



## PNOZ mo1p

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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 mo1p. 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 mo1p
- ▶ Jumper

### 2.2 Unit features

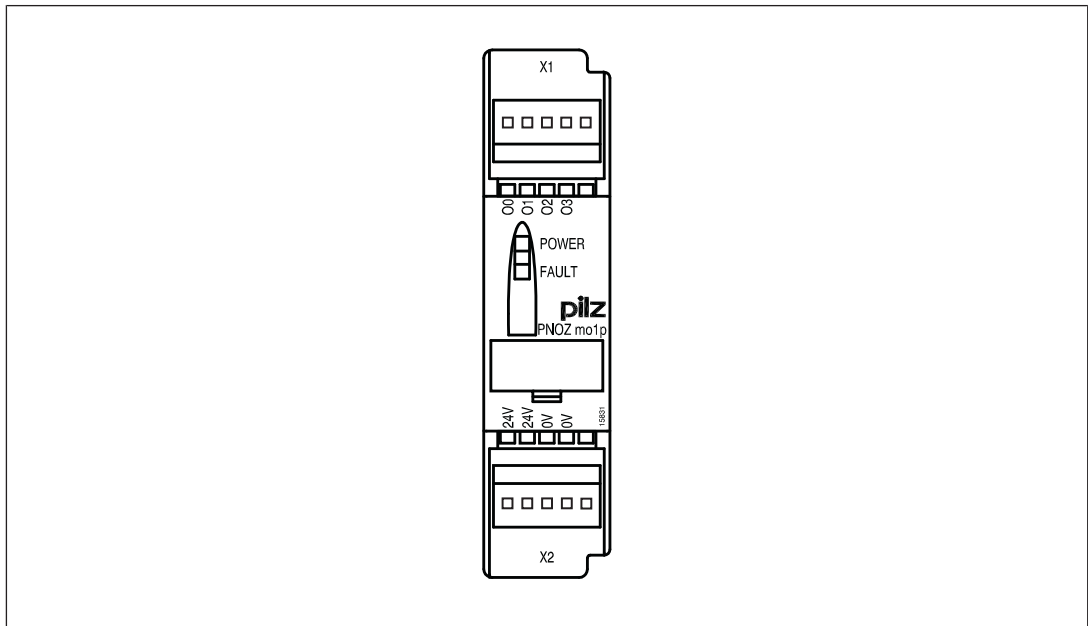
Application of the product PNOZ mo1p:

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:
  - 4 safety outputs
  - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ 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).
- ▶ Coated version:
  - Increased environmental requirements (see [Technical details](#)  17)

## 2.3 Front view



### Legend:

- ▶ 0 V, 24 V  
Supply connections
- ▶ O0 – O4  
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 coated version of the product PNOZ mo1p is suitable for use where there are increased environmental requirements (see [Technical details](#)  17).

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](#)  17).



#### 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 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.



### **3.2.2 Warranty and liability**

All claims to warranty and liability will be rendered invalid if

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

### **3.2.3 Disposal**

- ▶ When decommissioning, please comply with local regulations regarding the disposal of electronic devices (e.g. Electrical and Electronic Equipment Act).

