, the delayed outputs may open before the delay time has elapsed.

14 Maintenance and testing

It is not necessary to perform maintenance work on the product in normal operation.

- ▶ Please return any faulty product to Pilz.

14.1 Function test of the relay outputs

When the relay outputs are switched on, the mechanical contact on the relay cannot be tested automatically. Depending on the operational environment, measures to detect the non-opening of switching elements may be required under some circumstances.

When the product is used in accordance with the European Machinery Directive, a check must be carried out to ensure that the safety contacts on the relay outputs open correctly. Restart the product or open the safety contacts (switch off output) so that the internal diagnostics can check that the safety contacts open correctly

- ▶ For SIL 3/PL e at least 1x per month

or

- ▶ For SIL 2/PL d, at least 1x per year.

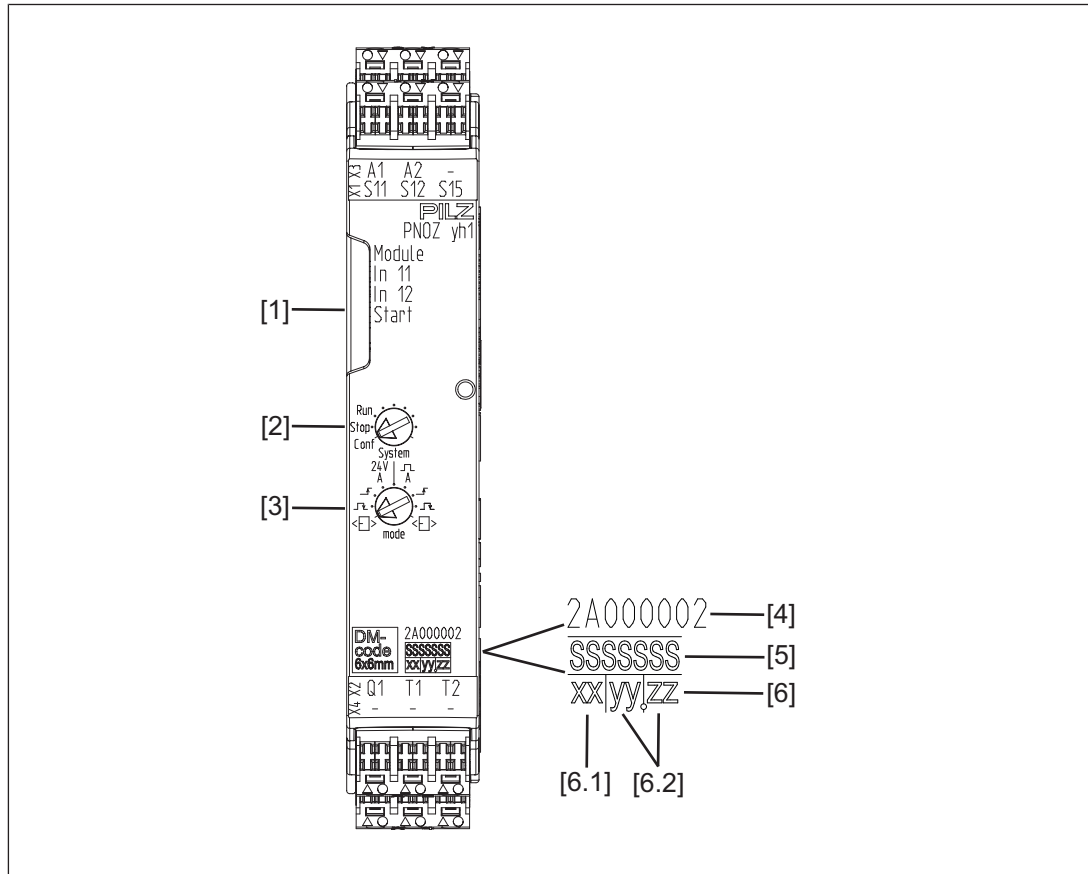
15 Head modules

15.1 PNOZ yh1 2DI 24VDC

15.1.1 Product features

- ▶ Head module for safe applications of the myPNOZ
- ▶ Communication with expansion modules
- ▶ Supply voltage for myPNOZ
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 2 test pulse outputs to detect shorts across contacts and short circuits
- ▶ 1 signal output Q1 as status indicator for input function (S11, S12)
- ▶ 1 **System** rotary switch to select the functions: save system configuration, system stop, system running
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input

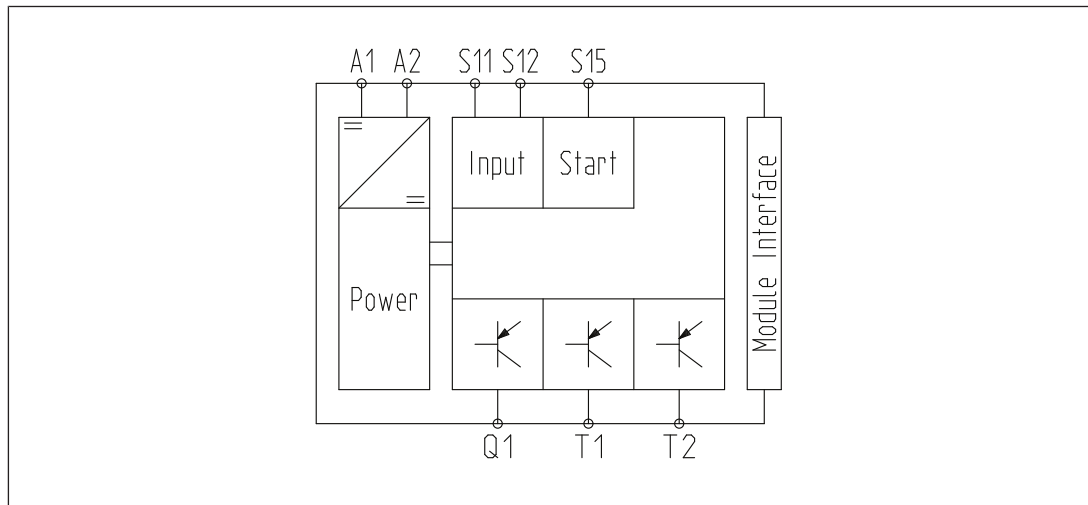
15.1.2 Front view



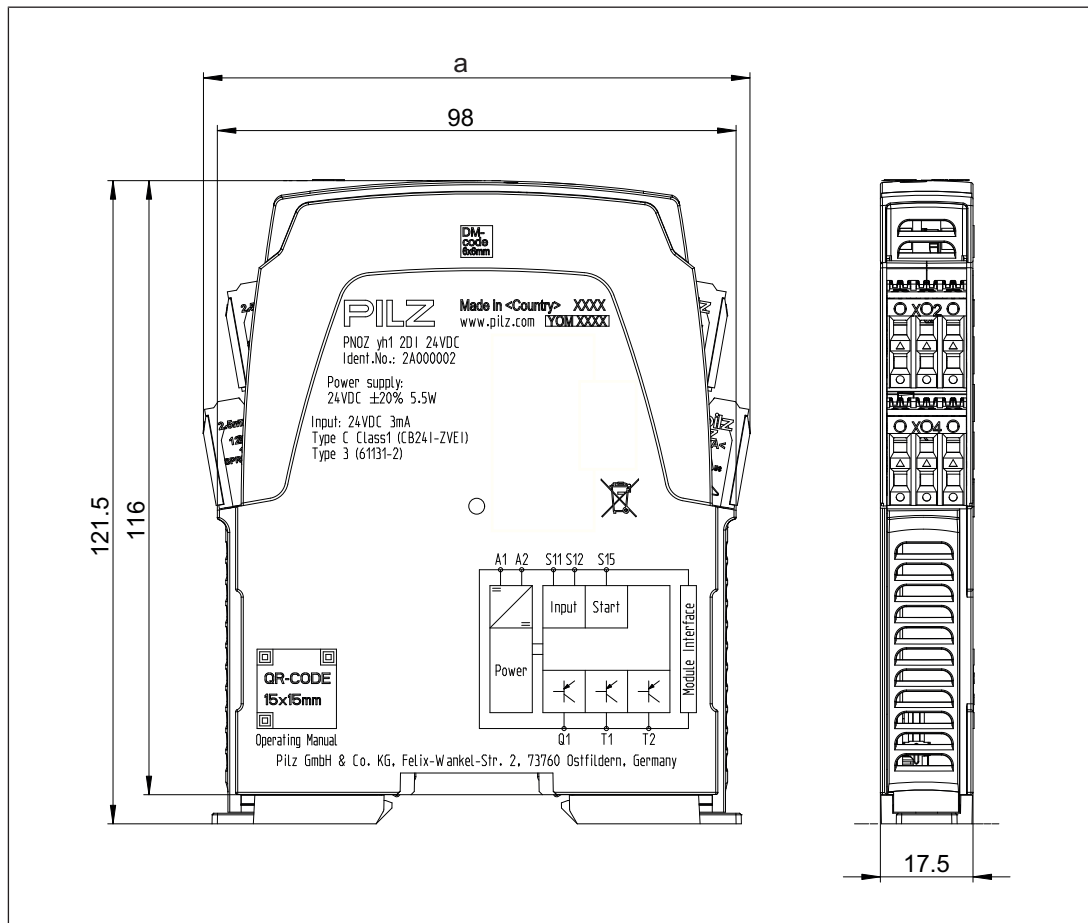
Legend

- [1] LEDs for diagnostics
- [2] **System** rotary switch for configuration and operating states
- [3] **mode** rotary switch for start types and test pulse evaluation (S11, S12)
- [4] Order number
- [5] Serial number
- [6] Product version, consists of:
 - [6.1] Hardware version
 - [6.2] Firmware version, e.g. 0200 = 02.00

15.1.3 Block diagram



15.1.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

15.1.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Supply to the system
Voltage	24 V
Kind	DC
Voltage tolerance	-20 %/+20 %
Min. continuous current that the external power supply must provide	5 A
Inrush current that the external power supply must provide	3 A
Residual ripple DC	20 %
Supply voltage	
Max. current consumption without signal outputs	50 mA
Max. power dissipation of module	1 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	2
Number of start inputs	1
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	1
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Test pulse outputs	
Number of test pulse outputs	2

Test pulse outputs	
Voltage	24 V
Current	0,3 A
Max. duration of off time during self test	4 ms
Short circuit-proof	Yes
Sum of individual cable runs at the test pulse output	6 km
Potential isolation	No
Times	
Recovery time at max. switching frequency 1/s after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start with rising edge	100 ms
with rising and falling edge	150 ms
Max. start pulse duration with a monitored start with rising and falling edge	2 s
Supply interruption before de-energisation	20 ms
Simultaneity, input circuit	∞
Environmental data	
Ambient temperature in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C
Storage temperature in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C
Climatic suitability in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
Max. operating height above SL	5000 m
EMC	EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4
Vibration in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm
Shock stress in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms
Airgap creepage in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2

Environmental data

Protection type	
in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Mechanical data

Mounting position	Any
DIN rail	
Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	17,5 mm
Depth	121 mm
Weight	86 g

15.1.6 Safety characteristic data



NOTICE

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

Unit	Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN 62061 SIL CL/ max. SIL	EN 62061 61508 PFH _D [1/h]	IEC 61511 61508 SIL	IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
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Logic								
CPU	2-channel	PL e	Cat. 4	SIL 3	1,51E-10	SIL 3	1,32E-05	20
Input								
Inputs	2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

15.1.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF

15.1.8 Order reference

15.1.8.1 Product

Product type	Features	Order no.
PNOZ yh1 2DI 24VDC	Head module for the modular safety relay myPNOZ, communication with expansion modules, supply voltage for myPNOZ, 1 input function, 2 test pulse outputs for detection of shorts across contacts and short circuits, 1 signal output, 1 rotary switch for selecting the functions, 1 rotary switch for setting the start type and test pulse evaluation, LED display	2A000002

15.1.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003
Adhesive seal for myPNOZ (20 pieces)	Adhesive seal for myPNOZ to protect potentiometer settings from manipulation	2A000200

16 Expansion modules

16.1 PNOZ yi1 4DI

16.1.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 2 input functions to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ Input functions are AND-linked
- ▶ 2 signal outputs (from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
- ▶ 1 **mode 1** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **mode 2** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input



NOTICE

Required firmware version of the head module for signal outputs Q10, Q20: ≥ 02.00

The new signal outputs Q10, Q20 only work from this firmware version onwards. The firmware version is stated on the head module (see head module [Front view](#)  90).

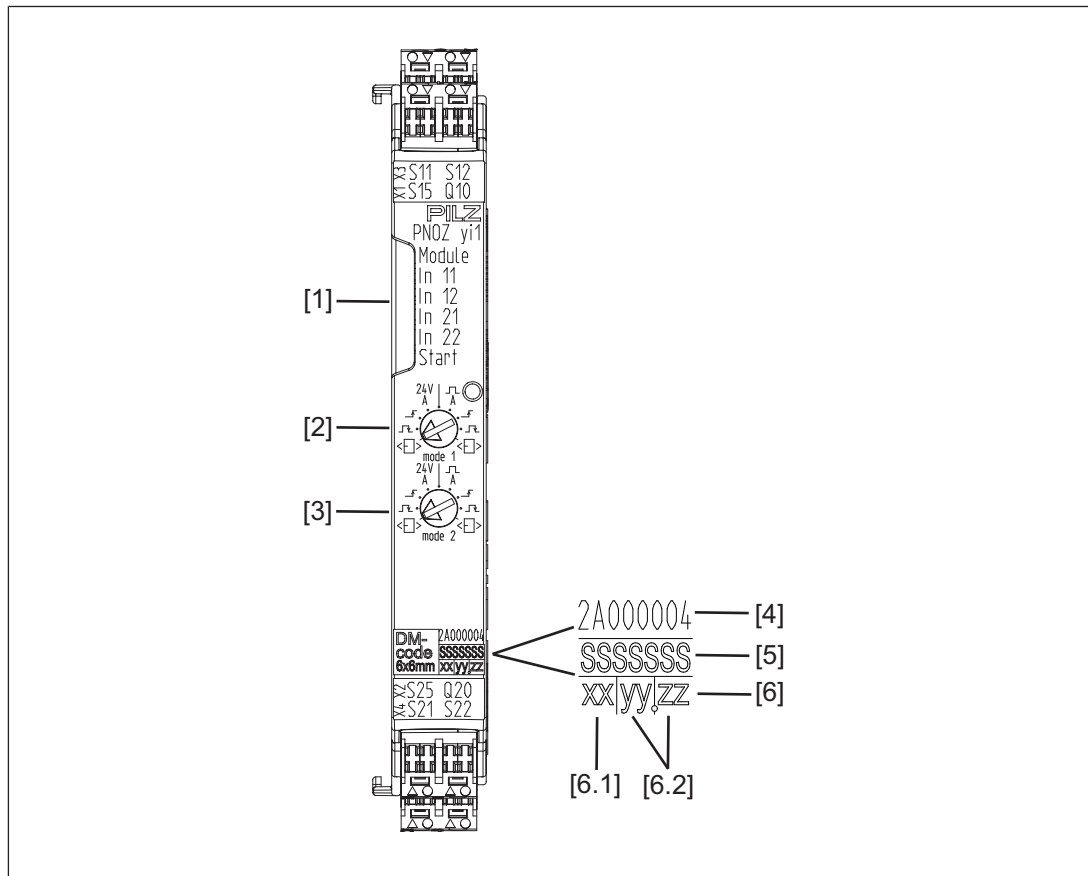


NOTICE

An expansion module with hardware version 02 is installed together with a head module with firmware version 01.00:

The expansion module with hardware version 02 will then function in the same way as an expansion module with hardware version 01, without signal outputs Q10, Q20.

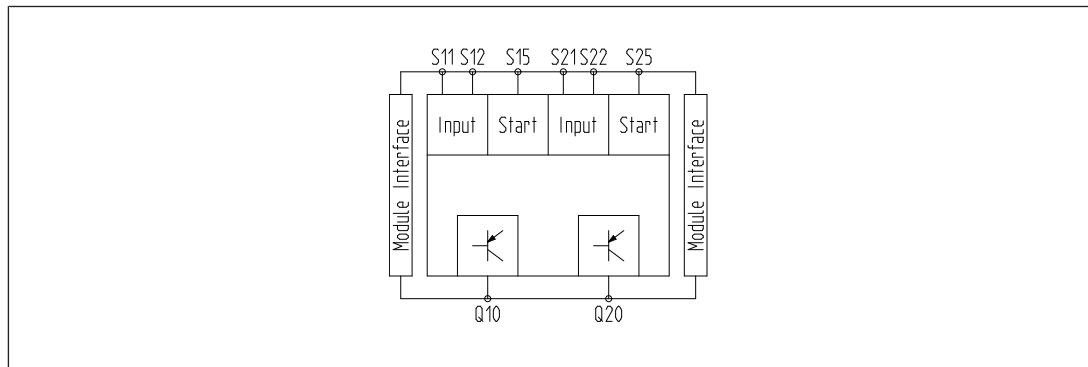
16.1.2 Front view



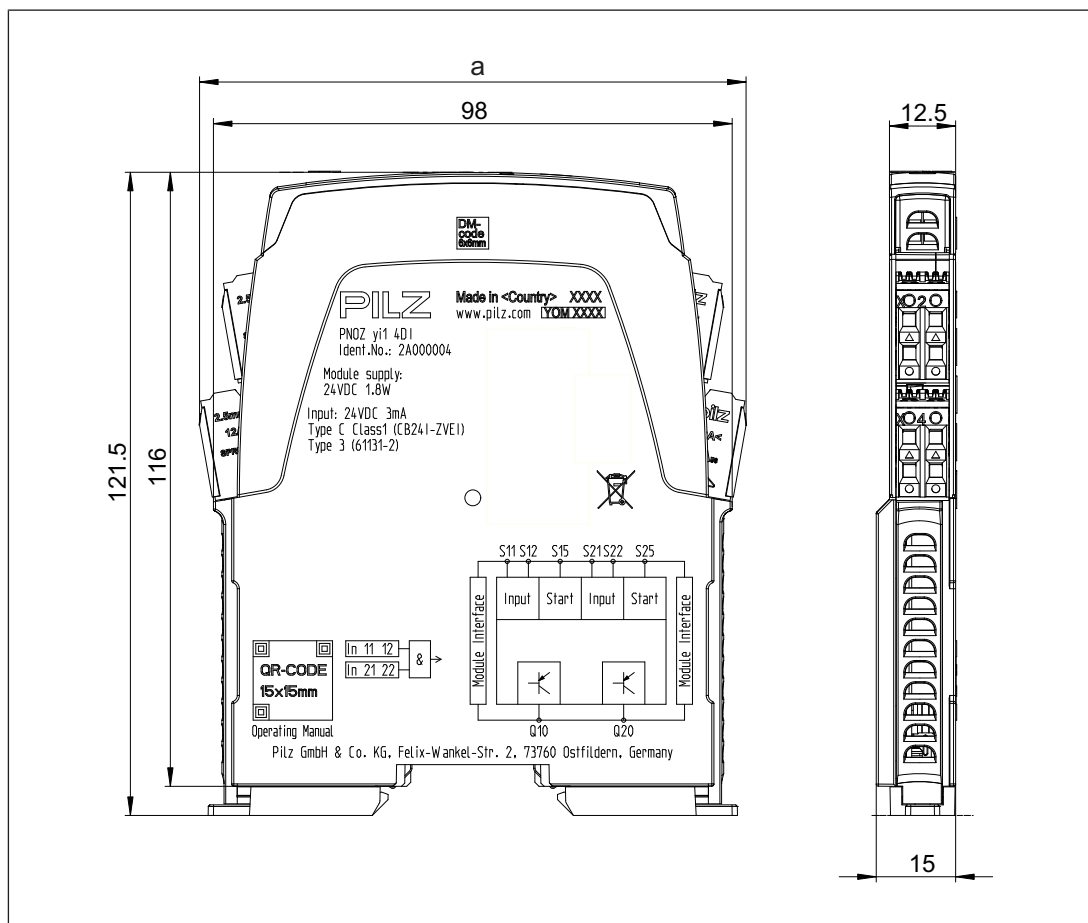
Legend

- [1] LEDs for diagnostics
- [2] **mode 1** rotary switch for start types and test pulse evaluation (S11, S12)
- [3] **mode 2** rotary switch for start types and test pulse evaluation (S21, S22)
- [4] Order number
- [5] Serial number
- [6] Product version, consists of:
 - [6.1] Hardware version
 - [6.2] Firmware version, e.g. 0200 = 02.00

16.1.3 Block diagram



16.1.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.1.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	35 mA
Max. power dissipation of module	0,81 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	4
Number of start inputs	2
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _I max	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	2
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Recovery time at max. switching frequency 1/s after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start	
with rising edge	100 ms
with rising and falling edge	150 ms

Times

Max. start pulse duration with a monitored start

with rising and falling edge **2 s**Supply interruption before de-energisation **20 ms**Simultaneity, input circuit **∞****Environmental data**

Ambient temperature

in accordance with the standard **EN 60068-2-14**Temperature range **-20 - 55 °C**

Storage temperature

in accordance with the standard **EN 60068-2-1/-2**Temperature range **-40 - 85 °C**

Climatic suitability

in accordance with the standard **EN 60068-2-78**Condensation during operation **Not permitted**Max. operating height above SL **5000 m**EMC **EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4**

Vibration

in accordance with the standard **EN 60068-2-6**Frequency **10 - 55 Hz**Amplitude **0,35 mm**

Shock stress

in accordance with the standard **EN 60068-2-27**Acceleration **15g**Duration **11 ms**

Airgap creepage

in accordance with the standard **EN 60947-5-1**Overvoltage category **III**Pollution degree **2**

Protection type

in accordance with the standard **EN 60529**Housing **IP20**Terminals **IP20**Mounting area (e.g. control cabinet) **IP54****Mechanical data**Mounting position **Any**

DIN rail

Top hat rail **35 x 7,5 EN/IEC 60715**Recess width **27 mm**

Material

Bottom **PC**Top **PC**Connection type **Spring-loaded terminal, screw terminal**Mounting type **plug-in**

Mechanical data

Conductor cross section with screw terminals

1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
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2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
---	---

2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
---	---

Torque setting with screw terminals	0,5 Nm
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Stripping length with screw terminals	7 mm
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Conductor cross section with spring-loaded terminals:

Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
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Spring-loaded terminals: Terminal points per connection	2
---	----------

Stripping length with spring-loaded terminals	9 mm
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Dimensions

Height	98 mm
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Width	12,5 mm
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Depth	121 mm
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Weight	75 g
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16.1.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.1.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF

16.1.8 Order reference

16.1.8.1 Product

Product type	Features	Order no.
PNOZ yi1 4DI	Expansion module for the modular safety relay myPNOZ, 2 input functions, input functions AND-linked, 2 signal outputs, 2 rotary switches for setting the start type and test pulse evaluation, LED display	2A000004

16.1.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 12.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	750002
PNOZ s Setspring loaded terminals 12.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	751002

16.2 PNOZ yi2 4DI OR

16.2.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 2 input functions to connect safety gate switch or light curtain and start button, for example
- ▶ Input functions are OR-linked
- ▶ 2 signal outputs (from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
- ▶ 1 **mode 1** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **mode 2** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input



NOTICE

Required firmware version of the head module for signal outputs Q10, Q20: ≥ 02.00

The new signal outputs Q10, Q20 only work from this firmware version onwards. The firmware version is stated on the head module (see head module [Front view](#)  90).

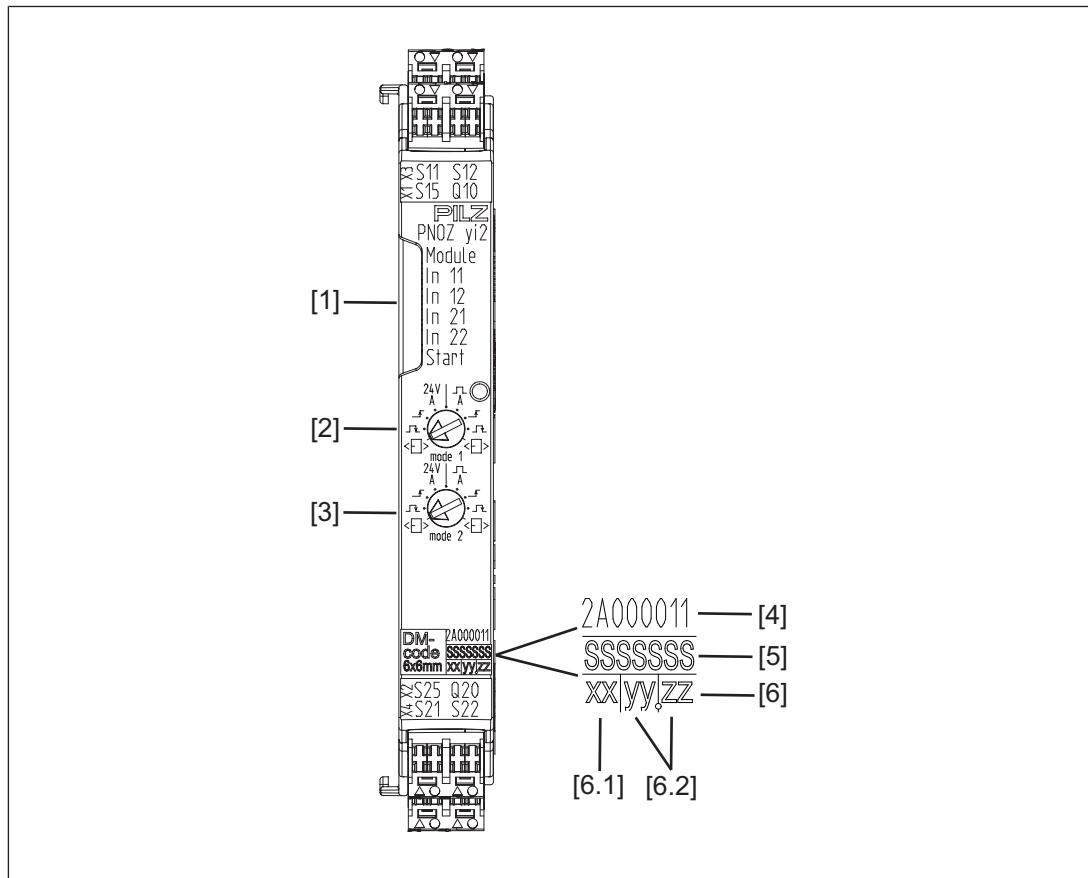


NOTICE

An expansion module with hardware version 02 is installed together with a head module with firmware version 01.00:

The expansion module with hardware version 02 will then function in the same way as an expansion module with hardware version 01, without signal outputs Q10, Q20.

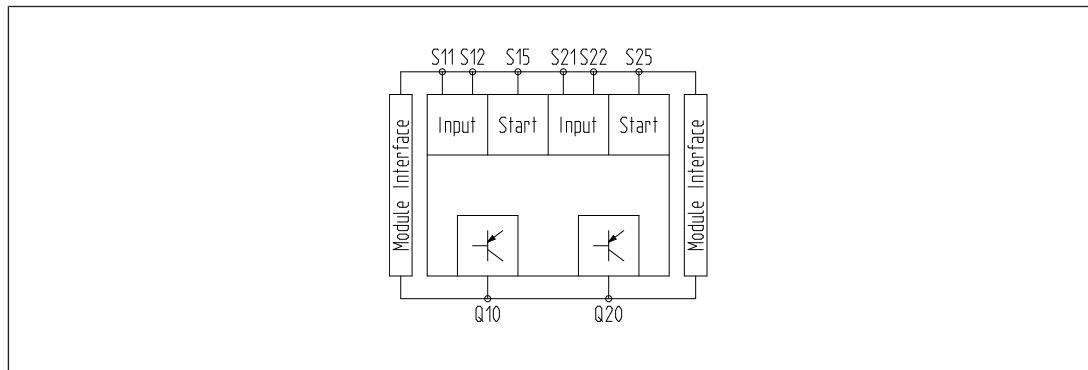
16.2.2 Front view



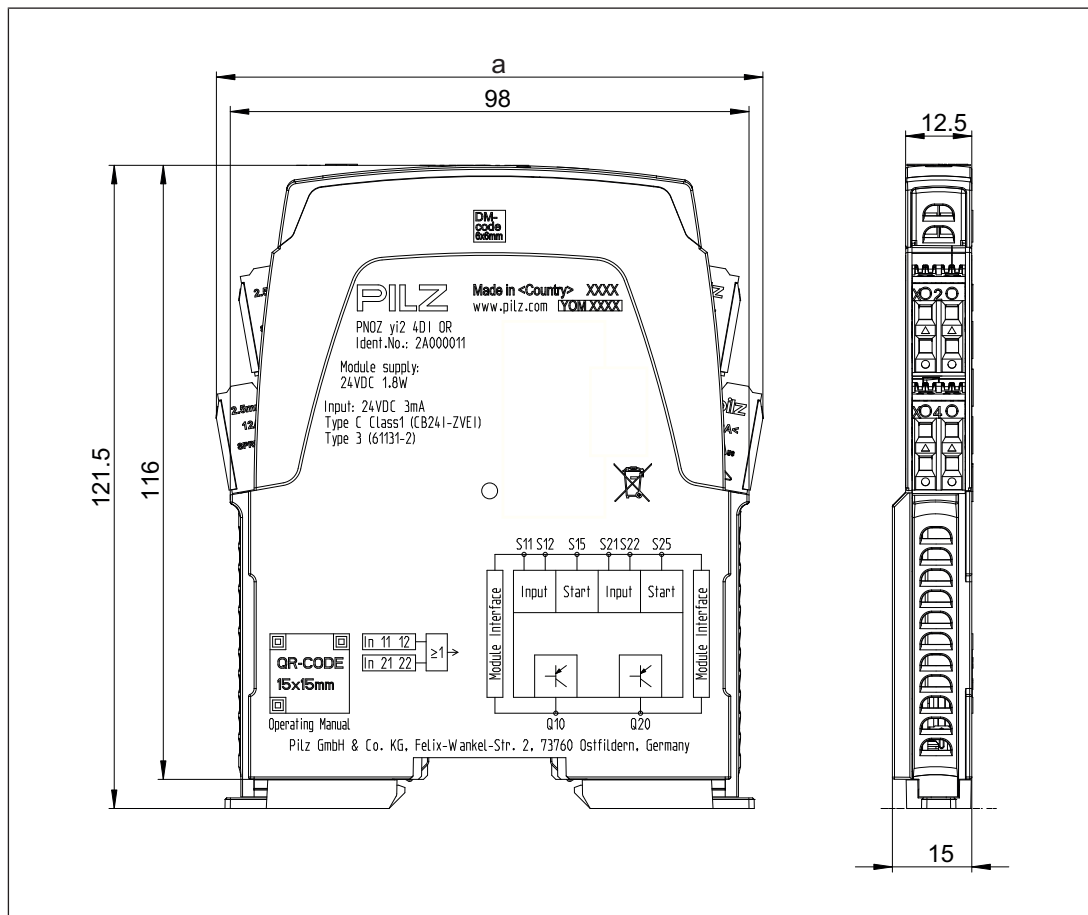
Legend

- [1] LEDs for diagnostics
- [2] **mode 1** rotary switch for start types and test pulse evaluation (S11, S12)
- [3] **mode 2** rotary switch for start types and test pulse evaluation (S21, S22)
- [4] Order number
- [5] Serial number
- [6] Product version, consists of:
 - [6.1] Hardware version
 - [6.2] Firmware version, e.g. 0200 = 02.00

16.2.3 Block diagram



16.2.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.2.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	35 mA
Max. power dissipation of module	0,81 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	4
Number of start inputs	2
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _I max	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	2
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Recovery time at max. switching frequency 1/s after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start	
with rising edge	100 ms
with rising and falling edge	150 ms

Times

Max. start pulse duration with a monitored start

with rising and falling edge **2 s**Supply interruption before de-energisation **20 ms**Simultaneity, input circuit **∞****Environmental data**

Ambient temperature

in accordance with the standard **EN 60068-2-14**Temperature range **-20 - 55 °C**

Storage temperature

in accordance with the standard **EN 60068-2-1/-2**Temperature range **-40 - 85 °C**

Climatic suitability

in accordance with the standard **EN 60068-2-78**

Condensation during operation

Not permitted

Max. operating height above SL

5000 m

EMC

EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4

Vibration

in accordance with the standard **EN 60068-2-6**Frequency **10 - 55 Hz**Amplitude **0,35 mm**

Shock stress

in accordance with the standard **EN 60068-2-27**Acceleration **15g**Duration **11 ms**

Airgap creepage

in accordance with the standard **EN 60947-5-1**Overvoltage category **III**Pollution degree **2**

Protection type

in accordance with the standard **EN 60529**Housing **IP20**Terminals **IP20**Mounting area (e.g. control cabinet) **IP54****Mechanical data**Mounting position **Any**

DIN rail

Top hat rail **35 x 7,5 EN/IEC 60715**Recess width **27 mm**

Material

Bottom **PC**Top **PC**

Connection type

Spring-loaded terminal, screw terminal

Mounting type

plug-in

Mechanical data

Conductor cross section with screw terminals

1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
-----------------	---

2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
---	---

2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
---	---

Torque setting with screw terminals	0,5 Nm
-------------------------------------	---------------

Stripping length with screw terminals	7 mm
---------------------------------------	-------------

Conductor cross section with spring-loaded terminals:

Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
---------------------------------------	--

Spring-loaded terminals: Terminal points per connection	2
---	----------

Stripping length with spring-loaded terminals	9 mm
---	-------------

Dimensions

Height	98 mm
--------	--------------

Width	12,5 mm
-------	----------------

Depth	121 mm
-------	---------------

Weight	75 g
--------	-------------

16.2.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T_M [year]
2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.2.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF

16.2.8 Order reference

16.2.8.1 Product

Product type	Features	Order no.
PNOZ yi2 4DI OR	Expansion module for the modular safety relay myPNOZ, 2 input functions, input functions OR-linked, 2 signal outputs, 2 rotary switches for setting the start type and test pulse evaluation, LED display	2A000011

16.2.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 12.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	750002
PNOZ s Setspring loaded terminals 12.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	751002

16.3 PNOZ yi3 2DI T3A

16.3.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 1 input function to connect a two-hand pushbutton (Type III A)
- ▶ Input functions are AND-linked
- ▶ 1 signal output Q20 (from hardware version 02) as status indicator for input function (S21, S22)
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input



NOTICE

The expansion module PNOZ yi3 2DI T3A may not be used on press controllers. For these we recommend the expansion module PNOZ yi4. It is only suitable for use where the risk analysis has established a low level of risk (e.g. EN ISO 13849-1 Cat. 1)



NOTICE

Required firmware version of the head module for signal output Q20: ≥ 02.00

The new signal output Q20 only works from this firmware version onwards. The firmware version is stated on the head module (see head module [Front view](#) [ 90]).

