# PNOZmulti Modular Safety System

pilz
more than automation
safe automation

Configuration guide

COMPLETE Safety & Control AUTOMATION

Technical Catalogue 3.4 – August 2008 edition

# Why does Pilz offer more?

pilz
more than automation
safe automation

**Because the integrality of our business activities is what sets us apart.**

Pilz is a solution supplier for all automation functions. Including standard control functions. Developments from Pilz protect man, machine and the environment. That's why all our experience and knowledge goes into individual products as well as consistently sophisticated system solutions.

- Sensor technology
- Control and communication
- Motion Control
- Operating and monitoring
- Software
- Consulting
- Engineering
- Training

Appropriate services relating to individual components and independent generic services guarantee that our customers obtain customised automation solutions, all from one source.

**You can find more details about Pilz and your products and services on the Internet:**

- www.pilz.com

**Pilz is a family business that's closer to its customers**

Pilz has a tradition as a family-run company stretching back over 50 years. Real proximity to customers is visible in all areas, instilling confidence through individual consultation, flexibility and reliable service.

We are your contact, guide and competency leader en route to an optimum automation solution.

**Support – Technical help round the clock!**

Technical support is available from Pilz round the clock. This service is provided free of charge beyond standard business hours.

**You can reach our international hotline on:**

- +49 711 3409-444

Exclusion of liability

We have taken great care in compiling our application manual. It contains information about our company and our products. All statements are made in accordance with the current status of technology and to the best of our know-ledge and belief. However, we cannot except liability for the accuracy and entirety of the information provided, except in the case of gross negligence. In particular it should be noted that statements do not have the legal quality of assurances or assured properties. We are grateful for any feedback on the contents.

August 2008

All rights to this publication are reserved by Pilz GmbH & Co. KG. We reserve the right to amend specifications without prior notice. Copies may be made for the user's internal purposes. The names of products, goods and technologies used in this manual are trademarks of the respective companies.

# Contents


| | |
|---|---|
| **Basics** | **1.0** |
| System description | 1.1 |
| Installation | 1.2 |
| Electrical installation | 1.3 |
| Configuration and Wiring | 1.4 |
| **Products** | **2.0** |
| Selection guide | 2.1 |
| Base units | 2.2 |
| Expansion modules | 2.3 |
| Adapter for PNOZ ms1p and PNOZ ms2p | 2.4 |
| Software | 2.5 |
| **Applications** | **3.0** |
| **Accessories** | **4.0** |
| **Order reference** | **5.0** |
| Order reference | 5.1 |
| **Standards and directives** | **6.0** |
| Standards and directives | 6.1 |
| **Service** | **7.0** |
| Service | 7.1 |

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

| Contents | Page |
|---|---|
| System description | from 1.1-1 |
| Installation | from 1.2-1 |
| Electrical installation | from 1.3-1 |
| Configuration and Wiring | from 1.4-1 |

# System description





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# System description


| Contents | Page |
|---|---|
| **System description** | |
| Overview | 1.1-2 |
| Hardware | 1.1-3 |
| Software | 1.1-4 |
| Maximum system expansion | 1.1-5 |
| Diagnostics | 1.1-7 |
| Safety | 1.1-8 |

# System description
## Overview



### Modular design

- The modular safety system consists of a base unit and several expansion modules.
- The base unit has several inputs and outputs and is fully functional even without an expansion module.
- The expansion modules supplement the base unit with additional inputs or outputs.

### Configuration in the PNOZmulti Configurator

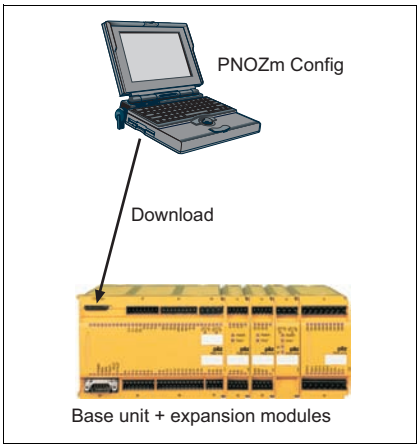
- The function of the safety system is established through the PNOZmulti Configurator.
- The PNOZmulti Configurator is a graphic tool which is used to define the functions of the units. Using predefined symbols, a simple circuit diagram shows how the units' inputs and outputs should be connected. This circuit diagram is then downloaded to the base unit.
- From this data, the base unit recognises the safety functions it is to perform. For example, safety functions such as E-STOP, two-hand monitoring and safety gate monitoring are available. With the correct circuitry it is possible to achieve categories 2, 3 and 4 in accordance with EN 954-1.
- The fact that the system is modular and configurable guarantees the highest level of flexibility. The safety system can be expanded or the safety functions modified at any time.

### Inputs

- Units in the PNOZmulti modular safety system have semiconductor inputs for safety-related and standard applications.
- The inputs for standard applications can also be set via the serial interface or via fieldbus modules (e.g. PROFIBUS-DP, CANopen, ...).
- One expansion module in the PNOZmulti modular safety system has safe, analogue inputs. The input signals are converted into digital signals.
- For standard applications, the exact analogue values are made available to the base unit to forward to a fieldbus.

### Outputs

- Units in the PNOZmulti modular safety system have both semiconductor and relay safety outputs.
- The outputs for standard functions use semiconductor technology.
- The safety outputs use semiconductor technology, require no maintenance and are non-wearing; they are therefore suitable for applications with frequent operations or cyclical functions. They can be used for 24 VDC applications.
- The relay safety outputs are suitable for less frequent operations, but they have a higher breaking capacity and can be used for AC applications.
- The outputs for standard applications can also be evaluated via the serial interface or via fieldbus modules (e.g. PROFIBUS-DP, CANopen, ...).



Base unit + expansion modules


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# System description
## Hardware



### Design of the modular safety system

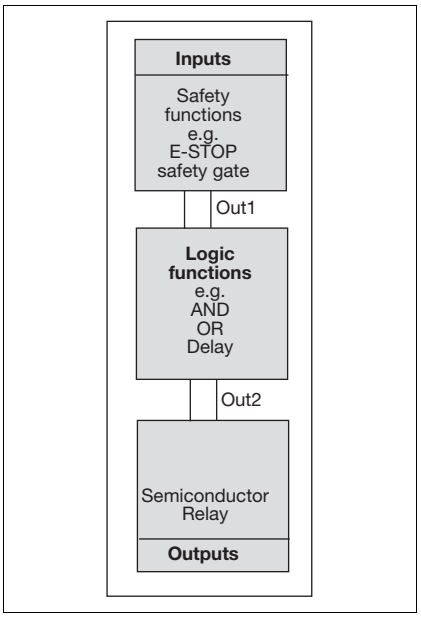
The modular safety system consists of the base unit and expansion modules. The base unit itself has
- 20 inputs
- 2 relay outputs
- 4 semiconductor outputs
- 1 auxiliary output, which is required for deleting the configuration data in the base unit
- 1 cascading input
- 1 cascading output

The number of inputs and outputs can be increased at any time using the expansion modules. The modules are linked via a jumper. The system is configured using the PNOZmulti Configurator. Special expansion modules enable data to be exchanged via a fieldbus (non-safety-related) or safe speed monitoring, for example.

### Operation of the units

The PNOZmulti Configurator generates a project file which is downloaded to the base unit; there it defines:
- Which safety functions the inputs are to carry out, e.g. E-STOP monitoring, safety gate monitoring
- How the inputs are connected to the outputs via logic functions
- Which output is configured (semiconductor, relay)

The units react the same, irrespective of these functions:
If the start-up condition of the specific safety function is met, there will be a high signal at the output “Out1”. The output signal can be linked via a logic function and is then present as the “Out2” signal at the output on the PNOZmulti unit.




### Fieldbus modules

The fieldbus modules are used to
- Read the diagnostic data
- Set virtual inputs for standard functions
- Read virtual outputs for standard functions

### RS 232 interface

The base unit has an RS 232 interface to
- Download the project
- Read the diagnostic data
- Set virtual inputs for standard functions
- Read virtual outputs for standard functions

### Safety functions

The safety system has inputs and outputs, which can be used for safety functions. The PNOZmulti safety system can be configured to monitor
- E-STOP pushbuttons
- Operating mode selector switches
- Enable switches
- Two-hand buttons
- Safety gates
- Light curtains
- Light beam devices
- Speeds
- Analogue input signals
- Safety mats
- Muting
- Mechanical presses
- Standstill

Various switch types are available for the required safety-related applications. With some switch types it is possible to monitor for simultaneity (see chapter on “Configuration and Wiring”).

### Standard functions

Expansion modules are available with inputs and outputs for standard functions.

### Press applications

The PNOZ m2p base unit is designed for applications on mechanical presses.

# System description
## Software

The functions of the PNOZmulti system are defined in the PNOZmulti Configurator software.



**Procedure**

- In the PNOZmulti Configurator, the first step is to enter the units that are to be used in the safety system. Each unit must be given a resource label.
- When all the units are selected, the interface appears for entering the circuit diagram. The circuit diagram describes the application for which the safety system is to be used. It is here that you determine which inputs are assigned to which safety-related or standard functions.
- The inputs and/or the results of the safety-related or standard functions can be linked through logic functions. The results of the logic functions or the results of the safety-related or standard functions are channelled to the outputs on the PNOZmulti units.
- The circuit diagram is generated on a graphical interface. Symbols are provided for the safety-related or standard functions, logic functions and the various output types. These are simply dragged on to a workspace, configured and interconnected.
- Once the circuit diagram is complete, the data must be saved and downloaded to the base unit. The circuit diagram, unit configuration and all the data that has been entered are stored within a project.
- When the project is saved, various passwords can be used to protect it from unauthorised access.
- Once it is saved, the project has to be downloaded to the base unit. To do this, the project data is downloaded on to a chip card. The data is either downloaded via the RS 232 interface or via a chip card reader.
- After downloading, a test must be performed to check that the safety devices function correctly.

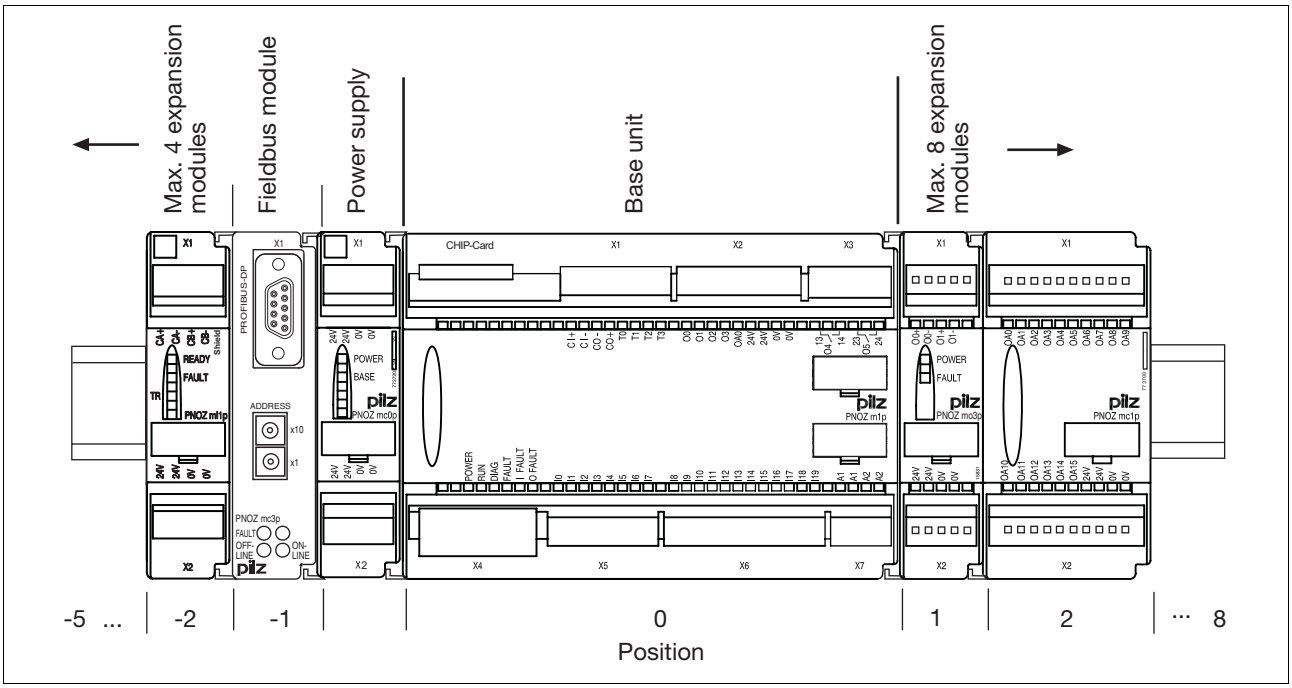

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# System description
## Maximum system expansion

The PNOZmulti Configurator software provides support when assembling a PNOZmulti system. The maximum system expansion is limited only by the maximum permitted number of expansion modules that can be connected.
The following modules are available:
- Base units
- Expansion modules
- Fieldbus modules

**Positioning of units**

- Only one base unit may be used.
- Expansion modules and a fieldbus module may be connected to the left or right, depending on the base unit type. The maximum number per type is given in the tables below.
- The position of the expansion modules is defined in the PNOZmulti Configurator.
- Expansion modules for safety-related and standard applications may be combined as required.
- However, if expansion modules of the same function are combined into groups it makes things clearer and simplifies the wiring.
- The power supply for a fieldbus module is not given a position number.
- If there is no fieldbus module, the position numbers to the left of the base unit will be -1 ... -4.




