



PNOZ mo3p

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THE SPIRIT OF SAFETY

- ▶ Configurable, safe small controllers PNOZmulti Classic

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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 PNOZ mo3p. It is valid until new documentation is published.

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

1.2 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 Overview

2.1 Scope

- ▶ Expansion module PNOZ mo3p
- ▶ Jumper

2.2 Unit features

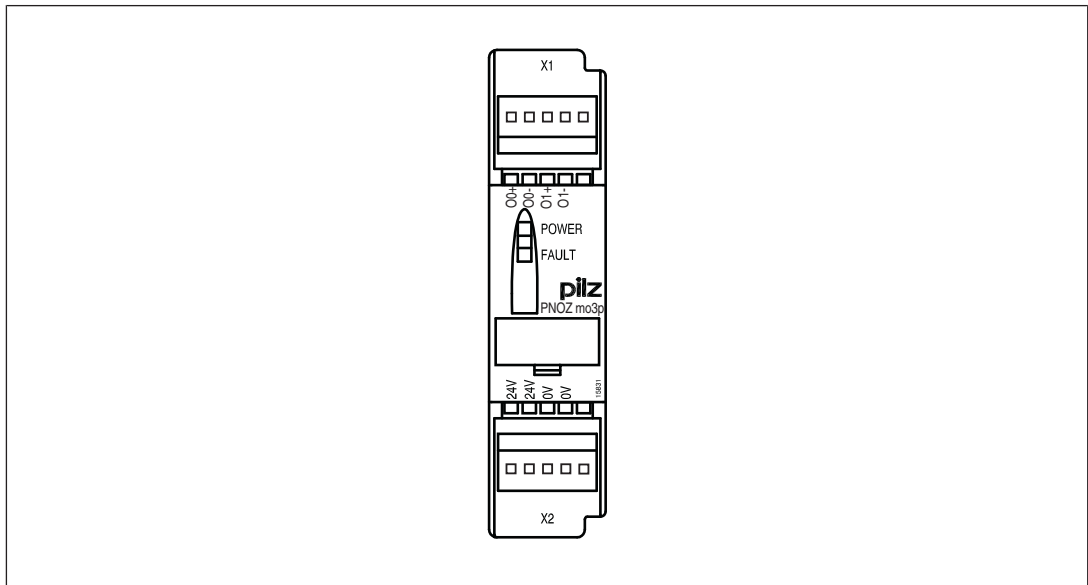
Application of the product PNOZ mo3p:

Expansion module for connection to a base unit from the configurable control system PNOZmulti

The product has the following features:

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Semiconductor outputs:
 - 2 dual-pole safety outputs
up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061, depending on the application
- ▶ Open circuit detection
- ▶ Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.
- ▶ Plug-in connection terminals:
 - Either spring-loaded terminal or screw terminal available as an accessory (see Order references for accessories).

2.3 Front view



Legend:

- ▶ 0 V, 24 V
Supply connections
- ▶ O0+, O0- and O1+, O1-
Dual-pole semiconductor outputs

3 Safety


3.1 Intended use

The expansion module may only be connected to a base unit from the PNOZmulti system (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected).

The configurable small control systems PNOZmulti are used for the safety-related interruption of safety circuits and are designed for use in:

- ▶ E-STOP equipment
- ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

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 manual,
- ▶ Use of the product outside the technical details (see [Technical details](#)  18]).



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.

3.2 Safety regulations

3.2.1 Safety assessment

Before using a device it is necessary to perform a safety assessment in accordance with the Machinery Directive.

Functional safety is guaranteed for the product as a single component. However, this does not guarantee the functional safety of the overall plant/machine. In order to achieve the required safety level for the overall plant/machine, define the safety requirements for the plant/machine and then define how these must be implemented from a technical and organisational standpoint.

3.2.2 Use of qualified personnel

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

A competent person is someone who, because of their training, experience and current professional activity, has the specialist knowledge required to test, assess and operate the work equipment, devices, systems, plant and machinery in accordance with the general standards and guidelines for safety technology.

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 this description under "Safety",
- ▶ And have a good knowledge of the generic and specialist standards applicable to the specific application.