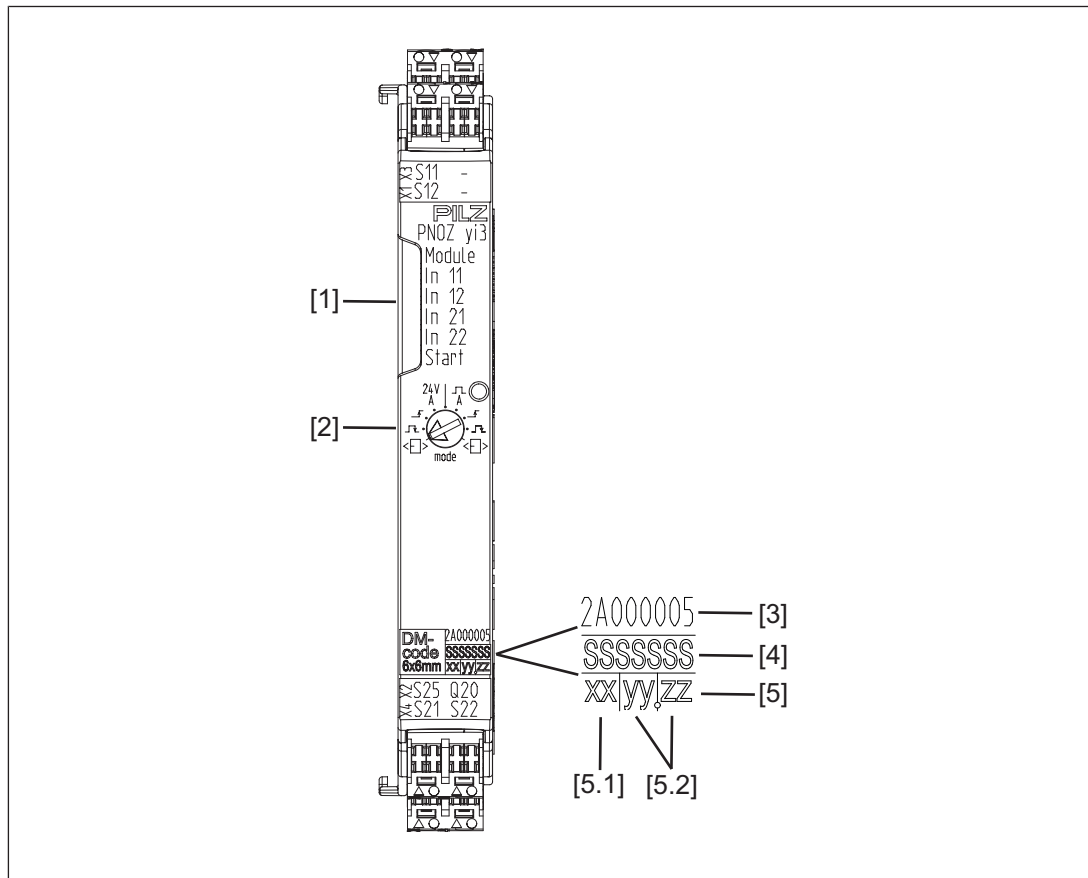


NOTICE

An expansion module with hardware version 02 is installed together with a head module with firmware version 01.00:

The expansion module with hardware version 02 will then function in the same way as an expansion module with hardware version 01, without signal output Q20.

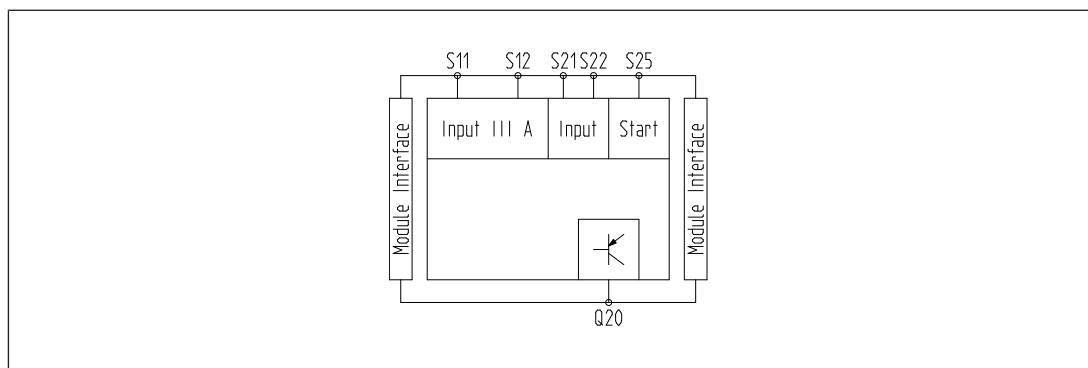
16.3.2 Front view



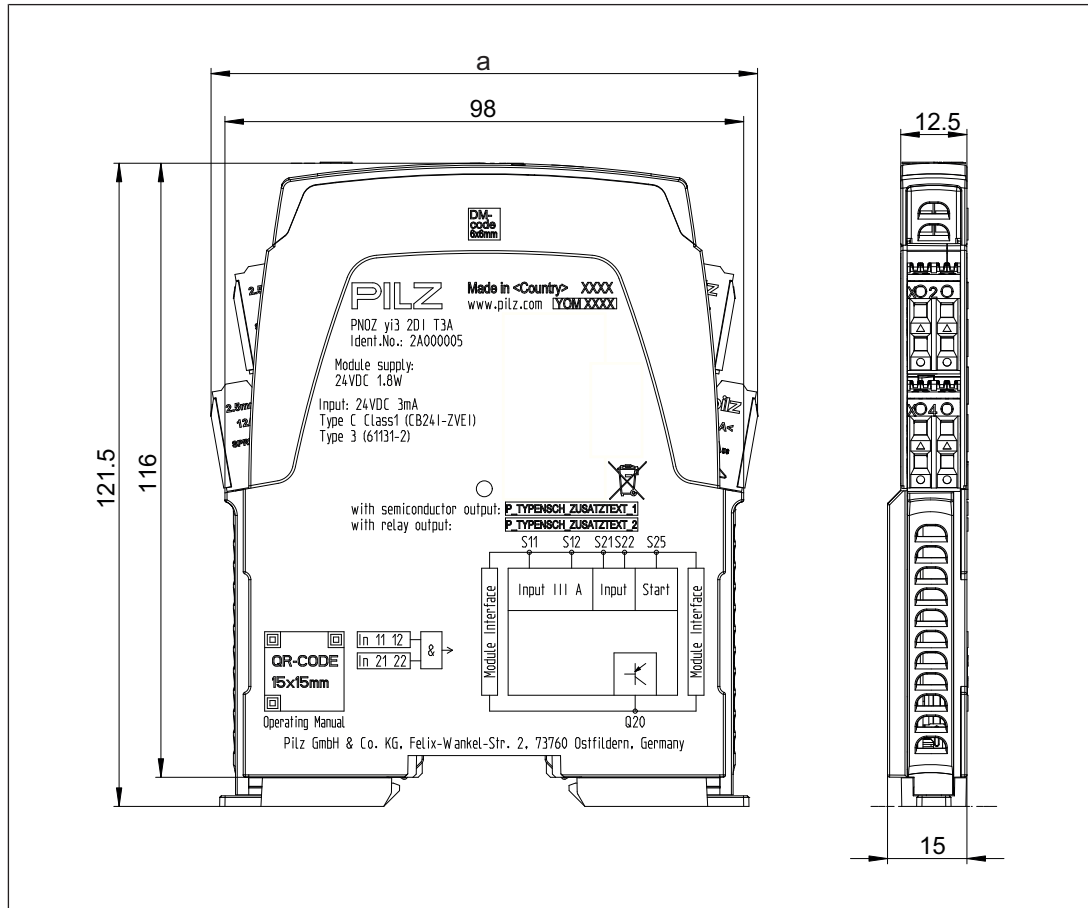
Legend

- [1] LEDs for diagnostics
- [2] **mode** rotary switch for start types and test pulse evaluation (S21, S22)
- [3] Order number
- [4] Serial number
- [5] Product version, consists of:
 - [5.1] Hardware version
 - [5.2] Firmware version, e.g. 0200 = 02.00

16.3.3 Block diagram



16.3.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.3.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	35 mA
Max. power dissipation of module	0,73 W
Duty cycle	100 %
Status indicator	LED
Two-hand control relay type	
in accordance with the standard	ISO 13851
Type	III A
Inputs	
Quantity	4
Number of start inputs	1
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	1
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Recovery time at max. switching frequency 1/s	
after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms

Times

Min. start pulse duration with a monitored start

with rising edge **100 ms**with rising and falling edge **150 ms**

Max. start pulse duration with a monitored start

with rising and falling edge **2 s**

Supply interruption before de-energisation

20 ms

Simultaneity in the two-hand circuit

0,5 s

Simultaneity, input circuit

∞**Environmental data**

Ambient temperature

in accordance with the standard **EN 60068-2-14**Temperature range **-20 - 55 °C**

Storage temperature

in accordance with the standard **EN 60068-2-1/-2**Temperature range **-40 - 85 °C**

Climatic suitability

in accordance with the standard **EN 60068-2-78**

Condensation during operation

Not permitted

Max. operating height above SL

5000 m

EMC

EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4

Vibration

in accordance with the standard **EN 60068-2-6**Frequency **10 - 55 Hz**Amplitude **0,35 mm**

Shock stress

in accordance with the standard **EN 60068-2-27**Acceleration **15g**Duration **11 ms**

Airgap creepage

in accordance with the standard **EN 60947-5-1**Overvoltage category **III**Pollution degree **2**

Protection type

in accordance with the standard **EN 60529**Housing **IP20**Terminals **IP20**Mounting area (e.g. control cabinet) **IP54****Mechanical data**

Mounting position

Any

DIN rail

Top hat rail **35 x 7,5 EN/IEC 60715**Recess width **27 mm**

Mechanical data

Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm ² , 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm ² , 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm ² , 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm ² , 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	12,5 mm
Depth	121 mm
Weight	73 g

16.3.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20
Two-hand function	PL c	Cat. 2	SIL 1	6,07E-09	SIL 1	5,32E-04	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.3.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF

16.3.8 Order reference

16.3.8.1 Product

Product type	Features	Order no.
PNOZ yi3 2DI T3A	Expansion module for the modular safety relay myPNOZ, 1 input function, 1 input function for connection to a two-hand pushbutton (Type III A), input functions AND-linked, 1 signal output, 1 rotary switch for setting the start type and test pulse evaluation, LED display	2A000005

16.3.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 12.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	750002
PNOZ s Setspring loaded terminals 12.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	751002

16.4 PNOZ yi4 2DI T3C

16.4.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 1 input function to connect a two-hand pushbutton (Type III C)
- ▶ Input functions are AND-linked
- ▶ 1 signal output Q20 (from hardware version 02) as status indicator for input function (S21, S22)
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input



NOTICE

**Required firmware version of the head module for signal output Q20:
≥ 02.00**

The new signal output Q20 only works from this firmware version onwards. The firmware version is stated on the head module (see head module [Front view](#) [ 90]).

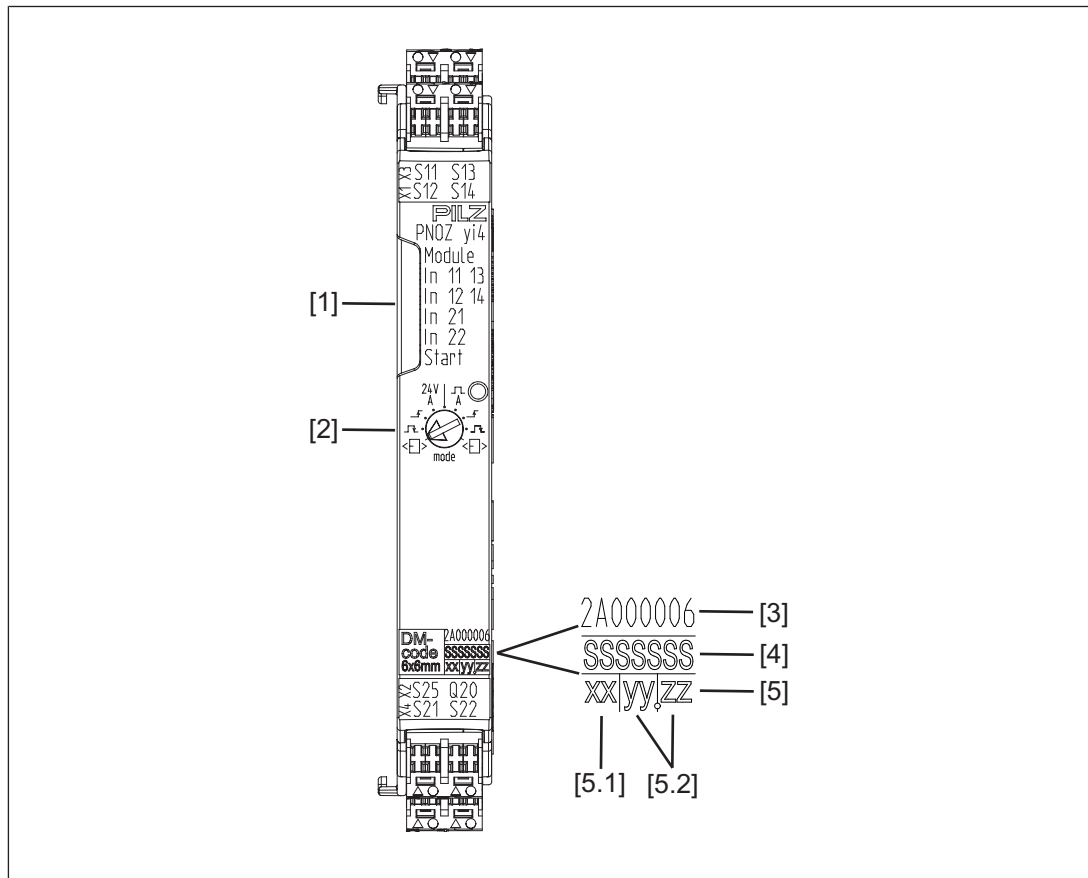


NOTICE

An expansion module with hardware version 02 is installed together with a head module with firmware version 01.00:

The expansion module with hardware version 02 will then function in the same way as an expansion module with hardware version 01, without signal output Q20.

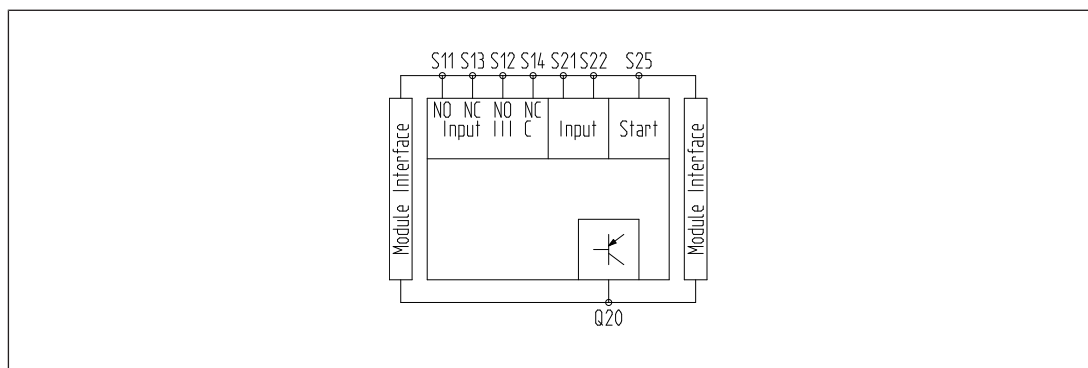
16.4.2 Front view



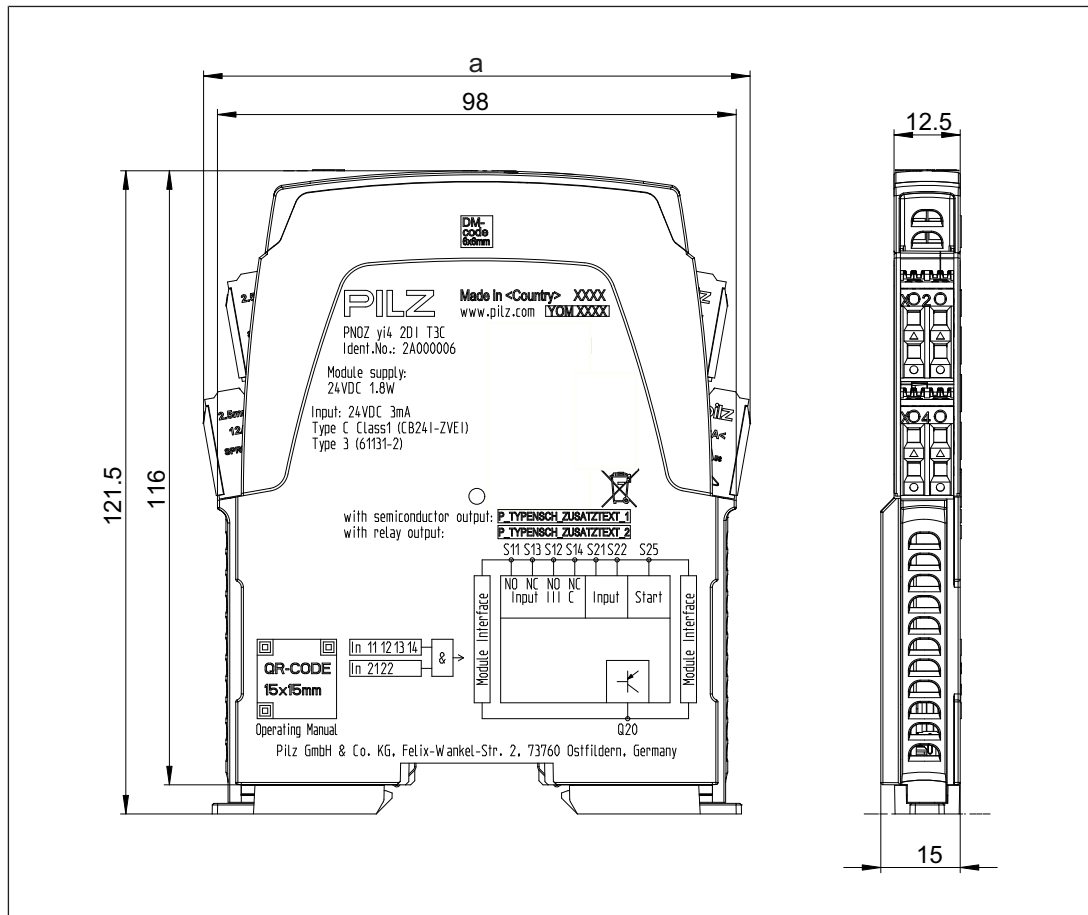
Legend

- [1] LEDs for diagnostics
- [2] **mode** rotary switch for start types and test pulse evaluation (S21, S22)
- [3] Order number
- [4] Serial number
- [5] Product version, consists of:
 - [5.1] Hardware version
 - [5.2] Firmware version, e.g. 0200 = 02.00

16.4.3 Block diagram



16.4.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.4.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	35 mA
Max. power dissipation of module	0,89 W
Duty cycle	100 %
Status indicator	LED
Two-hand control relay type	
in accordance with the standard	ISO 13851
Type	III C
Inputs	
Quantity	6
Number of start inputs	1
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	1
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Recovery time at max. switching frequency 1/s	
after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms

Times

Min. start pulse duration with a monitored start

with rising edge **100 ms**with rising and falling edge **150 ms**

Max. start pulse duration with a monitored start

with rising and falling edge **2 s**

Supply interruption before de-energisation

20 ms

Simultaneity in the two-hand circuit

0,5 s

Simultaneity, input circuit

∞**Environmental data**

Ambient temperature

in accordance with the standard **EN 60068-2-14**Temperature range **-20 - 55 °C**

Storage temperature

in accordance with the standard **EN 60068-2-1/-2**Temperature range **-40 - 85 °C**

Climatic suitability

in accordance with the standard **EN 60068-2-78**

Condensation during operation

Not permitted

Max. operating height above SL

5000 m

EMC

EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4

Vibration

in accordance with the standard **EN 60068-2-6**Frequency **10 - 55 Hz**Amplitude **0,35 mm**

Shock stress

in accordance with the standard **EN 60068-2-27**Acceleration **15g**Duration **11 ms**

Airgap creepage

in accordance with the standard **EN 60947-5-1**Overvoltage category **III**Pollution degree **2**

Protection type

in accordance with the standard **EN 60529**Housing **IP20**Terminals **IP20**Mounting area (e.g. control cabinet) **IP54****Mechanical data**

Mounting position

Any

DIN rail

Top hat rail **35 x 7,5 EN/IEC 60715**Recess width **27 mm**

Mechanical data

Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm ² , 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm ² , 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm ² , 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm ² , 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	12,5 mm
Depth	121 mm
Weight	74 g

16.4.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20
Two-hand function	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.4.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF

16.4.8 Order reference

16.4.8.1 Product

Product type	Features	Order no.
PNOZ yi4 2DI T3C	Expansion module for the modular safety relay myPNOZ, 1 input function, 1 input function for connection to a two-hand pushbutton (Type III C), input functions AND-linked, 1 signal output, 1 rotary switch for setting the start type and test pulse evaluation, LED display	2A000006

16.4.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 12.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	750002
PNOZ s Setspring loaded terminals 12.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	751002

16.5 PNOZ yi5 8DI variable

16.5.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Variable input functions:
 - 4 input functions with autostart function (S11/S12, S21/S22, S31/S32 and S41/S42), to connect E-STOP pushbutton, safety gate switch or light curtain, for example, when the input functions are AND-linked
 - or
 - 3 input functions (S11/S12, S21/S22 and S31/S32) to connect E-STOP pushbutton, safety gate switch or light curtain and start button (S41), for example, when the input functions are AND-linked
 - or
 - 3 input functions (S11/S12, S21/S22 and S31/S32) to connect E-STOP pushbutton, safety gate switch or light curtain and start button (S41), for example, when the input functions are OR-linked
 - or
 - 3 input functions (S11/S12, S21/S22 and S31/S32) to connect E-STOP pushbutton, safety gate switch or light curtain and start button (S41), for example, when the input functions are 2oo3-linked
- ▶ 4 signal outputs as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
 - Q30 for input function (S31, S32)
 - Q40 for input function (S41, S42)
- ▶ 1 **function** rotary switch to select functions
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input

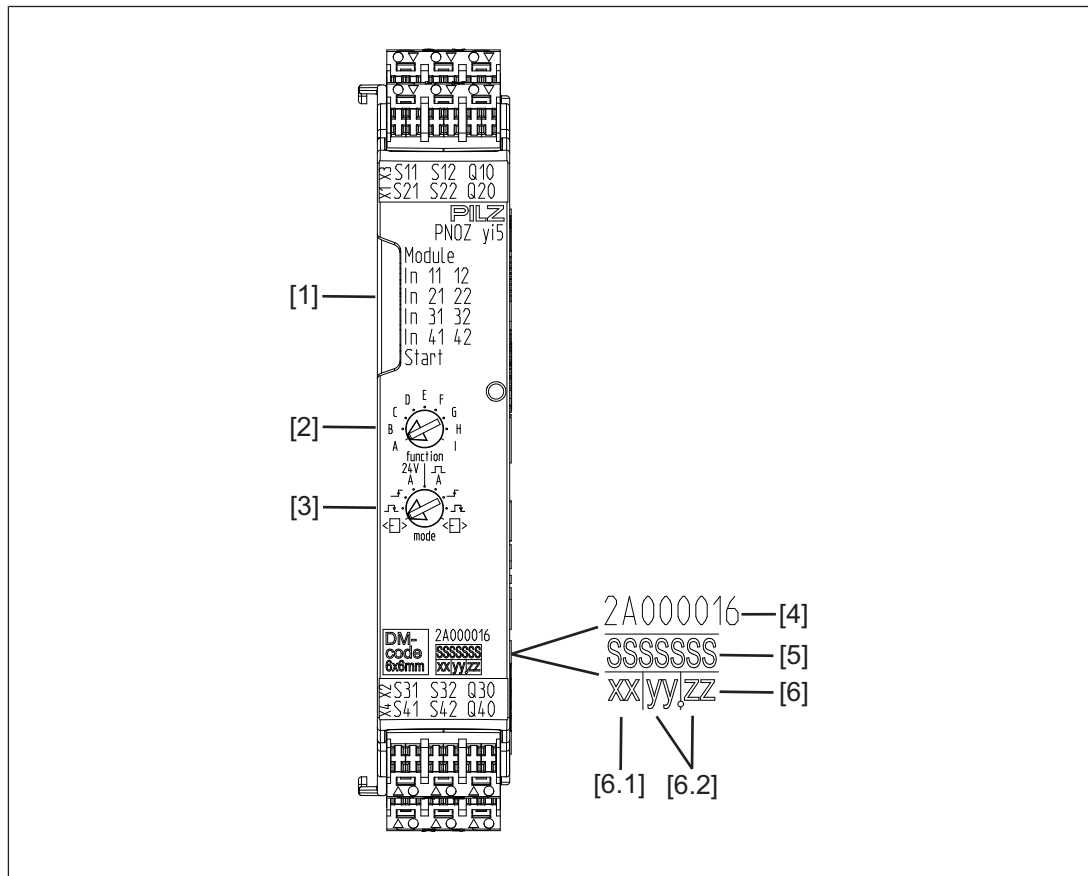


NOTICE

Required firmware version of the head module: ≥ 03.00

The expansion module also only works from this firmware version. The firmware version is stated on the head module (see head module [Front view](#)  90).