### **3.2.4 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.

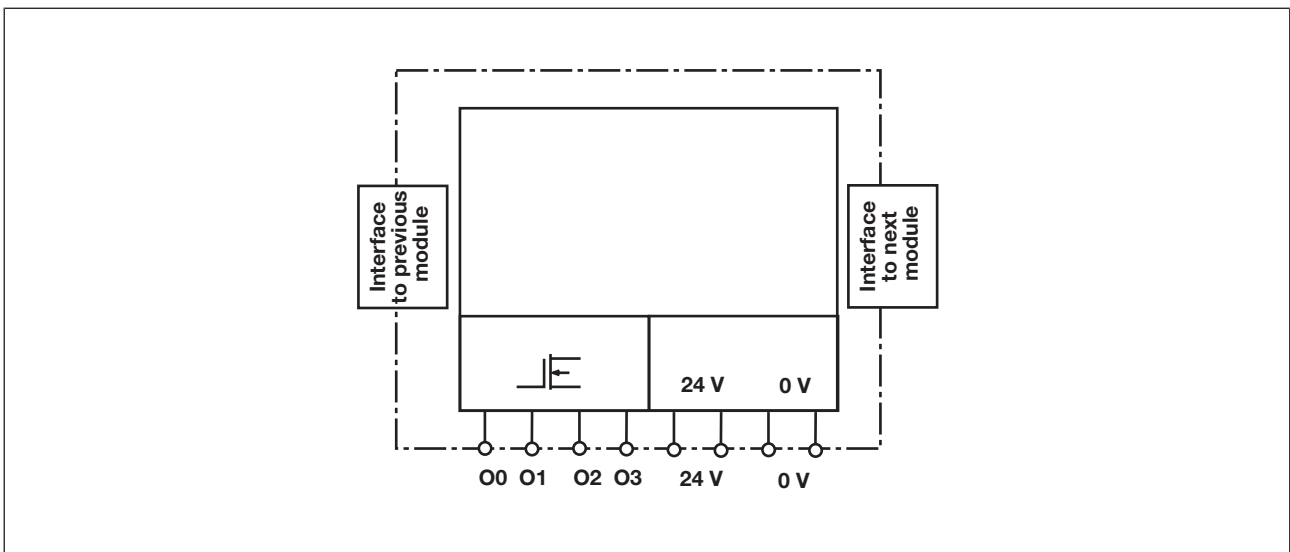
### 4.2 Functions

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.

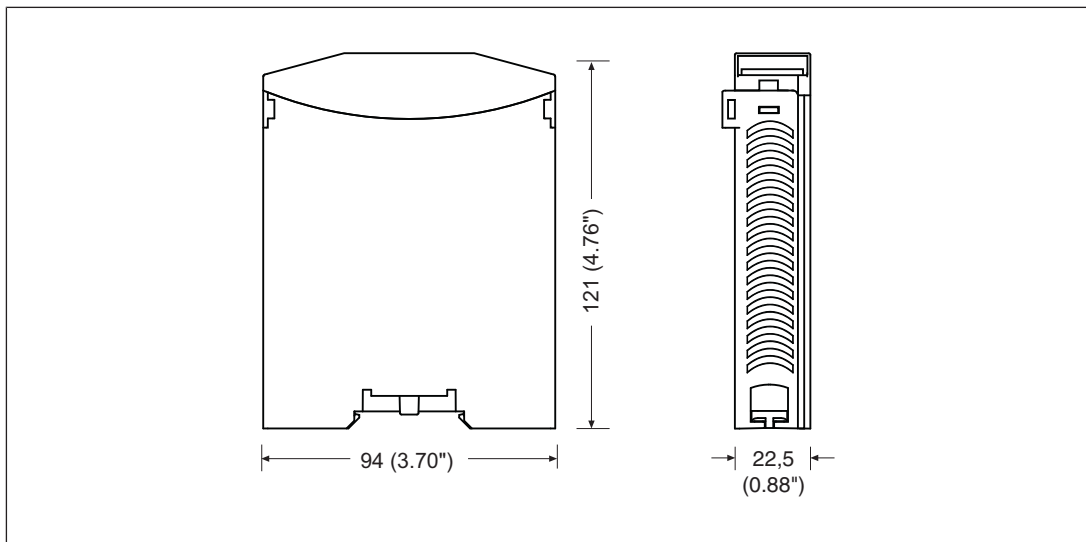


#### NOTICE

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 \[17\]](#) 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.