3.2.3 **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.).

3.2.4 **Disposal**

- ▶ In safety-related applications, please comply with the mission time T_M in the safety-related characteristic data.
- ▶ When decommissioning, please comply with local regulations regarding the disposal of electronic devices (e.g. Electrical and Electronic Equipment Act).

3.2.5 **For your safety**

The unit meets all the necessary conditions for safe operation. However, you should always ensure that the following safety requirements are met:

- ▶ This operating manual only describes the basic functions of the unit. The expanded functions are described in the PNOZmulti Configurator's online help. Only use these functions once you have read and understood the documentations.
- ▶ Do not open the housing or make any unauthorised modifications.
- ▶ Please make sure you shut down the supply voltage when performing maintenance work (e.g. exchanging contactors).

3.3 **System requirements**

Please refer to the "Product Modifications PNOZmulti" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

4 Function description

4.1 Integrated protection mechanisms

The relay meets the following safety requirements:

- ▶ The circuit is redundant with built-in self-monitoring.
- ▶ The safety device remains effective in the case of a component failure.
- ▶ The safety outputs are tested periodically using a disconnection test.

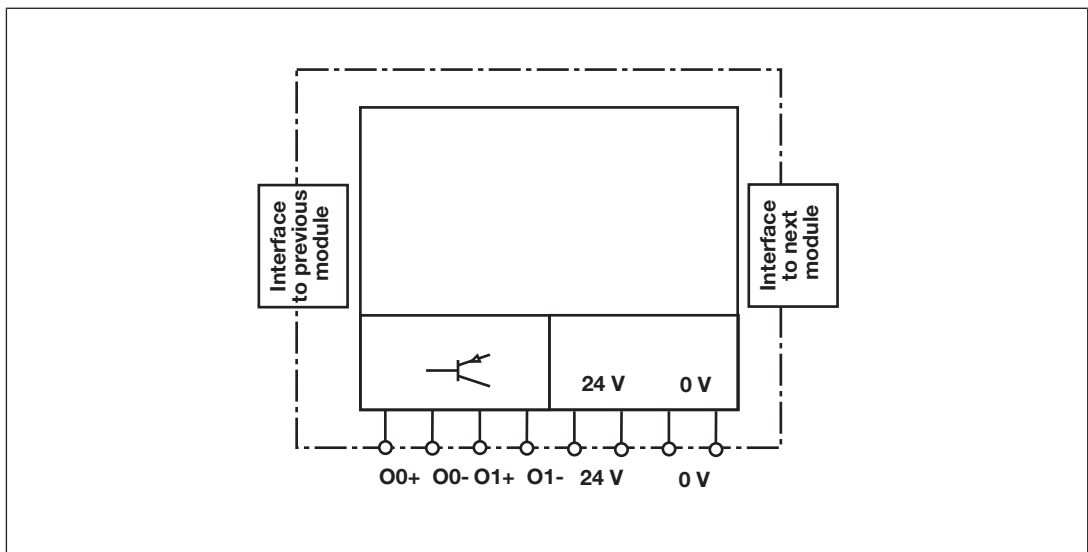
4.2 Functions

The expansion module provides additional semiconductor outputs.

The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.

The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

4.3 Block diagram



4.4 System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion".

5 Installation

5.1 General installation guidelines

- ▶ The control system should be installed in a control cabinet with a protection type of at least IP54. Fit the control system to a horizontal mounting rail. The venting slots must face upward and downward. Other mounting positions could destroy the control system.
- ▶ Use the locking elements on the rear of the unit to attach it to a mounting rail. Connect the control system to the mounting rail in an upright position, so that the earthing springs on the control system are pressed on to the mounting rail.
- ▶ The ambient temperature of the devices in the control cabinet must not exceed the figure stated in the technical details. Air conditioning may otherwise be required.
- ▶ To comply with EMC requirements, the mounting rail must have a low impedance connection to the control cabinet housing.