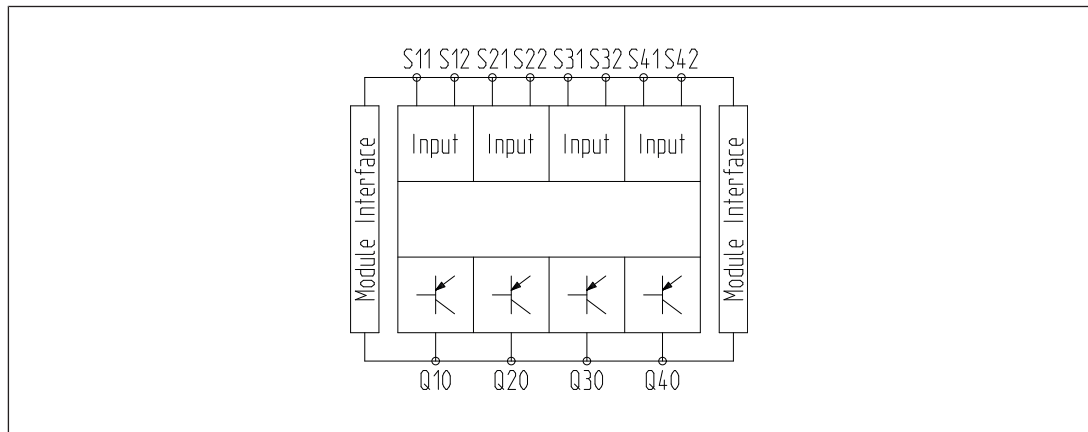
16.5.2 Front view



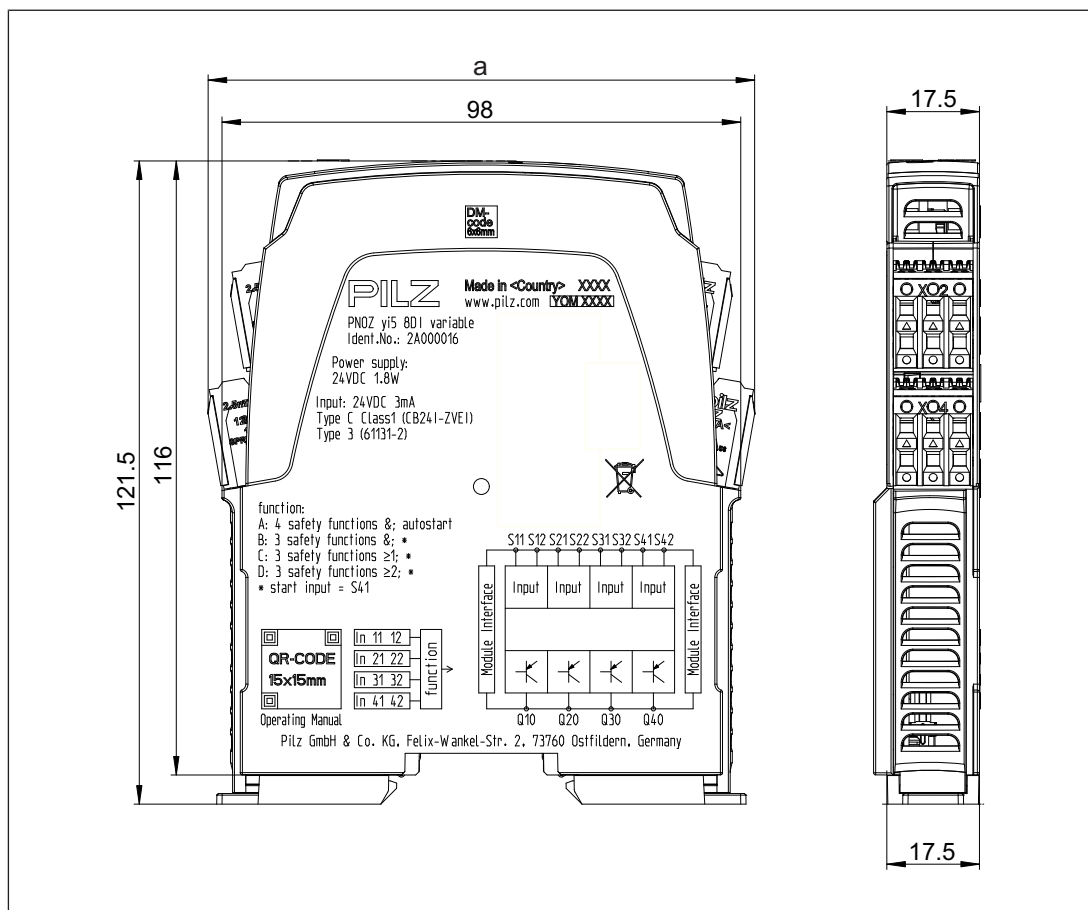
Legend

- [1] LEDs for diagnostics
- [2] **function** rotary switch for function selection
- [3] **mode** rotary switch for start types and test pulse evaluation
- [4] Order number
- [5] Serial number
- [6] Product version, consists of:
 - [6.1] Hardware version
 - [6.2] Firmware version, e.g. 0200 = 02.00

16.5.3 Block diagram



16.5.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.5.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CE, CE, TÜV, TÜV, UKCA, cULus Listed, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	35 mA
Max. power dissipation of module	0,97 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	8
Number of start inputs	1
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _I max	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	4
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Recovery time at max. switching frequency 1/s after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start	
with rising edge	100 ms
with rising and falling edge	150 ms

Times

Max. start pulse duration with a monitored start

with rising and falling edge **2 s**Supply interruption before de-energisation **20 ms**Simultaneity, input circuit **∞****Environmental data**

Ambient temperature

in accordance with the standard **EN 60068-2-14**Temperature range **-20 - 55 °C**

Storage temperature

in accordance with the standard **EN 60068-2-1/-2**Temperature range **-40 - 85 °C**

Climatic suitability

in accordance with the standard **EN 60068-2-78**Condensation during operation **Not permitted**Max. operating height above SL **5000 m**EMC **EN 60947-5-1, EN 60947-5-1, EN 61326-3-1, EN 61326-3-1, EN IEC 61000-6-4, EN IEC 61000-6-4**

Vibration

in accordance with the standard **EN 60068-2-6**Frequency **10 - 55 Hz**Amplitude **0,35 mm**

Shock stress

in accordance with the standard **EN 60068-2-27**Acceleration **15g**Duration **11 ms**

Airgap creepage

in accordance with the standard **EN 60947-5-1**Overvoltage category **III**Pollution degree **2**

Protection type

in accordance with the standard **EN 60529**Housing **IP20**Terminals **IP20**Mounting area (e.g. control cabinet) **IP54****Mechanical data**Mounting position **Any**

DIN rail

Top hat rail **35 x 7,5 EN/IEC 60715**Recess width **27 mm**

Material

Bottom **PC**Top **PC**

Connection type

—

Mounting type

plug-in

Mechanical data

Conductor cross section with screw terminals

1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
-----------------	---

2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
---	---

2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
---	---

Torque setting with screw terminals	0,5 Nm
-------------------------------------	---------------

Stripping length with screw terminals	7 mm
---------------------------------------	-------------

Conductor cross section with spring-loaded terminals:

Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
---------------------------------------	--

Spring-loaded terminals: Terminal points per connection	2
---	----------

Stripping length with spring-loaded terminals	9 mm
---	-------------

Dimensions

Height	98 mm
--------	--------------

Width	17,5 mm
-------	----------------

Depth	121 mm
-------	---------------

Weight	84 g
--------	-------------

16.5.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.5.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C1, C2, C2, C3, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF

16.5.8 Order reference

16.5.8.1 Product

Product type	Features	Order no.
PNOZ yi5 8DI variable	Expansion module for the modular safety relay myPNOZ, variable input functions with 3 or 4 input functions, input functions AND-linked or input functions OR-linked or input functions 2oo3-linked, 4 signal outputs, 1 rotary switch for setting the function, 1 rotary switch for setting the start type and test pulse evaluation, LED display	2A000016

16.5.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003

16.6 PNOZ yi6 4DI bypass

16.6.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 2 input functions to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ Input functions are AND-linked
- ▶ Module input result is OR-linked with the logic result of the left-hand inputs from the same zone
- ▶ 2 signal outputs as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
- ▶ 1 **mode 1** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **mode 2** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input

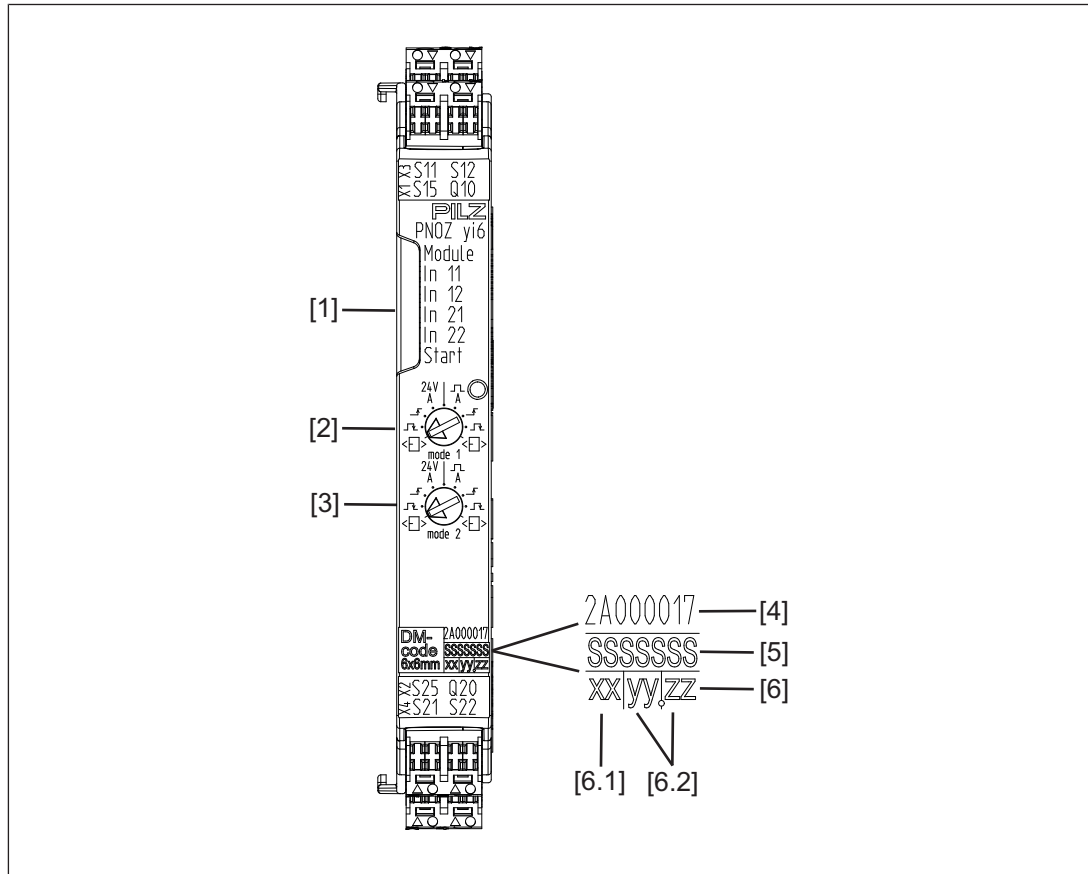


NOTICE

Required firmware version of the head module: ≥ 03.00

The expansion module also only works from this firmware version. The firmware version is stated on the head module (see head module [Front view](#)  90).

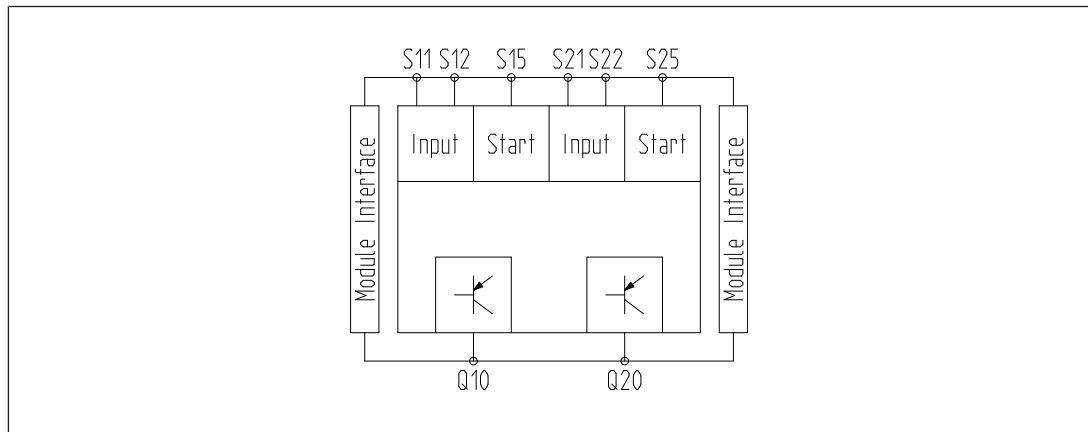
16.6.2 Front view



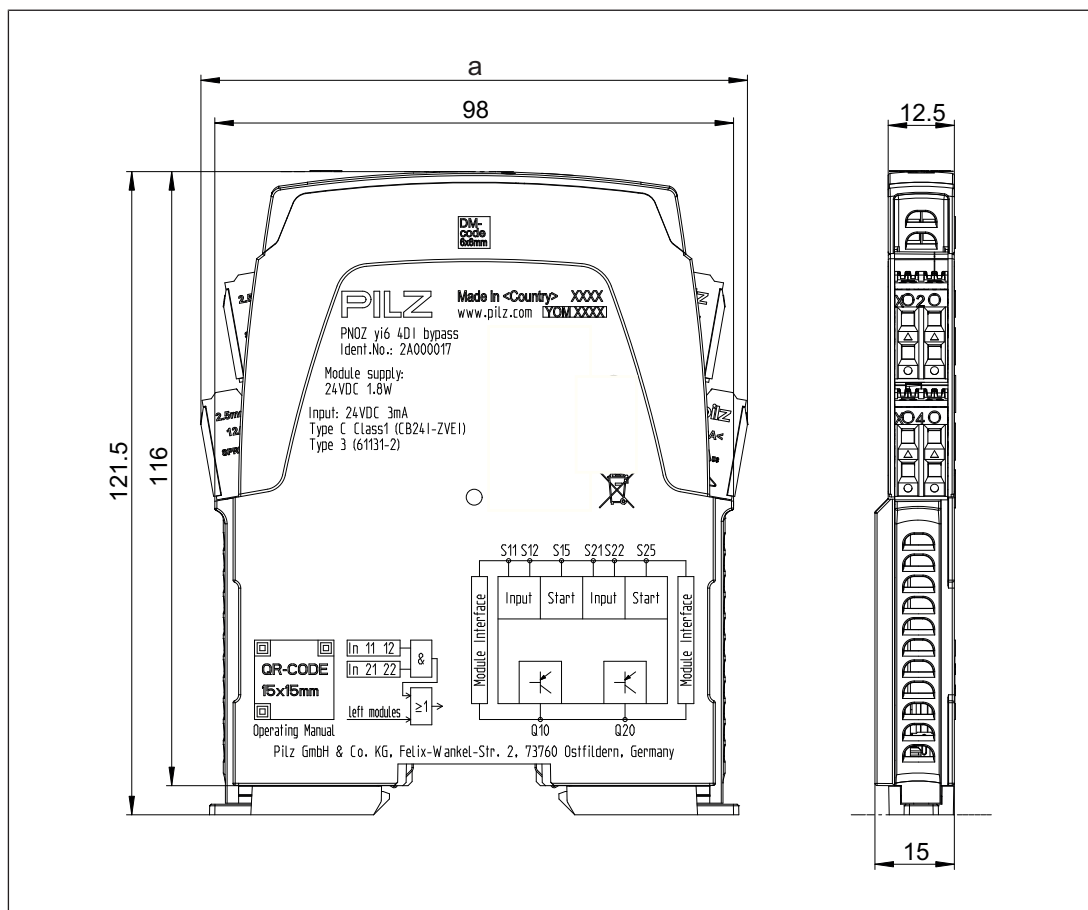
Legend

- [1] LEDs for diagnostics
- [2] **mode 1** rotary switch for start types and test pulse evaluation (S11, S12)
- [3] **mode 2** rotary switch for start types and test pulse evaluation (S21, S22)
- [4] Order number
- [5] Serial number
- [6] Product version, consists of:
 - [6.1] Hardware version
 - [6.2] Firmware version, e.g. 0200 = 02.00

16.6.3 Block diagram



16.6.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.6.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CE, CE, TÜV, TÜV, UKCA, cULus Listed, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	35 mA
Max. power dissipation of module	0,81 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	4
Number of start inputs	2
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _I max	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	2
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Recovery time at max. switching frequency 1/s after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start	
with rising edge	100 ms
with rising and falling edge	150 ms

Times

Max. start pulse duration with a monitored start

with rising and falling edge **2 s**Supply interruption before de-energisation **20 ms**Simultaneity, input circuit **∞****Environmental data**

Ambient temperature

in accordance with the standard **EN 60068-2-14**Temperature range **-20 - 55 °C**

Storage temperature

in accordance with the standard **EN 60068-2-1/-2**Temperature range **-40 - 85 °C**

Climatic suitability

in accordance with the standard **EN 60068-2-78**Condensation during operation **Not permitted**Max. operating height above SL **5000 m**EMC **EN 60947-5-1, EN 60947-5-1, EN 61326-3-1, EN 61326-3-1, EN IEC 61000-6-4, EN IEC 61000-6-4**

Vibration

in accordance with the standard **EN 60068-2-6**Frequency **10 - 55 Hz**Amplitude **0,35 mm**

Shock stress

in accordance with the standard **EN 60068-2-27**Acceleration **15g**Duration **11 ms**

Airgap creepage

in accordance with the standard **EN 60947-5-1**Overvoltage category **III**Pollution degree **2**

Protection type

in accordance with the standard **EN 60529**Housing **IP20**Terminals **IP20**Mounting area (e.g. control cabinet) **IP54****Mechanical data**Mounting position **Any**

DIN rail

Top hat rail **35 x 7,5 EN/IEC 60715**Recess width **27 mm**

Material

Bottom **PC**Top **PC**

Connection type

—

Mounting type

plug-in

Mechanical data

Conductor cross section with screw terminals

1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
-----------------	---

2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
---	---

2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
---	---

Torque setting with screw terminals	0,5 Nm
-------------------------------------	---------------

Stripping length with screw terminals	7 mm
---------------------------------------	-------------

Conductor cross section with spring-loaded terminals:

Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
---------------------------------------	--

Spring-loaded terminals: Terminal points per connection	2
---	----------

Stripping length with spring-loaded terminals	9 mm
---	-------------

Dimensions

Height	98 mm
--------	--------------

Width	12,5 mm
-------	----------------

Depth	121 mm
-------	---------------

Weight	75 g
--------	-------------

16.6.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.6.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C1, C2, C2, C3, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF

16.6.8 Order reference

16.6.8.1 Product

Product type	Features	Order no.
PNOZ yi6 4DI bypass	Expansion module for the modular safety relay myPNOZ, 2 input functions, input functions AND-linked, result of the input function OR-linked with the left-hand input functions, 2 signal outputs, 2 rotary switches for setting the start type and test pulse evaluation, LED display	2A000017

16.6.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 12.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	750002
PNOZ s Setspring loaded terminals 12.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	751002

16.7 PNOZ yi7 lock

16.7.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Supply voltage connection for the semiconductor outputs
- ▶ 1 guard locking management function to connect one safety locking device, one safe risk-free monitoring device (e.g. standstill monitor) and 2 pushbuttons to operate the safety locking device
- ▶ 1 signal output Q10 as status indicator for input function (S11, S12)
- ▶ 1 **mode** rotary switch for start type and test pulse evaluation of safe guard locking (S11, S12)
- ▶ 1 **safe state** rotary switch for test pulse evaluation of safe risk-free monitoring (S21, S22), e.g. standstill monitor
- ▶ 1 **out** rotary switch for configuration of the guard locking function
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input
 - Switch state of the outputs

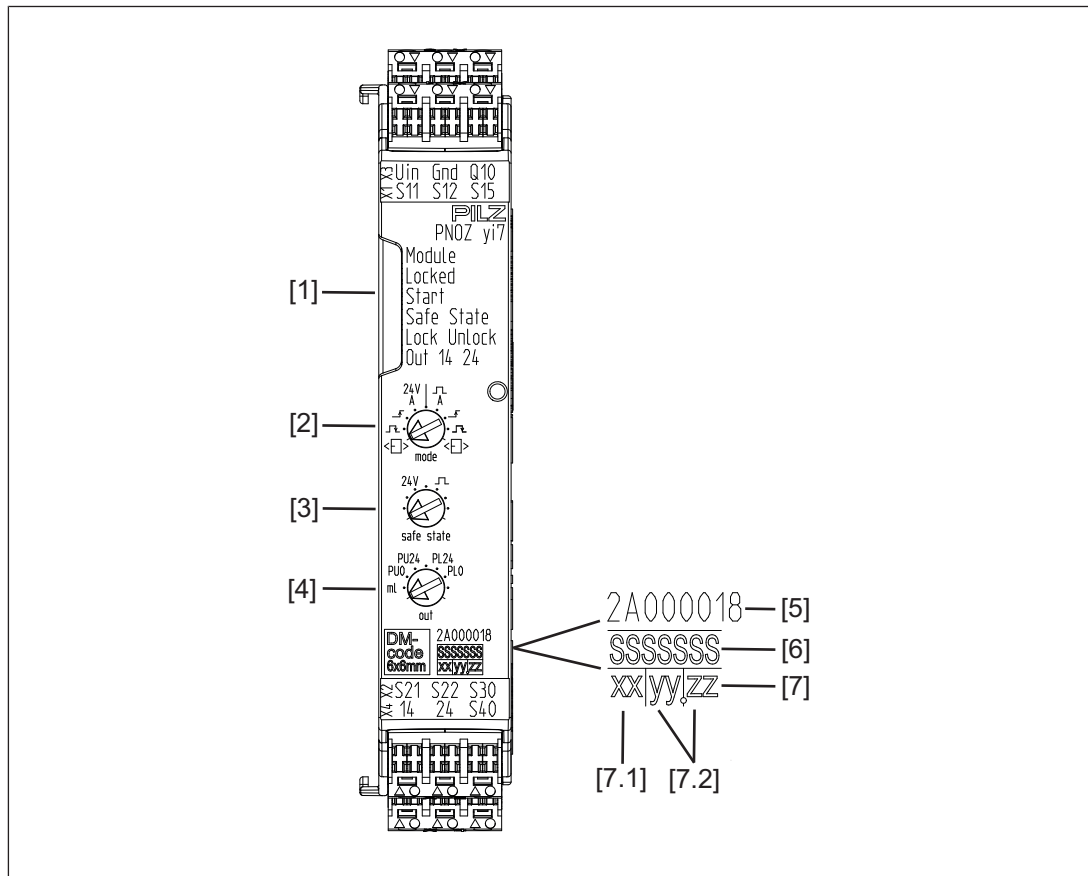


NOTICE

Required firmware version of the head module: ≥ 04.00

The expansion module also only works from this firmware version. The firmware version is stated on the head module (see head module [Front view](#)  90).

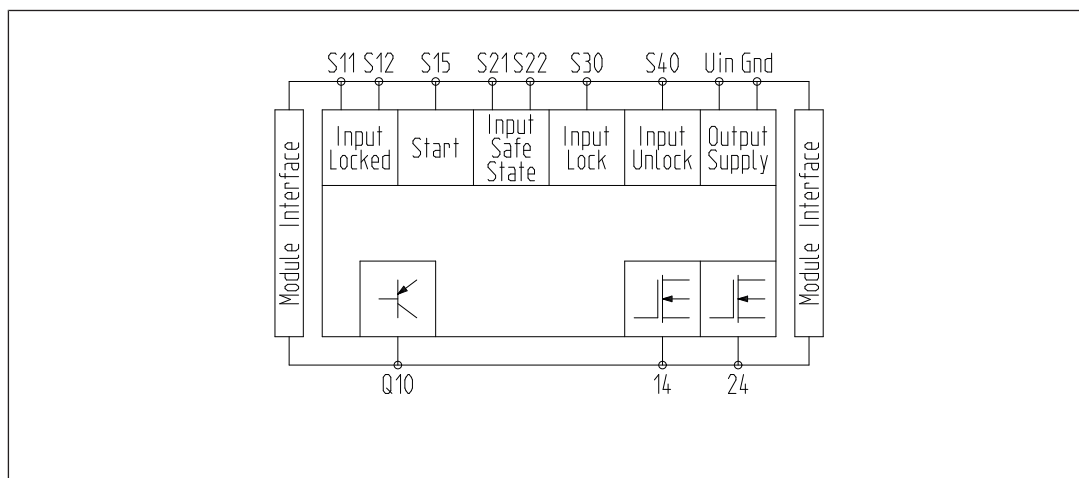
16.7.2 Front view



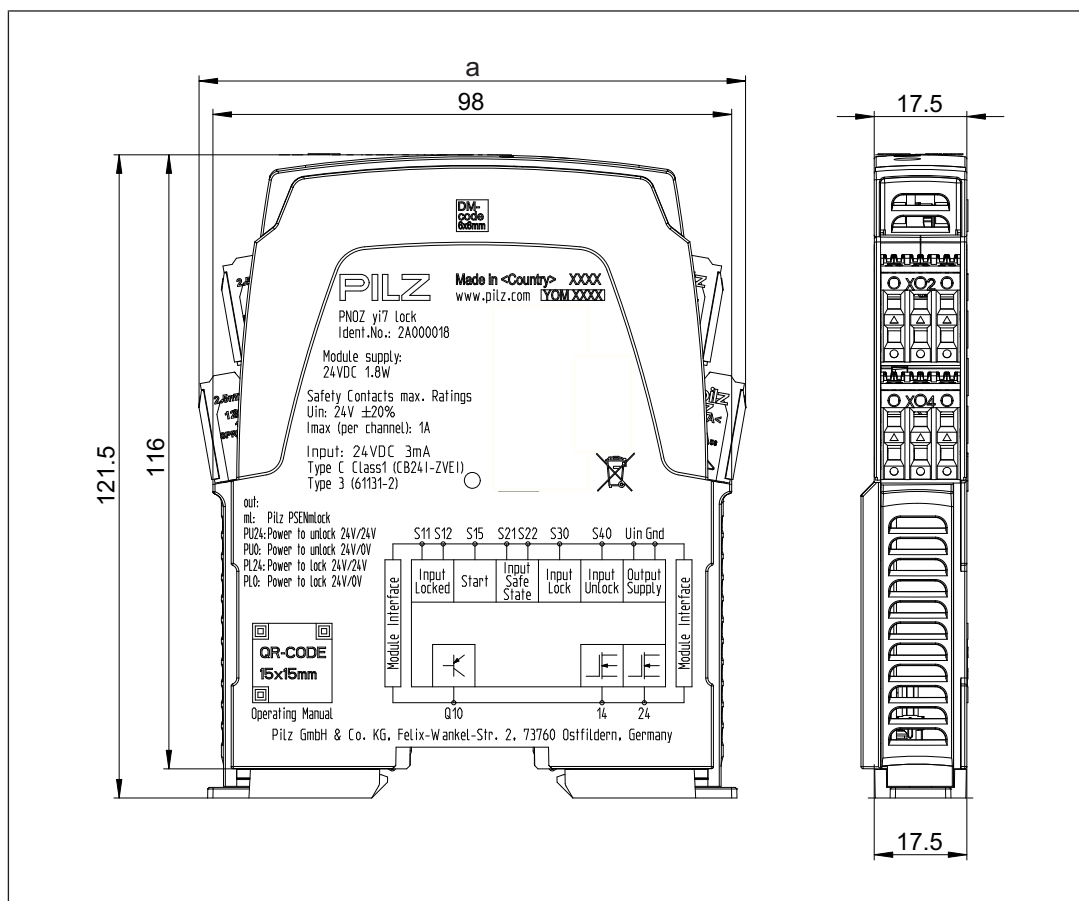
Legend

- [1] LEDs for diagnostics
- [2] **mode** rotary switch for start type and test pulse evaluation of safe guard locking (S11, S12)
- [3] **safe state** rotary switch for test pulse evaluation of safe risk-free monitoring (S21, S22), (standstill monitor)
- [4] **out** rotary switch for configuration of the guard locking function
- [5] Order number
- [6] Serial number
- [7] Product version, consists of:
 - [7.1] Hardware version
 - [7.2] Firmware version, e.g. 0200 = 02.00

16.7.3 Block diagram



16.7.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.7.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CE, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Supply to the SC outputs
Voltage	24 V
Kind	DC
Voltage tolerance	-20 %/+20 %
Max. continuous current that the external power supply must provide	2 A
External unit fuse protection F2	Blow-out fuse 6 A slow/gG; 6 A DC circuit breaker characteristic B/C
Potential isolation	No
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	55 mA
Max. power dissipation of module	2,66 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	4
Number of start inputs	1
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Semiconductor outputs	
Number of safety outputs	
Instantaneous	1
Switching capability	
Voltage	24 V
Current	1 A
Max. switching frequency	1 Hz

Semiconductor outputs

Max. permitted total current	2 A
Residual current at "0" signal	0,5 mA
Max. capacitive load	1 µF
Max. internal voltage drop	1,2 V
Max. duration of off time during self test	500 µs
Potential isolation	No
Short circuit-proof	Yes
Permitted loads	inductive, capacitive, resistive

Signal outputs

Quantity	1
Voltage	24V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes

Times

Recovery time at max. switching frequency 1/s after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start with rising edge	100 ms
with rising and falling edge	150 ms
Max. start pulse duration with a monitored start with rising and falling edge	2 s
Supply interruption before de-energisation	20 ms
Simultaneity, input circuit	∞

Environmental data

Ambient temperature in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C
Storage temperature in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C
Climatic suitability in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
Max. operating height above SL	5000 m
EMC	EN 60947-5-1, EN 61000-6-4, EN 61326-3-1
Vibration in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm

Environmental data

Shock stress

in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms

Airgap creepage

in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2

Protection type

in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Mechanical data

Mounting position	Any
-------------------	------------

DIN rail

Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm

Material

Bottom	PC
Top	PC

Connection type	Spring-loaded terminal, screw terminal
-----------------	---

Mounting type	plug-in
---------------	----------------

Conductor cross section with screw terminals

1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG

Torque setting with screw terminals	0,5 Nm
-------------------------------------	---------------

Stripping length with screw terminals	7 mm
---------------------------------------	-------------

Conductor cross section with spring-loaded terminals:

Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
---------------------------------------	--

Spring-loaded terminals: Terminal points per connection

2

Stripping length with spring-loaded terminals	9 mm
---	-------------

Dimensions

Height	98 mm
Width	17,5 mm
Depth	121 mm

Weight	88 g
--------	-------------

16.7.6 Safety characteristic data



NOTICE

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

Unit	Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN 62061 SIL CL/ max. SIL	EN 62061 61508 PFH _D [1/h]	IEC 61511 61508 SIL	IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
------	----------------	----------------------------	----------------------------------	---------------------------------	---	---------------------------	---------------------------	---

Input								
Inputs	2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20
Output								
SC output (1-pole)	1-channel	PL d	Cat. 2	SIL 2	3,63E-09	SIL 2	3,18E-04	20
SC output (1-pole)	2-channel	PL e	Cat. 4	SIL 3	1,55E-10	SIL 3	1,35E-05	20
SC output (2-pole)	2-channel	PL e	Cat. 4	SIL 3	1,55E-10	SIL 3	1,35E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.7.7 Classification in accordance with ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF
Single-pole output	
Interfaces	
Source	
Interface	Module
Class	C2
Drain	
Interface	Actuator
Class	C1, C2
Source parameters	
Max. test pulse duration	500 µs
Max. rated current	1 A
Max. capacitive load	1 µF

16.7.8 Order reference

16.7.8.1 Product

Product type	Features	Order no.
PNOZ yi7 lock	Expansion module for the modular safety relay myPNOZ, connection for supply voltage to the semiconductor outputs, 1 guard locking management function to connect one safety locking device, one safe risk-free monitoring device (e.g. standstill monitor) and 2 push-buttons to operate the safety locking device, 1 rotary switch for start type and test pulse evaluation, 1 rotary switch for output function and test pulse evaluation, LED display	2A000018

16.7.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003

16.8 PNOZ yi8 4DI NO/NC

16.8.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Variable input functions:
 - Normally open/normally closed (NO/NC) input function (S11/S12) AND-linked to the normally open/normally closed (NO/NC) input function (S21/S22)
or
 - Normally open/normally closed (NO/NC) input function (S11/S12) OR-linked to the normally open/normally closed (NO/NC) input function (S21/S22)
or
 - Normally open/normally closed (NO/NC) input function (S11/S12) AND-linked to the normally open/normally open (NO/NO) input function (S21/S22)
or
 - Normally open/normally closed (NO/NC) input function (S11/S12) OR-linked to the normally open/normally open (NO/NO) input function (S21/S22)
or
 - 2 single-channel input functions (S11/S12) AND-linked to 2 single-channel input functions (S21/S22)
or
 - 2 single-channel input functions (S11/S12) AND-linked to normally open/normally open (NO/NO) input function (S21/S22)
or
 - 2 single-channel input functions (S11/S12) OR-linked to normally open/normally open (NO/NO) input function (S21/S22)
- ▶ 2 signal outputs as status indicators
 - Q10 for input function (S11, S12)
 - Q20 for input function (S21, S22)
- ▶ 1 **function** rotary switch to select functions
- ▶ 1 **mode 1** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **mode 2** rotary switch to set the start type and test pulse evaluation (S21, S22)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input



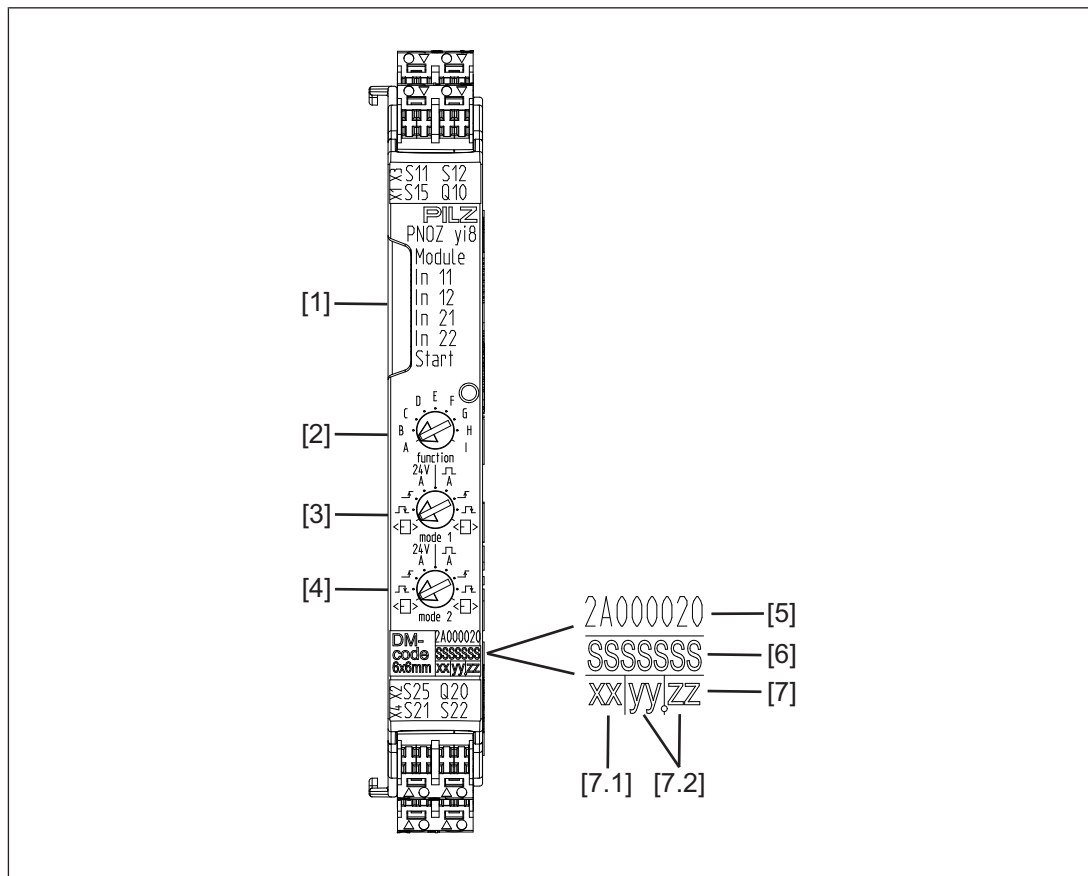
NOTICE

Required firmware version of the head module: ≥ 03.00

The expansion module also only works from this firmware version. The firmware version is stated on the head module (see head module [Front view](#)  90).