#### NOTICE

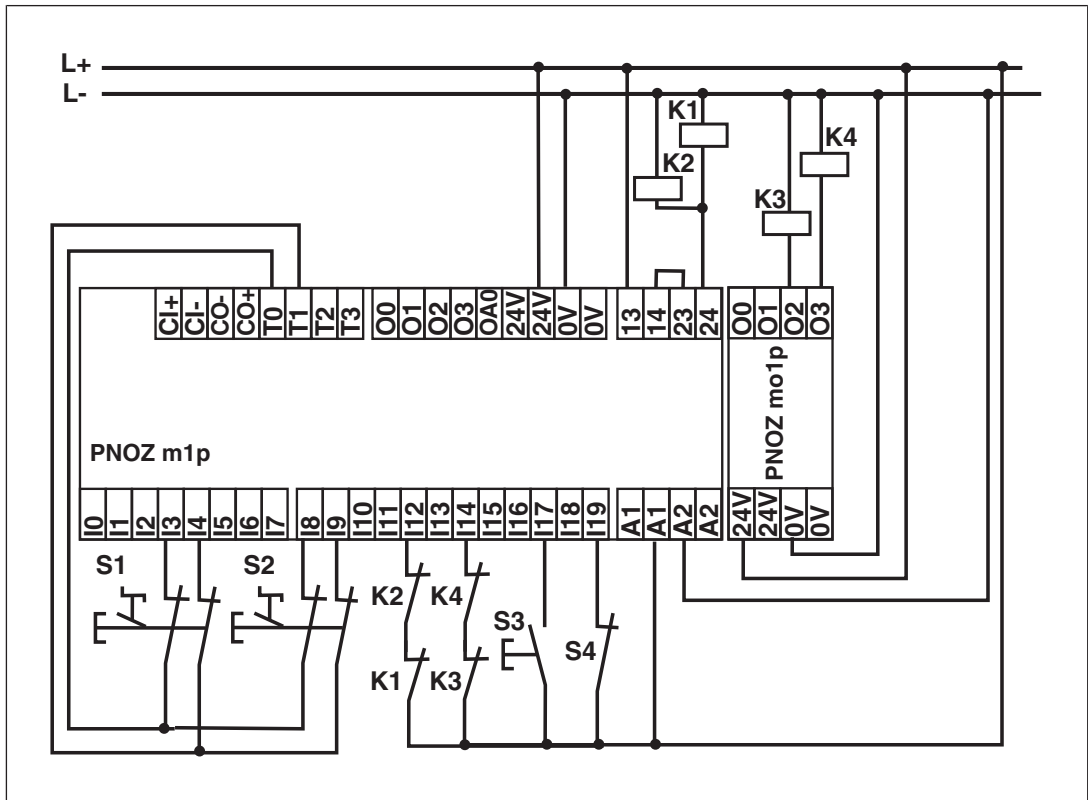
On the module PNOZ mo1p coated version, please note the limited overall performance at the outputs with ambient temperatures >50 °C (see [Technical details \[17\]](#))

### 6.2 Connection

Supply voltage	AC	DC
	/	

<p>Redundant output</p>		
<p>Single output</p>		
<p>Feedback loop Contacts from external contactors</p>		

### 6.3 Connection example



PNOZ mo1p: Contactor K3 and K4  
 PNOZ m1p: Feedback loop K3 and K4 at I14

### 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 mo1p		Error
Input Ix	Run	Diag	Fault	IFAULT	OFAULT	Fault	IN/OUT	
	●							External error on the output, e.g. short across contacts
						●		Internal error on the expansion module
								External error on the output, e.g. feedback loop defective



## 8 Technical details

<b>General</b>	<b>773500</b>	<b>773505</b>
Certifications	BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed	BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed
<b>Electrical data</b>	<b>773500</b>	<b>773505</b>
Supply voltage		
for	<b>Supply to the SC outputs</b>	<b>Supply to the SC outputs</b>
Voltage	<b>24 V</b>	<b>24 V</b>
Kind	<b>DC</b>	<b>DC</b>
Voltage tolerance	<b>-15 %/+20 %</b>	<b>-15 %/+20 %</b>
Output of external power supply (DC)	<b>192 W</b>	<b>192 W</b>
Residual ripple DC	<b>5 %</b>	<b>5 %</b>
Potential isolation	<b>yes</b>	<b>yes</b>
Supply voltage		
for	<b>Module supply</b>	<b>Module supply</b>
internal	<b>Via base unit</b>	<b>Via base unit</b>
Voltage	<b>5 V</b>	<b>5 V</b>
Kind	<b>DC</b>	<b>DC</b>
Voltage tolerance	<b>-2 %/+2 %</b>	<b>-2 %/+2 %</b>
Power consumption	<b>2,5 W</b>	<b>2,5 W</b>
Status indicator	<b>LED</b>	<b>LED</b>
<b>Semiconductor outputs</b>	<b>773500</b>	<b>773505</b>
Number	<b>4</b>	<b>4</b>
Switching capability		
Voltage	<b>24 V</b>	<b>24 V</b>
Current	<b>2 A</b>	<b>2 A</b>
Power	<b>48 W</b>	<b>48 W</b>
Voltage	–	<b>24 V</b>
Current	–	<b>1 A</b>
Power	–	<b>24 W</b>
Signal level at "1"	<b>UB - 0.5 VDC at 2 A</b>	<b>UB - 0.5 VDC at 2 A</b>
Residual current at "0"	<b>0,5 mA</b>	<b>0,5 mA</b>
Max. capacitive load	<b>1 µF</b>	<b>1 µF</b>
Max. duration of off time during self test	<b>300 µs</b>	<b>300 µs</b>
Switch-off delay	<b>30 ms</b>	<b>30 ms</b>
Potential isolation	<b>yes</b>	<b>yes</b>
Short circuit-proof	<b>yes</b>	<b>yes</b>
<b>Times</b>	<b>773500</b>	<b>773505</b>
Switch-on delay	<b>5 s</b>	<b>5 s</b>
Supply interruption before de-energisation	<b>20 ms</b>	<b>20 ms</b>