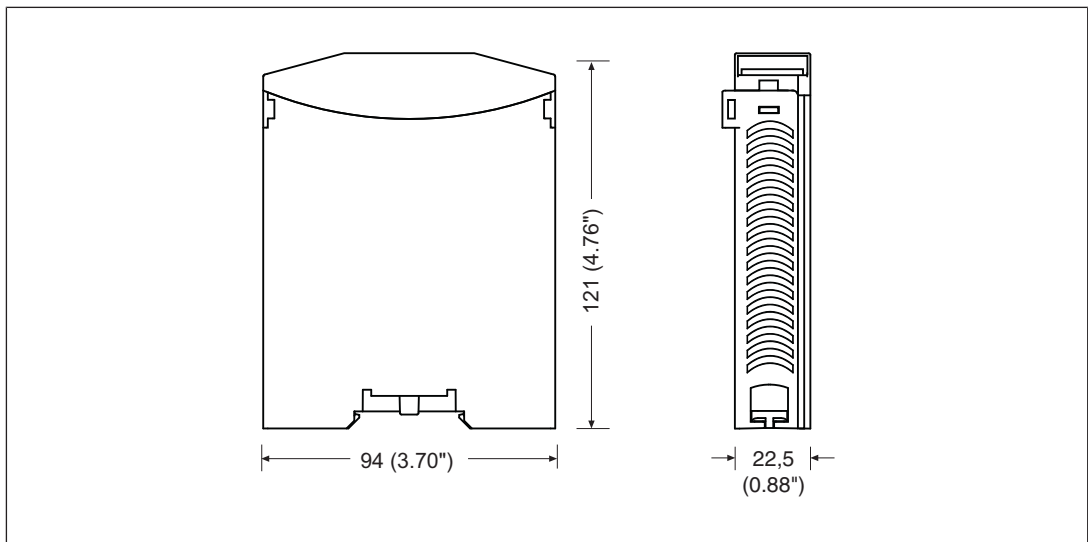


NOTICE

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.

5.2 Dimensions in mm



5.3 Connecting the base unit and expansion modules

Connect the base unit and the expansion modules as described in the operating manuals for the base modules.

- ▶ The terminator must be fitted to the last expansion module
- ▶ Install the expansion module in the position configured in the PNOZmulti Configurator.

The position of the expansion modules is defined in the PNOZmulti Configurator. The expansion modules are connected to the left or right of the base unit, depending on the type.

Please refer to the document "PNOZmulti System Expansion" for details of the number of modules that can be connected to the base unit and the module types.

6 Commissioning

6.1 General wiring guidelines

The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Please note:

- ▶ Information given in the [Technical details \[18\]](#) must be followed.
- ▶ The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- ▶ Use copper wiring with a temperature stability of 75 °C.
- ▶ Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. When the supply voltage is looped, the current at each terminal may not exceed 3 A.
- ▶ Please note: The supply voltage always must be present at X2, even if you do not use the semiconductor outputs.

The unit has 2 dual-pole semiconductor outputs. These may be configured as single or redundant outputs. The output assignment is defined in the PNOZmulti Configurator. Wire the output circuit as described in the table.