16.8.2

Front view



[1] LEDs for diagnostics

[2] **function** rotary switch for function selection

[3] **mode 1** rotary switch for start types and test pulse evaluation (S11, S12)

[4] **mode 2** rotary switch for start types and test pulse evaluation (S21, S22)

[5] Order number

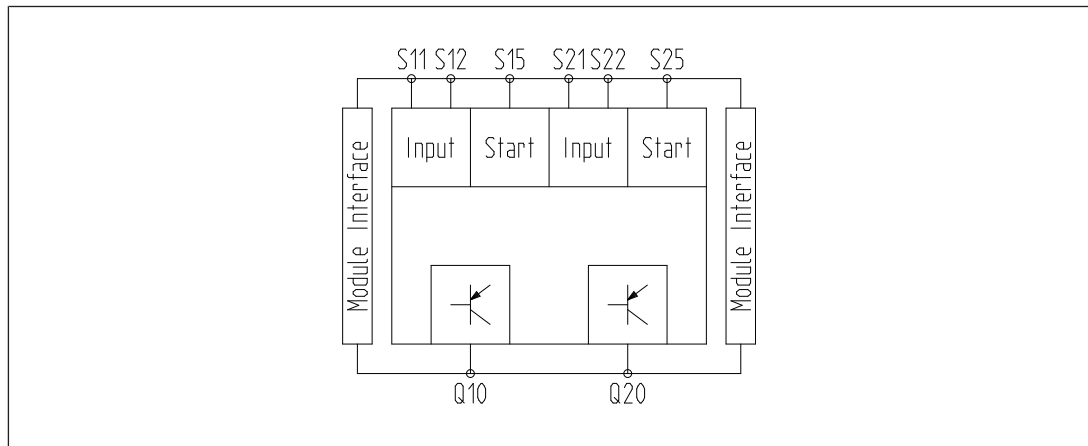
[6] Serial number

[7] Product version, consists of:

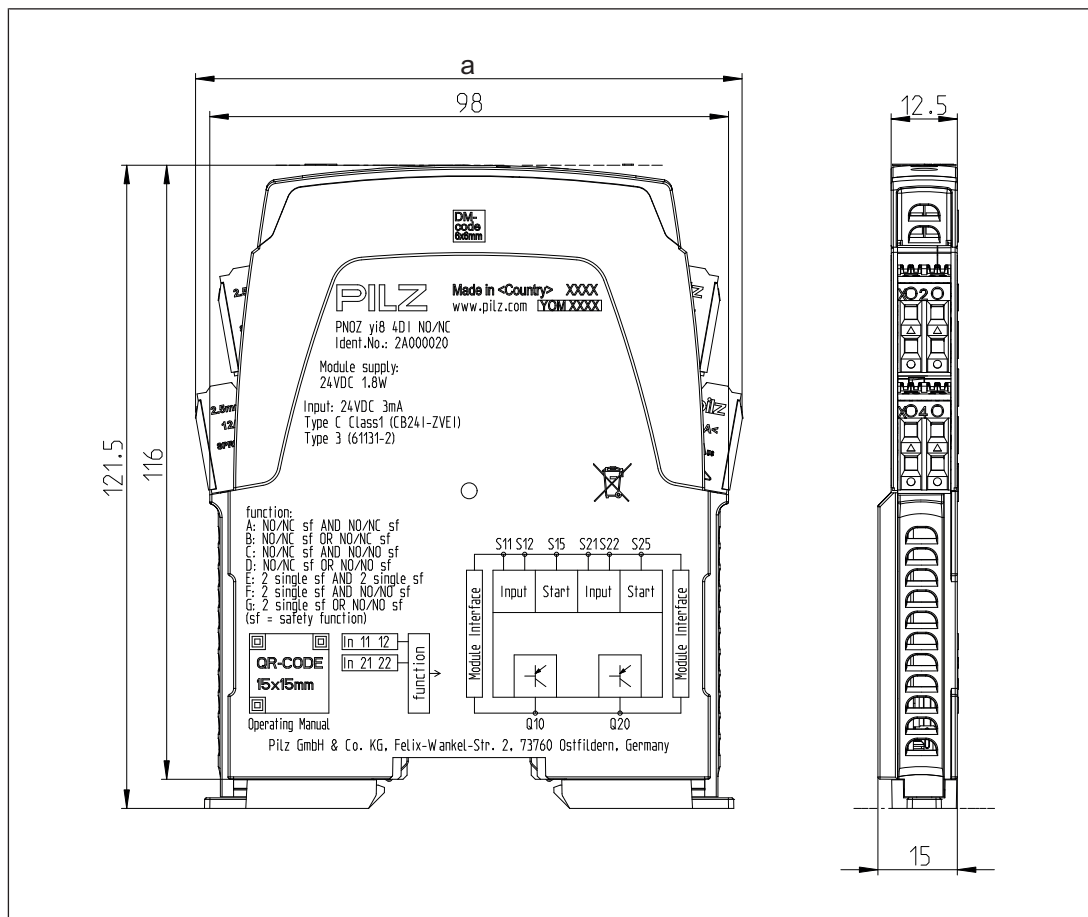
[7.1] Hardware version

[7.2] Firmware version, e.g. 0200 = 02.00

16.8.3 Block diagram



16.8.4 Dimensions



a Screw terminal 97 mm
Spring-loaded terminal 104 mm

16.8.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CE, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	35 mA
Max. power dissipation of module	0,81 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	4
Number of start inputs	2
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _I max	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	2
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Recovery time at max. switching frequency 1/s after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start	
with rising edge	100 ms
with rising and falling edge	150 ms

Times

Max. start pulse duration with a monitored start

with rising and falling edge **2 s**Supply interruption before de-energisation **20 ms**Simultaneity, input circuit **∞****Environmental data**

Ambient temperature

in accordance with the standard **EN 60068-2-14**Temperature range **-20 - 55 °C**

Storage temperature

in accordance with the standard **EN 60068-2-1/-2**Temperature range **-40 - 85 °C**

Climatic suitability

in accordance with the standard **EN 60068-2-78**

Condensation during operation

Not permitted

Max. operating height above SL

5000 m

EMC

EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4

Vibration

in accordance with the standard **EN 60068-2-6**Frequency **10 - 55 Hz**Amplitude **0,35 mm**

Shock stress

in accordance with the standard **EN 60068-2-27**Acceleration **15g**Duration **11 ms**

Airgap creepage

in accordance with the standard **EN 60947-5-1**Overvoltage category **III**Pollution degree **2**

Protection type

in accordance with the standard **EN 60529**Housing **IP20**Terminals **IP20**Mounting area (e.g. control cabinet) **IP54****Mechanical data**Mounting position **Any**

DIN rail

Top hat rail **35 x 7,5 EN/IEC 60715**Recess width **27 mm**

Material

Bottom **PC**Top **PC**

Connection type

Spring-loaded terminal, screw terminal

Mounting type

plug-in

Mechanical data

Conductor cross section with screw terminals

1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
-----------------	---

2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
---	---

2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
---	---

Torque setting with screw terminals	0,5 Nm
-------------------------------------	---------------

Stripping length with screw terminals	7 mm
---------------------------------------	-------------

Conductor cross section with spring-loaded terminals:

Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
---------------------------------------	--

Spring-loaded terminals: Terminal points per connection	2
---	----------

Stripping length with spring-loaded terminals	9 mm
---	-------------

Dimensions

Height	98 mm
--------	--------------

Width	12,5 mm
-------	----------------

Depth	121 mm
-------	---------------

Weight	73 g
--------	-------------

16.8.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20
1-channel	PL d	Cat. 2	SIL 2	6,07E-09	SIL 2	5,32E-04	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.8.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF

16.8.8 Order reference

16.8.8.1 Product

Product type	Features	Order no.
PNOZ yi8 4DI NO/NC	Expansion module for the modular safety relay myPNOZ, variable input functions with 2 to 4 input functions, input functions AND-linked or input functions OR-linked for antivalent contacts or single-channel safety functions, 2 signal outputs, 1 rotary switch for setting the function, 2 rotary switches for setting the start type and test pulse evaluation, LED display	2A000020

16.8.8.2 Accessories

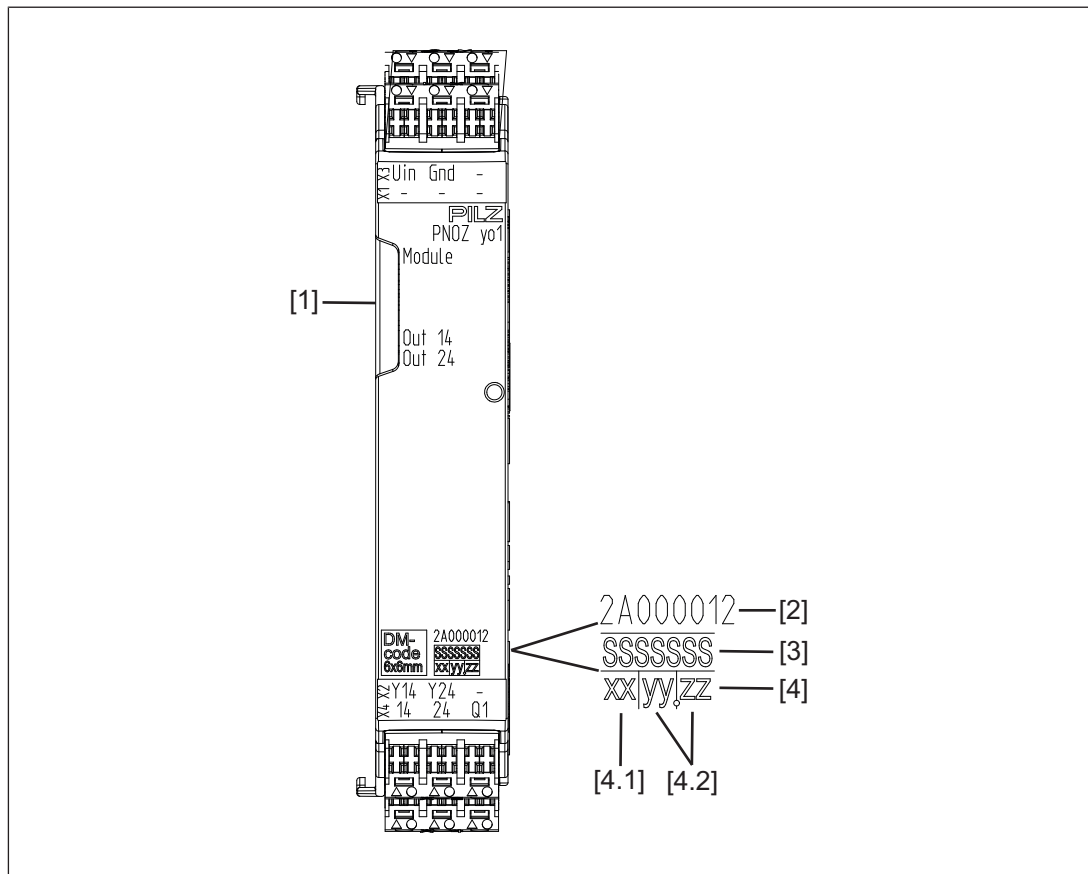
Product type	Features	Order no.
PNOZ s Setscrew terminals 12.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	750002
PNOZ s Setspring loaded terminals 12.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 2-pin, for 12.5 mm housing.	751002

16.9 PNOZ yo1 2SO

16.9.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Supply voltage connection for the semiconductor outputs
- ▶ 2 output functions, each with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop
- ▶ 1 signal output Q1 as status indicator for output function
- ▶ LED display for:
 - Module status
 - Switch state of the outputs

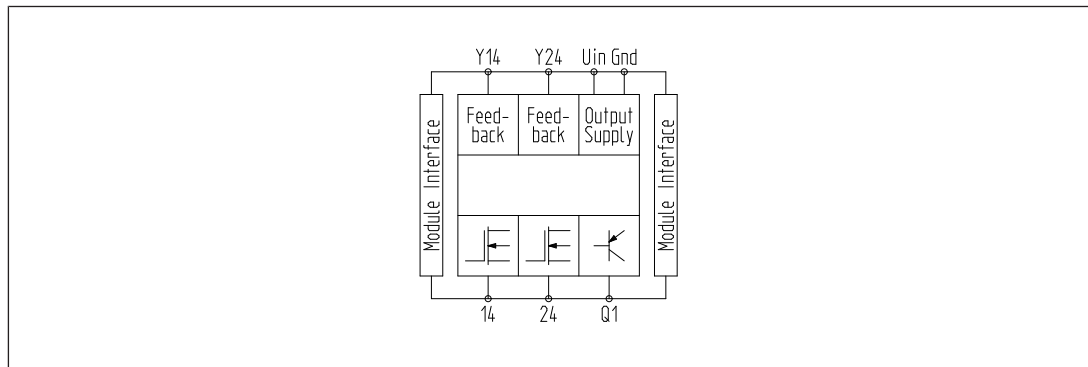
16.9.2 Front view



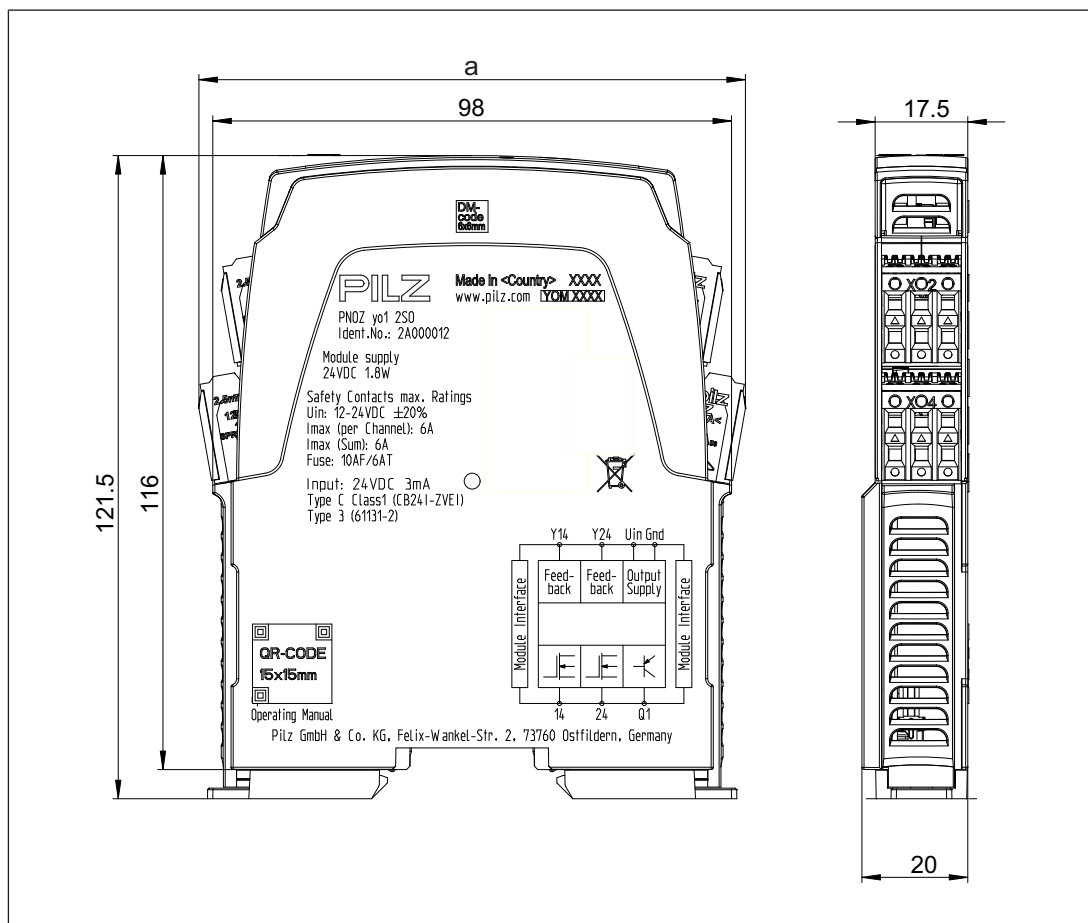
Legend

- [1] LEDs for diagnostics
- [2] Order number
- [3] Serial number
- [4] Product version, consists of:
 - [4.1] Hardware version
 - [4.2] Firmware version, e.g. 0200 = 02.00

16.9.3 Block diagram



16.9.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.9.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Supply to the SC outputs
Voltage	12 - 24 V
Kind	DC
Voltage tolerance	-20 %/+20 %
Max. continuous current that the external power supply must provide	6 A
Potential isolation	No
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	55 mA
Max. power dissipation of module	1,83 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Number of feedback loop inputs	2
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Semiconductor outputs	
Number of safety outputs	
Instantaneous	2
Switching capability	
Voltage	12 - 24 V
Current	6 A
Max. switching frequency	1 Hz
Max. permitted total current	6 A
Residual current at "0" signal	0,5 mA
Max. transient pulsed current	100 A

Semiconductor outputs	
Max. capacitive load	2,5 µF
Max. internal voltage drop	160 mV
Max. duration of off time during self test	500 µs
Potential isolation	No
Short circuit-proof	Yes
Permitted loads	inductive, capacitive, resistive
Signal outputs	
Quantity	1
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Supply interruption before de-energisation	20 ms
Environmental data	
Ambient temperature	
in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C
Storage temperature	
in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C
Climatic suitability	
in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
Max. operating height above SL	5000 m
EMC	EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4
Vibration	
in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm
Shock stress	
in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms
Airgap creepage	
in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2

Environmental data

Protection type	
in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Mechanical data

Mounting position	Any
DIN rail	
Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm
Cable length	
Recommended cable length per input, max.	1 km
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	17,5 mm
Depth	121 mm
Weight	84 g

16.9.6 Safety characteristic data



NOTICE

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

Unit	Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN IEC 62061 SIL CL/ max. SIL	EN IEC 62061 PFH _D [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
SC output, single	2-channel	PL e	Cat. 4	SIL 3	6,44E-10	SIL 3	5,43E-05	20
SC output, redundant	2-channel	PL e	Cat. 4	SIL 3	9,68E-10	SIL 3	8,16E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.9.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Single-pole output

Interfaces

Source

Interface
Class

Module
C2

Drain

Interface
Class

Actuator
C1, C2

Source parameters

Max. test pulse duration	500 µs
Max. rated current	6 A
Max. capacitive load	2,5 µF

16.9.8 Order reference

16.9.8.1 Product

Product type	Features	Order no.
PNOZ yo1 2SO	Expansion module for the modular safety relay myPNOZ, connection for supply voltage to the semiconductor outputs, 2 output functions, each with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop, 1 signal output, LED display	2A000012

16.9.8.2 Accessories

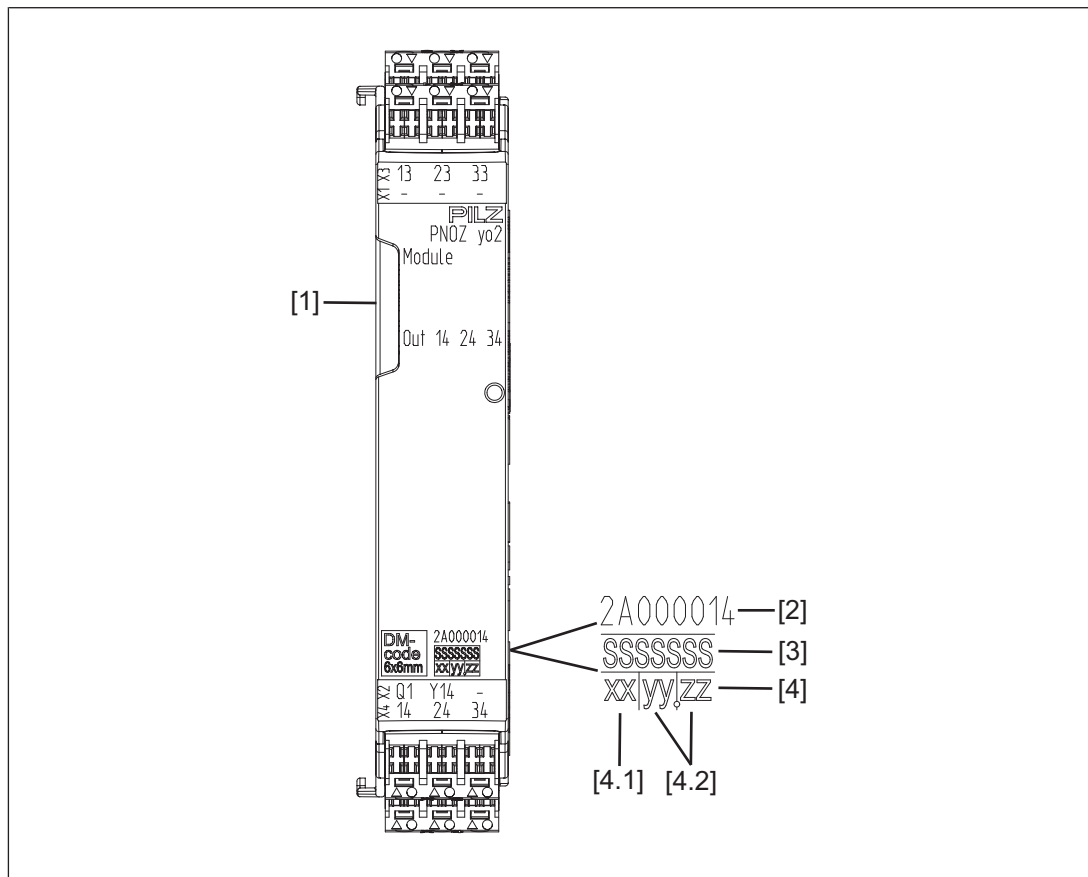
Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003
Terminal Block Filter 3-10kOhm	Terminal block with filter function 3 – 10 kOhm.	772290
Terminal Block Filter 10-30kOhm	Terminal block with filter function 10 – 30 kOhm.	772291

16.10 PNOZ yo2 3NO

16.10.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 output function with 3 safe relay outputs, positive-guided, instantaneous, and 1 input for feedback loop
- ▶ 1 signal output Q1 as status indicator for output function
- ▶ LED display for:
 - Module status
 - Switch state of the outputs

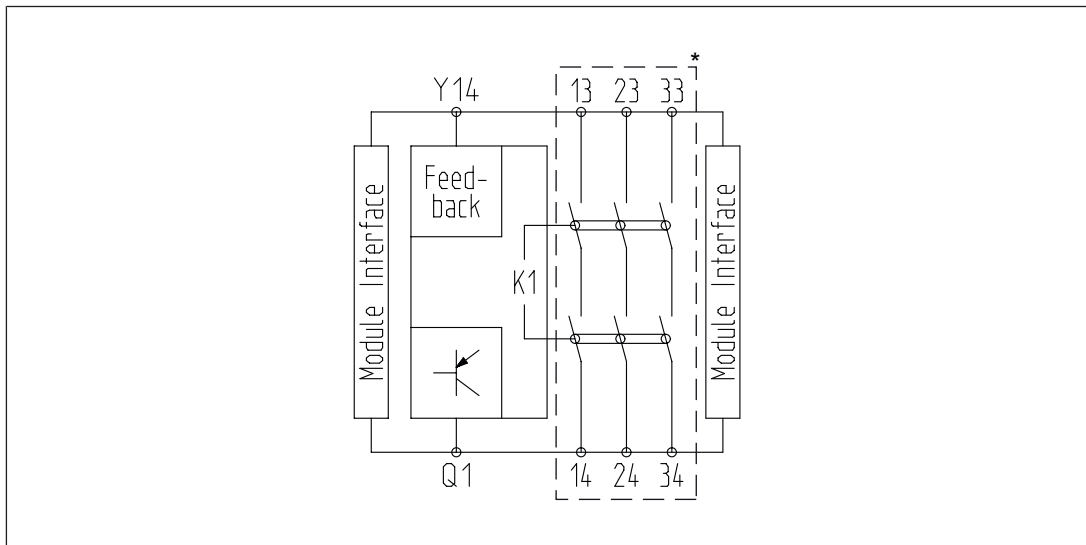
16.10.2 Front view



Legend

- [1] LEDs for diagnostics
- [2] Order number
- [3] Serial number
- [4] Product version, consists of:
 - [4.1] Hardware version
 - [4.2] Firmware version, e.g. 0200 = 02.00

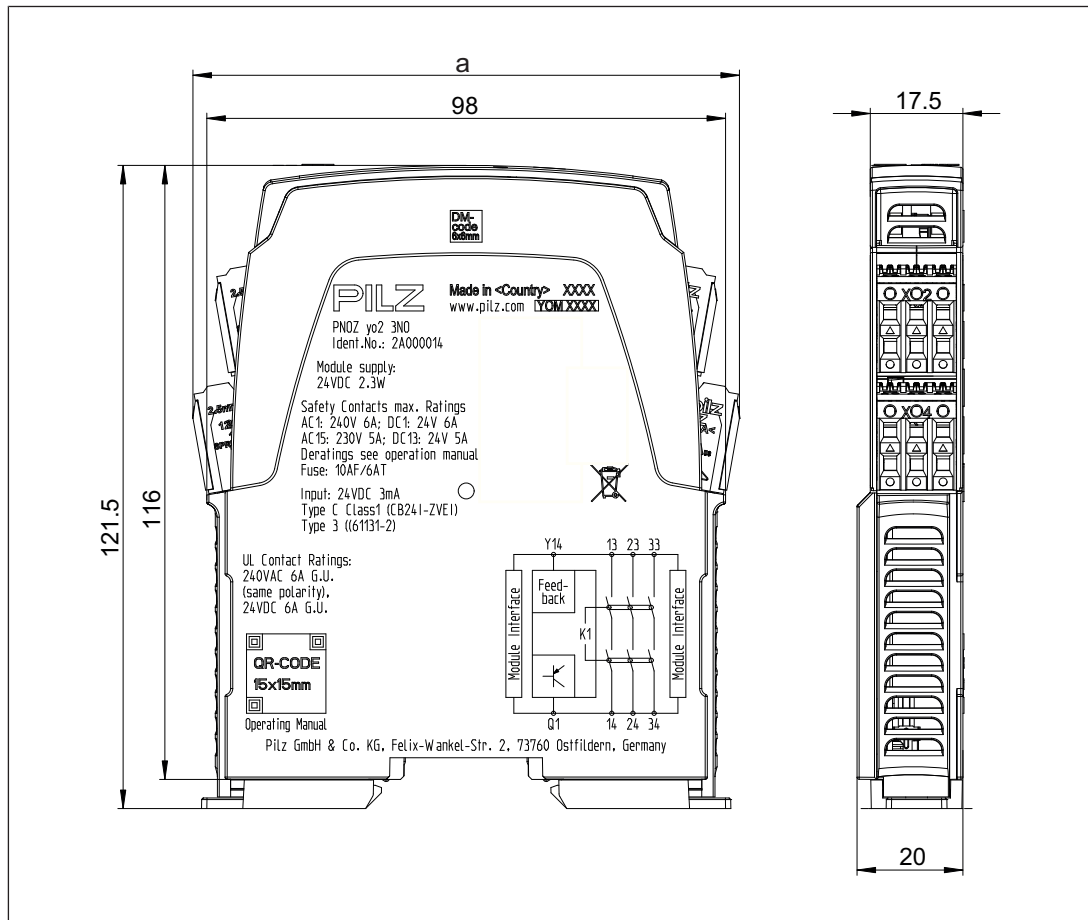
16.10.3 Block diagram



* Insulation against the non-marked area and between the relay contacts:

- ▶ Basic insulation, overvoltage category III
- ▶ Safe separation, overvoltage category II

16.10.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.10.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	75 mA
Max. power dissipation of module	3,66 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Number of feedback loop inputs	1
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Potential isolation	No
Signal outputs	
Quantity	1
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Relay outputs	
Number of output contacts	
Safety contacts (N/O), instantaneous	3
Max. short circuit current I _K	1 kA
Utilisation category	
in accordance with the standard	EN IEC 60947-4-1

Relay outputs

Utilisation category of safety contacts

AC1 at	240 V
Min. current	3 mA
Max. current	6 A
Max. power	1.500 VA
DC1 at	24 V
Min. current	3 mA
Max. current	6 A
Max. power	150 W

Utilisation category

in accordance with the standard	EN 60947-5-1
---------------------------------	--------------

Utilisation category of safety contacts

AC15 at	230 V
Max. current	5 A
Max. power	1.150 W
DC13 (6 cycles/min) at	24 V
Max. current	5 A
Max. power	120 W

Utilisation category in accordance with UL

Voltage	240 V AC Pilot Duty same pol.
with current	6 A
Voltage	24 V DC Pilot Duty
with current	6 A
Pilot Duty	B300, R300

External contact fuse protection, safety contacts

in accordance with the standard	EN 60947-5-1
Max. melting integral	260 A ² s
Blow-out fuse, quick	10 A
Blow-out fuse, slow	6 A
Blow-out fuse, gG	10 A

Contact material

AgCuNi + 0,2 µm Au

Potential isolation

Yes

Conventional thermal current while loading several contactsI_{th} per contact at UB DC; AC1: 240 V, DC1: 24 V

Conv. therm. current with 1 contact	6 A
Conv. therm. current with 2 contacts	5,5 A
Conv. therm. current with 3 contacts	4,5 A

Times

Supply interruption before de-energisation	20 ms
--	-------

Environmental data

Ambient temperature

in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C

Environmental data

Storage temperature	
in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C
Climatic suitability	
in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
EMC	EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4
Vibration	
in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm
Shock stress	
in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms
Airgap creepage	
in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2
Protection type	
in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Potential isolation

Potential isolation between	Output and system voltage
Type of potential isolation	Protective separation
Rated insulation voltage	250 V
Rated surge voltage	6000 V

Mechanical data

Mounting position	Any
Mechanical life	10,000,000 cycles
DIN rail	
Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm
Cable length	
Recommended cable length per input, max.	1 km
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in

Mechanical data

Conductor cross section with screw terminals

1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
-----------------	---

2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
---	---

2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
---	---

Torque setting with screw terminals	0,5 Nm
-------------------------------------	---------------

Stripping length with screw terminals	7 mm
---------------------------------------	-------------

Conductor cross section with spring-loaded terminals:

Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
---------------------------------------	--

Spring-loaded terminals: Terminal points per connection	2
---	----------

Stripping length with spring-loaded terminals	9 mm
---	-------------

Dimensions

Height	98 mm
--------	--------------

Width	17,5 mm
-------	----------------

Depth	121 mm
-------	---------------

Weight	115 g
--------	--------------

16.10.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
2-channel	PL e	Cat. 4	SIL 3	8,75E-10	SIL 3	7,21E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

With relay outputs, refer to the guidelines under [Service life curve](#)  179].