Base units:

| Unit type | Max. number of expansion modules installed on the left | Max. number of expansion modules installed on the right |
|---|---|---|
| PNOZ m0p | 4 + 1 fieldbus module | --- |
| PNOZ m1p | 4 + 1 fieldbus module | 8 |
| PNOZ m2p | 4 + 1 fieldbus module | 8 |

# System description
## Maximum system expansion



Expansion modules:

| Unit type | Function | Max. number of expansion modules installed on the left | Max. number of expansion modules installed on the right |
|---|---|---|---|
| PNOZ ma1p | 2 safe analogue inputs | 4 | --- |
| PNOZ mc1p | 16 outputs for standard functions | --- | 8 |
| PNOZ mi1p | 8 safe inputs | --- | 8 |
| PNOZ mi2p | 8 inputs for standard functions | --- | 8 |
| PNOZ ml1p | Connection module for 32 virtual inputs and outputs | 4 | --- |
| PNOZ mo1p | 4 safe 1-pole semiconductor outputs | --- | 6 |
| PNOZ mo2p | 2 safe relay outputs | --- | 6 |
| PNOZ mo3p | 2 safe 2-pole semiconductor outputs | --- | 6 |
| PNOZ mo4p | 4 safe relay outputs | --- | 6 |
| PNOZ ms1p | 2 incremental encoders or proximity switches | --- | 4 |
| PNOZ ms1p | 2 incremental encoders or proximity switches | --- | 4 |

Fieldbus modules:

| Unit type | Fieldbus | Max. number of expansion modules installed on the left | Max. number of expansion modules installed on the right |
|---|---|---|---|
| PNOZ mc3p | PROFIBUS-DP | 1 | --- |
| PNOZ mc4p | DeviceNet | 1 | --- |
| PNOZ mc5p | Interbus | 1 | --- |
| PNOZ mc5.1p | Interbus fibre-optic cable | 1 | --- |
| PNOZ mc6p | CANopen | 1 | --- |
| PNOZ mc7p | CC-Link | 1 | --- |
| PNOZ mc8p | Ethernet IP/Modbus TCP | 1 | --- |
| PNOZ mc9p | PROFINET IO | 1 | --- |


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# System description
## Diagnostics



The PNOZmulti has many options for diagnostics and fault detection:
- LEDs on the base unit and expansion modules
- Diagnostic data via serial interface and fieldbus
- Expanded diagnostic options using a visualisation system, e.g. PMImicro diag
- Error stack
- Diagnostic word in the PNOZmulti Configurator

**Note**

Please refer to the chapters
- “Diagnostic interface” and
- “Diagnostic word”

in the configuration guide “PNOZmulti – Special applications”.

**LEDs on the base unit and expansion modules**

The LEDs signal
- Operating statuses (e.g. “RUN”)
- External and internal errors

The key to the LEDs can be found in the operating instructions supplied with the units.

**Diagnostic Interface**

The serial interface on the PNOZmulti modular safety system is used to transfer diagnostic data to a user program.

**Diagnostic data**

The diagnostic data can be called up via the serial interface or via a connected fieldbus.
The diagnostic data may only be used for non-safety purposes, e.g. visualisation.
Diagnostic data on the PNOZmulti modular safety system comprises:
- Version:
  Product number, unit version, serial number
- Status of inputs/outputs:
  Indicates whether inputs and outputs are active or inactive (open/closed)
- LED status:
  Indicates the status of the LEDs on the base unit and expansion modules (on/off/flashes), plus the operating mode (start up, RUN, STOP)
- Simplified status scan:
  Shows group messages relating to the safety system: Signal changes, LED status, operating statuses
- Virtual inputs and outputs:
  Virtual inputs can be set. The status of the virtual inputs and outputs can be scanned.
- Diagnostic word:
  The diagnostic word contains the status of elements from the user program within the PNOZmulti.
- Test data:
  To check commmunication.
- Data in table form:
  This is structured data (arranged in tables and segments) from the PNOZmulti, as it could also be read via a fieldbus module:
  – Configuration
  – Status of the inputs and outputs
  – LED status
  – Diagnostic word
  – Element types

**Expanded diagnostic options using a diagnostic terminal, e.g. PMImicro diag**

An expanded diagnsotic configuration can be created in the PNOZmulti Configurator. The diagnostic configuration enables appropriate event messages to be displayed in the case of:
- Errors in or on the PNOZmulti:
  Contains the event messages that are triggered when there are errors in or on the PNOZmulti (error stack)
- Changes in the operating status of the PNOZmulti
- which are triggered when safety devices, inputs, outputs and connection points have a defined status

PNOZmulti event messages can also be supplemented through additional information, which is helpful during diagnostics.
With expanded diagnostics, a display unit (e.g. PMImicro diag) is connected to a PNOZmulti. If an event occurs in or on the PNOZmulti, an event telegram is sent to the display unit. The event telegram is evaluated in the display unit. In most cases, the event message that corresponds to the event is displayed and is entered in the event list. The event message contains a description of the event. A remedy can be displayed for each event message. The remedy describes how to react to the event, in other words, what “actions” to take.
The diagnostic configuration is project-related, i.e. a separate diagnostic configuration is created for each PNOZmulti project (see Create a diagnostic configuration).
Then the diagnostic configuration is downloaded to the PNOZmulti and to the display unit.
The diagnostic configuration is described in detail in the PNOZmulti Configurator's online help.

**Error stack**

The error stack on the PNOZmulti contains important information for diagnostics and troubleshooting. The error stack can be read out by the PNOZmulti Configurator. It contains messages and help texts such as
- Hardware errors
- Wiring errors
- Configuration errors
- Errors in the operation of the interface or fieldbus
- Errors in the project's user program
- Messages relating to differences between the programs stored on the PNOZmulti and chip card

**Diagnostic word**

A diagnostic word can be called up for those elements of the PNOZmulti Configurator interface that have the ability to store a status:
- Online in the PNOZmulti Configurator
- Via the base unit's serial interface
- Via a connected fieldbus

The diagnostic word contains information about a certain element, e.g.:
- Operating statuses (e.g. switch operated)
- Error messages (e.g. monitoring time elapsed)

An individual bit from a diagnostic word can be evaluated in the user program of the PNOZmulti Configurator.

# System description
## Safety



**Safety assessments**

Before using a unit it is necessary to perform a safety assessment in accordance with the Machinery Directive. The safety system guarantees functional safety, but not the safety of the entire application. You should therefore define the safety requirements for the plant as a whole, and also define how these will be implemented from a technical and organisational standpoint.

**General safety requirements**

Always ensure the following safety requirements are met:

- Only install and commission the unit if you are familiar with the information in the operating instructions or this technical catalogue, as well as the relevant regulations concerning health and safety at work and accident prevention.
- Only use the unit for the purpose for which it is intended and comply with both the general and specific technical details.
- Transport, storage and operating conditions should all conform to EN 60068-2-6, 01/00 (see general technical details).
- Adequate protection must be provided for all inductive consumers.
- Do not open the housing or make any unauthorised modifications.
- Failure to comply with the safety requirements will render the guarantee invalid.

**Intended use**

- The PNOZmulti Configurator software is designed to configure units from the PNOZmulti modular safety system for use on E-STOP equipment and safety circuits, in accordance with EN 60204-1 (VDE 0113-1), 11/98 and IEC 60204-1, 12/97.
- The units' intended use depends on the individual unit and is therefore explained in the chapter entitled “Units”.
- The PNOZ m2p base unit is designed for applications on mechanical presses. Please refer to the safety guidelines in the chapter on “Safety solutions for presses” in the configuration guide “PNOZmulti – Special applications”.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# System description
Safety

# Installation





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Installation


| Contents | Page |
|---|---|
| **Installation** | |
| Installing within the control cabinet | 1.2-2 |
| Installing the units | 1.2-3 |

# Installation
## Installing within the control cabinet



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

**Positioning of units**

- Expansion modules and a fieldbus module may be connected, depending on the base unit type.
- Install the expansion modules in the position defined in the PNOZmulti Configurator (see section entitled “Maximum system expansion” in Chapter 1.1 “System Description”).

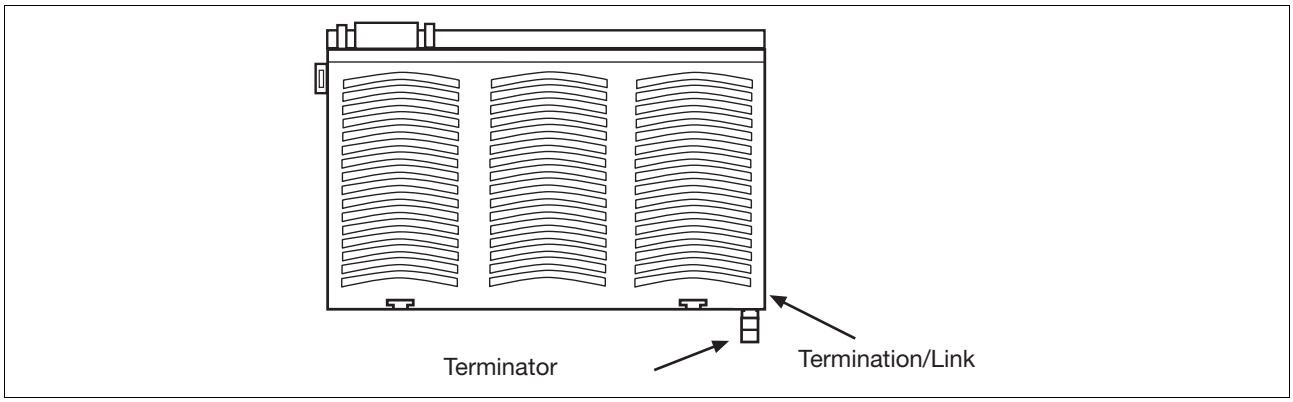

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Installation
## Installing the units

**Installing a base unit without expansion modules**

- The terminator must be fitted to the side of the base unit marked “Termination/Link”.
- Do not fit a terminator to the left side of the base unit.



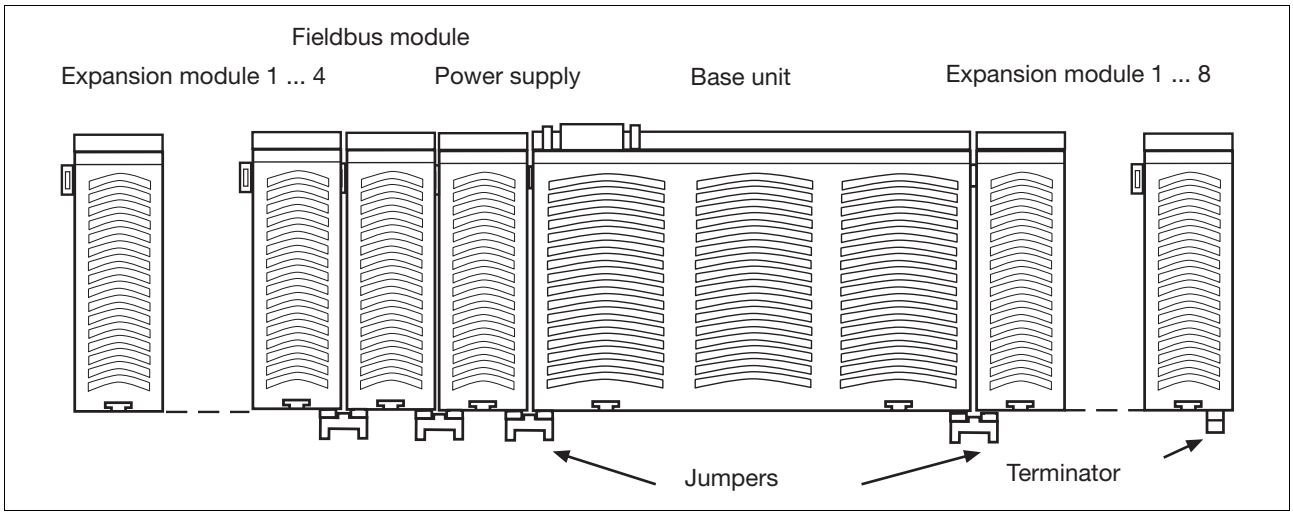



**Connecting the base unit and expansion modules (PNOZ m1p, PNOZ m1p coated version, PNOZ m2p only)**

Jumpers are used to connect the modules.

There are 2 pin connectors on the rear of the base unit.

- Make sure that no terminator is fitted.
- Connect the base unit, the expansion modules and the fieldbus module using the jumpers supplied.
- The terminator must be fitted to the last expansion module to the right of the base unit.
- Do not fit a terminator to the last expansion module to the left of the base unit.



# Electrical installation





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Electrical installation


| Contents | Page |
|---|---|
| **Electrical installation** | |
| General requirements | 1.3-2 |

# Electrical installation
## General requirements



### EMC

- The PNOZmulti is designed for use in an industrial environment. It is not suitable for use in a domestic environment, as this can lead to interference.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Supply voltage

- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation (SELV, PELV).
- 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. The current at each terminal may not exceed 9 A.

### Cables

- Do **not** route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Use copper wiring that can withstand temperatures of 60/75°C.

### Terminals

- The plug-in terminals for the inputs and outputs are not supplied with the system. You can select between a cage clamp connection or a screw connection.
- The plug-in connection terminals on the relay outputs carry mains voltage and should only be connected and disconnected when the voltage is switched off.

### ESD

Electrostatic discharge can damage components. Ensure against discharge before touching the units, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Electrical installation
## General requirements

# Configuration and Wiring





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Configuration and Wiring


| Contents | Page |
|---|---|
| **Configuration and Wiring** | |
| Inputs | 1.4-2 |
| Logic elements | 1.4-7 |
| Outputs | 1.4-8 |
| Inputs and outputs for standard functions | 1.4-9 |
| Cascading | 1.4-10 |

# Configuration and Wiring
## Inputs



**Connection options**

Depending on the unit type, the following may be connected to the inputs on the PNOZmulti:
- E-STOP pushbutton
- Safety gate limit switch
- Two-hand button
- Reset button
- Light beam device, light curtain
- Safety mats
- Enable switch
- Operating mode selector switch
- Proximity switch
- Incremental encoder
- Foot switch
- Key switch
- Limit switch
- Pushbutton
- Encoder or transducer to monitor safe analogue input signals

The PNOZmulti has inputs for both safety-related and standard applications.
- Only safety inputs should be used for safety-related applications.
- Inputs for standard functions may be used for a reset button, for example.

**Application with safety mats**

The application with safety mats is described in detail in the configuration guide under “Special applications”.