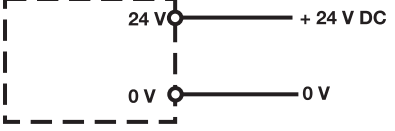
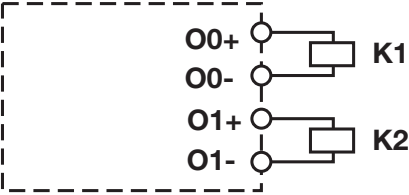
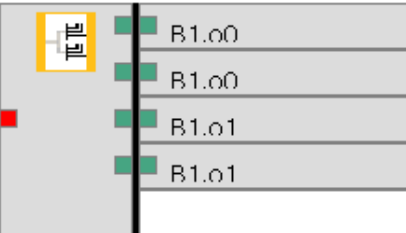
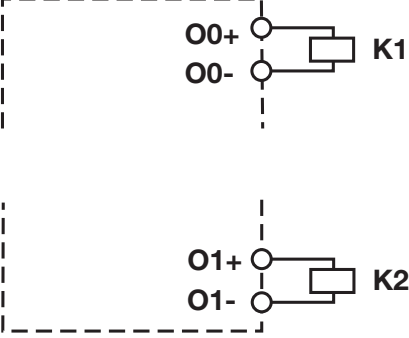
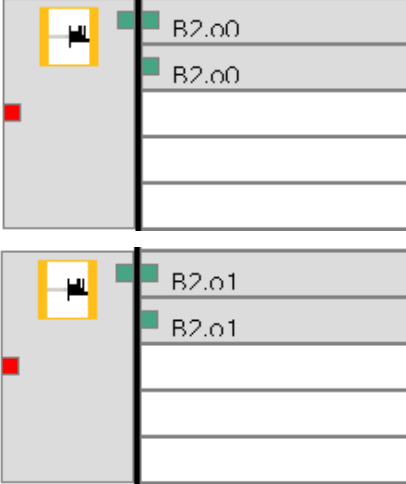
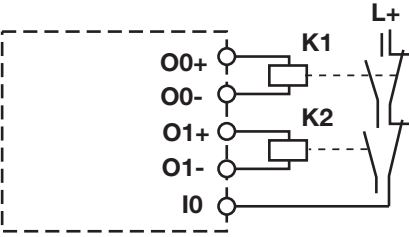



NOTICE

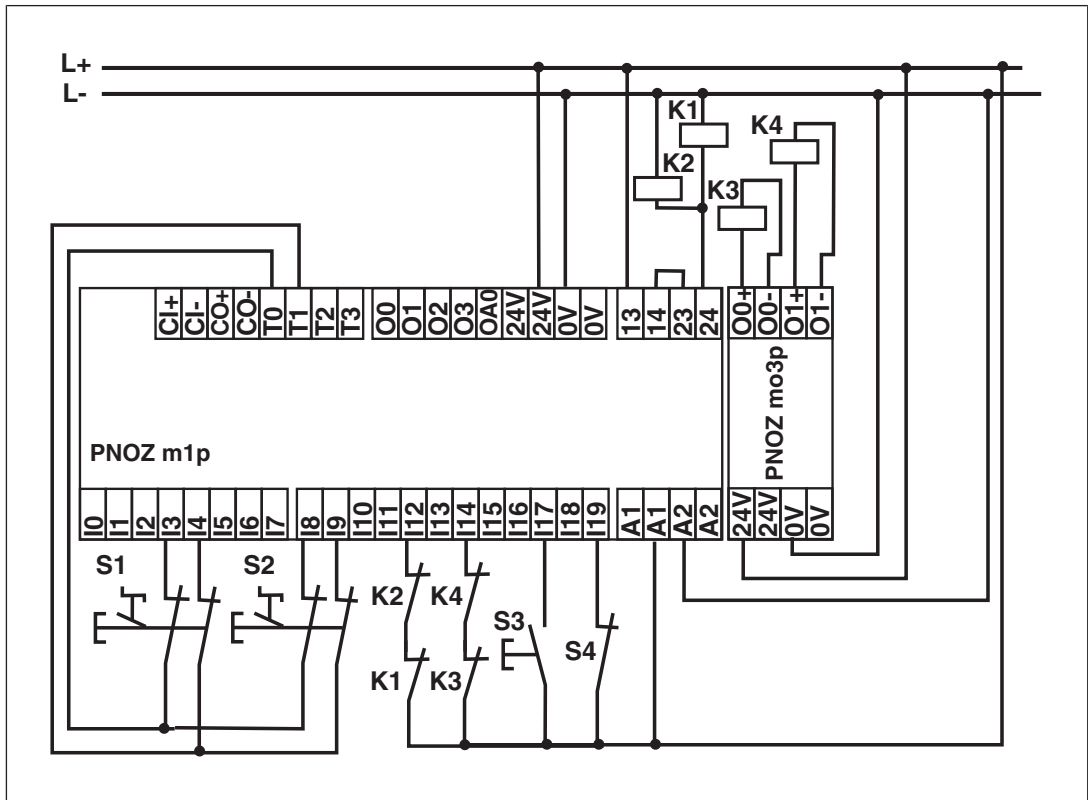
A resistance greater than 3 kOhm at the outputs is detected as an open circuit. On the following base units, only the outputs configured in the PNOZmulti Configurator are tested:

- PNOZ m1p (coated version) from Version 5.0, PNOZ m0p, PNOZ m2p from Version 2.0.
- On earlier versions of the base units, unused outputs must be loaded with a resistance of less than 3 kOhm. Example: $R = 2.7 \text{ kOhm}$, 0.3 W at 24 V.