16.10.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Relay outputs**Interfaces**

Source

Interface	Module
Class	A

Drain

Interface	Actuator
Class	A

Source parameters

Min. switching voltage	12 V
Max. switching voltage	250 V
Min. switching current	3 mA
Max. switching current	6 A
Potential isolation	Yes

16.10.8 Supplementary data

16.10.8.1 Operating height

The values stated in the technical details apply to the use of the product in operating heights up to max. 2000 m above sea level. When used in greater heights, constraints have to be taken into account:

- ▶ Permitted maximum operating height 5000 m

Reduction of the voltage at the relay outputs at $U_B = 30\text{ V}$ depending on the operating height

Prerequisite:

- ▶ Overvoltage category: III
- ▶ Pollution degree: 2

Maximum operating height	Max. voltage at the relay output
2000 m	300 V
3000 m	150 V
4000 m	150 V
5000 m	150 V

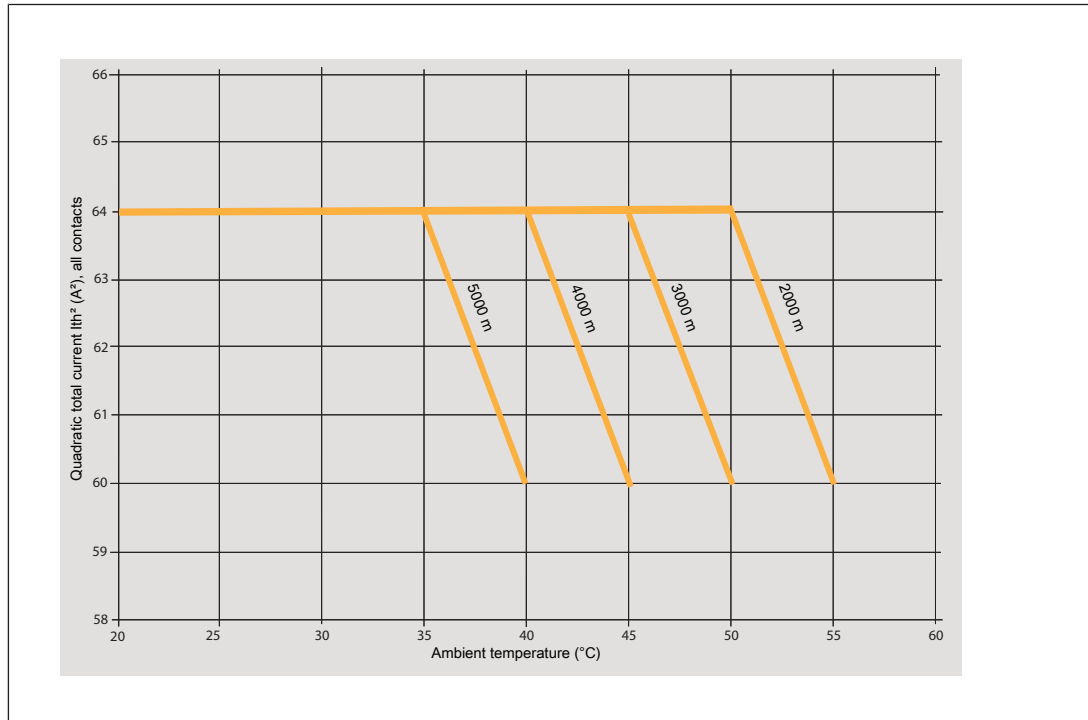
- ▶ From an operating height of 2000 m the max. permitted ambient temperature is reduced by 0.5 °C/100 m

Operating height	Permitted ambient temperature
3000 m	50 °C
4000 m	45 °C
5000 m	40 °C

16.10.8.2 Conventional thermal current

The following diagram applies to expansion modules that are installed correctly on a vertical or horizontal top hat rail (see [Installation and removal](#) [58]).

The permitted total current is shown depending on the operating height and the ambient temperature (see [Operating height](#) [178]).



$$I_{th^2 \max} = (I_{\text{terminal } 17})^2 + (I_{\text{terminal } 27})^2 + (I_{\text{terminal } 37})^2$$

16.10.8.3 Service life graph

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.

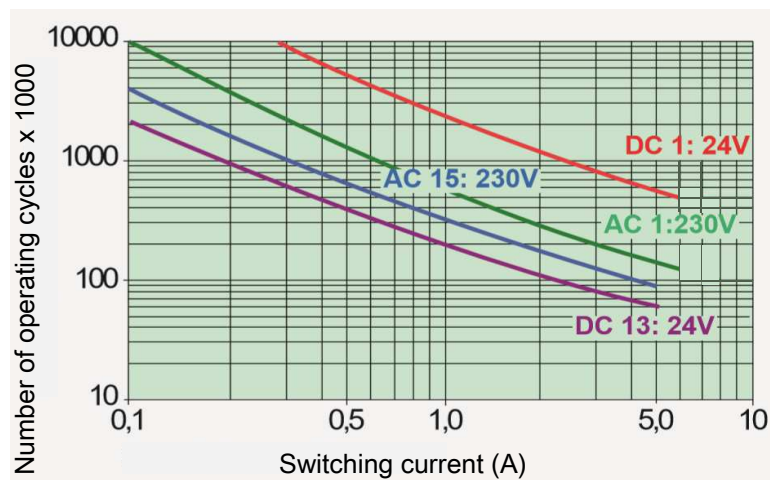


CAUTION!

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switch frequency and the load of the relay output.

If the service life graphs are not accessible, the stated PFH value can be used irrespective of the switch frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.



Example

- ▶ Inductive load: 0.3 A
- ▶ Utilisation category AC15
- ▶ Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value can be used in the calculation (see [Safety characteristic data](#) [176]).

To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With DC contactors, use flywheel diodes for spark suppression.

16.10.9 Order reference**16.10.9.1 Product**

Product type	Features	Order no.
PNOZ yo2 3NO	Expansion module for the modular safety relay myPNOZ, 1 output function with 3 safe relay outputs, positive-guided, instantaneous, and 1 input for feedback loop, 1 signal output, LED display	2A000014

16.10.9.2 Accessories

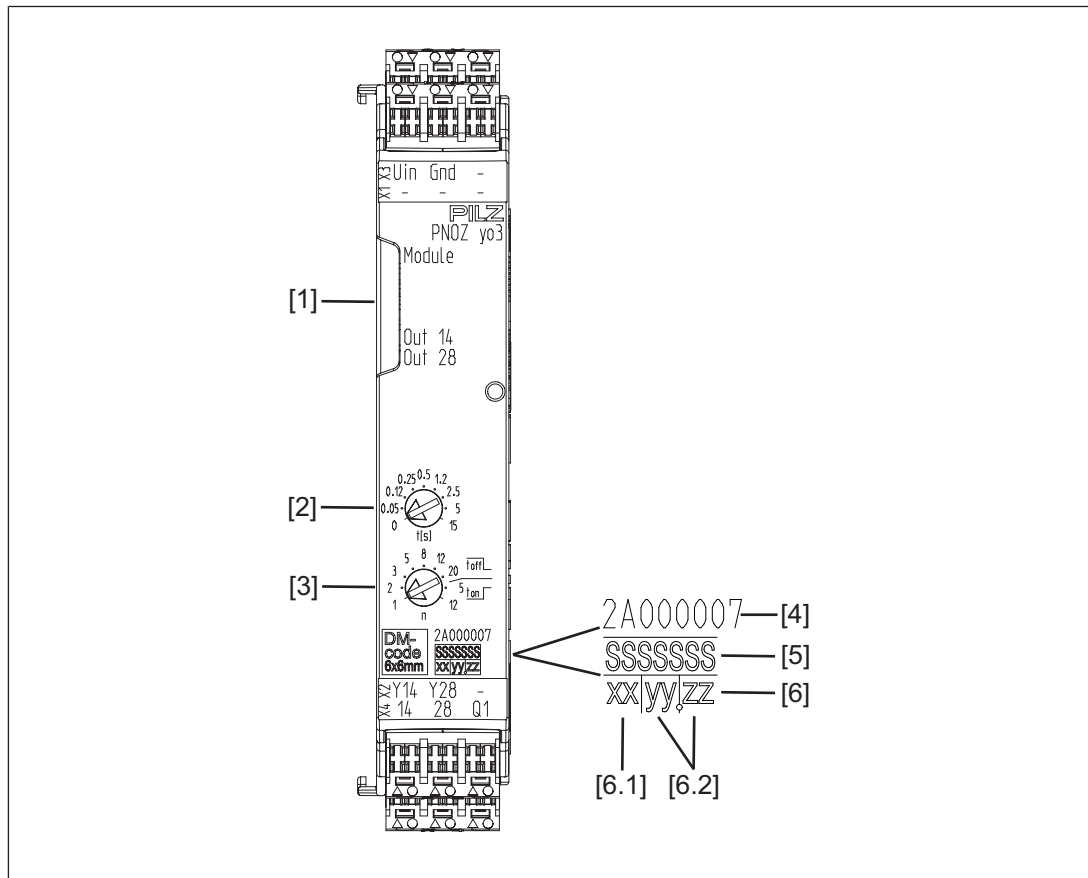
Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003

16.11 PNOZ yo3 ISO 1SO t

16.11.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Supply voltage connection for the semiconductor outputs
- ▶ 1 output function with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop
- ▶ 1 output function with 1 safe semiconductor output, delayed, and 1 input for feedback loop
- ▶ 1 signal output Q1 as status indicator for output function without delay time
- ▶ 1 **t[s]** rotary switch to set the delay time
- ▶ 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- ▶ LED display for:
 - Module status
 - Switch state of the outputs

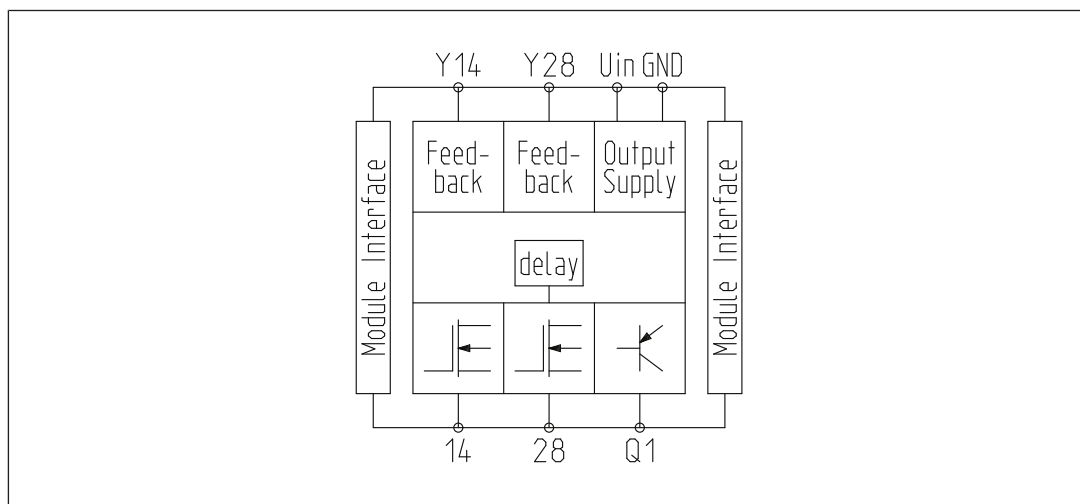
16.11.2 Front view



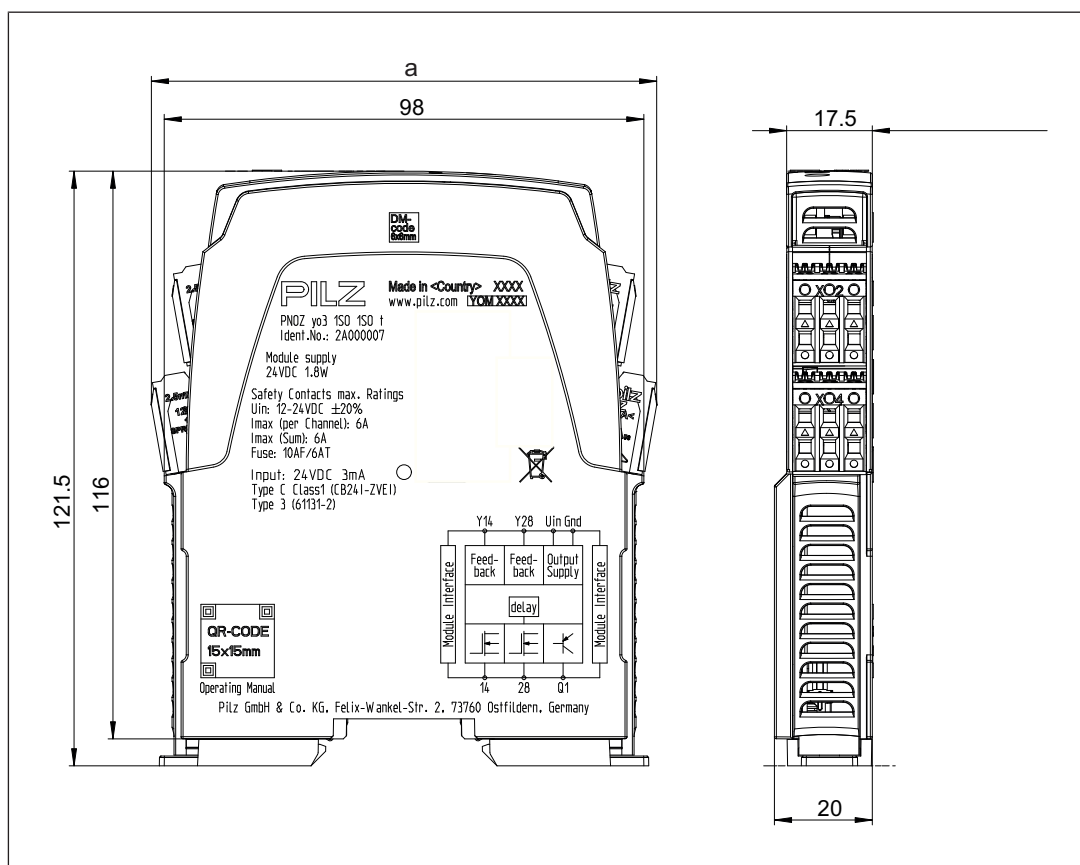
Legend

- [1] LEDs for diagnostics
- [2] ***t[s]*** rotary switch for time value for the delay
- [3] ***n*** rotary switch for delay factor and delay type (when switching on or off)
- [4] Order number
- [5] Serial number
- [6] Product version, consists of:
 - [6.1] Hardware version
 - [6.2] Firmware version, e.g. 0200 = 02.00

16.11.3 Block diagram



16.11.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.11.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Supply to the SC outputs
Voltage	12 - 24 V
Kind	DC
Voltage tolerance	-20 %/+20 %
Max. continuous current that the external power supply must provide	6 A
Potential isolation	No
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	55 mA
Max. power dissipation of module	1,83 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Number of feedback loop inputs	2
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Semiconductor outputs	
Number of safety outputs	
Instantaneous	2
Switching capability	
Voltage	12 - 24 V
Current	6 A
Max. switching frequency	1 Hz
Max. permitted total current	6 A
Residual current at "0" signal	0,5 mA
Max. transient pulsed current	100 A

Semiconductor outputs	
Max. capacitive load	2,5 µF
Max. internal voltage drop	160 mV
Max. duration of off time during self test	500 µs
Potential isolation	No
Short circuit-proof	Yes
Permitted loads	inductive, capacitive, resistive
Signal outputs	
Quantity	1
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Supply interruption before de-energisation	20 ms
Environmental data	
Ambient temperature	
in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C
Storage temperature	
in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C
Climatic suitability	
in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
Max. operating height above SL	5000 m
EMC	EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4
Vibration	
in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm
Shock stress	
in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms
Airgap creepage	
in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2

Environmental data

Protection type	
in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Mechanical data

Mounting position	Any
DIN rail	
Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm
Cable length	
Recommended cable length per input, max.	1 km
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	17,5 mm
Depth	121 mm
Weight	84 g

16.11.6 Safety characteristic data



NOTICE

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

Unit	Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN IEC 62061 SIL CL/ max. SIL	EN IEC 62061 PFH _D [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
SC output, single	2-channel	PL e	Cat. 4	SIL 3	6,44E-10	SIL 3	5,43E-05	20
SC output, redundant	2-channel	PL e	Cat. 4	SIL 3	9,68E-10	SIL 3	8,16E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.11.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Single-pole output

Interfaces

Source

Interface

Module

Class

C2

Drain

Interface

Actuator

Class

C1, C2

Source parameters

Max. test pulse duration

500 μ s

Max. rated current

6 A

Max. capacitive load

2,5 μ F

16.11.8 Order reference

16.11.8.1 Product

Product type	Features	Order no.
PNOZ yo3 1SO 1SO t	Expansion module for the modular safety relay myPNOZ, connection for supply voltage to the semiconductor outputs, 1 output function with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop, 1 output function with 1 safe semiconductor output, delayed, and 1 input for feedback loop, 1 signal output, 1 rotary switch for setting the delay time, 1 rotary switch for the factor setting for the delay and for selecting the off or on-delay, LED display	2A000007

16.11.8.2 Accessories

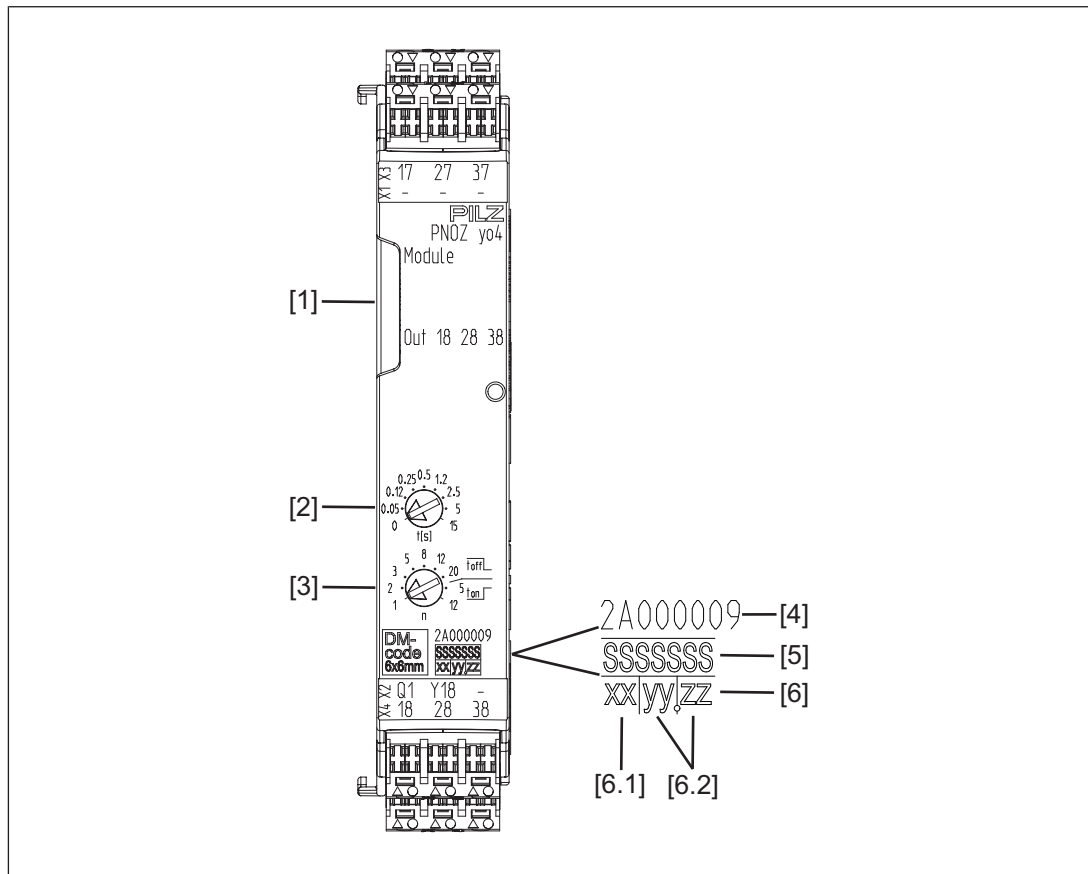
Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003
Terminal Block Filter 3-10kOhm	Terminal block with filter function 3 – 10 kOhm.	772290
Terminal Block Filter 10-30kOhm	Terminal block with filter function 10 – 30 kOhm.	772291

16.12 PNOZ yo4 3NO t

16.12.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 output function with 3 safe relay outputs, positive-guided, delayed, and 1 input for feed-back loop
- ▶ 1 signal output Q1 as status indicator for output function without delay time
- ▶ 1 **t[s]** rotary switch to set the delay time
- ▶ 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- ▶ LED display for:
 - Module status
 - Switch state of the outputs

16.12.2 Front view



Legend

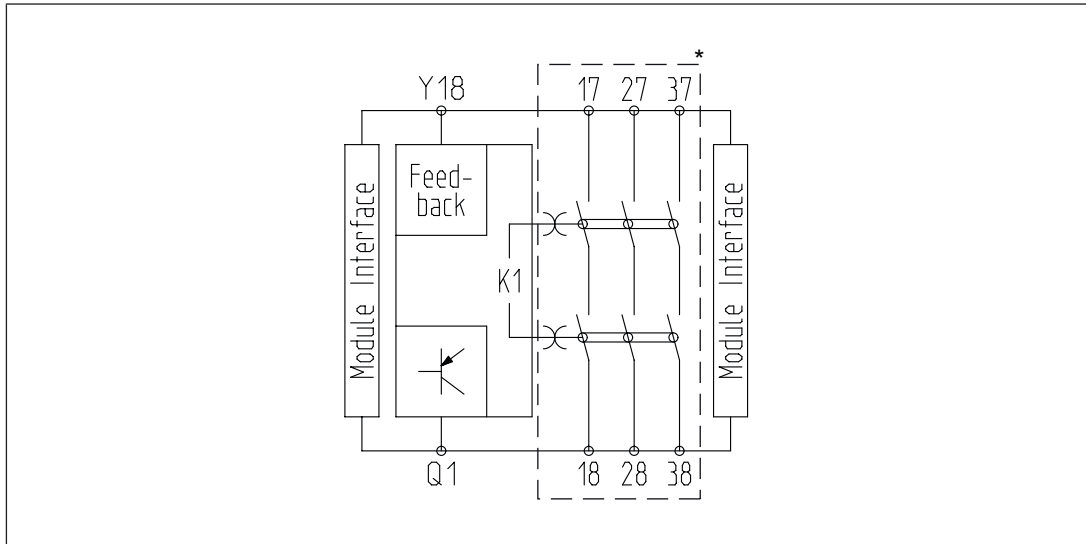
- [1] LEDs for diagnostics
- [2] **t[s]** rotary switch for time value for the delay
- [3] **n** rotary switch for delay factor and delay type (when switching on or off)
- [4] Order number
- [5] Serial number

[6] Product version, consists of:

[6.1] Hardware version

[6.2] Firmware version, e.g. 0200 = 02.00

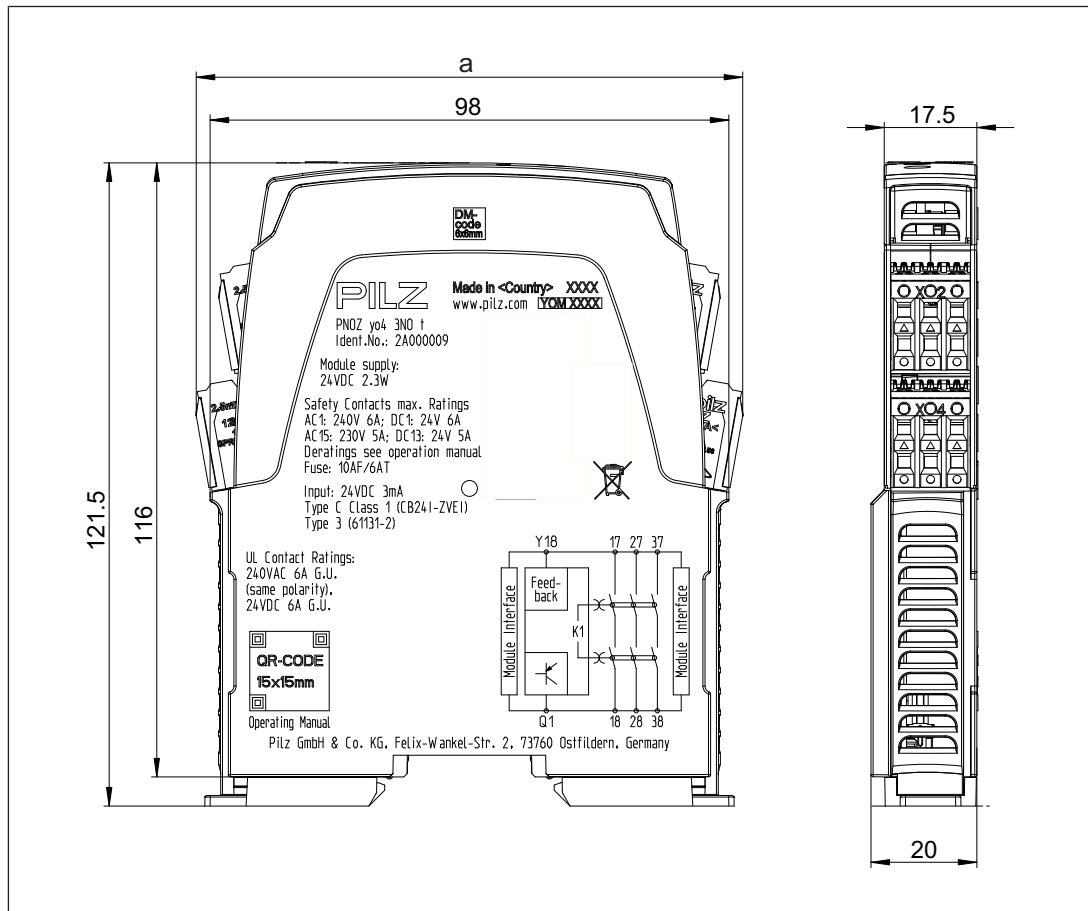
16.12.3 Block diagram



* Insulation against the non-marked area and between the relay contacts:

- ▶ Basic insulation, overvoltage category III
- ▶ Safe separation, overvoltage category II

16.12.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.12.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	75 mA
Max. power dissipation of module	3,63 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Number of feedback loop inputs	1
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Potential isolation	No
Signal outputs	
Quantity	1
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Relay outputs	
Number of output contacts	
Safety contacts (N/O), delayed	3
Max. short circuit current I _K	1 kA
Utilisation category	
in accordance with the standard	EN IEC 60947-4-1

Relay outputs

Utilisation category of safety contacts

AC1 at	240 V
Min. current	3 mA
Max. current	6 A
Max. power	1.500 VA
DC1 at	24 V
Min. current	3 mA
Max. current	6 A
Max. power	150 W

Utilisation category

in accordance with the standard	EN 60947-5-1
---------------------------------	---------------------

Utilisation category of safety contacts

AC15 at	230 V
Max. current	5 A
Max. power	1.150 W
DC13 (6 cycles/min) at	24 V
Max. current	5 A
Max. power	120 W

Utilisation category in accordance with UL

Voltage	240 V AC Pilot Duty same pol.
with current	6 A
Voltage	24 V DC Pilot Duty
with current	6 A
Pilot Duty	B300, R300

External contact fuse protection, safety contacts

in accordance with the standard	EN 60947-5-1
Max. melting integral	260 A²s
Blow-out fuse, quick	10 A
Blow-out fuse, slow	6 A
Blow-out fuse, gG	10 A

Contact material	AgCuNi + 0,2 µm Au
------------------	---------------------------

Potential isolation	Yes
---------------------	------------

Conventional thermal current while loading several contactsI_{th} per contact at UB DC; AC1: 240 V, DC1: 24 V

Conv. therm. current with 1 contact	6 A
Conv. therm. current with 2 contacts	5,5 A
Conv. therm. current with 3 contacts	4,5 A

Times

Selectable delay time when switching on	0,25 s, 0,6 s, 1,25 s, 1,44 s, 12,5 s, 14,4 s, 180 s, 2,5 s, 25 s, 3 s, 30 s, 6 s, 60 s, 75 s
---	--

Times

Selectable delay time when switching off	0,05 s, 0,1 s, 0,12 s, 0,15 s, 0,24 s, 0,25 s, 0,36 s, 0,4 s, 0,5 s, 0,6 s, 0,75 s, 0,96 s, 1 s, 1,2 s, 1,25 s, 1,44 s, 1,5 s, 10 s, 100 s, 12,5 s, 120 s, 14,4 s, 15 s, 180 s, 2 s, 2,4 s, 2,5 s, 20 s, 24 s, 25 s, 3 s, 3,6 s, 30 s, 300 s, 4 s, 40 s, 45 s, 5 s, 6 s, 60 s, 7,5 s, 75 s, 9,6 s
Time accuracy	+/-1,5 %
Supply interruption before de-energisation	20 ms

Environmental data

Ambient temperature	
in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C
Storage temperature	
in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C
Climatic suitability	
in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
EMC	EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4
Vibration	
in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm
Shock stress	
in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms
Airgap creepage	
in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2
Protection type	
in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Potential isolation

Potential isolation between	Output and system voltage
Type of potential isolation	Protective separation
Rated insulation voltage	250 V
Rated surge voltage	6000 V

Mechanical data

Mounting position	Any
Mechanical life	10,000,000 cycles

Mechanical data

DIN rail	
Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm
Cable length	
Recommended cable length per input, max.	1 km
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	17,5 mm
Depth	121 mm
Weight	117 g

16.12.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
2-channel	PL e	Cat. 4	SIL 3	8,75E-10	SIL 3	7,21E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

With relay outputs, refer to the guidelines under [Service life curve](#)  200].