**Configuration in the PNOZmulti Configurator**

The inputs on the PNOZmulti units are configured in the PNOZmulti Configurator.
For example, you can define the following:
- Switch types for various safety functions
- Connection assignment
- Detection of shorts between contacts in the input circuit
- Reset types
- Start-up test
- Detection of shorts between contacts in the reset circuit with test pulse assignment
- Input for standard function

Some configuration options can only be selected for particular safety functions (e.g. the start-up test can only be selected for the safety gate and light curtain safety functions).

**Input signals**

Due to the cyclical processing, changes in the input signal will only be detected safely if the off-time >15 ms.

**Connection assignment**

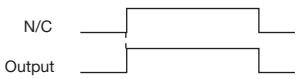
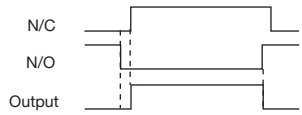
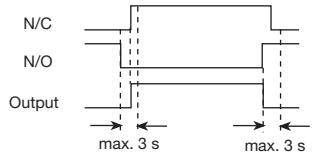
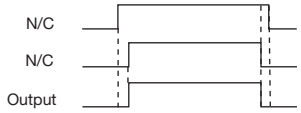
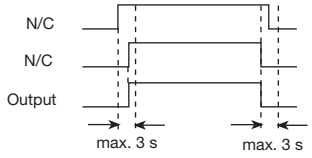
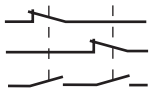
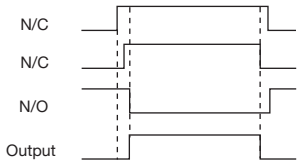
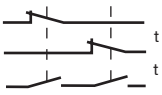
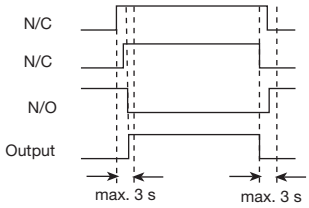
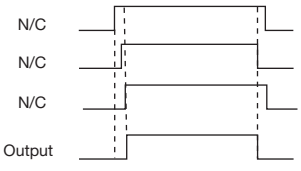
Inputs on the PNOZmulti units are assigned to particular safety functions (e.g. E-STOP, safety gate) in the PNOZmulti Configurator. The safety contacts must be connected to the inputs on the PNOZmulti units in accordance with their configuration.

**Select switch type**

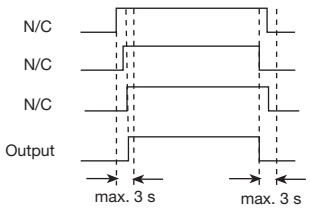
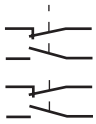
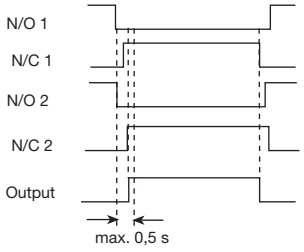
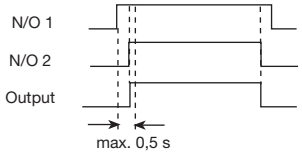
The PNOZmulti Configurator provides the user with various switch types for safety-related applications. The switch types that can be selected will depend on the type of input element (e.g. E-STOP, safety gate). The switches drawn below are shown in the state when not activated, such as with the safety gate closed or E-STOP not pressed.
On switches that are monitored for simultaneity, the maximum switch-on time and the maximum switch-off time are the same. These values can be found in the “Description” and “Timing diagram” columns.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Configuration and Wiring
## Inputs

| Switch type | Application | Description | Switch symbol | Timing diagram |
|---|---|---|---|---|
| 1 | E-STOP<br>Safety gate<br>Enable switch<br>Foot switch | Safety contacts:<br>1 normally closed (N/C)<br>without on and off-time |  |  |
| 2 | E-STOP<br>Safety gate<br>Foot switch | Safety contacts:<br>1 normally closed (N/C)<br>1 normally open (N/O)<br>without on and off-time | |  |
| 2 -<br>Simultaneity | E-STOP<br>Safety gate<br>Foot switch | Safety contacts:<br>1 normally closed (N/C)<br>1 normally open (N/O)<br>with on and off-time 3 s | |  |
| 3 | E-STOP<br>Safety gate<br>Safety gate with Interlock<br>Light curtain<br>Enable switch<br>Foot switch | Safety contacts:<br>2 normally closed (N/C)<br>without on and off-time | |  |
| 3 -<br>Simultaneity | E-STOP<br>Safety gate<br>Light curtain<br>Enable switch<br>Foot switch | Safety contacts:<br>2 normally closed (N/C)<br>with on and off-time 3 s | |  |
| 4 | Safety gate | Safety contacts:<br>2 normally closed (N/C)<br>1 normally open (N/O)<br>without on and off-time |  |  |
| 4 -<br>Simultaneity | Safety gate | Safety contacts:<br>2 normally closed (N/C)<br>1 Schließer (S)<br>with on and off-time 3 s |  |  |
| 5 | Safety gate | Safety contacts:<br>3 normally closed (N/C)<br>without on and off-time | |  |

# Configuration and Wiring
## Inputs

| Switch type | Application | Description | Switch symbol | Timing diagram |
|---|---|---|---|---|
| 5 - Simultaneity | Safety gate | Safety contacts: 3 normally closed (N/C) with on and off-time 3 s | |   |
| 6 | Two-hand button | Safety contacts: 2 changeover contacts (C/O) with simultaneity monitoring 0.5 s, off-time not monitored |  |   |
| 7 | Two-hand button Ohne Taktung nur bis Kategorie 1 nach EN 954-1 einsetzbar | Safety contacts: 2 normally open (N/O) (C/O) with simultaneity monitoring 0.5 s, off-time not monitored | |   |
| 9 | Operating mode | Safety contacts: Switch 1 from 2 | | |
| 10 | Operating mode | Safety contacts: Switch 1 from 3 | | |
| 11 | Operating mode | Safety contacts: Switch 1 from 4 | | |
| 12 | Operating mode | Safety contacts: Switch 1 from 5 | | |
| 13 | Operating mode | Safety contacts: Switch 1 from 6 | | |
| 14 | Operating mode | Safety contacts: Switch 1 from 7 | | |
| 15 | Operating mode | Safety contacts: Switch 1 from 8 | | |
| 16 | Button Key switch Limit switch | Safety contacts: 1 normally closed (N/C) |  | |
| 17 | Button Key switch Limit switch | Safety contacts: 1 normally open (N/O) |  | |





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Configuration and Wiring
## Inputs

### Input devices

When selecting input devices, you must comply with the technical details of the input circuits on the PNOZmulti units. To help you in your selection, Pilz has performed application tests with a number of input devices. The following input devices have passed the application test:

- Light curtains:
  - SICK FGS
  - SICK C4000
  - Honeywell MEYLAN
  - CEDES Safe 4
  - OMRON F3SN-A
  - Fiessler ULVT
  - STI Minisafe MS 4600 (from S/N: AC283791 / BA022933)
  - STI Optofence OF 4600
- Limit switches:
  - Schmersal AZ 16-02
  - Guardmaster ferrocode
  - Euchner NP1-628AS
  - Euchner CES-A-C5E-01 (only when operating without detection of shorts across contacts)
  - Euchner CES-A-C5E-01 (only with test pulse wiring)
  - Euchner ENG-071990
  - Euchner NM11KB

The following may not be used:

- Limit switches:
  - Euchner CES-A-C5E-01 with pulse signals

The following is generally valid: Input devices with mechanical contacts (relays) can be used in operating modes with or without detection of shorts across contacts, provided you comply with the technical details. It is not always possible to use input devices with semiconductor outputs when operating with detection of shorts across contacts.

### Units with OSSD semiconductor outputs

Units with OSSD semiconductor outputs (e.g. self-testing light barriers) may only be used if the PNOZmulti is operated without detection of shorts across contacts.

### ESPE

If the function of an ESPE (e.g. light barrier) is switched off via an operating mode selector switch, the supply voltage to the ESPE must be switched off at the same time.

### Operating modes

The following operating modes are available, depending on the selected safety function:

- Single-channel operation: Input wiring in accordance with EN 60204, no redundancy in the input circuit; earth faults in the input circuit are detected.
- Dual-channel operation: Redundant input circuit; earth faults in the input circuit are detected, with or without detection of shorts between the input contacts.
- Triple-channel operation: Redundant input circuit; earth faults in the input circuit are detected, with or without detection of shorts between the input contacts.
- Automatic reset: Unit is active as soon as the input circuit is closed.
- Manual reset: The unit is not active until the reset button has been operated.
- Monitored reset: Unit is not active until the reset button has been operated and then released. This eliminates the possibility of the reset button being overridden, triggering automatic activation.
- Detection of shorts between contacts in the input circuit: Enabled by pulsing the input circuits. This operating mode is automatically detected on start-up.
- Detection of shorts between contacts in the reset circuit:
- Only on E-STOP, safety gate and light curtain
- Start-up test: The unit checks whether safety gates that are closed are opened and then closed again when supply voltage is applied.
- Increase in the number of safety contacts available by connecting a contact block (e.g. PZE 9P) or external contactors.

### Reset button

A reset button triggers an enable for a safety device when all the corresponding safety switches (e.g. E-STOP) are closed. This prevents a machine starting up automatically after the supply has been interrupted or after a safety device has closed, for example.

### Reset modes

When configuring inputs for E-STOPs, safety gates or light guards in the PNOZmulti Configurator, it is possible to define the reset mode:

- Automatic reset
- Manual reset
- Monitored reset

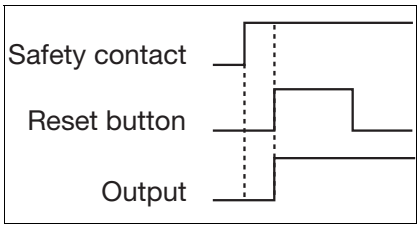
For a manual and monitored reset, the reset button can also be configured as a standard input.

- Automatic reset

With an automatic reset, the output on the function element goes to “1” when the safety switches on the input circuit are closed.

- Manual reset

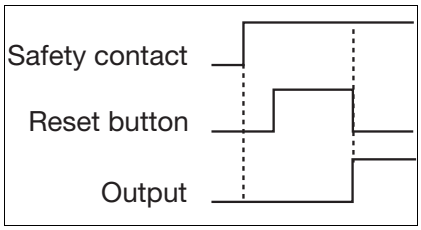
A N/O contact on the reset input generates the reset signal. The reset button must be operated after the safety switch has closed. The output on the input element is set to “1” when the reset button is operated.




- Monitored reset

A N/O contact on the reset input generates the reset signal. The reset button must be operated after the safety switch has closed. The output on the input element is set to “1” when the reset button is released.

# Configuration and Wiring
## Inputs






**Test pulses and detection of shorts across contacts**

- Under certain circumstances, signal inputs with infrequent operation (constant signals) supply an unchanging signal over a long period of time. During this time, the function of the periphery devices can only be monitored to a limited extent. Faults that arise may remain undetected. Signal inputs with infrequent operation must therefore be checked via test pulses from category 2 onwards, in accordance with EN 954-1.
- Test pulses are assigned to inputs in the PNOZm Configurator. If “Detection of shorts between contacts in the input circuit” has been selected, the base unit provides 4 test pulses.
- Two-hand button: Switch type 6 contains a N/C / N/O combination per two-hand button.
- If switch type 7 is used, the two N/O contacts should use different test pulses.
- Please refer to clause 4 of EN 574 during configuration.
- Detection of shorts between contacts in the reset circuit: Monitored reset mode will detect a short across the contacts. For wiring reasons the reset circuit may also use test pulses.
- Test pulse outputs may only be used to test the inputs. They must not be used to drive loads.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.
  Where test pulses are used for the safety mat, they may not be reused for other purposes.
  Safety mats are supported from the following base unit versions:
  - PNOZ m0p: From Version 1.2
  - PNOZ m1p: From Version 4.3
  - PNOZ m2p: From Version 1.3

**Start-up test**

- A start-up test is available for the safety gate and light curtain safety functions.
- When supply voltage is removed and then re-applied, the safety gate is enabled (output on the safety gate input element = “1”) only after the gate has been opened and then closed. In this way you are forced to check the correct function of the safety gate and safety gate switch.
- The PNOZmulti switches to a STOP condition after an error. The PNOZmulti switches back to a RUN condition when the supply voltage has been switched on and off. For this reason the start-up test must be carried out again after each STOP.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Configuration and Wiring
## Logic elements

The functions on the PNOZmulti devices are configured using the PNOZmulti Configurator.
Logic elements affect the state of the function elements. Logic elements include:
- Logic connections e.g. AND, OR
- Time elements
- Event counter
- Speed monitor
- Start element
- Connection point
- Press elements
- Muting

Logic elements can be linked with
- the outputs of the function elements
- other logic elements
- the inputs of the output elements

**Speed monitor**

The speed monitor logic element is used to configure the PNOZ ms1p/ PNOZ ms2p speed monitor. The speed monitor monitors
- Standstill
- Overspeed
- Direction of rotation

The following input devices can be evaluated:
- Incremental encoders (TTL and Sin-Cos)
- Proximity switches

The following can be configured in the PNOZmulti Configurator:
- Maximum of 4 PNOZ ms1p speed monitors
- Maximum of 2 independent axes per speed monitor

**Logic elements for press applications**

Press-related logic elements are designed for applications on mechanical presses.
All the functions required for a press are available.
These include:
- Operating modes
- Set-up mode
- Single stroke
- Automatic
- Monitoring a rotary cam arrangement
- Run monitoring
- Monitoring electrosensitive protective equipment (pulse mode)
- Driving and monitoring a press safety valve

For applications on presses (PNOZ m2p only), please refer to the chapter on “Safety solutions for presses” in the configuration guide “PNOZmulti – Special applications”. It contains safely guidelines and a detailed example.

**Time elements**

Due to the cyclical processing, delay times on time elements may be up to 15 ms longer than the configured value.