6.2 Connection

Supply voltage	AC	DC
	/	
Redundant output		
Single output		
Feedback loop Contacts from external contactors		

6.3 Connection example



6.4 Download modified project to the PNOZmulti system

As soon as an additional expansion module has been connected to the system, the project must be amended in the PNOZmulti Configurator and downloaded back into the base unit. Proceed as described in the operating manual for the base unit.



NOTICE




For the commissioning and after every user program change, you must check whether the safety devices are functioning correctly.

7 Operation








When the supply voltage is switched on, the PNOZmulti copies the configuration from the chip card.

The PNOZmulti system is ready for operation when the "POWER" and "RUN" LEDs on the base unit are lit continuously.

Legend

-  LED on
-  LED flashes
-  LED off

7.1 Messages

Base unit						PNOZ mo3p		Error
Input Ix	Run	Diag	Fault	IFAULT	OFAULT	Fault	Output Ox	
								External error, which leads to a safe state; the fault is at the outputs whose LEDs are flashing, e.g. short across the contact
								External error on the output
								Internal error on the expansion module

8 Technical details

General	
Certifications	BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed
Electrical data	
Supply voltage	Supply to the SC outputs
for	
Voltage	24 V
Kind	DC
Voltage tolerance	-15 %/+20 %
Output of external power supply (DC)	96 W
Residual ripple DC	5 %
Potential isolation	yes
Supply voltage	Module supply
for	
internal	Via base unit
Voltage	5 V
Kind	DC
Voltage tolerance	-2 %/+2 %
Power consumption	2,5 W
Status indicator	LED
Semiconductor outputs, 2-pole	
Number	2
Switching capability	
Voltage	24 V DC
Current	2 A
Power	48 W
Residual current at "0"	0,5 mA
Signal level at "1"	2 A: UB - 0,5 V DC
Switch-off delay	30 ms
Open circuit detection off	3 kOhm
Galvanic isolation	yes
Short circuit-proof	yes
Times	
Switch-on delay	5 s
Supply interruption before de-energisation	20 ms
Environmental data	
Ambient temperature	
In accordance with the standard	EN 60068-2-14
Temperature range	0 - 60 °C
Forced convection in control cabinet off	55 °C
Storage temperature	
In accordance with the standard	EN 60068-2-1/-2
Temperature range	-25 - 70 °C

Environmental data

Climatic suitability	
In accordance with the standard	EN 60068-2-30, EN 60068-2-78
Humidity	93 % r. h. at 40 °C
Condensation during operation	Not permitted
EMC	EN 61131-2
Vibration	
In accordance with the standard	EN 60068-2-6
Frequency	10 - 150 Hz
Acceleration	1g
Shock stress	
In accordance with the standard	EN 60068-2-27
Acceleration	15g
Duration	11 ms
Max. operating height above sea level	2000 m
Airgap creepage	
In accordance with the standard	EN 61131-2
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Protection type	
In accordance with the standard	EN 60529
Mounting area (e.g. control cabinet)	IP54
Housing	IP20
Terminals	IP20

Potential isolation

Potential isolation between	SC output and system voltage
Type of potential isolation	Protective separation
Rated surge voltage	2500 V

Mechanical data

Mounting position	horizontally on mounting rail
DIN rail	
Top hat rail	35 x 7,5 EN 50022
Recess width	27 mm
Material	
Bottom	PPO UL 94 V0
Front	ABS UL 94 V0
Connection type	Spring-loaded terminal, screw terminal
Conductor cross section with screw terminals	
1 core flexible	0,25 - 1,5 mm², 24 - 16 AWG
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	0,25 - 0,75 mm², 24 - 20 AWG
Torque setting with screw terminals	0,25 Nm
Stripping length with screw terminals	7 mm