16.12.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Relay outputs**Interfaces**

Source

Interface	Module
Class	A

Drain

Interface	Actuator
Class	A

Source parameters

Min. switching voltage	12 V
Max. switching voltage	250 V
Min. switching current	3 mA
Max. switching current	6 A
Potential isolation	Yes

16.12.8 Supplementary data

16.12.8.1 Operating height

The values stated in the technical details apply to the use of the product in operating heights up to max. 2000 m above sea level. When used in greater heights, constraints have to be taken into account:

- ▶ Permitted maximum operating height 5000 m

Reduction of the voltage at the relay outputs at $U_B = 30\text{ V}$ depending on the operating height

Prerequisite:

- ▶ Overvoltage category: III
- ▶ Pollution degree: 2

Maximum operating height	Max. voltage at the relay output
2000 m	300 V
3000 m	150 V
4000 m	150 V
5000 m	150 V

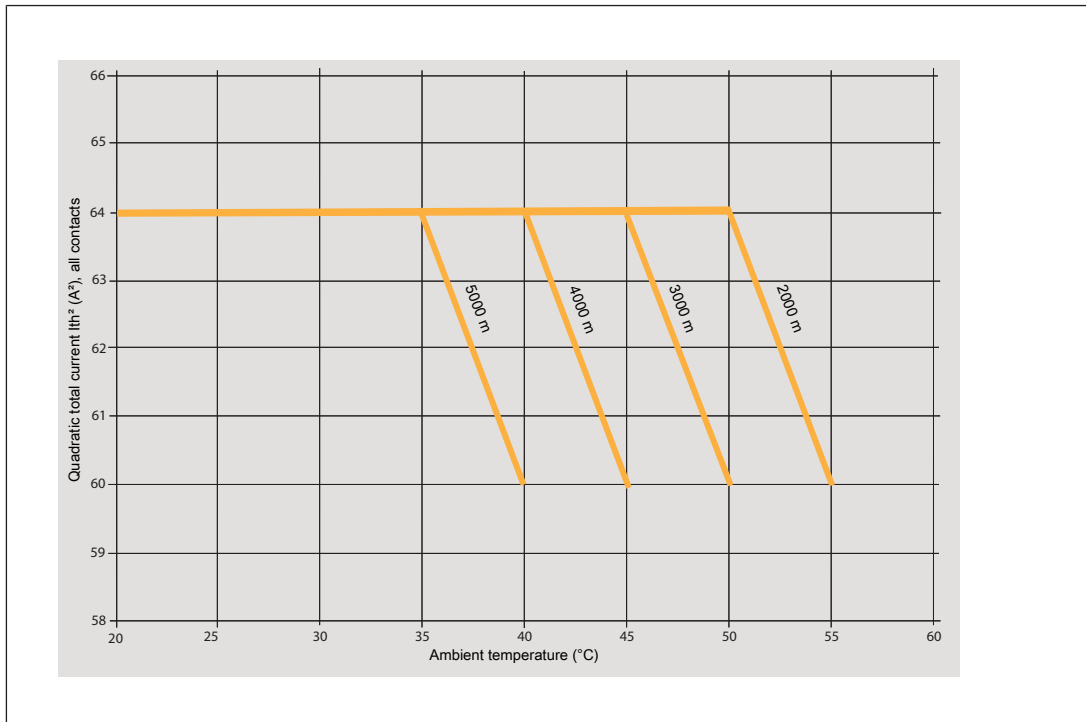
- ▶ From an operating height of 2000 m the max. permitted ambient temperature is reduced by 0.5 °C/100 m

Operating height	Permitted ambient temperature
3000 m	50 °C
4000 m	45 °C
5000 m	40 °C

16.12.8.2 Conventional thermal current

The following diagram applies to expansion modules that are installed correctly on a vertical or horizontal top hat rail (see [Installation and removal](#) [ 58]).

The permitted total current is shown depending on the operating height and the ambient temperature (see [Operating height](#) [ 199]).



$$I_{th^2 \max} = (I_{\text{terminal } 17})^2 + (I_{\text{terminal } 27})^2 + (I_{\text{terminal } 37})^2$$

16.12.8.3

Service life graph

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.

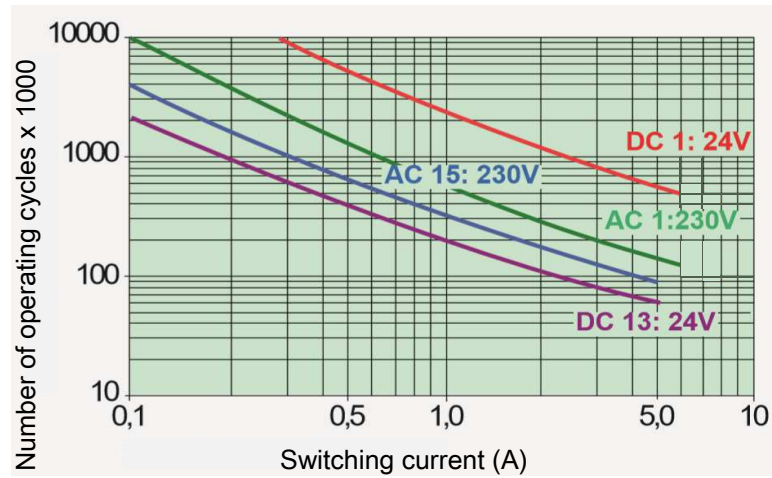


CAUTION!

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switch frequency and the load of the relay output.

If the service life graphs are not accessible, the stated PFH value can be used irrespective of the switch frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.



Example

- ▶ Inductive load: 0.3 A
- ▶ Utilisation category AC15
- ▶ Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value can be used in the calculation (see [Safety characteristic data](#) [197]).

To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With DC contactors, use flywheel diodes for spark suppression.

16.12.9 Order reference**16.12.9.1 Product**

Product type	Features	Order no.
PNOZ yo4 3NO t	Expansion module for the modular safety relay myPNOZ, 1 output function with 3 safe relay outputs, positive guided, delayed and 1 input for feedback loop, 1 signal output, 1 rotary switch for setting the delay time, 1 rotary switch for the factor setting for the delay and for selecting the off or on-delay, LED display	2A000009

16.12.9.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003

16.13 PNOZ yo5 2NO 2NO t

16.13.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 output function
 - with 2 safe relay outputs, positive-guided, delay-on terminal 29, 38 and 1 input for feedback loop Y38
 - and
 - with 2 safe relay outputs, positive-guided, delay-off terminal 18, 28 and 1 input for feedback loop Y18

Only one of the two outputs at a time can be used with a time delay, the other output then always reacts instantaneously.

- ▶ 1 signal output Q1 as status indicator for output function without delay time
- ▶ 1 **t[s]** rotary switch to set the delay time
- ▶ 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- ▶ LED display for:
 - Module status
 - Switch state of the outputs

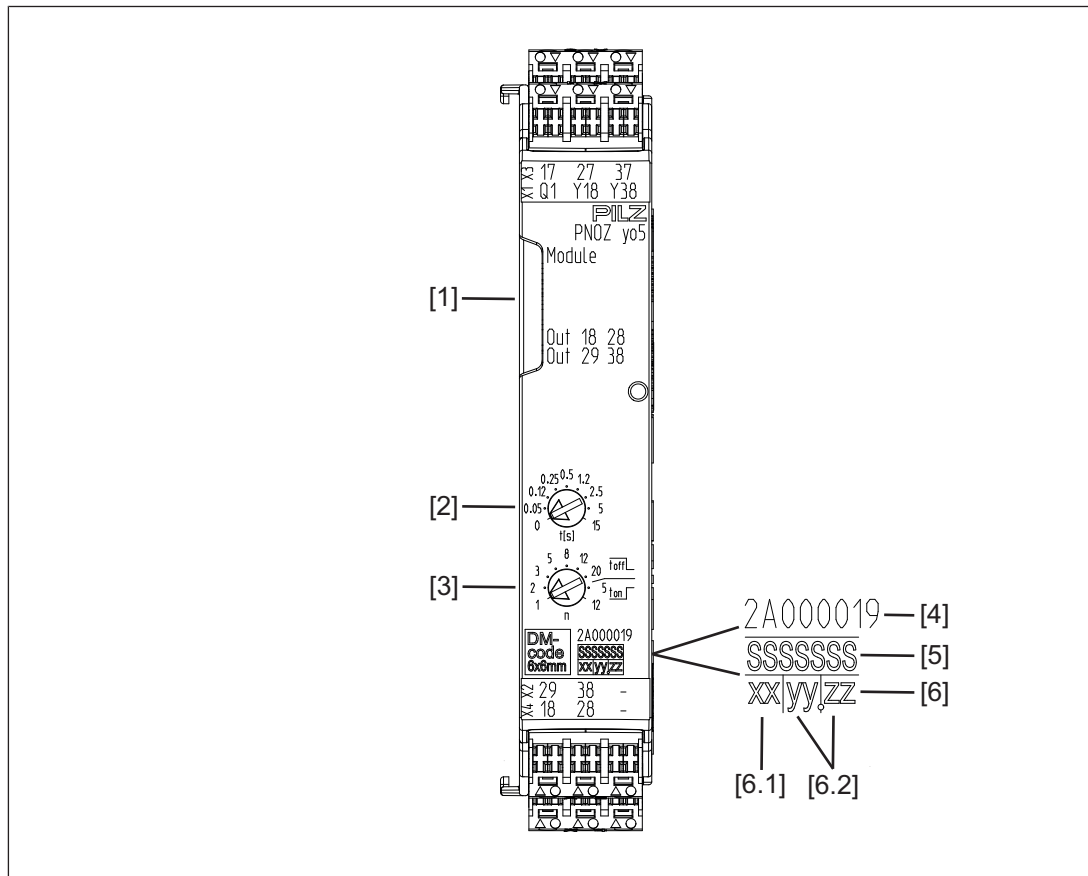


NOTICE

Required firmware version of the head module: ≥ 03.00

The expansion module also only works from this firmware version. The firmware version is stated on the head module (see head module [Front view](#)  90).

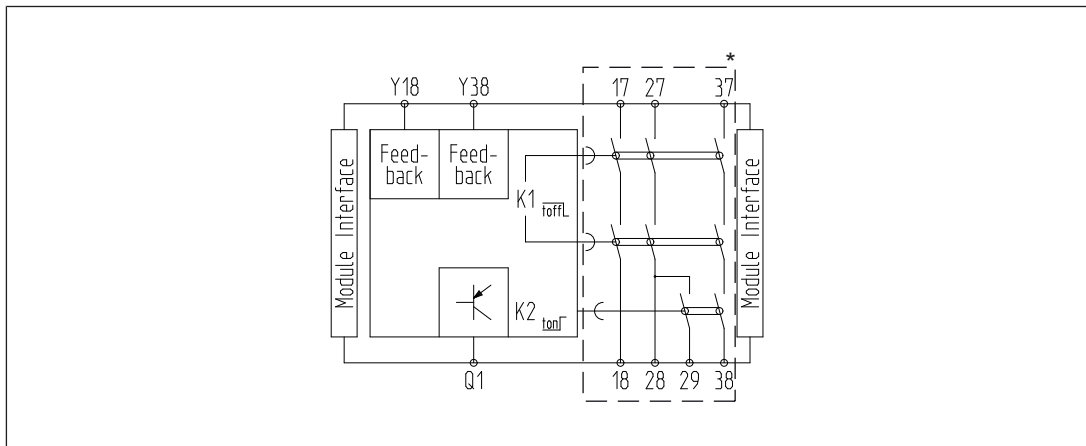
16.13.2 Front view



Legend

- [1] LEDs for diagnostics
- [2] **t[s]** rotary switch for time value for the delay
- [3] **n** rotary switch for delay factor and delay type (when switching on or off)
- [4] Order number
- [5] Serial number
- [6] Product version, consists of:
 - [6.1] Hardware version
 - [6.2] Firmware version, e.g. 0200 = 02.00

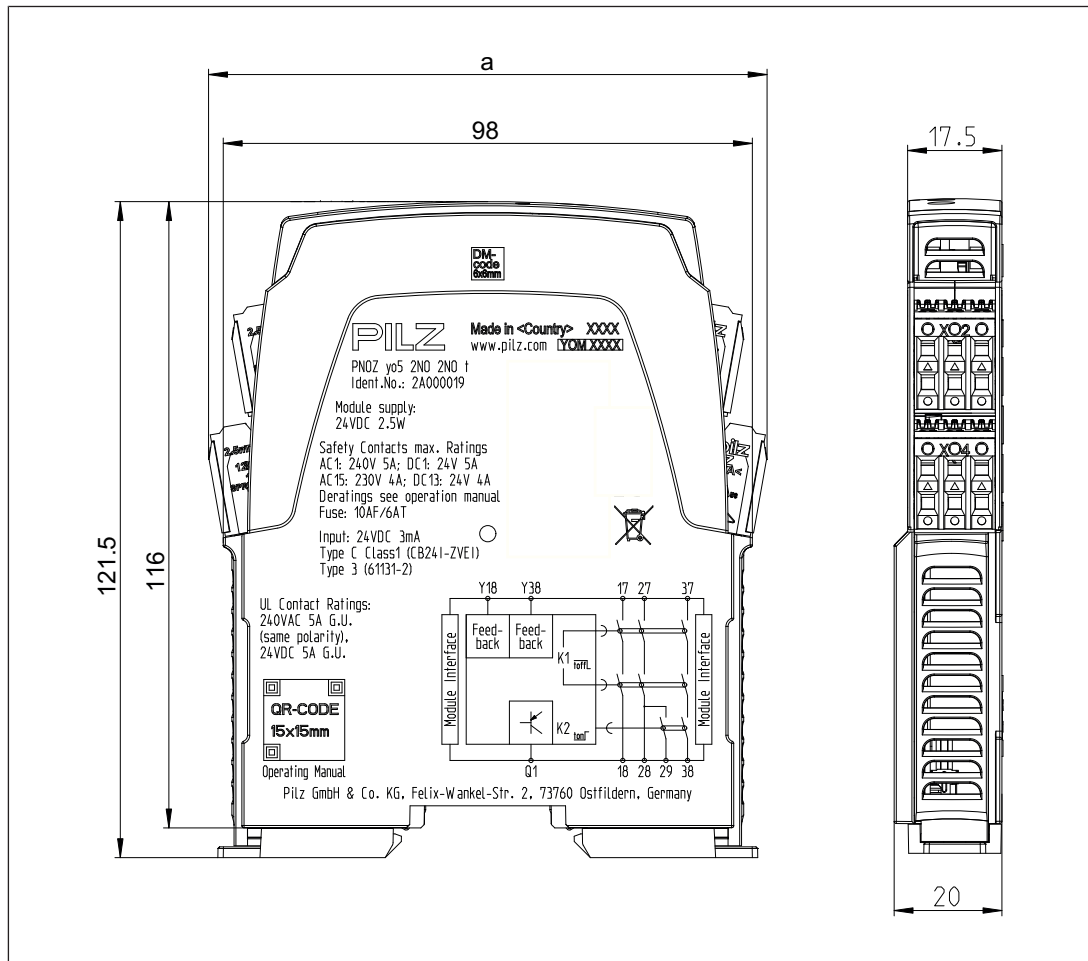
16.13.3 Block diagram



* Insulation against the non-marked area and between the relay contacts:

- ▶ Basic insulation, overvoltage category III
- ▶ Safe separation, overvoltage category II

16.13.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.13.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CE, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	95 mA
Max. power dissipation of module	4,8 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Number of feedback loop inputs	2
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Potential isolation	No
Signal outputs	
Quantity	1
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Relay outputs	
Number of output contacts	
Safety contacts (N/O), instantaneous	2
Safety contacts (N/O), delayed	2
Max. short circuit current I _K	1 kA
Utilisation category	
in accordance with the standard	EN IEC 60947-4-1

Relay outputs

Utilisation category of safety contacts

AC1 at	240 V
Min. current	3 mA
Max. current	5 A
Max. power	1.200 VA
DC1 at	24 V
Min. current	3 mA
Max. current	5 A
Max. power	120 W

Utilisation category

in accordance with the standard	EN 60947-5-1
---------------------------------	---------------------

Utilisation category of safety contacts

AC15 at	230 V
Max. current	4 A
Max. power	920 W
DC13 (6 cycles/min) at	24 V
Max. current	4 A
Max. power	96 W

Utilisation category in accordance with UL

Voltage	240 V AC Pilot Duty same pol.
with current	5 A
Voltage	24 V DC Pilot Duty
with current	5 A
Pilot Duty	B300, R300

External contact fuse protection, safety contacts

in accordance with the standard	EN 60947-5-1
Max. melting integral	260 A²s
Blow-out fuse, quick	10 A
Blow-out fuse, slow	6 A
Blow-out fuse, gG	10 A

Contact material	AgCuNi + 0,2 µm Au
------------------	---------------------------

Potential isolation	Yes
---------------------	------------

Conventional thermal current while loading several contactsI_{th} per contact at UB DC; AC1: 240 V, DC1: 24 V

Conv. therm. current with 1 contact	5 A
Conv. therm. current with 2 contacts	4 A
Conv. therm. current with 3 contacts	3,5 A

Times

Selectable delay time when switching on	0,25 s, 0,6 s, 1,25 s, 1,44 s, 12,5 s, 14,4 s, 180 s, 2,5 s, 25 s, 3 s, 30 s, 6 s, 60 s, 75 s
---	--

Times

Selectable delay time when switching off	0,05 s, 0,1 s, 0,12 s, 0,15 s, 0,24 s, 0,25 s, 0,36 s, 0,4 s, 0,5 s, 0,6 s, 0,75 s, 0,96 s, 1 s, 1,2 s, 1,25 s, 1,44 s, 1,5 s, 10 s, 100 s, 12,5 s, 120 s, 14,4 s, 15 s, 180 s, 2 s, 2,4 s, 2,5 s, 20 s, 24 s, 25 s, 3 s, 3,6 s, 30 s, 300 s, 4 s, 40 s, 45 s, 5 s, 6 s, 60 s, 7,5 s, 75 s, 9,6 s
Time accuracy	+/-1,5 %
Supply interruption before de-energisation	20 ms

Environmental data

Ambient temperature	
in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C
Storage temperature	
in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C
Climatic suitability	
in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
EMC	EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4
Vibration	
in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm
Shock stress	
in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms
Airgap creepage	
in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2
Protection type	
in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Potential isolation

Potential isolation between	Output and system voltage
Type of potential isolation	Protective separation
Rated insulation voltage	250 V
Rated surge voltage	6000 V

Mechanical data

Mounting position	Any
Mechanical life	10,000,000 cycles

Mechanical data

DIN rail	
Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	17,5 mm
Depth	121 mm
Weight	137 g

16.13.6 Safety characteristic data



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/max. SIL	EN IEC 62061 61508 PFH [1/h]	EN/IEC 61511 61508 SIL	EN/IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
2-channel	PL e	Cat. 4	SIL 3	8,75E-10	SIL 3	7,21E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

With relay outputs, refer to the guidelines under [Service life curve](#)  214].

16.13.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Relay outputs**Interfaces**

Source

Interface	Module
Class	A

Drain

Interface	Actuator
Class	A

Source parameters

Min. switching voltage	12 V
Max. switching voltage	250 V
Min. switching current	3 mA
Max. switching current	5 A
Potential isolation	Yes

16.13.8 Supplementary data

16.13.8.1 Operating height

The values stated in the technical details apply to the use of the product in operating heights up to max. 2000 m above sea level. When used in greater heights, constraints have to be taken into account:

- ▶ Permitted maximum operating height 5000 m

Reduction of the voltage at the relay outputs at $U_B = 30\text{ V}$ depending on the operating height

Prerequisite:

- ▶ Overvoltage category: III
- ▶ Pollution degree: 2

Maximum operating height	Max. voltage at the relay output
2000 m	300 V
3000 m	150 V
4000 m	150 V
5000 m	150 V

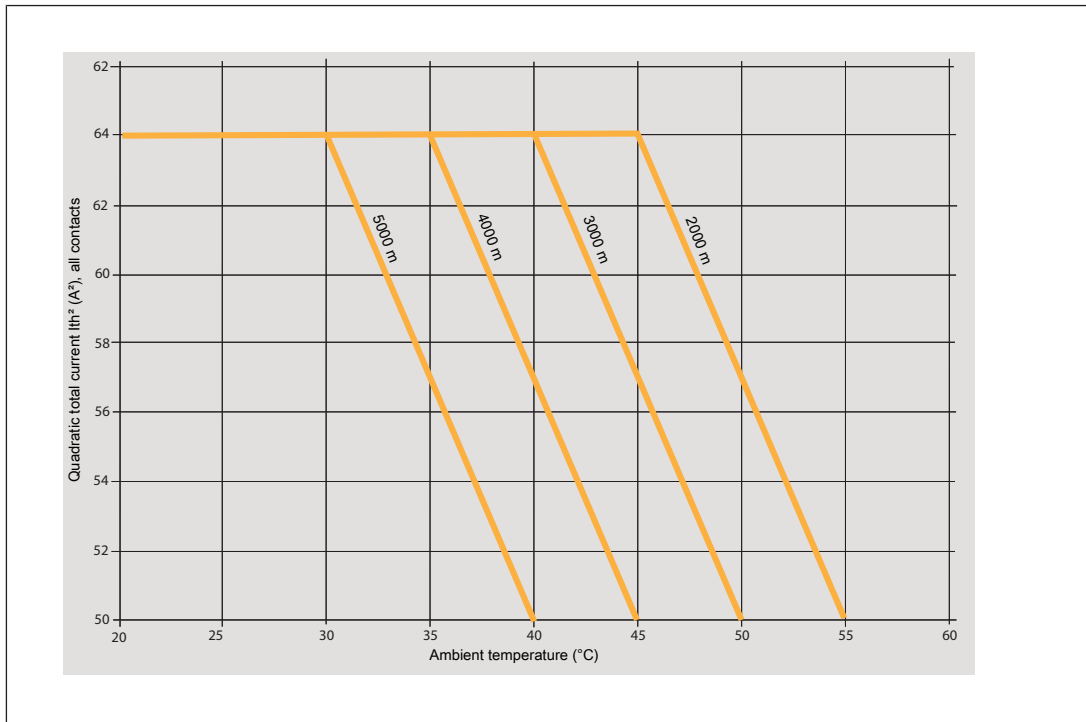
- ▶ From an operating height of 2000 m the max. permitted ambient temperature is reduced by 0.5 °C/100 m

Operating height	Permitted ambient temperature
3000 m	50 °C
4000 m	45 °C
5000 m	40 °C

16.13.8.2 Conventional thermal current

The following diagram applies to expansion modules that are installed correctly on a vertical or horizontal top hat rail (see [Installation and removal](#) [ 58]).

The permitted total current is shown depending on the operating height and the ambient temperature (see [Operating height](#) [ 213]).



$$I_{th^2 \max} = (I_{\text{terminal } 17})^2 + (I_{\text{terminal } 27})^2 + (I_{\text{terminal } 37})^2 + (I_{\text{terminal } 29})^2/2 + (I_{\text{terminal } 39})^2/2$$

16.13.8.3

Service life graph

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.

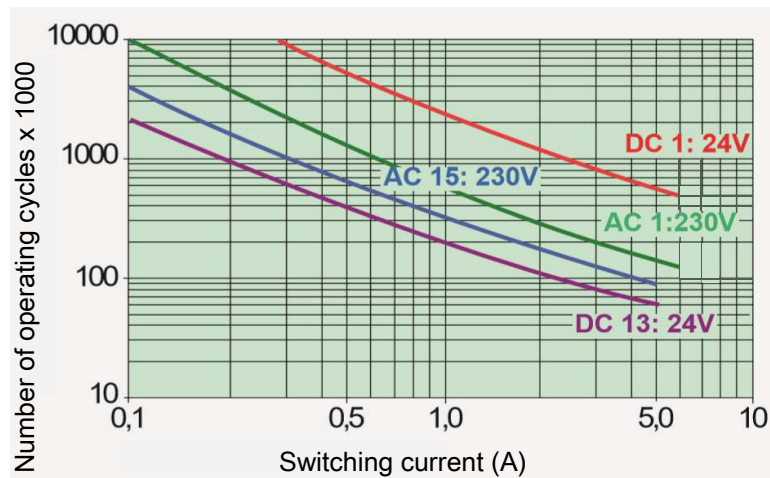


CAUTION!

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switch frequency and the load of the relay output.

If the service life graphs are not accessible, the stated PFH value can be used irrespective of the switch frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.



Example

- ▶ Inductive load: 0.3 A
- ▶ Utilisation category AC15
- ▶ Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value can be used in the calculation (see [Safety characteristic data](#) [211]).

To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With DC contactors, use flywheel diodes for spark suppression.

16.13.9 Order reference**16.13.9.1 Product**

Product type	Features	Order no.
PNOZ yo5 2NO 2NO t	Expansion module for the modular safety relay myPNOZ, 1 output function with 2 safe relay outputs, positive guided, on-delay, and 1 input for feedback loop and with 2 safe relay outputs, positive guided, off-delay, and 1 input for feedback loop, 1 signal output, 1 rotary switch for setting the delay time, 1 rotary switch for the factor setting for the delay and for selecting the off or on-delay, LED display	2A000019

16.13.9.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003

16.14 PNOZ yio1 2DI 2SO

16.14.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Supply voltage connection for the semiconductor outputs
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 2 output functions, each with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop
- ▶ 2 signal outputs (Q10 from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q1 for output function
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input
 - Switch state of the outputs



NOTICE

**Required firmware version of the head module for signal output Q10:
≥ 02.00**

The new signal output Q10 only works from this firmware version onwards. The firmware version is stated on the head module (see head module [Front view](#) [ 90]).

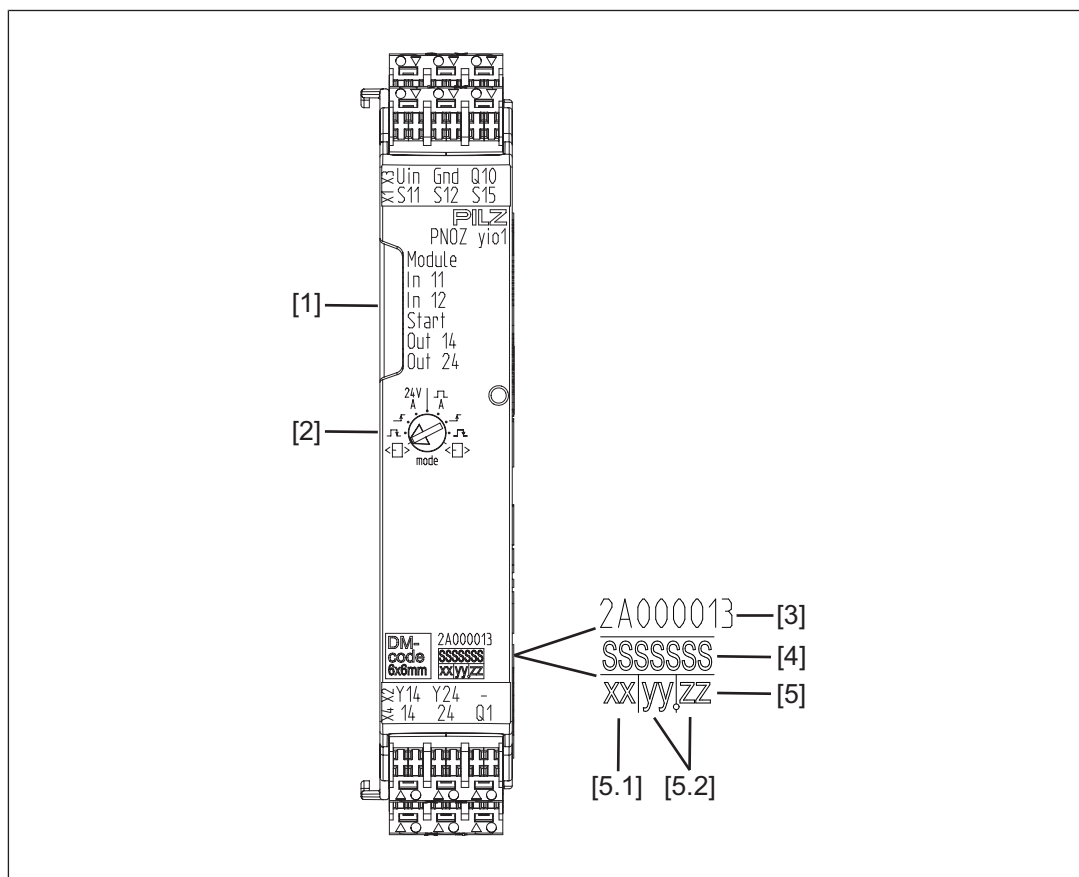


NOTICE

An expansion module with hardware version 02 is installed together with a head module with firmware version 01.00:

The expansion module with hardware version 02 will then function in the same way as an expansion module with hardware version 01, without signal output Q10.