<b>Environmental data</b>	<b>773500</b>	<b>773505</b>
<b>Ambient temperature</b>		
In accordance with the standard	<b>EN 60068-2-14</b>	<b>EN 60068-2-14</b>
Temperature range	<b>0 - 60 °C</b>	<b>-25 - 60 °C</b>
Forced convection in control cabinet off	<b>55 °C</b>	–
<b>Storage temperature</b>		
In accordance with the standard	<b>EN 60068-2-1/-2</b>	<b>EN 60068-2-1/-2</b>
Temperature range	<b>-25 - 70 °C</b>	<b>-25 - 70 °C</b>
<b>Climatic suitability</b>		
In accordance with the standard	<b>EN 60068-2-30, EN 60068-2-78</b>	<b>EN 60068-2-30, EN 60068-2-78</b>
Humidity	<b>93 % r. h. at 40 °C</b>	<b>93 % r. h. at 40 °C</b>
<b>Condensation during operation</b>		
	<b>Not permitted</b>	<b>Short-term</b>
<b>EMC</b>		
	<b>EN 61131-2</b>	<b>EN 61131-2</b>
<b>Vibration</b>		
In accordance with the standard	<b>EN 60068-2-6</b>	<b>EN 60068-2-6</b>
Frequency	<b>10 - 150 Hz</b>	<b>5 - 500 Hz</b>
Acceleration	<b>1g</b>	<b>1g</b>
<b>Broadband noise</b>		
In accordance with the standard	–	<b>EN 60068-2-64</b>
Frequency	–	<b>5 - 500 Hz</b>
Acceleration	–	<b>1,9grms</b>
<b>Corrosive gas check</b>		
SO <sub>2</sub> : Concentration 10 ppm, duration 10 days, passive	–	<b>DIN V 40046-36</b>
H <sub>2</sub> S: Concentration 1 ppm, duration 10 days, passive	–	<b>DIN V 40046-37</b>
<b>Shock stress</b>		
In accordance with the standard	<b>EN 60068-2-27</b>	<b>EN 60068-2-27</b>
Acceleration	<b>15g</b>	<b>15g</b>
Duration	<b>11 ms</b>	<b>11 ms</b>
<b>Max. operating height above sea level</b>		
	<b>2000 m</b>	<b>2000 m</b>
<b>Airgap creepage</b>		
In accordance with the standard	<b>EN 61131-2</b>	<b>EN 61131-2</b>
Overvoltage category	<b>III</b>	<b>III</b>
Pollution degree	<b>2</b>	<b>2</b>
<b>Rated insulation voltage</b>		
	<b>30 V</b>	<b>30 V</b>
<b>Protection type</b>		
In accordance with the standard	<b>EN 60529</b>	<b>EN 60529</b>
Mounting area (e.g. control cabinet)	<b>IP54</b>	<b>IP54</b>
Housing	<b>IP20</b>	<b>IP20</b>
Terminals	<b>IP20</b>	<b>IP20</b>
<b>Potential isolation</b>	<b>773500</b>	<b>773505</b>
Potential isolation between	<b>SC output and system voltage</b>	<b>SC output and system voltage</b>
Type of potential isolation	<b>Protective separation</b>	<b>Protective separation</b>