**Muting**

The muting logic element is used to temporarily suspend the safety functions (ESPE/AOPD) without interrupting the process (muting).

For a limited period of time, and for a specific operational phase (e.g. when feeding materials), it will suspend the effect of safety devices during the working process. Once completed, it will reset the safety function.

Performance features:
- Muting via light beam devices or limit switches
- Selectable: sequential, parallel or cross muting
- Ability to override the muting function if a fault occurs
- Max. muting time can be set
- Time monitoring of the muting sensors
- Suspension of bounce time

Operating modes:
- Sequential muting
- Parallel muting
- Cross muting

The muting application is described in detail in the configuration guide under “Special applications”.

# Configuration and Wiring
## Outputs



**Connection options**

Depending on the unit type, the following may be connected to the outputs on the PNOZmulti:
- Relays
- Contactors
- Valves
- Signal lamps

The PNOZmulti has outputs for both safety-related and standard applications.
- Only safety outputs should be used for safety-related applications.
- Outputs for standard functions may be used for a signal lamp, for example.

**Configuration in the PNOZmulti Configurator**

The outputs on the PNOZmulti units are configured in the PNOZmulti Configurator.
For example, you can define the following:
- Relays
- Semiconductors
- Valve control
- Feedback loop
- Output for standard function

Some configuration options can only be selected for specific safety functions (e.g. single, double or directional valve)

**Switch-off delay**

When establishing the reaction time of the safety device, the switch-off delay on the outputs must be taken into account (see Technical details). The switch-off delay indicates the time between the safety function on the input of the PNOZmulti unit being triggered and the output contacts switching over / the semiconductor outputs carrying a low signal.

**Relay**

The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.

Single-channel or redundant relay outputs are available. The redundant outputs are suitable for applications with a higher level of safety (for wiring options please see the chapter entitled “Units”).

**2-channel operation of loads**

- Loads should be driven through 2 separate channels or, in the case of redundant relay outputs, shorts across contacts should be prevented e.g. by installing the safety system and its loads (contactors) in a control cabinet.
- In terms of load on the relays, keep to the max. permitted operations stated in the technical details.

**Semiconductor**

Single-channel or redundant semiconductor outputs are available. The redundant outputs are suitable for applications with a higher level of safety (for wiring options please see the chapter entitled “Units”).

**Feedback loop**

- The feedback loop is used to monitor the actuators that are being driven.
- On a feedback loop, positive-guided N/C contacts on the driven contactors (actuators) are connected in series. If 24 VDC are present at the input on the feedback loop, all the connected contactors are de-energised. If the N/O contact on a contactor has welded, the feedback loop is not closed when switching off. The safety output will not be switched if the feedback loop is interrupted.

The PNOZmulti registers an error in the following cases:
- The output is switched on and 24 VDC is not present at the input on the feedback loop.
- The feedback loop remains closed for longer than 3 seconds (24 V on the feedback loop input) after the output was switched on.

In both cases, the output will switch off and the error will be entered in the error stack. The “OFAULT” LED flashes. The error is reset by switching off the output.

**Contactor with positive-guided contacts**

Only contactors with positive-guided contacts should be used on the PNOZmulti's safety outputs.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Configuration and Wiring
## Inputs and outputs for standard functions

### Inputs

Inputs for standard functions may be
- Inputs for standard functions from units in the PNOZmulti-range
- 24 inputs for standard functions which are transmitted via the fieldbus
- 24 virtual inputs for standard functions which are transmitted via the serial interface
- Results of logic operations (RLO = 0, RLO = 1)

Inputs for standard functions may only be used in the PNOZmulti Configurator
- As a reset button for
  - the function elements E-STOP, safety gate and light curtain
  - the reset logic element
- As an input for an AND connection, which also has an additional safe input
- As a reset or acknowledgement button on logic elements
- As an input for a non-safety-related output element (e.g. non-safety-related semiconductor outputs)
- As a direct connection to a fieldbus output

### Outputs

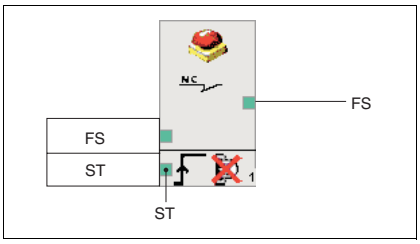
Outputs for standard functions may be
- Outputs for standard functions from units in the PNOZmulti-range
- 24 outputs for standard functions which are transmitted via the fieldbus
- 24 virtual outputs for standard functions which are transmitted via the serial interface

### Use

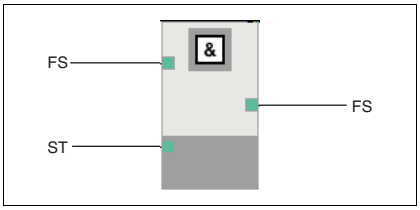
Inputs and outputs for standard functions must not be used for safety-related applications.

### Examples in the PNOZmulti Configurator

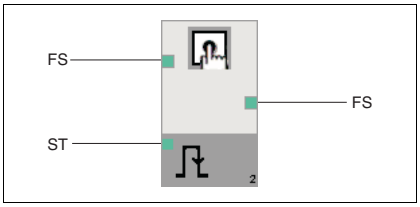
ST: Input or output for standard functions
FS: Input or output for safety functions
- Reset button on function elements



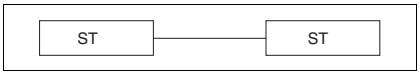

- AND connection



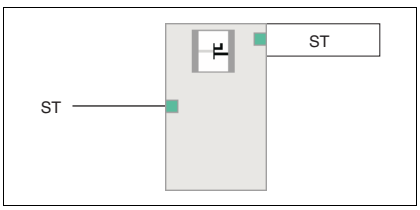

- Acknowledgement on reset element




- Direct connection of inputs and outputs for standard functions




- Input for driving an output for standard functions



# Configuration and Wiring
## Cascading

- Base units on the modular safety system can be networked. The cascading output on one base unit is connected to the cascading input on another base unit. In this way, one base unit can have direct access to a logic output and/or an input on the connected base unit.
- The base units can be connected in series or a tree structure can be built.
- PNOZelog units may also be included in the network.
- The cascading outputs may not be used to drive loads. The same also applies to outputs on PNOZelog units that are connected to cascading inputs on PNOZmulti units.
- If necessary, a reset lock must be provided on each cascaded unit.

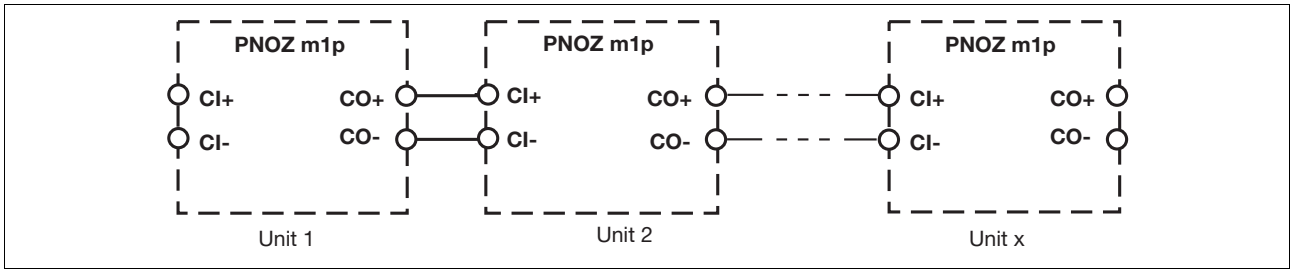
**System requirements**

PNOZmulti Configurator: from Version 3.0.0
Please contact Pilz if you have an older version.



**Series connection**

As many PNOZ m1p base units as necessary may be connected in series. The number of units connected in succession will depend only on the reaction time required by the application. As the delay times on the individual units are added together, the reaction time increases with each unit.

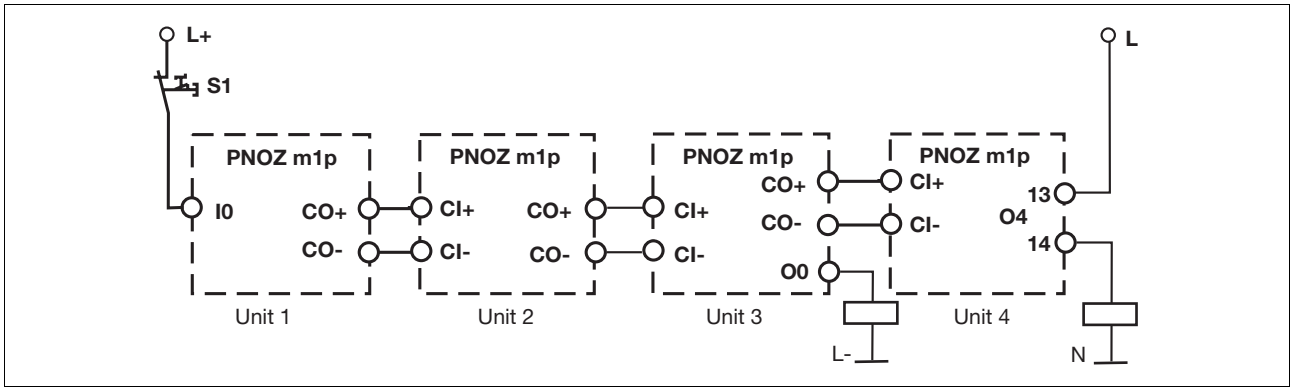



| Delay time on the PNOZmulti | Switch-off delay | Switch-on delay |
|---|---|---|
| Between input and cascading output | Max. 40 ms | Typ. 100 ms |
| Between cascading input and a semiconductor output | Max. 40 ms | Typ. 100 ms |
| Between cascading input and a relay output | Max. 60 ms | Typ. 120 ms |
| Between cascading input and a cascading output | Max. 40 ms | Typ. 120 ms |

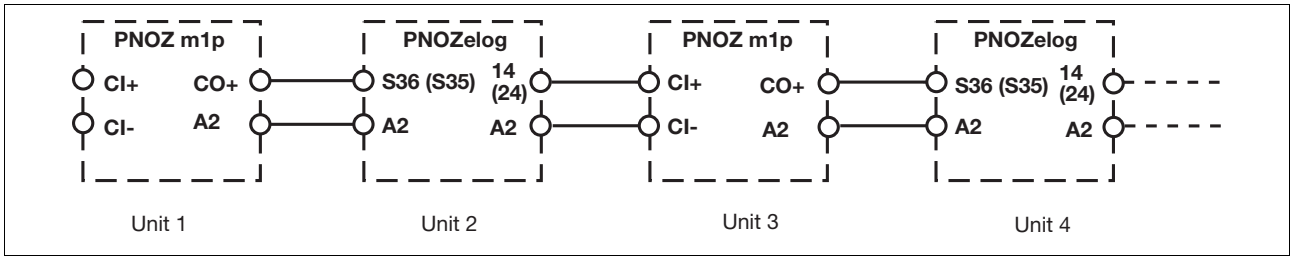

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Configuration and Wiring
## Cascading

Example:
- Delay between input I0 - cascading output Unit 1: 40 ms
- Delay between input I0 - cascading output Unit 2: 40 ms + 40 ms
- Delay between input I0 - semiconductor output Unit 3: 40 ms + 40 ms + 40 ms
- Delay between input I0 - relay output Unit 4: 40 ms + 40 ms + 40 ms + 60 ms




Incorporating PNOZelog units:
- PNOZelog units may also be included in the series connection. The delay times on the individual units are also added together with this type of cascading.
- Remember to consider the switch-on delay and any potential delay time for the outputs on the PNOZelog units (see operating manual or PNOZelog technical catalogue).
- When connecting PNOZmulti - PNOZelog, the cascading output “CO-” is not connected.



# Configuration and Wiring
## Cascading

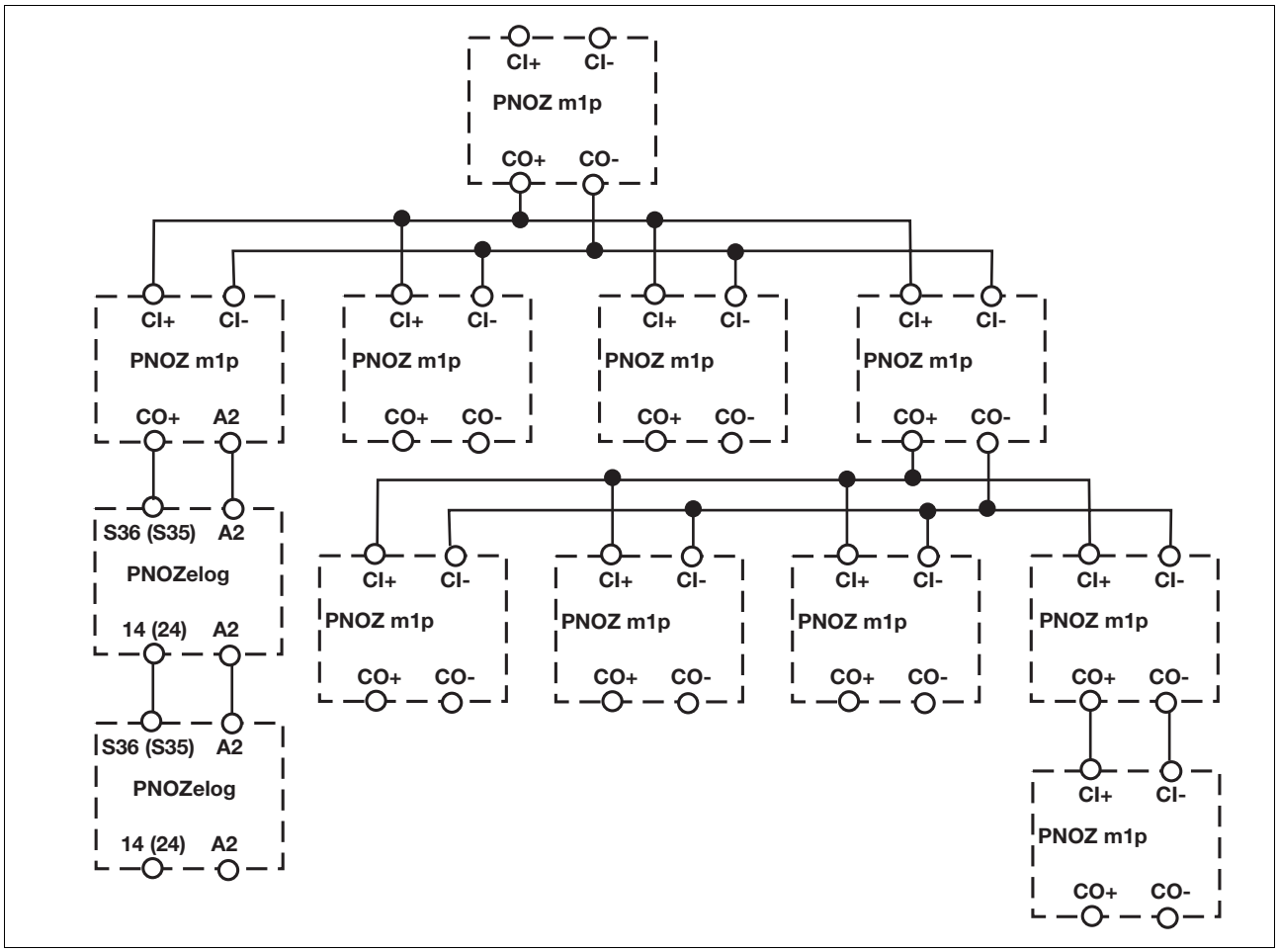
**Tree structure**

- Tree structures may be designed with as many levels as necessary.