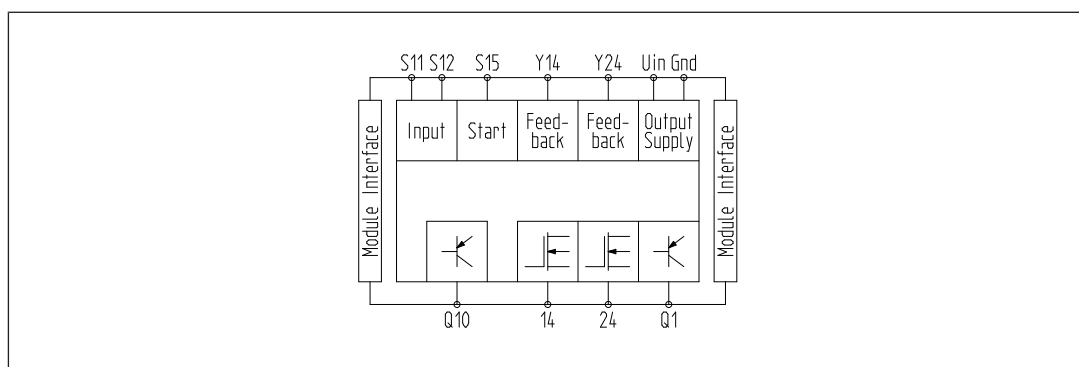
16.14.2 Front view



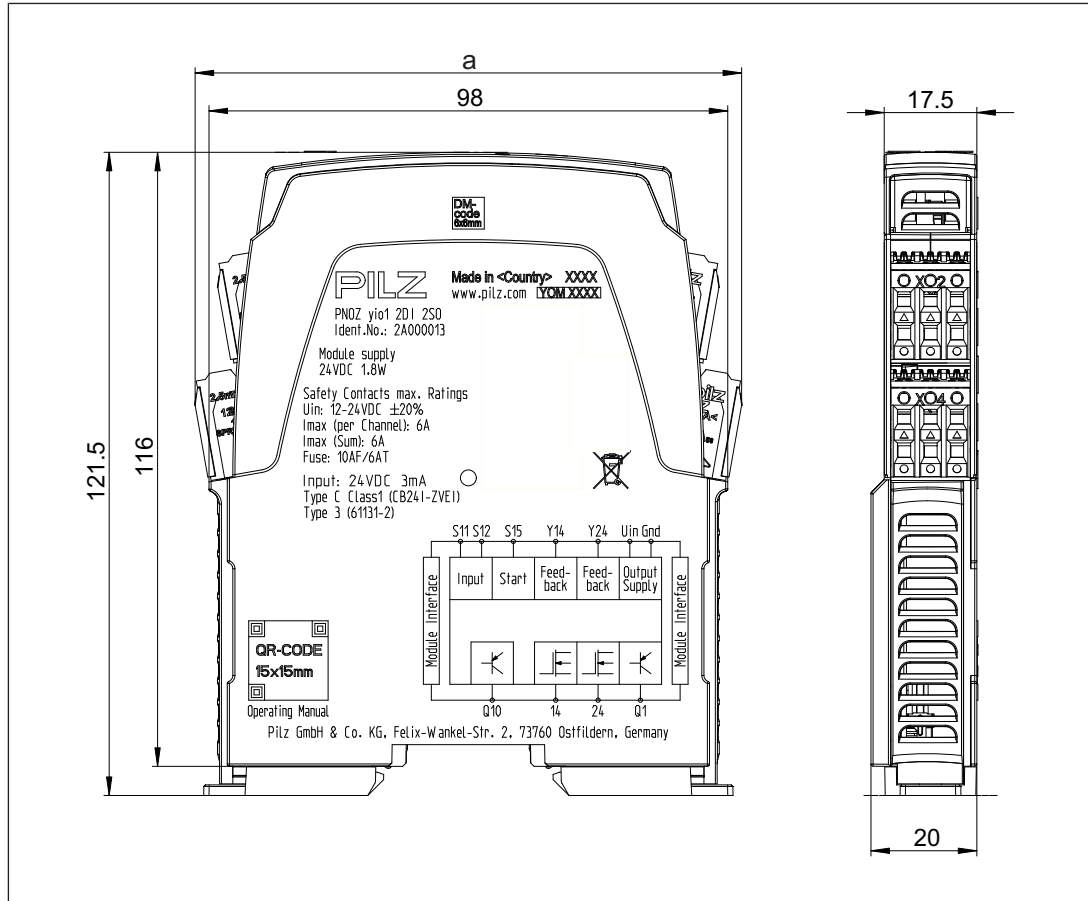
Legend

- [1] LEDs for diagnostics
- [2] **mode** rotary switch for start types and test pulse evaluation (S11, S12)
- [3] Order number
- [4] Serial number
- [5] Product version, consists of:
 - [5.1] Hardware version
 - [5.2] Firmware version, e.g. 0200 = 02.00

16.14.3 Block diagram



16.14.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.14.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Supply to the SC outputs
Voltage	12 - 24 V
Kind	DC
Voltage tolerance	-20 %/+20 %
Max. continuous current that the external power supply must provide	6 A
Potential isolation	No
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	55 mA
Max. power dissipation of module	2,2 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	2
Number of start inputs	1
Number of feedback loop inputs	2
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Semiconductor outputs	
Number of safety outputs	
Instantaneous	2
Switching capability	
Voltage	12 - 24 V
Current	6 A
Max. switching frequency	1 Hz

Semiconductor outputs

Max. permitted total current	6 A
Residual current at "0" signal	0,5 mA
Max. transient pulsed current	100 A
Max. capacitive load	2,5 µF
Max. internal voltage drop	160 mV
Max. duration of off time during self test	500 µs
Potential isolation	No
Short circuit-proof	Yes
Permitted loads	inductive, capacitive, resistive

Signal outputs

Quantity	2
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes

Times

Recovery time at max. switching frequency 1/s after E-STOP	30 ms
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start with rising edge	100 ms
with rising and falling edge	150 ms
Max. start pulse duration with a monitored start with rising and falling edge	2 s
Supply interruption before de-energisation	20 ms
Simultaneity, input circuit	∞

Environmental data

Ambient temperature in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C
Storage temperature in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C
Climatic suitability in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
Max. operating height above SL	5000 m
EMC	EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4
Vibration in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm

Environmental data

Shock stress	
in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms

Airgap creepage	
in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2

Protection type	
in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Mechanical data

Mounting position	Any
DIN rail	
Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	17,5 mm
Depth	121 mm
Weight	85 g

16.14.6 Safety characteristic data



NOTICE

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

Unit	Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN 62061 SIL CL/ max. SIL	EN 62061 61508 PFH _D [1/h]	IEC 61511 61508 SIL	IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
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Input								
Inputs	2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20
Output								
SC output, single	2-channel	PL e	Cat. 4	SIL 3	6,44E-10	SIL 3	5,43E-05	20
SC output, redundant	2-channel	PL e	Cat. 4	SIL 3	9,68E-10	SIL 3	8,16E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.14.7 Classification in accordance with ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF
Single-pole output	
Interfaces	
Source	
Interface	Module
Class	C2
Drain	
Interface	Actuator
Class	C1, C2
Source parameters	
Max. test pulse duration	500 µs
Max. rated current	6 A
Max. capacitive load	2,5 µF

16.14.8 Order reference**16.14.8.1 Product**

Product type	Features	Order no.
PNOZ yio1 2DI 2SO	Expansion module for the modular safety relay myPNOZ, connection for supply voltage to the semiconductor outputs, 1 input function, 2 output functions, each with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop, 2 signal outputs, 1 rotary switch for setting the start type and test pulse evaluation, LED display	2A000013

16.14.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003
Terminal Block Filter 3-10kOhm	Terminal block with filter function 3 – 10 kOhm.	772290
Terminal Block Filter 10-30kOhm	Terminal block with filter function 10 – 30 kOhm.	772291

16.15 PNOZ yio2 2DI 3NO

16.15.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 1 output function with 3 safe relay outputs, positive-guided, instantaneous, and 1 input for feedback loop
- ▶ 2 signal outputs (Q10 from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q1 for output function
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input
 - Switch state of the outputs



NOTICE

**Required firmware version of the head module for signal output Q10:
≥ 02.00**

The new signal output Q10 only works from this firmware version onwards. The firmware version is stated on the head module (see head module [Front view](#) [ 90]).

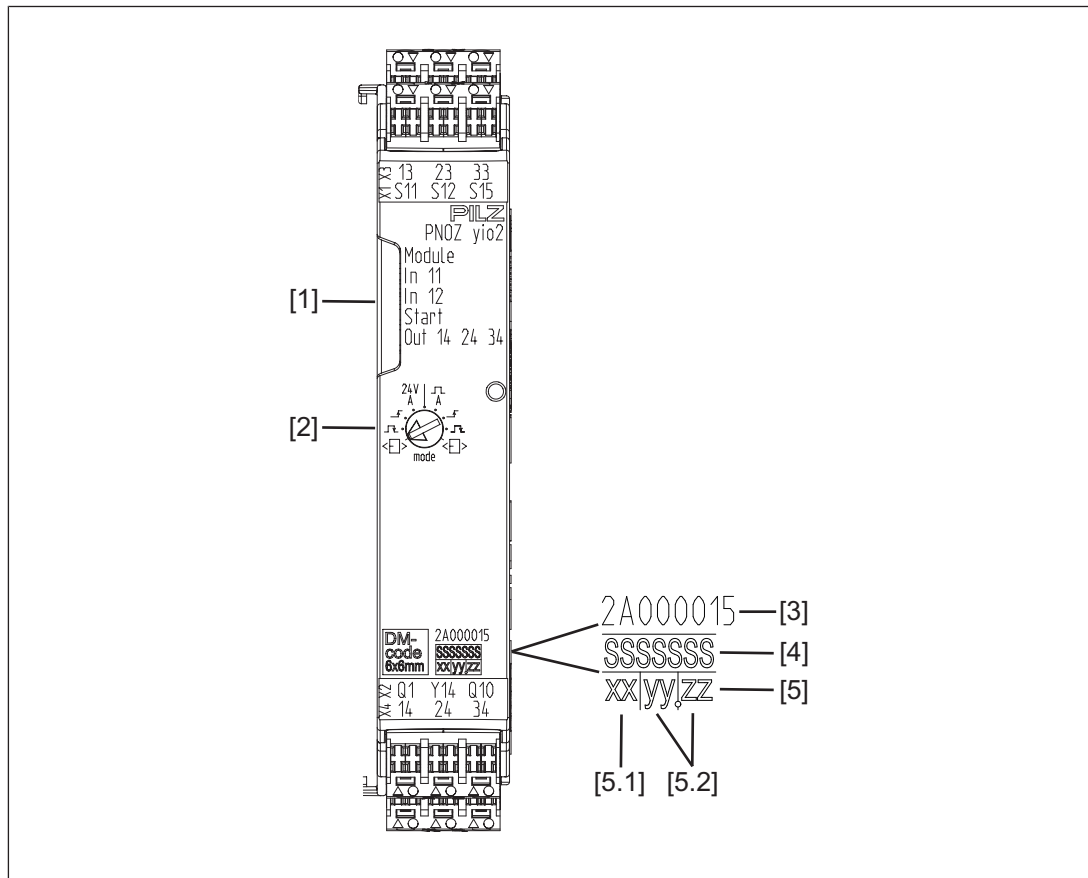


NOTICE

An expansion module with hardware version 02 is installed together with a head module with firmware version 01.00:

The expansion module with hardware version 02 will then function in the same way as an expansion module with hardware version 01, without signal output Q10.

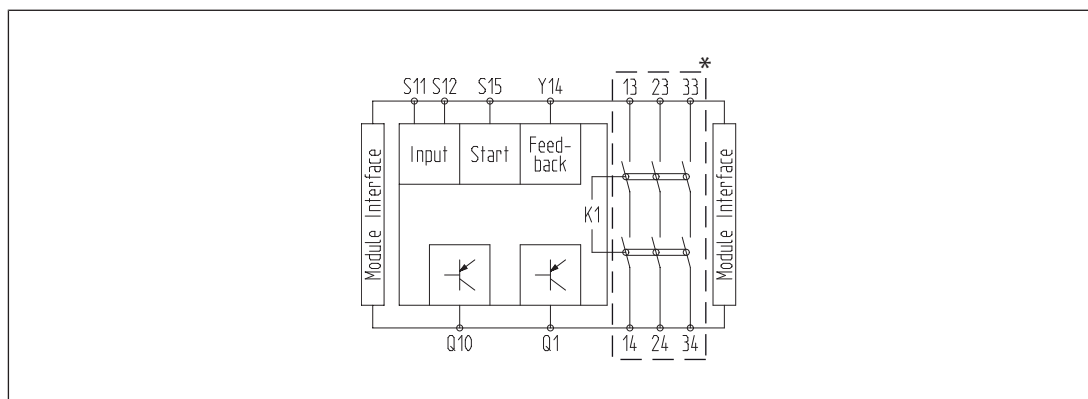
16.15.2 Front view



Legend

- [1] LEDs for diagnostics
- [2] **mode** rotary switch for start types and test pulse evaluation (S11, S12)
- [3] Order number
- [4] Serial number
- [5] Product version, consists of:
 - [5.1] Hardware version
 - [5.2] Firmware version, e.g. 0200 = 02.00

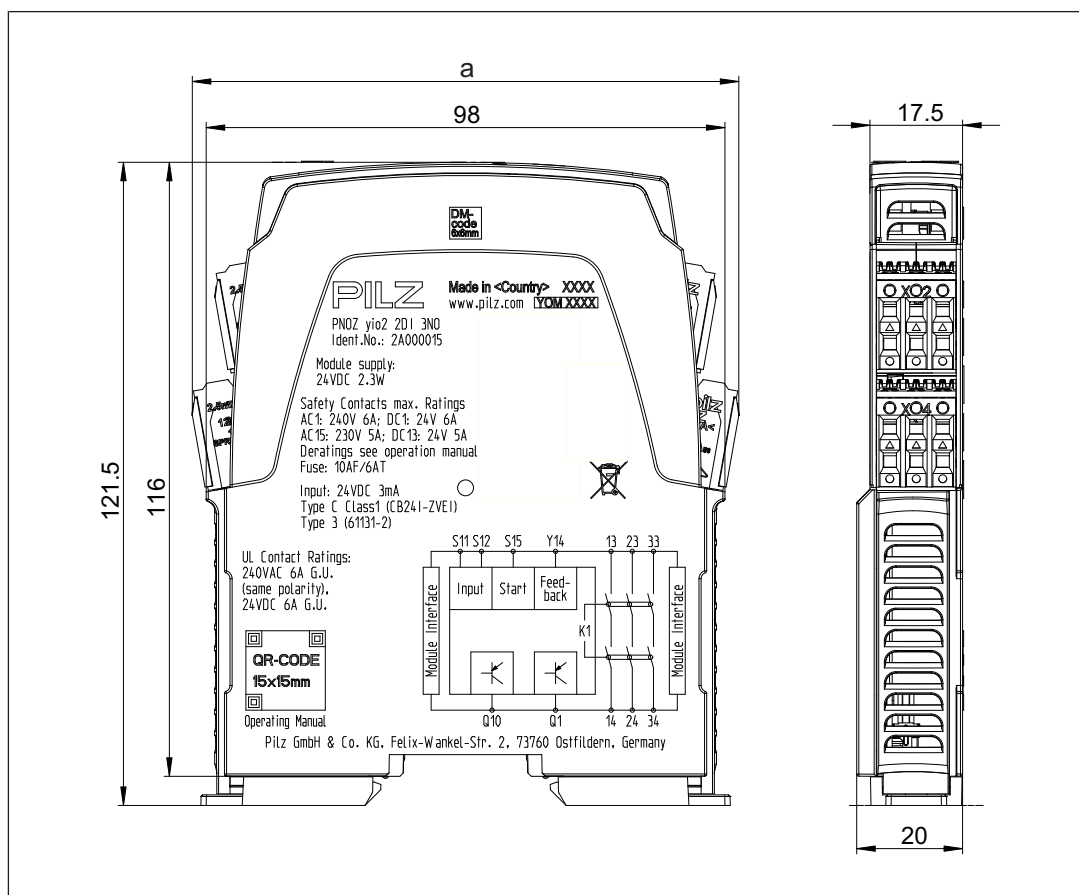
16.15.3 Block diagram



* Insulation against the non-marked area and between the relay contacts:

- ▶ Basic insulation, overvoltage category III
- ▶ Safe separation, overvoltage category II

16.15.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.15.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	75 mA
Max. power dissipation of module	4,17 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	2
Number of start inputs	1
Number of feedback loop inputs	1
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	2
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Relay outputs	
Number of output contacts	
Safety contacts (N/O), instantaneous	3
Max. short circuit current I _K	1 kA
Utilisation category	
in accordance with the standard	EN IEC 60947-4-1

Relay outputs

Utilisation category of safety contacts

AC1 at	240 V
Min. current	3 mA
Max. current	6 A
Max. power	1.500 VA
DC1 at	24 V
Min. current	3 mA
Max. current	6 A
Max. power	150 W

Utilisation category

in accordance with the standard	EN 60947-5-1
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Utilisation category of safety contacts

AC15 at	230 V
Max. current	5 A
Max. power	1.150 W
DC13 (6 cycles/min) at	24 V
Max. current	5 A
Max. power	120 W

Utilisation category in accordance with UL

Voltage	240 V AC Pilot Duty same pol.
with current	6 A
Voltage	24 V DC Pilot Duty
with current	6 A
Pilot Duty	B300, R300

External contact fuse protection, safety contacts

in accordance with the standard	EN 60947-5-1
Max. melting integral	260 A²s
Blow-out fuse, quick	10 A
Blow-out fuse, slow	6 A
Blow-out fuse, gG	10 A

Contact material	AgCuNi + 0,2 µm Au
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Potential isolation	Yes
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Conventional thermal current while loading several contacts

Ith per contact at UB DC; AC1: 240 V, DC1: 24 V

Conv. therm. current with 1 contact	6 A
Conv. therm. current with 2 contacts	5,5 A
Conv. therm. current with 3 contacts	4,5 A

Times

Recovery time at max. switching frequency 1/s

after E-STOP	30 ms
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Waiting period with manual and monitored start	30 ms
--	--------------

Min. start pulse duration with a monitored start

with rising edge	100 ms
with rising and falling edge	150 ms

Times

Max. start pulse duration with a monitored start

with rising and falling edge **2 s**Supply interruption before de-energisation **20 ms**Simultaneity, input circuit **∞****Environmental data**

Ambient temperature

in accordance with the standard **EN 60068-2-14**Temperature range **-20 - 55 °C**

Storage temperature

in accordance with the standard **EN 60068-2-1/-2**Temperature range **-40 - 85 °C**

Climatic suitability

in accordance with the standard **EN 60068-2-78**

Condensation during operation

Not permitted

EMC

EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4

Vibration

in accordance with the standard **EN 60068-2-6**Frequency **10 - 55 Hz**Amplitude **0,35 mm**

Shock stress

in accordance with the standard **EN 60068-2-27**Acceleration **15g**Duration **11 ms**

Airgap creepage

in accordance with the standard **EN 60947-5-1**Overvoltage category **III**Pollution degree **2**

Protection type

in accordance with the standard **EN 60529**Housing **IP20**Terminals **IP20**Mounting area (e.g. control cabinet) **IP54****Potential isolation**Potential isolation between **Output and system voltage**Type of potential isolation **Protective separation**Rated insulation voltage **250 V**Rated surge voltage **6000 V****Mechanical data**Mounting position **Any**Mechanical life **10,000,000 cycles**

DIN rail

Top hat rail **35 x 7,5 EN/IEC 60715**Recess width **27 mm**

Mechanical data

Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm ² , 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm ² , 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm ² , 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm ² , 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	17,5 mm
Depth	121 mm
Weight	116 g

16.15.6 Safety characteristic data



NOTICE

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

Unit	Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN 62061 SIL CL/ max. SIL	EN 62061 61508 PFH _D [1/h]	IEC 61511 61508 SIL	IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
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Input								
Inputs	2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20
Output								
Relay out-puts	2-channel	PL e	Cat. 4	SIL 3	8,75E-10	SIL 3	7,21E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

With relay outputs, refer to the guidelines under [Service life graph](#)  236].

16.15.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF
Relay outputs	
Interfaces	
Source	
Interface	Module
Class	A
Drain	
Interface	Actuator
Class	A
Source parameters	
Min. switching voltage	12 V
Max. switching voltage	250 V
Min. switching current	3 mA
Max. switching current	6 A
Potential isolation	Yes

16.15.8 Supplementary data

16.15.8.1 Operating height

The values stated in the technical details apply to the use of the product in operating heights up to max. 2000 m above sea level. When used in greater heights, constraints have to be taken into account:

- ▶ Permitted maximum operating height 5000 m

Reduction of the voltage at the relay outputs at $U_B = 30\text{ V}$ depending on the operating height

Prerequisite:

- ▶ Overvoltage category: III
- ▶ Pollution degree: 2

Maximum operating height	Max. voltage at the relay output
2000 m	300 V
3000 m	150 V
4000 m	150 V
5000 m	150 V

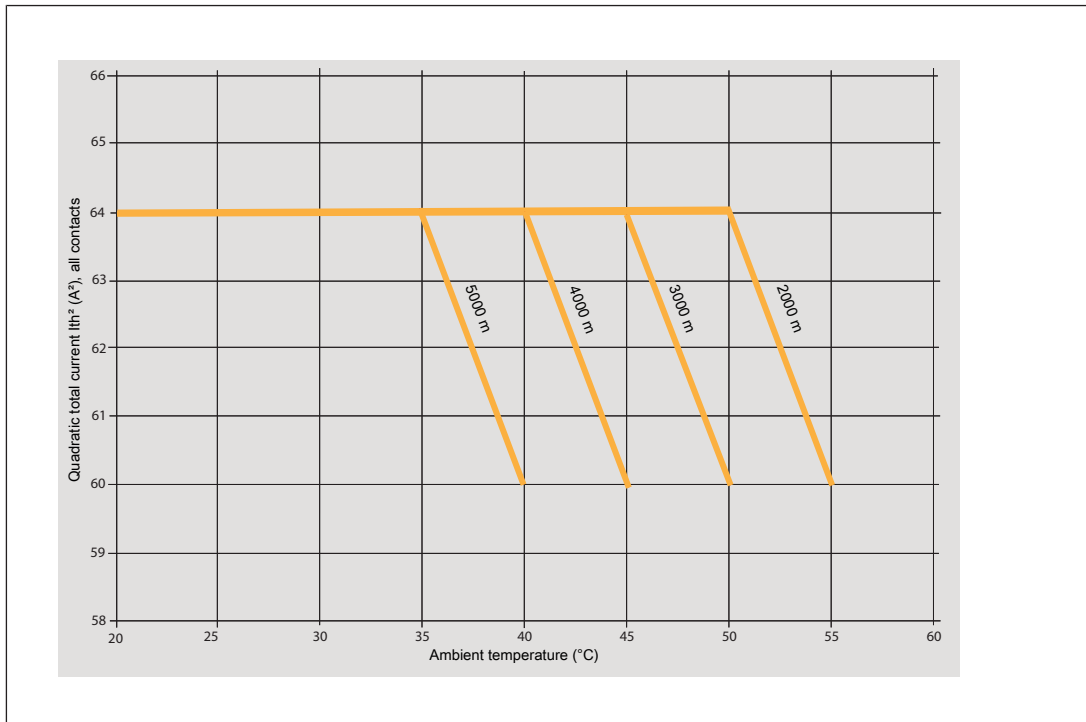
- ▶ From an operating height of 2000 m the max. permitted ambient temperature is reduced by 0.5 °C/100 m

Operating height	Permitted ambient temperature
3000 m	50 °C
4000 m	45 °C
5000 m	40 °C

16.15.8.2 Conventional thermal current

The following diagram applies to expansion modules that are installed correctly on a vertical or horizontal top hat rail (see [Installation and removal](#) [ 58]).

The permitted total current is shown depending on the operating height and the ambient temperature (see [Operating height](#) [ 235]).



$$I_{th^2 \max} = (I_{\text{terminal } 17})^2 + (I_{\text{terminal } 27})^2 + (I_{\text{terminal } 37})^2$$

16.15.8.3

Service life graph

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.

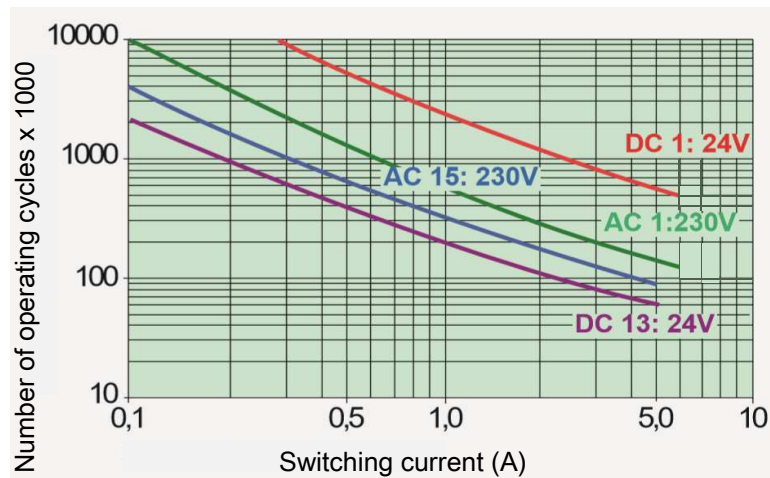


CAUTION!

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switch frequency and the load of the relay output.

If the service life graphs are not accessible, the stated PFH value can be used irrespective of the switch frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.



Example

- ▶ Inductive load: 0.3 A
- ▶ Utilisation category AC15
- ▶ Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value can be used in the calculation (see [Safety characteristic data](#) [233]).

To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With DC contactors, use flywheel diodes for spark suppression.

16.15.9 Order reference**16.15.9.1 Product**

Product type	Features	Order no.
PNOZ yio2 2DI 3NO	Expansion module for the modular safety relay myPNOZ, 1 input function, 1 output function with 3 safe relay outputs, positive guided, instantaneous, and 1 input for feedback loop, 2 signal outputs, 1 rotary switch for setting the start type and test pulse evaluation, LED display	2A000015

16.15.9.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003

16.16 PNOZ yio3 2DI 1SO 1SO t

16.16.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ Supply voltage connection for the semiconductor outputs
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 1 output function with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop
- ▶ 1 output function with 1 safe semiconductor output, delayed, and 1 input for feedback loop
- ▶ 2 signal outputs (Q10 from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q1 for output function without delay time
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **t[s]** rotary switch to set the delay time
- ▶ 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input
 - Switch state of the outputs



NOTICE

**Required firmware version of the head module for signal output Q10:
≥ 02.00**

The new signal output Q10 only works from this firmware version onwards. The firmware version is stated on the head module (see head module [Front view](#) [90]).

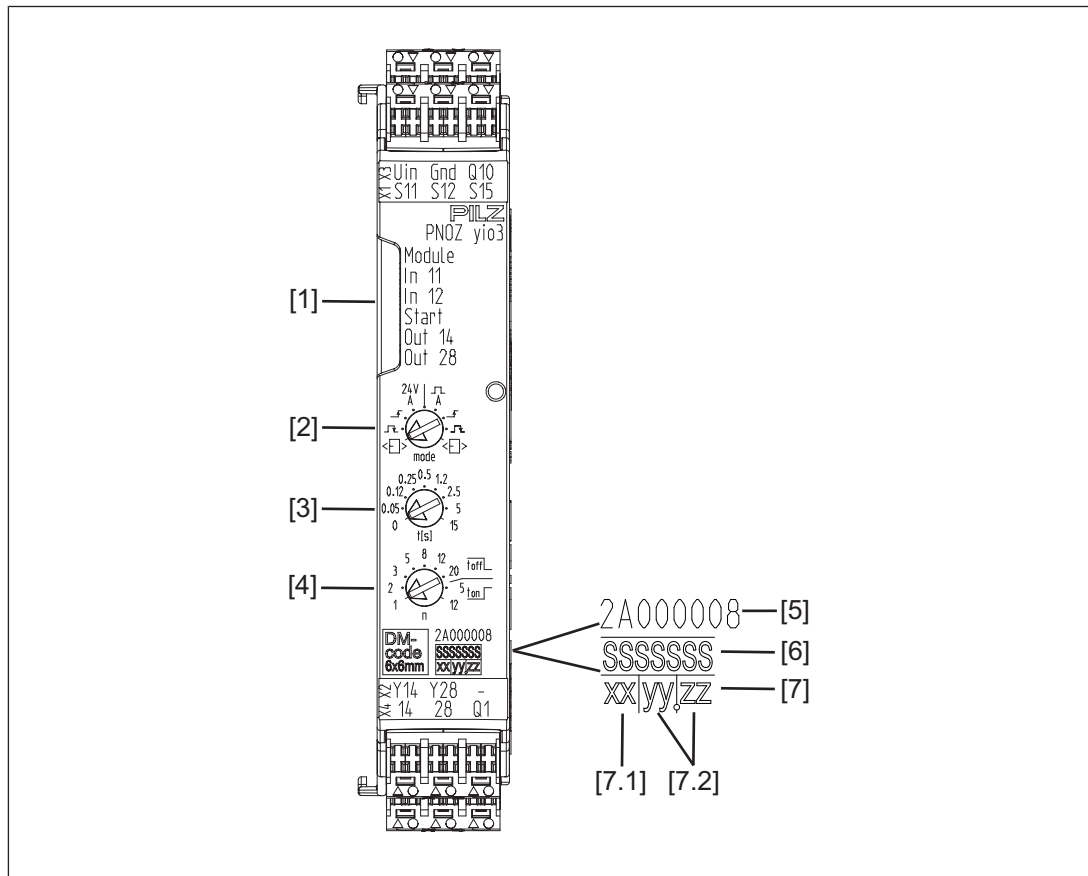


NOTICE

An expansion module with hardware version 02 is installed together with a head module with firmware version 01.00:

The expansion module with hardware version 02 will then function in the same way as an expansion module with hardware version 01, without signal output Q10.