<b>Potential isolation</b>	<b>773500</b>	<b>773505</b>
Rated surge voltage	<b>2500 V</b>	<b>2500 V</b>
<b>Mechanical data</b>	<b>773500</b>	<b>773505</b>
Mounting position	<b>horizontally on mounting rail</b>	<b>horizontally on mounting rail</b>
DIN rail		
Top hat rail	<b>35 x 7,5 EN 50022</b>	<b>35 x 7,5 EN 50022</b>
Recess width	<b>27 mm</b>	<b>27 mm</b>
Material		
Bottom	<b>PPO UL 94 V0</b>	<b>PPO UL 94 V0</b>
Front	<b>ABS UL 94 V0</b>	<b>ABS UL 94 V0</b>
Connection type	<b>Spring-loaded terminal, screw terminal</b>	<b>Spring-loaded terminal, screw terminal</b>
Conductor cross section with screw terminals		
1 core flexible	<b>0,25 - 1,5 mm<sup>2</sup>, 24 - 16 AWG</b>	<b>0,25 - 1,5 mm<sup>2</sup>, 24 - 16 AWG</b>
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	<b>0,25 - 0,75 mm<sup>2</sup>, 24 - 20 AWG</b>	<b>0,25 - 0,75 mm<sup>2</sup>, 24 - 20 AWG</b>
Torque setting with screw terminals	<b>0,25 Nm</b>	<b>0,25 Nm</b>
Stripping length with screw terminals	<b>7 mm</b>	<b>7 mm</b>
Conductor cross section with spring-loaded terminals		
1 core flexible without crimp connector	<b>0,25 - 1,5 mm<sup>2</sup>, 24 - 16 AWG</b>	<b>0,25 - 1,5 mm<sup>2</sup>, 24 - 16 AWG</b>
1 core flexible with crimp connector	<b>0,25 - 0,75 mm<sup>2</sup>, 24 - 20 AWG</b>	<b>0,25 - 0,75 mm<sup>2</sup>, 24 - 20 AWG</b>
Spring-loaded terminals: Terminal points per connection	<b>1</b>	<b>1</b>
Stripping length with spring-loaded terminals	<b>9 mm</b>	<b>9 mm</b>
Dimensions		
Height	<b>94 mm</b>	<b>94 mm</b>
Width	<b>22,5 mm</b>	<b>22,5 mm</b>
Depth	<b>121 mm</b>	<b>121 mm</b>
Weight	<b>154 g</b>	<b>156 g</b>

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 PL	EN ISO 13849-1: 2015 Category	EN 62061 SIL CL	EN 62061 PFH <sub>0</sub> [1/h]	IEC 61511 SIL	IEC 61511 PFD	EN ISO 13849-1: 2015 T <sub>M</sub> [year]
1-channel	PL d	Cat. 2	SIL CL 2	7,00E-09	SIL 2	6,14E-04	20
2-channel	PL e	Cat. 4	SIL CL 3	8,60E-10	SIL 3	1,30E-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<sub>M</sub> 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 mo1p	Expansion module, 2 or 4 semiconductor outputs, safe	773 500
PNOZ mo1p coated version	Expansion module, 2 or 4 semiconductor outputs, safe, coated version	773 505

### 9.2 Accessories

#### Terminator, jumper

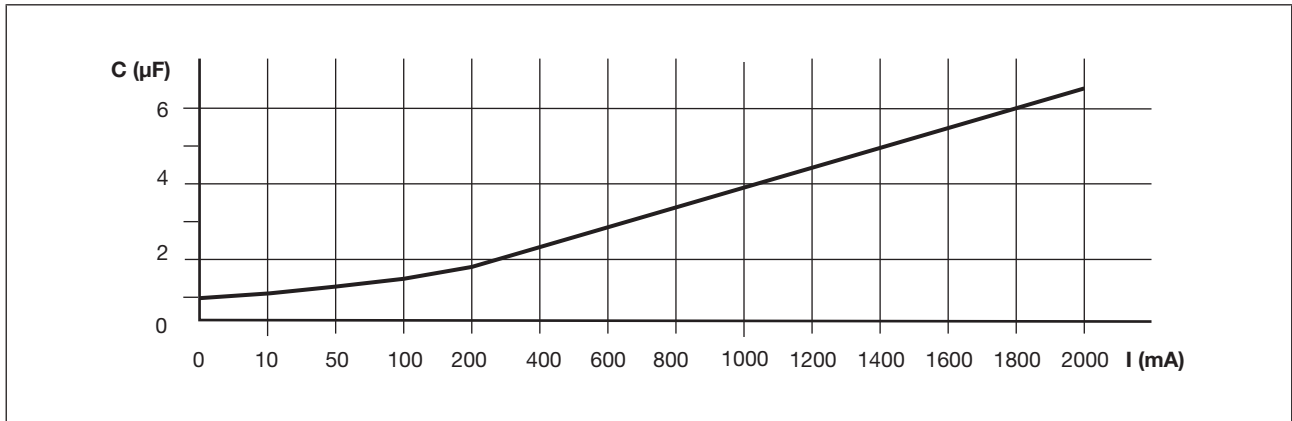
Product type	Features	Order No.
PNOZmulti bus terminator	Terminator	779 110
PNOZmulti bus terminator coated	Terminator, coated version	779 112
KOP-XE	Jumper	774 639
KOP-XE coated	Jumper, coated version	774 640

#### 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

## 10 Supplementary data

### 10.1 Maximum capacitive load $C$ ( $\mu\text{F}$ ) with load current $I$ (mA) at the semiconductor outputs



# ► Support

Technical support is available from Pilz round the clock.

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20881-EN-08, 2020-07 Printed in Germany  
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