Conditions:

- A max. of 4 PNOZmulti units may be incorporated in parallel on each level.
- PNOZelog units may only be connected to the PNOZmulti units in series. Max. of one PNOZelog unit is permitted on each level.







Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Configuration and Wiring
## Cascading

**Supply voltage for the cascaded units**

- The cascaded PNOZmulti units may be supplied via a power supply. The power consumption of the individual units should be considered when deciding on the size of the power supply.
- Cascaded PNOZelog units and all PNOZmulti units connected directly to PNOZelog units must be supplied via a common power supply. The voltage tolerance on the power supply may be a maximum of +20% or -10%.

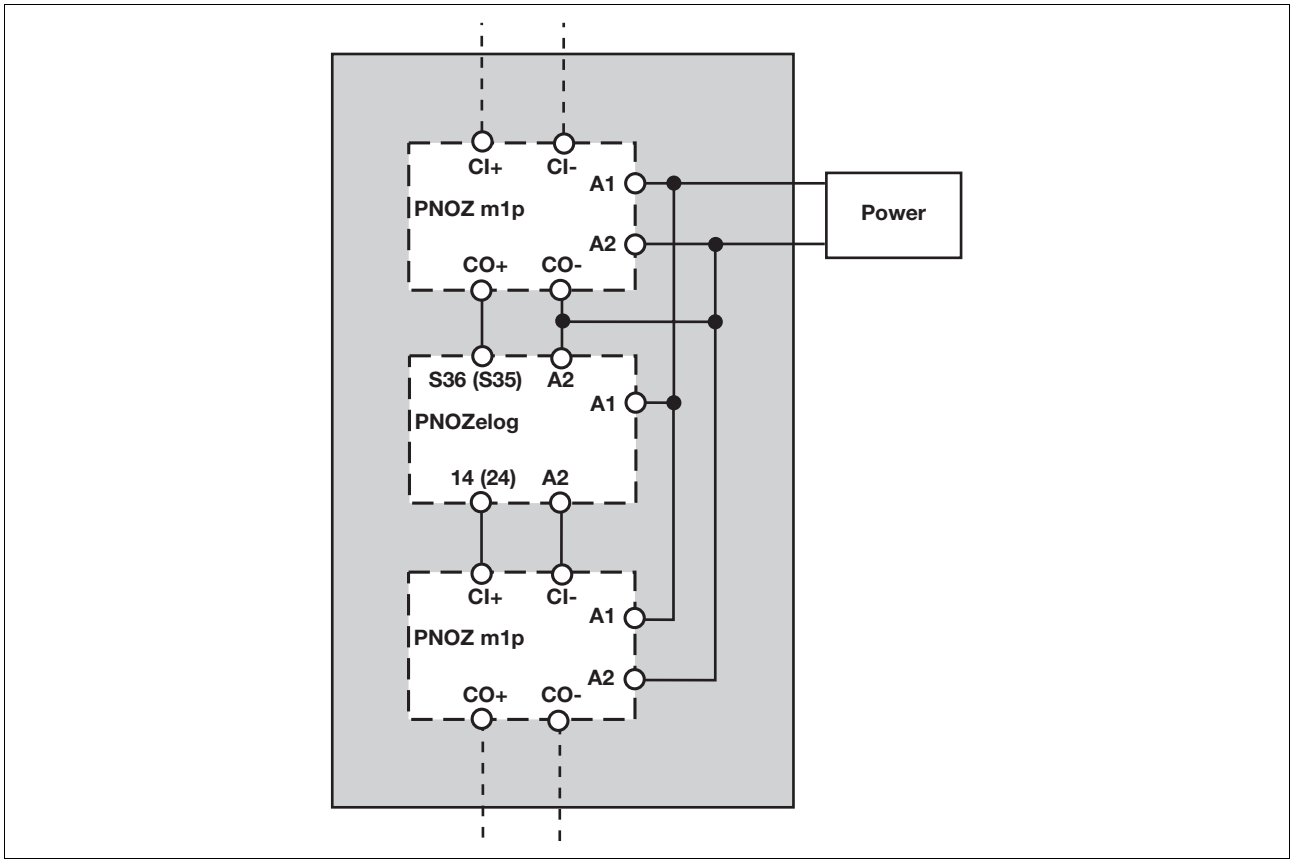
**Installing the cascaded units**

- If PNOZmulti units alone are being networked, the networked units may be housed in separate control cabinets.
- If PNOZelog units are integrated into the network, these PNOZelog units and their cascade cables must always be housed in the same control cabinet as the PNOZmulti units that are connected directly to the PNOZelog units.

**Wiring**

Please observe the following when wiring:

- Cable runs between the connected units:
- PNOZmulti - PNOZmulti: max. 100 m
- PNOZelog - PNOZmulti cascaded directly: max. 10 m
- Cable material: see technical details
- Outside the control cabinet, both the wires from the cascading input (CI+, CI-) and the wires from the cascading output (CO+, CO-) must be laid in separate multicore cables.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

more than automation
safe automation

| Contents | Page |
|---|---|
| Selection guide | from 2.1-1 |
| Base units | from 2.2-1 |
| Expansion modules | from 2.3-1 |
| Adapter for PNOZ ms1p and PNOZ ms2p | from 2.4-1 |
| Software | from 2.5-1 |

# Selection guide





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Selection guide


| Contents | Page |
|---|---|
| **Selection guide** | |
| Base units and expansion modules | 2.1-2 |
| Fieldbus modules | 2.1-3 |

pilz
more than automation
safe automation

# Selection guide
## Base units and expansion modules

| Type | Inputs Safe | Inputs Standard | Inputs Virtual | Inputs Speed Safe | Outputs Semiconductor Safe 1-pole | Outputs Semiconductor Safe 2-pole | Outputs Semiconductor Standard | Outputs Relay Safe | Outputs Virtual | Expansion modules Max. number |
|---|---|---|---|---|---|---|---|---|---|---|
| **PNOZ m0p** | 20 | | | | 4 | | 1 | 2 | | 1 field-bus mod-ule |
| **PNOZ m1p** | 20 | | | | 4 | | 1 | 2 | | 12 + 1 fieldbus module |
| **PNOZ m2p** | 20 | | | | 4 | | 1 | 2 | | 12 + 1 fieldbus module |
| **PNOZ ma1p** | 2 ana-logue | | | | | | | | | 4 |
| **PNOZ mc1p** | | | | | | | 16 | | | 8 |
| **PNOZ mi1p** | 8 | | | | | | | | | 8 |
| **PNOZ mi2p** | | 8 | | | | | | | | 8 |
| **PNOZ ml1p** | | | 32 | | | | | | 32 | 4 |
| **PNOZ mo1p** | | | | | 4 | | | | | 6 |
| **PNOZ mo2p** | | | | | | | | 2 | | 6 |
| **PNOZ mo3p** | | | | | | 2 | | | | 6 |
| **PNOZ mo4p** | | | | | | | | 4 | | 6 |
| **PNOZ ms1p** | | | | 2 | | | | | | 4 |
| **PNOZ ms2p** | | | | 2 | | | | | | 4 |





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Selection guide
## Fieldbus modules

| Type | Fieldbus | Fieldbus modules Max. number |
|---|---|---|
| **PNOZ mc3p** | PROFIBUS-DP | 1 |
| **PNOZ mc4p** | DeviceNet | 1 |
| **PNOZ mc5p** | Interbus | 1 |
| **PNOZ mc5.1p** | Interbus fibre-optic cable | 1 |
| **PNOZ mc6p** | CANopen | 1 |
| **PNOZ mc7p** | CC-Link | 1 |
| **PNOZ mc8p** | Ethernet IP/Modbus TCP | 1 |
| **PNOZ mc9p** | PROFINET | 1 |

# Base units





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units


| Contents | Page |
|---|---|
| **Base units** | |
| PNOZ m0p | 2.2-2 |
| PNOZ m1p | 2.2-11 |
| PNOZ m1p coated version | 2.2-20 |
| PNOZ m2p | 2.2-29 |

# Base units
## PNOZ m0p

Base units from the PNOZmulti modular safety system

**Approvals**

| | PNOZ m0p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

2.2

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  - 1 safety output in accordance with EN 954-1, Cat. 4 or 2 safety outputs in accordance with EN 954-1, Cat. 2
- Semiconductor outputs:
  - 2 safety outputs in accordance with EN 954-1, Cat. 4 or 4 safety outputs in accordance with EN 954-1, Cat. 3
  - 1 auxiliary output
- 4 test pulse outputs
- 1 cascading input and output; can also be used as a standard output
- 20 inputs for connecting:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Reset button
  - Light beam devices
  - Scanner
  - Enable switch
  - PSEN
  - Operating mode selector switch
  - Safety mats
- Muting function
- Connectable:
  - 1 fieldbus module on the left
  - 4 expansion modules on the left
- LED for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to detect shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

**Unit description**

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

**Chip card**

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see chapter containing the order references).

**Safety features**

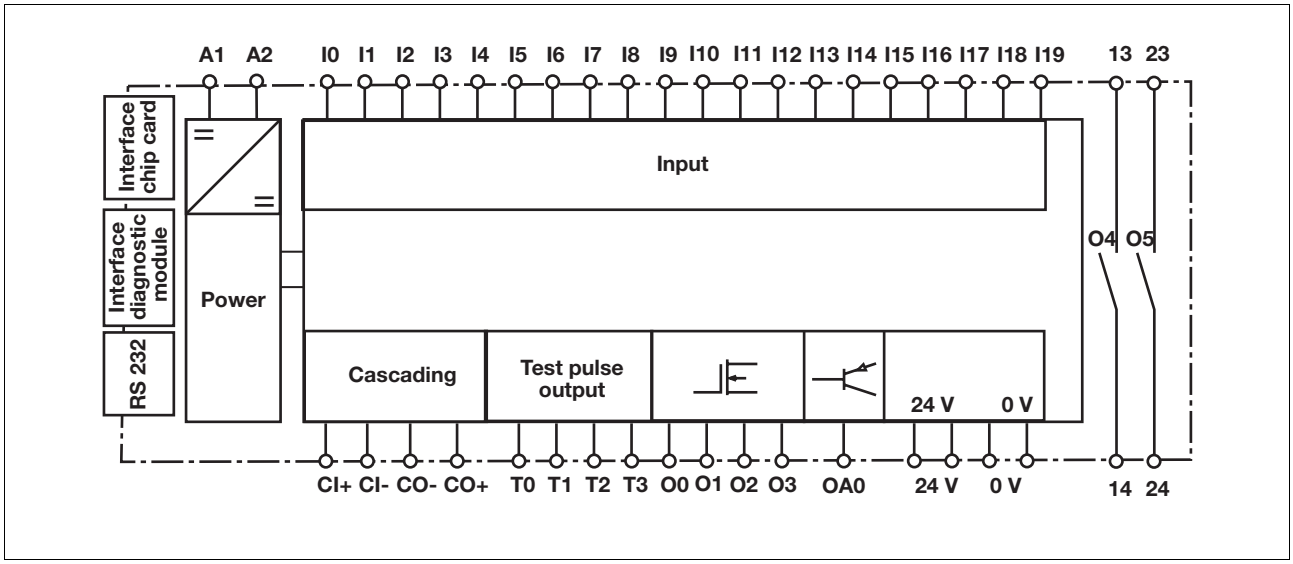
The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.
- The safety outputs are tested periodically using a disconnection test.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m0p

**Block diagram**






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m0p

**Function description**

The function of the inputs and 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.