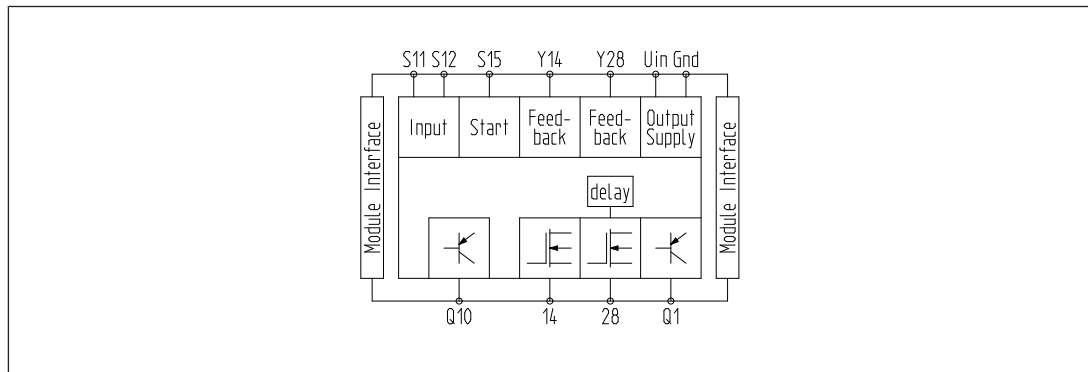
16.16.2 Front view



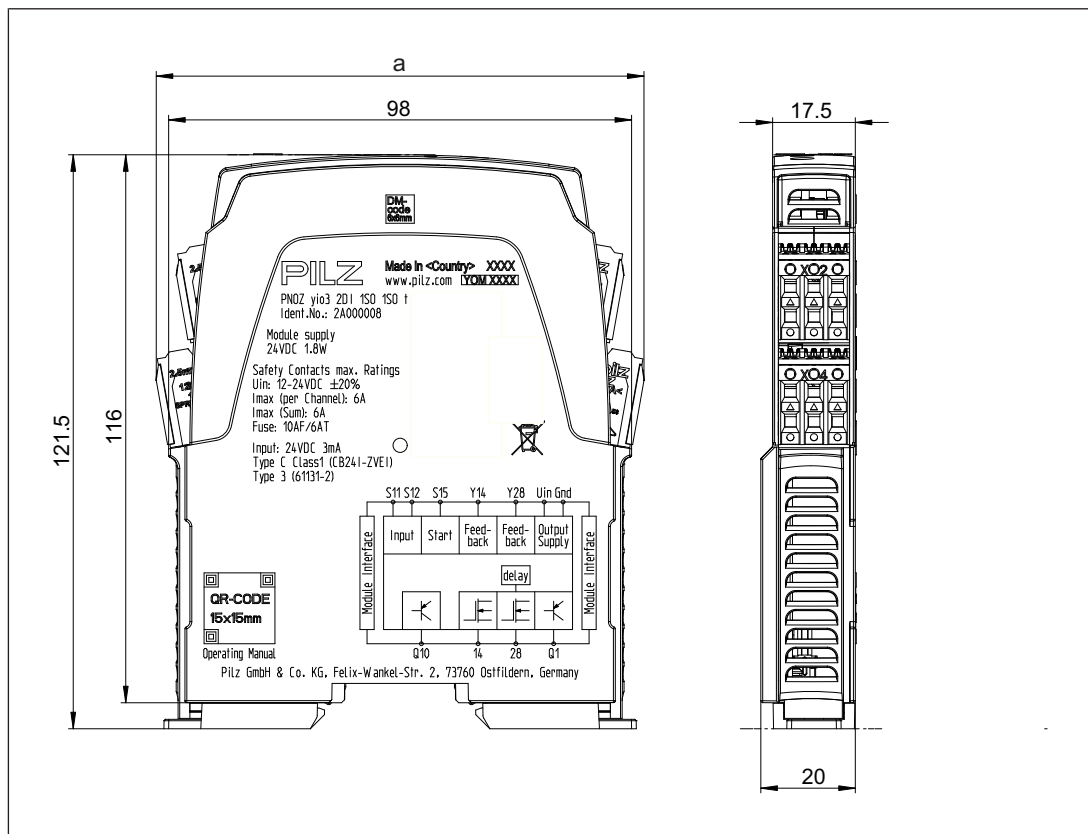
Legend

- [1] LEDs for diagnostics
- [2] **mode** rotary switch for start types and test pulse evaluation (S11, S12)
- [3] **t[s]** rotary switch for time value for the delay
- [4] **n** rotary switch for delay factor and delay type (when switching on or off)
- [5] Order number
- [6] Serial number
- [7] Product version, consists of:
 - [7.1] Hardware version
 - [7.2] Firmware version, e.g. 0200 = 02.00

16.16.3 Block diagram



16.16.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.16.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Supply to the SC outputs
Voltage	12 - 24 V
Kind	DC
Voltage tolerance	-20 %/+20 %
Max. continuous current that the external power supply must provide	6 A
Potential isolation	No
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	55 mA
Max. power dissipation of module	2,23 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	2
Number of start inputs	1
Number of feedback loop inputs	2
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Semiconductor outputs	
Number of safety outputs	
Delayed	1
Instantaneous	1
Switching capability	
Voltage	12 - 24 V
Current	6 A

Semiconductor outputs	
Max. switching frequency	1 Hz
Max. permitted total current	6 A
Residual current at "0" signal	0,5 mA
Max. transient pulsed current	100 A
Max. capacitive load	2,5 µF
Max. internal voltage drop	160 mV
Max. duration of off time during self test	500 µs
Potential isolation	No
Short circuit-proof	Yes
Permitted loads	inductive, capacitive, resistive
Signal outputs	
Quantity	2
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Times	
Recovery time at max. switching frequency 1/s after E-STOP	30 ms
Selectable delay time when switching on	0,25 s, 0,6 s, 1,25 s, 1,44 s, 12,5 s, 14,4 s, 180 s, 2,5 s, 25 s, 3 s, 30 s, 6 s, 60 s, 75 s
Selectable delay time when switching off	0,05 s, 0,1 s, 0,12 s, 0,15 s, 0,24 s, 0,25 s, 0,36 s, 0,4 s, 0,5 s, 0,6 s, 0,75 s, 0,96 s, 1 s, 1,2 s, 1,25 s, 1,44 s, 1,5 s, 10 s, 100 s, 12,5 s, 120 s, 14,4 s, 15 s, 180 s, 2 s, 2,4 s, 2,5 s, 20 s, 24 s, 25 s, 3 s, 3,6 s, 30 s, 300 s, 4 s, 40 s, 45 s, 5 s, 6 s, 60 s, 7,5 s, 75 s, 9,6 s
Time accuracy	+/-1,5 %
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start with rising edge	100 ms
with rising and falling edge	150 ms
Max. start pulse duration with a monitored start with rising and falling edge	2 s
Supply interruption before de-energisation	20 ms
Simultaneity, input circuit	∞
Environmental data	
Ambient temperature in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C
Storage temperature in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C

Environmental data

Climatic suitability	
in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
Max. operating height above SL	5000 m
EMC	EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4
Vibration	
in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm
Shock stress	
in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms
Airgap creepage	
in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2
Protection type	
in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Mechanical data

Mounting position	Any
DIN rail	
Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals:	
Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm

Mechanical data		
Dimensions		
Height		98 mm
Width		17,5 mm
Depth		121 mm
Weight		87 g

16.16.6 Safety characteristic data



NOTICE

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

Unit	Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN 62061 SIL CL/ max. SIL	EN 62061 61508 PFH _D [1/h]	IEC 61511 61508 SIL	IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
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Input								
Inputs	2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20
Output								
SC output, single	2-channel	PL e	Cat. 4	SIL 3	6,44E-10	SIL 3	5,43E-05	20
SC output, redundant	2-channel	PL e	Cat. 4	SIL 3	9,68E-10	SIL 3	8,16E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

16.16.7 Classification in accordance with ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. test pulse interval	10 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF
Single-pole output	
Interfaces	
Source	
Interface	Module
Class	C2
Drain	
Interface	Actuator
Class	C1, C2
Source parameters	
Max. test pulse duration	500 µs
Max. rated current	6 A
Max. capacitive load	2,5 µF

16.16.8 Order reference

16.16.8.1 Product

Product type	Features	Order no.
PNOZ yio3 2DI 1SO 1SO t	Expansion module for the modular safety relay myPNOZ, connection for supply voltage to the semiconductor outputs, 1 input function, 1 output function with 1 safe semiconductor output, instantaneous, and 1 input for feedback loop, 1 output function with 1 safe semiconductor output, delayed, and 1 input for feedback loop, 2 signal outputs, 1 rotary switch for setting the start type and test pulse evaluation, 1 rotary switch for setting the delay time, 1 rotary switch for the factor setting for the delay and for selecting the off or on-delay, LED display	2A000008

16.16.8.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003
Terminal Block Filter 3-10kOhm	Terminal block with filter function 3 – 10 kOhm.	772290
Terminal Block Filter 10-30kOhm	Terminal block with filter function 10 – 30 kOhm.	772291

16.17 PNOZ yio4 2DI 3NO t

16.17.1 Product features

- ▶ Expansion module for safe applications of the myPNOZ
- ▶ 1 input function to connect E-STOP pushbutton, safety gate switch or light curtain and start button, for example
- ▶ 1 output function with 3 safe relay outputs, positive-guided, delayed, and 1 input for feedback loop
- ▶ 2 signal outputs (Q10 from hardware version 02) as status indicators
 - Q10 for input function (S11, S12)
 - Q1 for output function without delay time
- ▶ 1 **mode** rotary switch to set the start type and test pulse evaluation (S11, S12)
- ▶ 1 **t[s]** rotary switch to set the delay time
- ▶ 1 **n** rotary switch for the factor setting for the delay and to select the off or on-delay
- ▶ LED display for:
 - Module status
 - State of the inputs
 - State of the start input
 - Switch state of the outputs



NOTICE

**Required firmware version of the head module for signal output Q10:
≥ 02.00**

The new signal output Q10 only works from this firmware version onwards. The firmware version is stated on the head module (see head module [Front view](#) [90]).

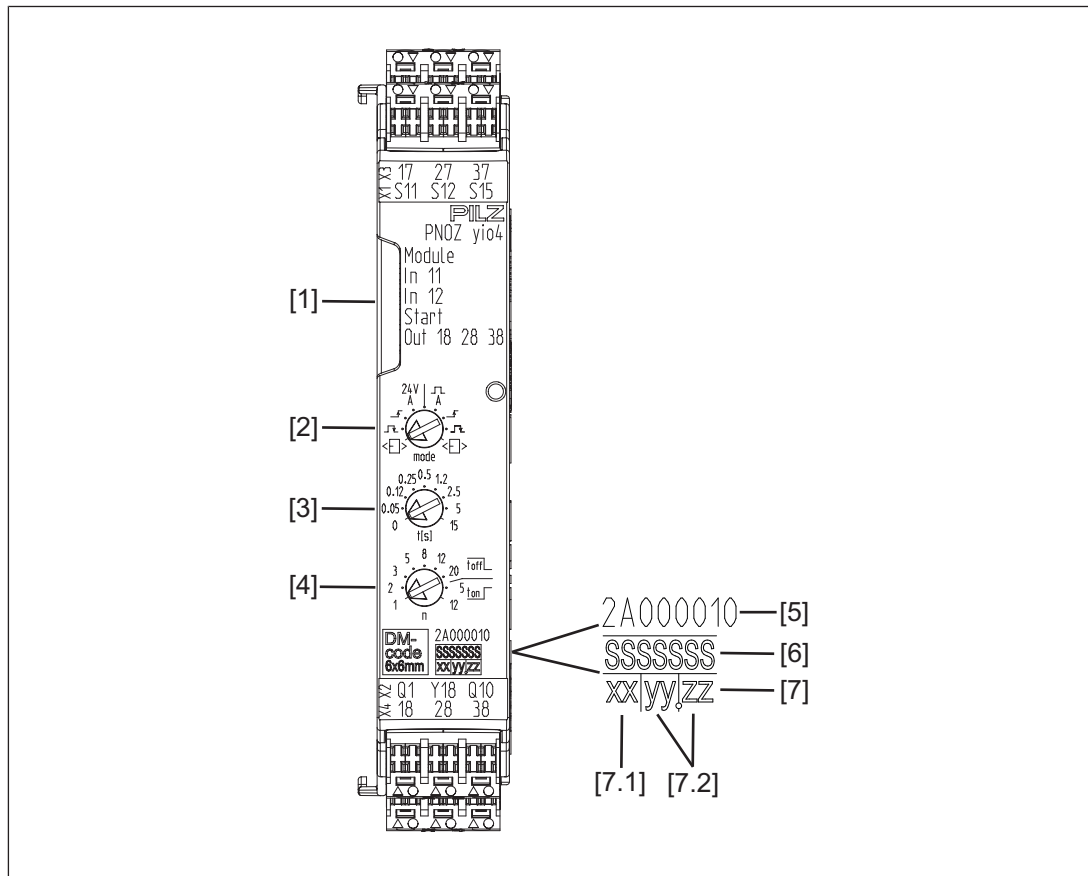


NOTICE

An expansion module with hardware version 02 is installed together with a head module with firmware version 01.00:

The expansion module with hardware version 02 will then function in the same way as an expansion module with hardware version 01, without signal output Q10.

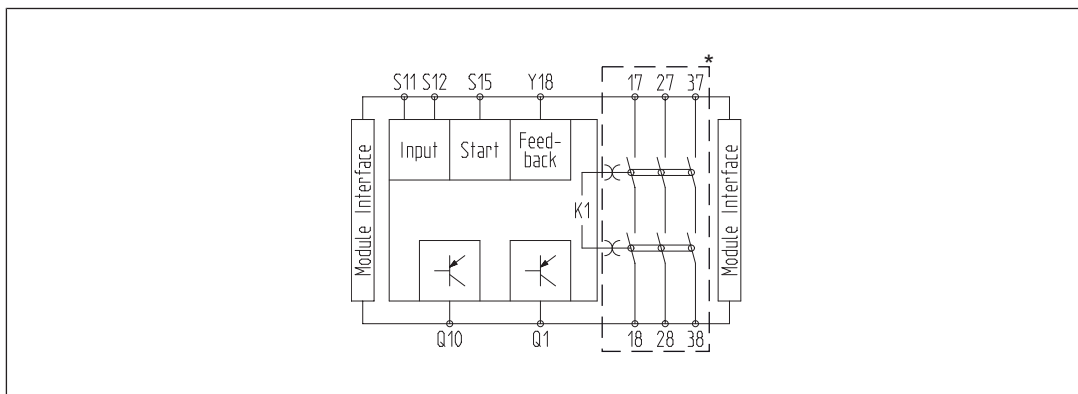
16.17.2 Front view



Legend

- [1] LEDs for diagnostics
- [2] **mode** rotary switch for start types and test pulse evaluation (S11, S12)
- [3] **t[s]** rotary switch for time value for the delay
- [4] **n** rotary switch for delay factor and delay type (when switching on or off)
- [5] Order number
- [6] Serial number
- [7] Product version, consists of:
 - [7.1] Hardware version
 - [7.2] Firmware version, e.g. 0200 = 02.00

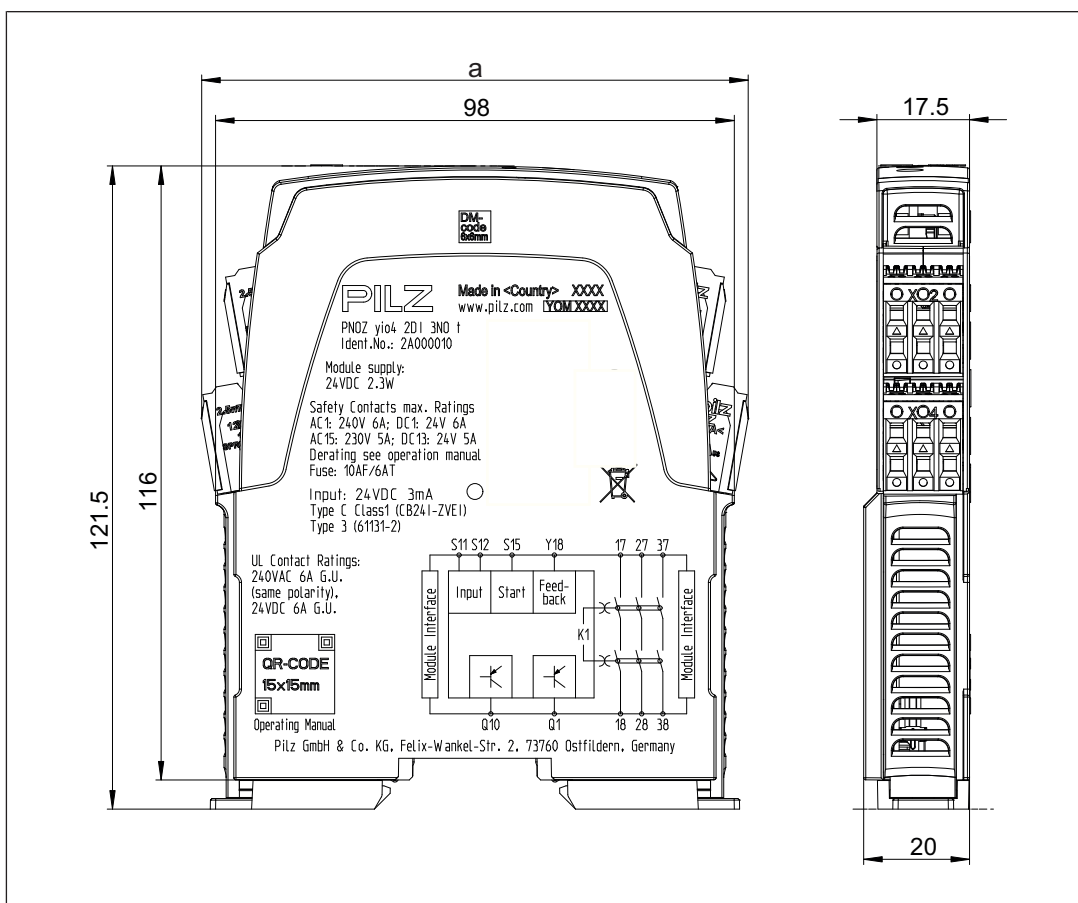
16.17.3 Block diagram



* Insulation against the non-marked area and between the relay contacts:

- ▶ Basic insulation, overvoltage category III
- ▶ Safe separation, overvoltage category II

16.17.4 Dimensions



Legend

- a Screw terminal 97 mm
- Spring-loaded terminal 104 mm

16.17.5 Technical details

Where standards are undated, the 2021-01 valid editions apply.

General	
Certifications	CCC, CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	
Supply voltage	
for	Module supply
internal	via head module
Voltage	24 V
Kind	DC
Max. current consumption without signal outputs	75 mA
Max. power dissipation of module	4,22 W
Duty cycle	100 %
Status indicator	LED
Inputs	
Quantity	2
Number of start inputs	1
Number of feedback loop inputs	1
Input voltage in accordance with EN 61131-2 Type 1	24 V DC
Input current at rated voltage	3 mA
Input current range	2,5 - 3,5 mA
Min. threshold voltage when signal changes from "1" to "0"	9 V
Max. threshold voltage when signal changes from "0" to "1"	12 V
Pulse suppression	1 ms
Maximum input delay	1,5 ms
Max. overall cable resistance R _{lmax}	2000 Ohm
Potential isolation	No
Signal outputs	
Quantity	2
Voltage	24 V
Current	50 mA
Residual current at "0"	10 µA
Max. transient pulsed current	70 mA
Max. total current of signal outputs on all modules	0,5 A
Short circuit-proof	Yes
Relay outputs	
Number of output contacts	
Safety contacts (N/O), delayed	3
Max. short circuit current I _K	1 kA
Utilisation category	
in accordance with the standard	EN IEC 60947-4-1

Relay outputs

Utilisation category of safety contacts

AC1 at	240 V
Min. current	3 mA
Max. current	6 A
Max. power	1.500 VA
DC1 at	24 V
Min. current	3 mA
Max. current	6 A
Max. power	150 W

Utilisation category

in accordance with the standard	EN 60947-5-1
---------------------------------	---------------------

Utilisation category of safety contacts

AC15 at	230 V
Max. current	5 A
Max. power	1.150 W
DC13 (6 cycles/min) at	24 V
Max. current	5 A
Max. power	120 W

Utilisation category in accordance with UL

Voltage	240 V AC Pilot Duty same pol.
with current	6 A
Voltage	24 V DC Pilot Duty
with current	6 A
Pilot Duty	B300, R300

External contact fuse protection, safety contacts

in accordance with the standard	EN 60947-5-1
Max. melting integral	260 A²s
Blow-out fuse, quick	10 A
Blow-out fuse, slow	6 A
Blow-out fuse, gG	10 A

Contact material	AgCuNi + 0,2 µm Au
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Potential isolation	Yes
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Conventional thermal current while loading several contacts

Ith per contact at UB DC; AC1: 240 V, DC1: 24 V

Conv. therm. current with 1 contact	6 A
Conv. therm. current with 2 contacts	5,5 A
Conv. therm. current with 3 contacts	4,5 A

TimesRecovery time at max. switching frequency 1/s
after E-STOP**30 ms**

Selectable delay time when switching on

**0,25 s, 0,6 s, 1,25 s, 1,44 s, 12,5 s, 14,4 s, 180 s,
2,5 s, 25 s, 3 s, 30 s, 6 s, 60 s, 75 s**

Times

Selectable delay time when switching off	0,05 s, 0,1 s, 0,12 s, 0,15 s, 0,24 s, 0,25 s, 0,36 s, 0,4 s, 0,5 s, 0,6 s, 0,75 s, 0,96 s, 1 s, 1,2 s, 1,25 s, 1,44 s, 1,5 s, 10 s, 100 s, 12,5 s, 120 s, 14,4 s, 15 s, 180 s, 2 s, 2,4 s, 2,5 s, 20 s, 24 s, 25 s, 3 s, 3,6 s, 30 s, 300 s, 4 s, 40 s, 45 s, 5 s, 6 s, 60 s, 7,5 s, 75 s, 9,6 s
Time accuracy	+/-1,5 %
Waiting period with manual and monitored start	30 ms
Min. start pulse duration with a monitored start	
with rising edge	100 ms
with rising and falling edge	150 ms
Max. start pulse duration with a monitored start	
with rising and falling edge	2 s
Supply interruption before de-energisation	20 ms
Simultaneity, input circuit	∞

Environmental data

Ambient temperature	
in accordance with the standard	EN 60068-2-14
Temperature range	-20 - 55 °C
Storage temperature	
in accordance with the standard	EN 60068-2-1/-2
Temperature range	-40 - 85 °C
Climatic suitability	
in accordance with the standard	EN 60068-2-78
Condensation during operation	Not permitted
EMC	EN 60947-5-1, EN 61326-3-1, EN IEC 61000-6-4
Vibration	
in accordance with the standard	EN 60068-2-6
Frequency	10 - 55 Hz
Amplitude	0,35 mm
Shock stress	
in accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms
Airgap creepage	
in accordance with the standard	EN 60947-5-1
Overvoltage category	III
Pollution degree	2
Protection type	
in accordance with the standard	EN 60529
Housing	IP20
Terminals	IP20
Mounting area (e.g. control cabinet)	IP54

Potential isolation

Potential isolation between	Output and system voltage
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Potential isolation	
Type of potential isolation	Protective separation
Rated insulation voltage	250 V
Rated surge voltage	6000 V
Mechanical data	
Mounting position	Any
Mechanical life	10,000,000 cycles
DIN rail	
Top hat rail	35 x 7,5 EN/IEC 60715
Recess width	27 mm
Material	
Bottom	PC
Top	PC
Connection type	Spring-loaded terminal, screw terminal
Mounting type	plug-in
Conductor cross section with screw terminals	
1 core flexible	0,25 - 2,5 mm², 24 - 12 AWG
2 core with the same cross section, flexible with crimp connectors, no plastic sleeve	0,25 - 1 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 1,5 mm², 24 - 16 AWG
Torque setting with screw terminals	0,5 Nm
Stripping length with screw terminals	7 mm
Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector	0,2 - 2,5 mm², 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length with spring-loaded terminals	9 mm
Dimensions	
Height	98 mm
Width	17,5 mm
Depth	121 mm
Weight	118 g

16.17.6 Safety characteristic data



NOTICE

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

Unit	Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN 62061 SIL CL/ max. SIL	EN 62061 61508 PFH _D [1/h]	IEC 61511 61508 SIL	IEC 61511 61508 PFD	EN ISO 13849-1: 2015 T _M [year]
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Input								
Inputs	2-channel	PL e	Cat. 4	SIL 3	1,93E-10	SIL 3	1,67E-05	20
Output								
Relay out-puts	2-channel	PL e	Cat. 4	SIL 3	8,75E-10	SIL 3	7,21E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ 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
- ▶ These characteristic data also apply in applications with feedback loop

Additional information for applications in accordance with EN/IEC 61511:

- ▶ Hardware fault tolerance: 1
- ▶ Type B subsystem
- ▶ Safety function: safe switch-off

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 products used and may differ from these.

With relay outputs, refer to the guidelines under [Service life graph](#)  259].

16.17.7 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Sensor
Class	C1
Source	
Interface	Module
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1 ms
Min. input resistance	10 kOhm
Max. capacitive load	126 nF
Relay outputs	
Interfaces	
Source	
Interface	Module
Class	A
Drain	
Interface	Actuator
Class	A
Source parameters	
Min. switching voltage	12 V
Max. switching voltage	250 V
Min. switching current	3 mA
Max. switching current	6 A
Potential isolation	Yes

16.17.8 Supplementary data

16.17.8.1 Operating height

The values stated in the technical details apply to the use of the product in operating heights up to max. 2000 m above sea level. When used in greater heights, constraints have to be taken into account:

- ▶ Permitted maximum operating height 5000 m

Reduction of the voltage at the relay outputs at $U_B = 30\text{ V}$ depending on the operating height

Prerequisite:

- ▶ Overvoltage category: III
- ▶ Pollution degree: 2

Maximum operating height	Max. voltage at the relay output
2000 m	300 V
3000 m	150 V
4000 m	150 V
5000 m	150 V

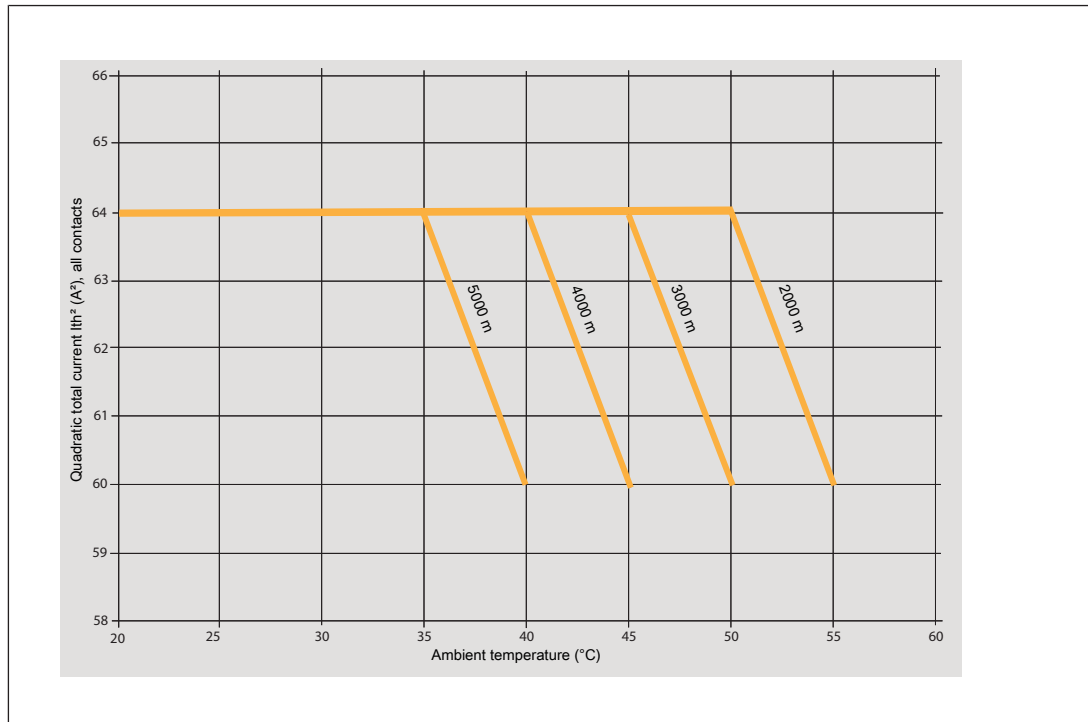
- ▶ From an operating height of 2000 m the max. permitted ambient temperature is reduced by 0.5 °C/100 m

Operating height	Permitted ambient temperature
3000 m	50 °C
4000 m	45 °C
5000 m	40 °C

16.17.8.2 Conventional thermal current

The following diagram applies to expansion modules that are installed correctly on a vertical or horizontal top hat rail (see [Installation and removal](#) [ 58]).

The permitted total current is shown depending on the operating height and the ambient temperature (see [Operating height](#) [ 258]).



$$I_{th^2 \max} = (I_{\text{terminal } 17})^2 + (I_{\text{terminal } 27})^2 + (I_{\text{terminal } 37})^2$$

16.17.8.3

Service life graph

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.

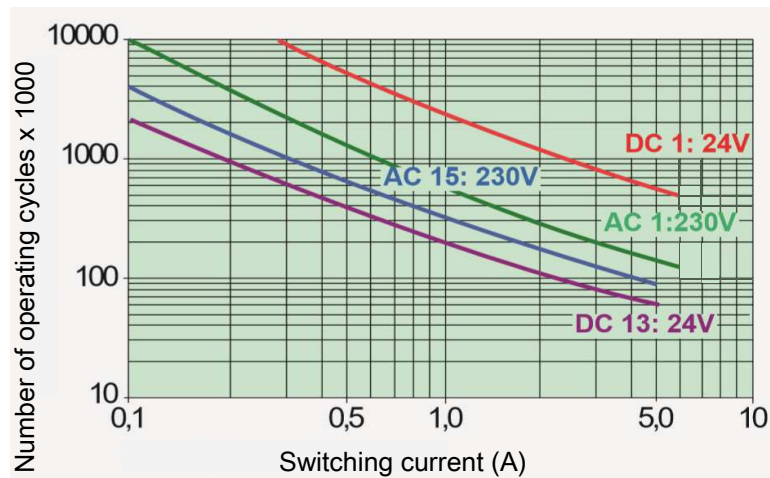


CAUTION!

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switch frequency and the load of the relay output.

If the service life graphs are not accessible, the stated PFH value can be used irrespective of the switch frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.



Example

- ▶ Inductive load: 0.3 A
- ▶ Utilisation category AC15
- ▶ Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value can be used in the calculation (see [Safety characteristic data](#) [256]).

To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With DC contactors, use flywheel diodes for spark suppression.

16.17.9 Order reference**16.17.9.1 Product**

Product type	Features	Order no.
PNOZ yio4 2DI 3NO t	Expansion module for the modular safety relay myPNOZ, 1 input function, 1 output function with 3 safe relay outputs, positive guided, delayed and 1 input for feedback loop, 2 signal outputs, 1 rotary switch for setting the start type and test pulse evaluation, 1 rotary switch for setting the delay time, 1 rotary switch for the factor setting for the delay and for selecting the off or on-delay, LED display	2A000010

16.17.9.2 Accessories

Product type	Features	Order no.
PNOZ s Setscrew terminals 17.5mm	Set of plug-in replacement terminals, screw terminals, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	750003
PNOZ s Setspring loaded terminals 17.5mm	Set of plug-in replacement terminals, spring loaded technology, PU = 1 piece each X1, X2, X3, X4, 3-pin, for 17.5 mm housing.	751003

17 **EC declaration of conformity**

This product/these products meet the requirements of the directive 2006/42/EC on 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.

Representative: Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

18 UKCA-Declaration of Conformity

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

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