Mechanical data

Conductor cross section with spring-loaded terminals

1 core flexible without crimp connector	0,25 - 1,5 mm², 24 - 16 AWG
1 core flexible with crimp connector	0,25 - 0,75 mm², 24 - 20 AWG

Spring-loaded terminals: Terminal points per connection

1

Stripping length with spring-loaded terminals

9 mm

Dimensions

Height	94 mm
Width	22,5 mm
Depth	121 mm

Weight

127 g

Where standards are undated, the 2020-07 latest editions shall apply.

8.1 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	EN ISO 13849-1: 2015	EN 62061 SIL CL	EN 62061 PFH _D [1/h]	IEC 61511 SIL	IEC 61511 PFD	EN ISO 13849-1: 2015
	PL	Category					T _M [year]
2-channel	PL e	Cat. 4	SIL CL 3	1,74E-09	SIL 3	2,48E-05	20

Explanatory notes for the safety-related characteristic data:

- ▶ The SIL CL value in accordance with EN 62061 corresponds to the SIL value in accordance with EN 61508.
- ▶ T_M is the maximum mission time in accordance with EN ISO 13849-1. The value also applies as the retest interval in accordance with EN 61508-6 and IEC 61511 and as the proof test interval and mission time in accordance with EN 62061.

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



INFORMATION

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

9 Order reference

9.1 Product

Product type	Features	Order No.
PNOZ mo3p	Expansion module, 2 dual-pole semiconductor outputs, safe	773 510

9.2 Accessories

Connection terminals

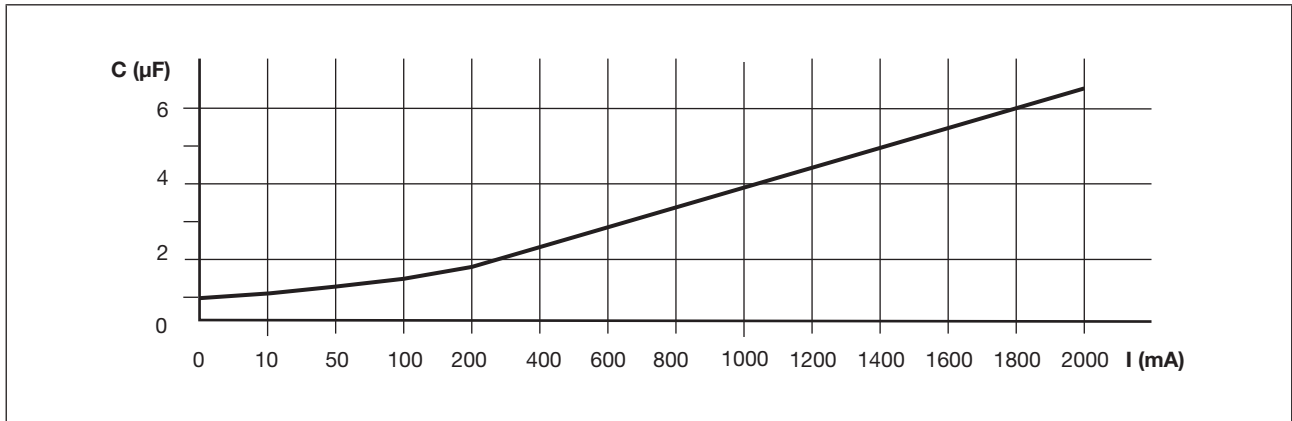
Product type	Features	Order No.
Set spring terminals	1 set of spring-loaded terminals	783 400
Set screw terminals	1 set of screw terminals	793 400

Terminator, jumper

Product type	Features	Order no.
PNOZmulti bus terminator	Terminator	779 110
KOP-XE	Jumper	774 639

10 Supplementary data

10.1 Maximum capacitive load C (μF) with load current I (mA) at the semiconductor outputs



► Support

Technical support is available from Pilz round the clock.

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Energy saving by Pilz



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THE SPIRIT OF SAFETY

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