**Wiring**

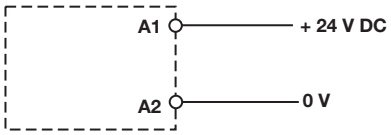
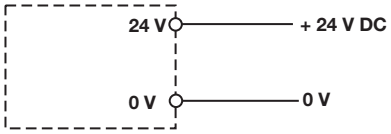
The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a particular safety function and the outputs that will switch this safety function.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- 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. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.
  Where test pulses are used for the safety mat, they may not be reused for other purposes.
  Safety mats are supported from Version 1.2 of the base unit.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m0p

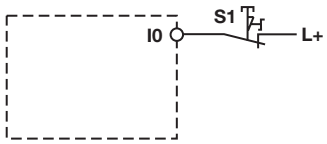
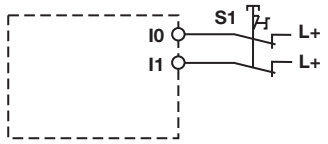
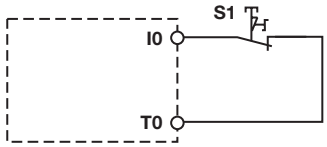
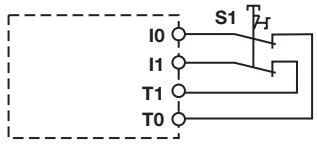
### Preparing for operation

▸ Supply voltage

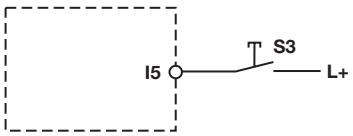
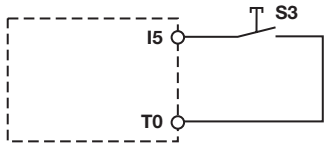
| Supply voltage | AC | DC |
|---|---|---|
| For the safety system<br>(connector X7) | |  |
| For the semiconductor outputs<br>(connector X2)<br>Must always be present, even if the semiconductor outputs are not used | |  |

### Connection examples:

▸ Input circuit

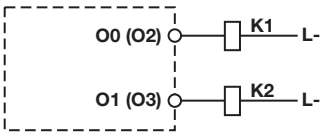
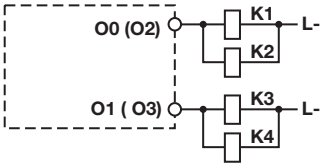
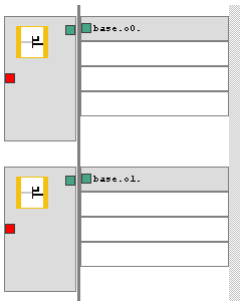
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| Example:<br>E-STOP<br>**without** detection of shorts across contacts |  |  |
| Example:<br>E-STOP<br>**with** detection of shorts across contacts |  |  |

▸ Reset circuit

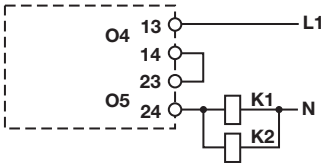
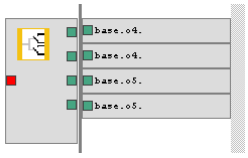
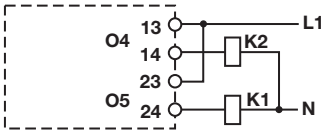
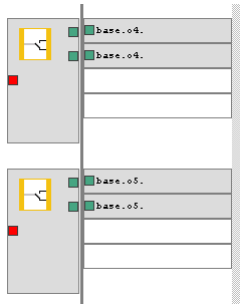
| Reset circuit | Input circuit without detection of shorts across contacts | Input circuit with detection of shorts across contacts |
|---|---|---|
| Monitored reset |  |  |

# Base units
## PNOZ m0p

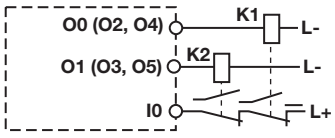
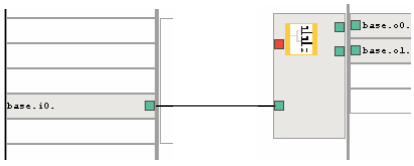
### Semiconductor outputs

| | | |
|---|---|---|
| Redundant output |  | |
| Single output |  |  |

### Relay outputs

| | | |
|---|---|---|
| Redundant |  |  |
| Single |  |  |

### Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

### Key

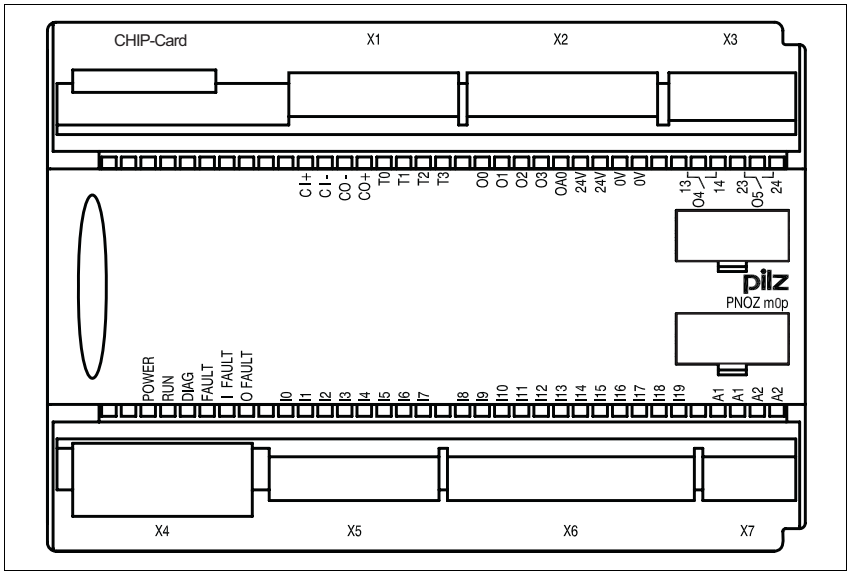
| | |
|---|---|
| S1 | E-STOP pushbutton |
| S3 | Reset button |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m0p

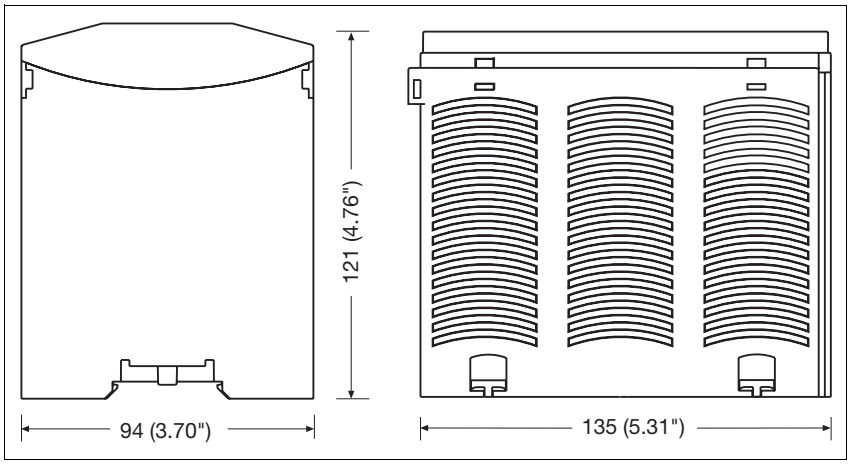
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions

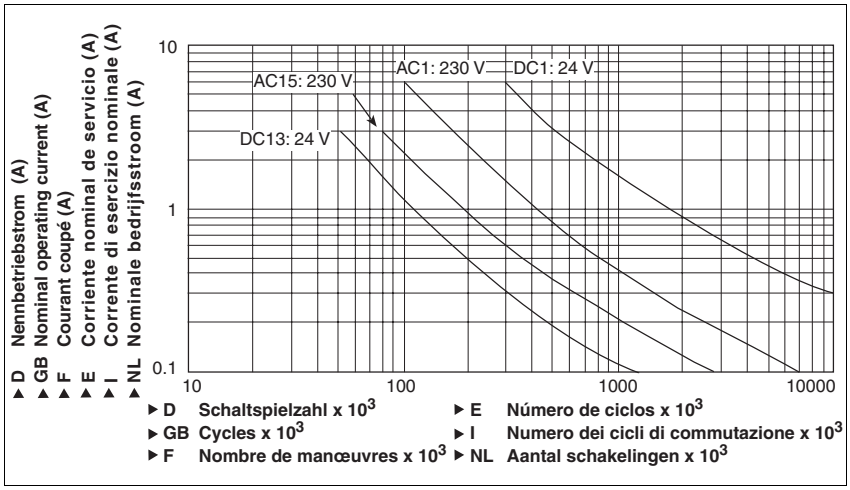


# Base units
## PNOZ m0p

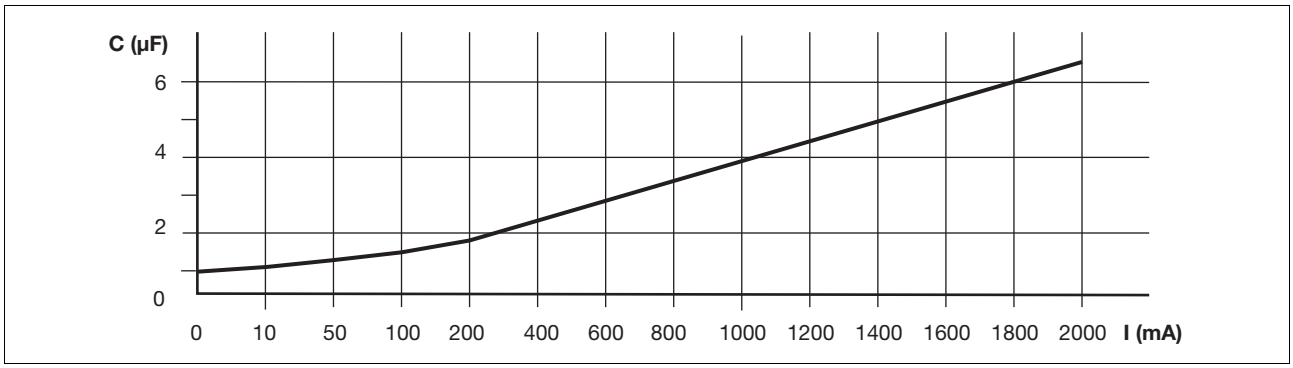
**Notice**

This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Service life graph**




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




| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **Max. 8.0 W + 2.5 W per expansion module** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Simultaneity channel 1/2/3 | **3 s, two-hand control relay: 0.5 s** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Inputs** | |
| Quantity | **20** |
| Voltage and current | **24 VDC/8 mA** |
| Galvanic isolation | **No** |
| Cascading input | **500 VAC** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m0p

| | |
|---|---|
| **Inputs** | |
| Signal level at “0” | **-3 ... +5 VDC** |
| Signal level at “1” | **15 ... 30 VDC** |
| Input delay | **0.6 ... 4 ms** |
| Status indicator | **LED** |
| **Test pulse outputs** | |
| Quantity | **4** |
| Voltage and current | **24 VDC / 0.5 A** |
| Off time during self test | **< 5 ms** |
| Galvanic isolation | **No** |
| Short circuit protection | **Yes** |
| Status indicator | **LED** |
| **Semiconductor outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 3 | <br>**2**<br>**4** |
| Switching capability | **24 VDC / max. 2 A / max. 48 W** |
| Max. capacitive load | **See diagram** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% - 10%** |
| Off time during self test | **< 300 µs** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Switch-off delay | **< 30 ms** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 2 A** |
| Status indicator | **LED** |
| **Relay outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 2 | <br>**1**<br>**2** |
| Utilisation category in accordance with<br>EN 60947-4-1, 02/01<br><br>EN 60947-5-1, 11/97 | <br>**AC1: 240 V / 6 A / 1440 VA**<br>**DC1: 24 V / 6 A / 144 W**<br>**AC15: 230 V / 3 A / 690 VA**<br>**DC13: 24 V / 3 A / 72 W** |
| Contact fuse protection in accordance with EN 60947-5-1, 08/00<br>Blow-out fuse<br>Circuit breaker 24 VDC | <br>**6 A quick or slow**<br>**6 A (characteristic B + C)** |
| Switch-off delay | **50 ms** |
| Status indicator | **LED** |
| **Auxiliary outputs** | |
| Quantity | **1** |
| Voltage and current | **24 VDC / max. 0.5 A / max. 12 W** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... +10%** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 0.5 A** |
| Status indicator | **LED** |
| **Cascading output as auxiliary output** | |
| Quantity | **1** |
| Voltage and current | **24 VDC / max. 0.2 A / max. 4.8 W** |
| Galvanic isolation | **No** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |

# Base units
## PNOZ m0p

| Environmental data | |
|---|---|
| Airgap creepage between | **DIN VDE 0110-1, 04/97** |
| relay contacts | **3 mm** |
| Relay contacts and other safe circuits | **5.5 mm** |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | |
| With UL approval | **0 ... +55 °C** |
| Without UL approval (with forced convection) | **0 ... +60 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Maximum cable runs | |
| Per input | **1 km** |
| Sum of individual cable runs at the test pulse output | **40 km** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | |
| Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1) | |
| auxiliary output (X2), cascading output | **0.5 ... 1.5 mm$^2$** |
| Relay outputs (X3) | **0.5 ... 2.5 mm$^2$** |
| Flexible multi-core with plastic sleeve | |
| Relay outputs (X3) | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | |
| Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1), | |
| auxiliary output (X2), cascading output | **0.2 ... 0.25 Nm** |
| Relay outputs (X3) | **0.4 ... 0.5 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 135 x 121 mm** |
| Weight with connector | **530 g** |

**Order reference**

| Type | Features | Order no. |
|---|---|---|
| PNOZ m0p | Base unit | 773 110 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p

Base units from the PNOZmulti modular safety system

**Approvals**

| | PNOZ m1p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  - 1 safety output in accordance with EN 954-1, Cat. 4 or 2 safety outputs in accordance with EN 954-1, Cat. 2
- Semiconductor outputs:
  - 2 safety outputs in accordance with EN 954-1, Cat. 4 or 4 safety outputs in accordance with EN 954-1, Cat. 3
  - 1 auxiliary output
- 4 test pulse outputs
- 1 cascading input and output can also be used as a standard output
- 20 inputs for connecting:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Reset button
  - Light beam devices
  - Scanner
  - Enable switch
  - PSEN
  - Operating mode selector switch
  - Safety mats
- Muting function
- Connectable:
  - 8 expansion modules on the right
  - 1 fieldbus module on the left
  - 4 expansion modules on the left
- LED for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to detect shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

**Unit description**

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

**Chip card**

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see chapter containing the order references).
The chip card with a memory of 32 kByte can only be used from PNOZ m1p Version 2.0.

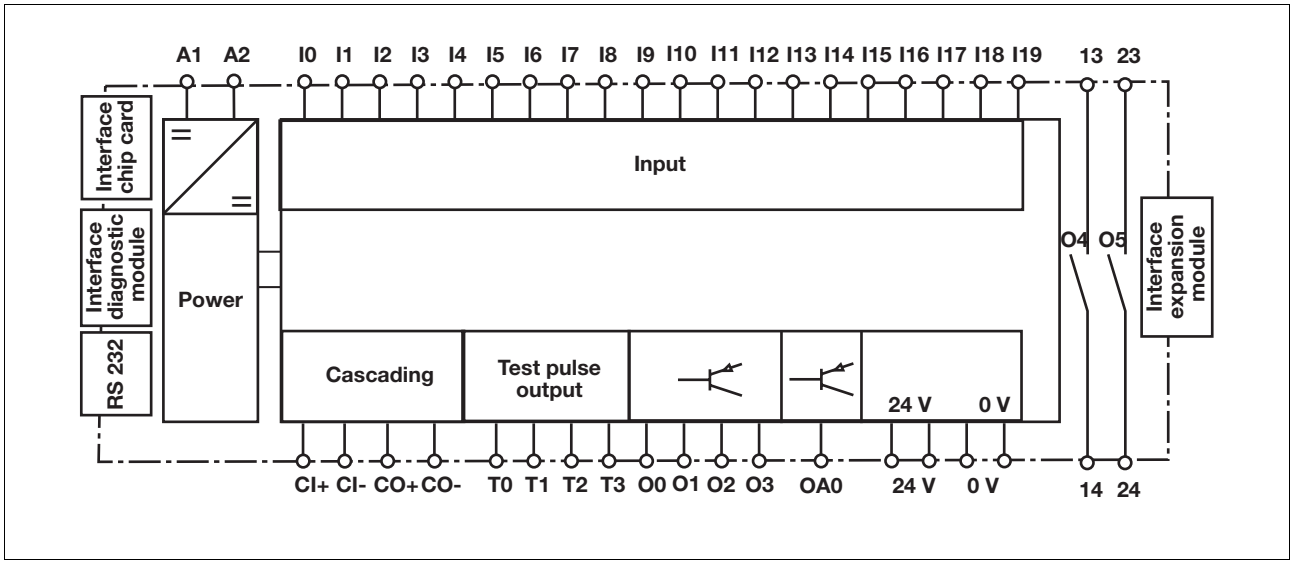
**Safety features**

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.
- The safety outputs are tested periodically using a disconnection test.

# Base units
## PNOZ m1p

**Block diagram**








Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p

**Function description**

The function of the inputs and 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.

**Wiring**

The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a particular safety function and the outputs that will switch this safety function.
Please note:

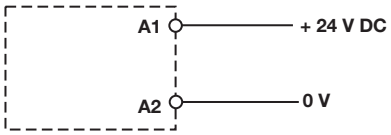
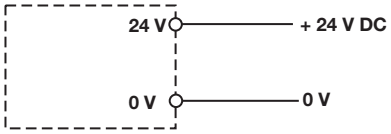
- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- 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. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.

  Where test pulses are used for the safety mat, they may not be reused for other purposes.
  Safety mats are supported from Version 4.3 of the base unit.

# Base units
## PNOZ m1p

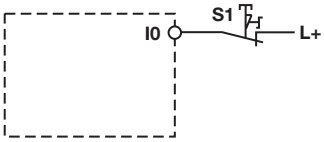
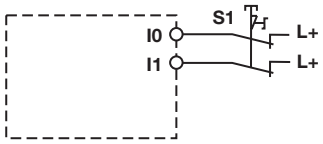
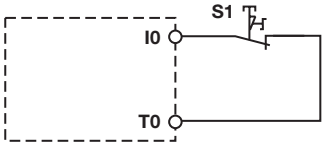
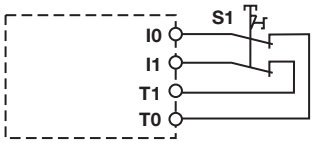
### Preparing for operation

▸ Supply voltage

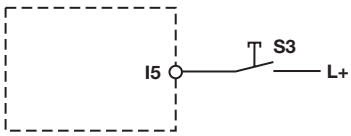
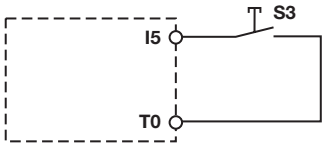
| Supply voltage | AC | DC |
|---|---|---|
| For the safety system<br>(connector X7) | |  |
| For the semiconductor outputs<br>(connector X2)<br>Must always be present, even if the semiconductor outputs are not used | |  |

### Connection examples

▸ Input circuit

| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

▸ Reset circuit

| Reset circuit | Input circuit without detection of shorts across contacts | Input circuit with detection of shorts across contacts |
|---|---|---|
| |  |  |

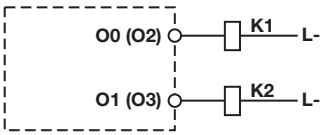
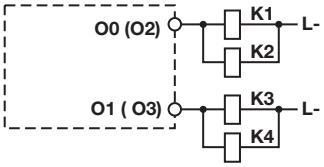
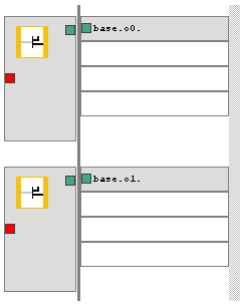




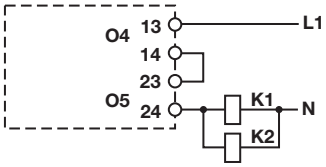
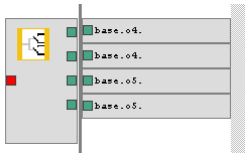
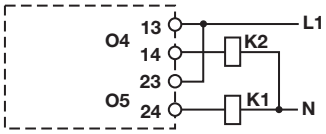
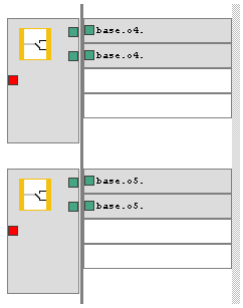
Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p

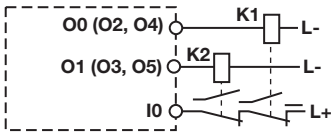
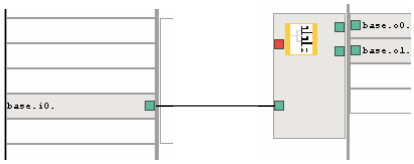
### Semiconductor outputs

| | | |
|---|---|---|
| Redundant output |  | |
| Single output |  |  |

### Relay outputs

| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |

### Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

### Key

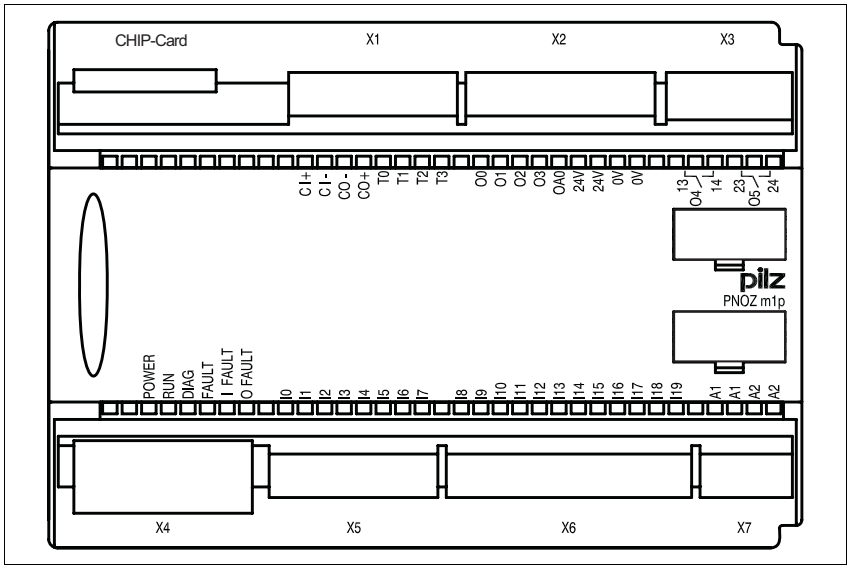
| | |
|---|---|
| S1 | E-STOP pushbutton |
| S3 | Reset button |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p

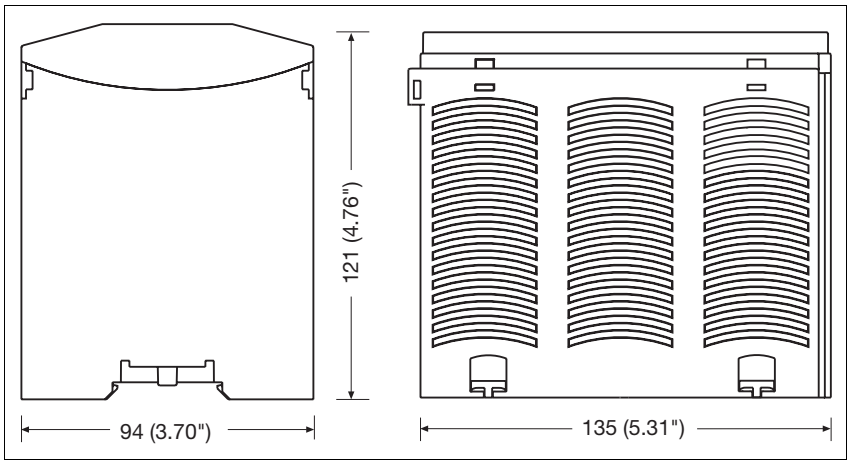
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions







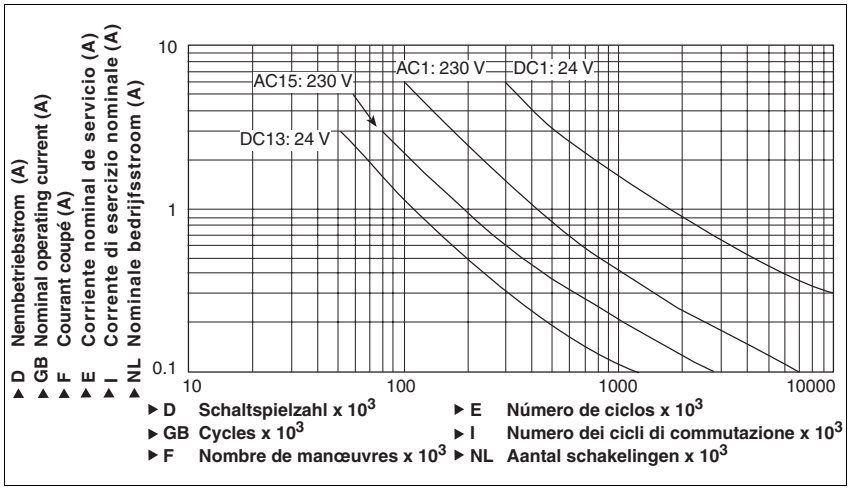

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p

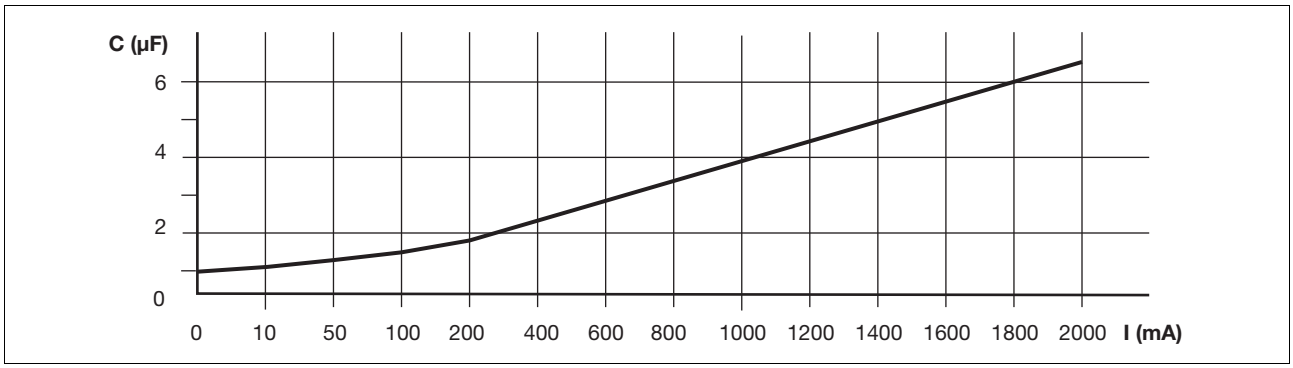
### Notice

This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

### Service life graph




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




| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **Max. 8.0 W + 2.5 W per expansion module** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Simultaneity channel 1/2/3 | **3 s, two-hand control relay: 0.5 s** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Inputs** | |
| Quantity | **20** |
| Voltage and current | **24 VDC/8 mA** |
| Galvanic isolation | **No** |
| Cascading input | **500 VAC** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p

| | |
|---|---|
| **Inputs** | |
| Signal level at “0” | **-3 ... +5 VDC** |
| Signal level at “1” | **15 ... 30 VDC** |
| Input delay | **0.6 ... 4 ms** |
| Status indicator | **LED** |
| **Test pulse outputs** | |
| Quantity | **4** |
| Voltage and current | **24 VDC / 0.5 A** |
| Off time during self test | **< 5 ms** |
| Galvanic isolation | **No** |
| Short circuit protection | **Yes** |
| Status indicator | **LED** |
| **Semiconductor outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 3 | <br>**2**<br>**4** |
| Switching capability | **24 VDC / max. 2 A / max. 48 W** |
| Max. capacitive load | **See diagram** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% - 10%** |
| Off time during self test | **< 300 µs** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Switch-off delay | **< 30 ms** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 2 A** |
| Status indicator | **LED** |
| **Relay outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 2 | <br>**1**<br>**2** |
| Utilisation category in accordance with<br>EN 60947-4-1, 02/01<br><br>EN 60947-5-1, 11/97 | <br>**AC1: 240 V / 6 A / 1440 VA**<br>**DC1: 24 V / 6 A / 144 W**<br>**AC15: 230 V / 3 A / 690 VA**<br>**DC13: 24 V / 3 A / 72 W** |
| Contact fuse protection in accordance with EN 60947-5-1, 08/00<br>Blow-out fuse<br>Circuit breaker 24 VDC | <br>**6 A quick or slow**<br>**6 A (characteristic B + C)** |
| Switch-off delay | **50 ms** |
| Status indicator | **LED** |
| **Auxiliary outputs** | |
| Quantity | **1** |
| Voltage and current | **24 VDC / max. 0.5 A / max. 12 W** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... +10%** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 0.5 A** |
| Status indicator | **LED** |
| **Cascading output as auxiliary output** | |
| Quantity | **1** |
| Voltage and current | **24 VDC / max. 0.2 A / max. 4.8 W** |
| Galvanic isolation | **No** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p

| Environmental data | |
|---|---|
| Airgap creepage between | **DIN VDE 0110-1, 04/97** |
| relay contacts | **3 mm** |
| Relay contacts and other safe circuits | **5.5 mm** |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | |
| With UL approval | **0 ... +55 °C** |
| Without UL approval (with forced convection) | **0 ... +60 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Maximum cable runs | |
| Per input | **1 km** |
| Sum of individual cable runs at the test pulse output | **40 km** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | |
| Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1) | |
| auxiliary output (X2), cascading output | **0.5 ... 1.5 mm$^2$** |
| Relay outputs (X3) | **0.5 ... 2.5 mm$^2$** |
| Flexible multi-core with plastic sleeve | |
| Relay outputs (X3) | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | |
| Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1), | |
| auxiliary output (X2), cascading output | **0.2 ... 0.25 Nm** |
| Relay outputs (X3) | **0.4 ... 0.5 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 135 x 121 mm** |
| Weight with connector | **530 g** |

**Order reference**

| Type | Features | Order no. |
|---|---|---|
| PNOZ m1p | Base unit | 773 100 |

# Base units
## PNOZ m1p coated version

Base units from the PNOZmulti modular safety system

**Approvals**

| | PNOZ m1p coated version |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

2.2

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  - 1 safety output in accordance with EN 954-1, Cat. 4 or 2 safety outputs in accordance with EN 954-1, Cat. 2
- Semiconductor outputs:
  - 2 safety outputs in accordance with EN 954-1, Cat. 4 or 4 safety outputs in accordance with EN 954-1, Cat. 3
  - 1 auxiliary output
- 4 test pulse outputs
- 1 cascading input and output can also be used as a standard output
- 20 inputs for connecting:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Reset button
  - Light beam devices
  - Scanner
  - Enable switch
  - PSEN
  - Operating mode selector switch
  - Safety mats
- Muting function
- Connectable:
  - 8 expansion modules on the right
  - 1 fieldbus module on the left
  - 4 expansion modules on the left
- LED for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to detect shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

**Unit description**

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

**Chip card**

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see chapter containing the order references).
The chip card with a memory of 32 kByte can only be used from PNOZ m1p Version 2.0.

**Safety features**

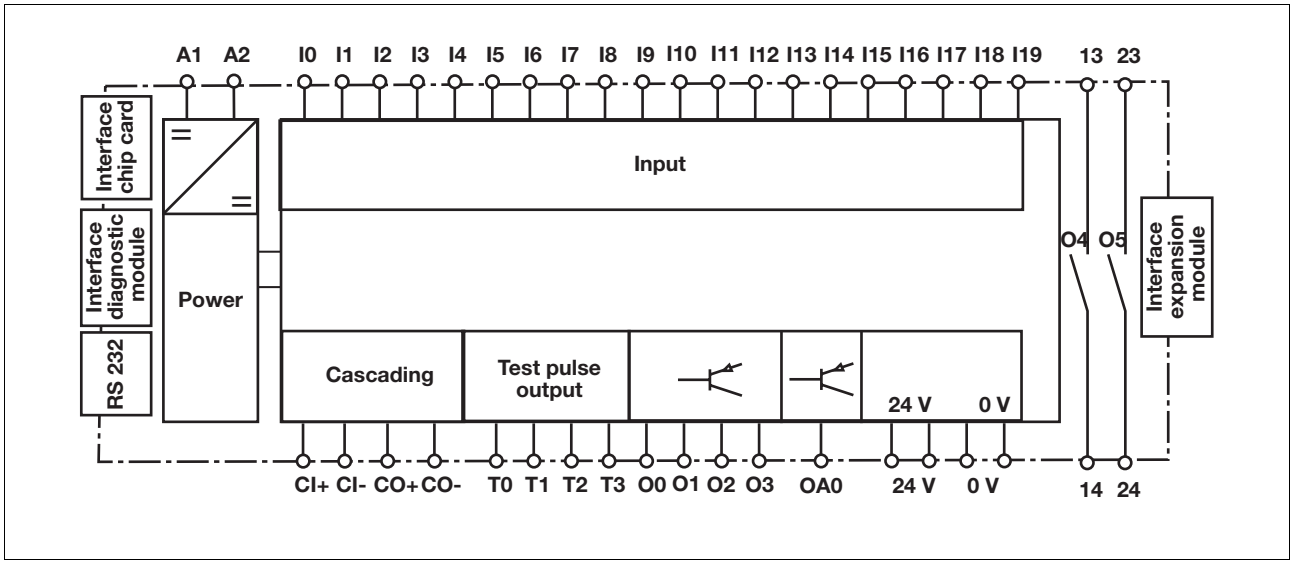
The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.
- The safety outputs are tested periodically using a disconnection test.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p coated version

**Block diagram**



# Base units
## PNOZ m1p coated version

**Function description**

The function of the inputs and 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.

**Wiring**

The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a particular safety function and the outputs that will switch this safety function.
Please note:

- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- 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. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.

  Where test pulses are used for the safety mat, they may not be reused for other purposes.
  Safety mats are supported from Version 4.3 of the base unit.

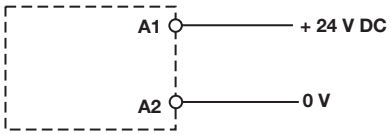
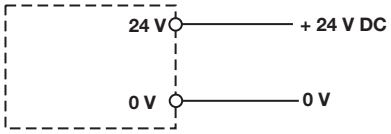



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p coated version

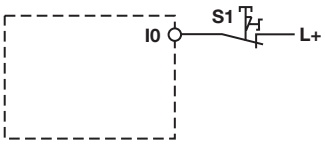
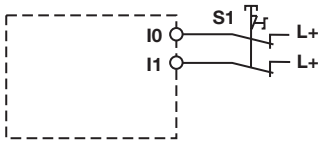
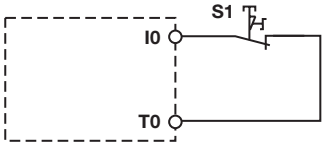
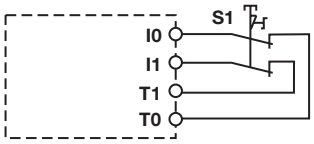
### Preparing for operation

▸ Supply voltage

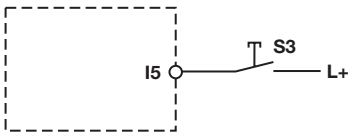
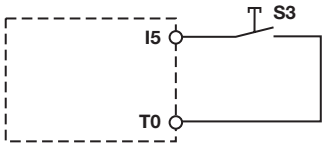
| Supply voltage | AC | DC |
|---|---|---|
| For the safety system<br>(connector X7) | |  |
| For the semiconductor outputs<br>(connector X2)<br>Must always be present, even if the semiconductor outputs are not used | |  |

### Connection examples

▸ Input circuit

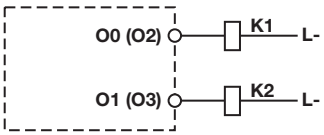
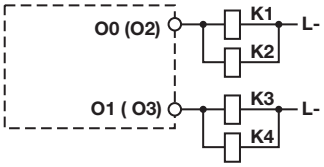
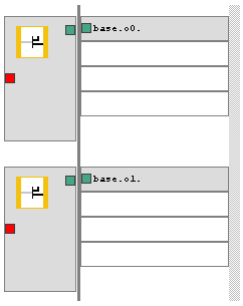
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

▸ Reset circuit

| Reset circuit | Input circuit without detection of shorts across contacts | Input circuit with detection of shorts across contacts |
|---|---|---|
| |  |  |

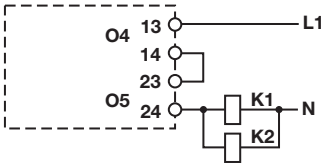
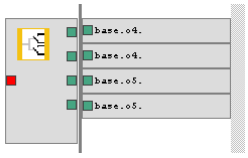
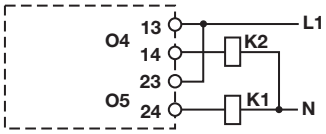
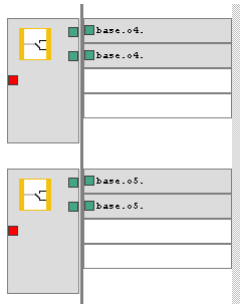
# Base units
## PNOZ m1p coated version

### Semiconductor outputs

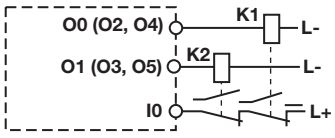
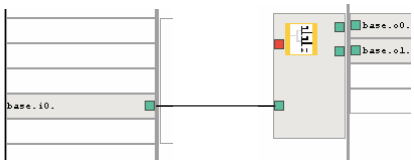
| | | |
|---|---|---|
| Redundant output |  | |
| Single output |  |  |



### Relay outputs

| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |

### Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

### Key

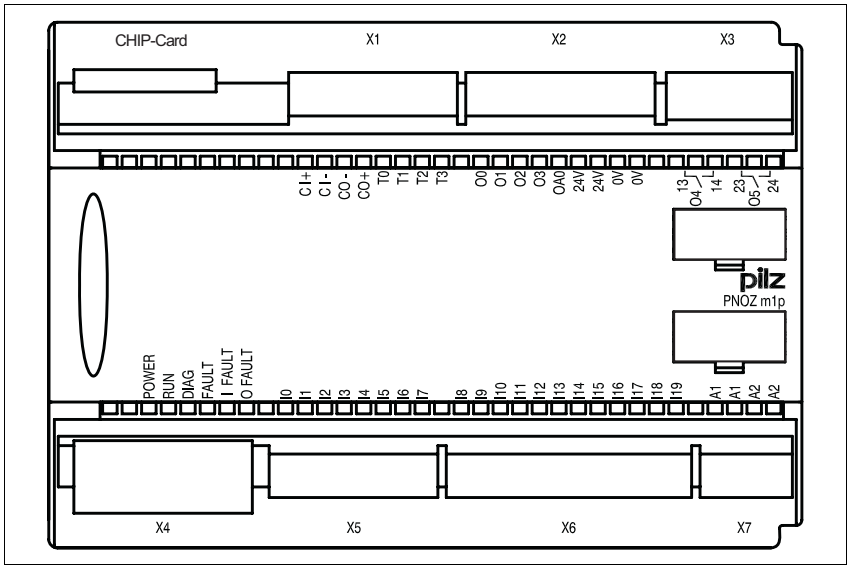
| | |
|---|---|
| S1 | E-STOP pushbutton |
| S3 | Reset button |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p coated version

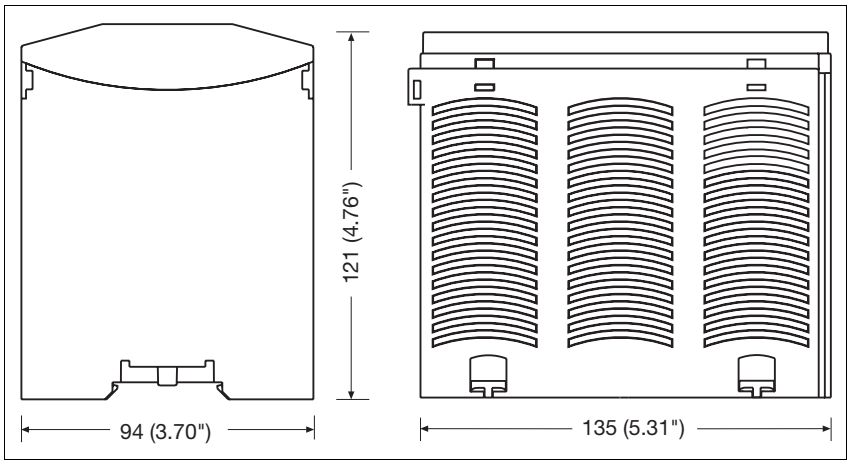
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions

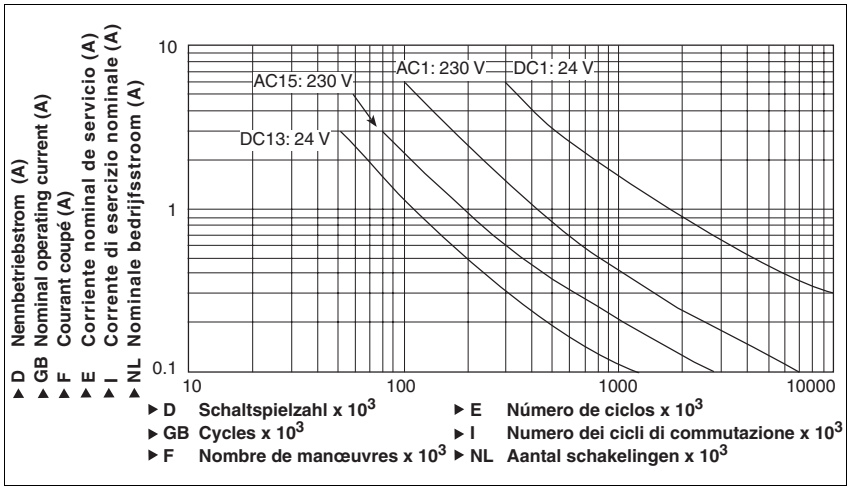


# Base units
## PNOZ m1p coated version

**Notice**

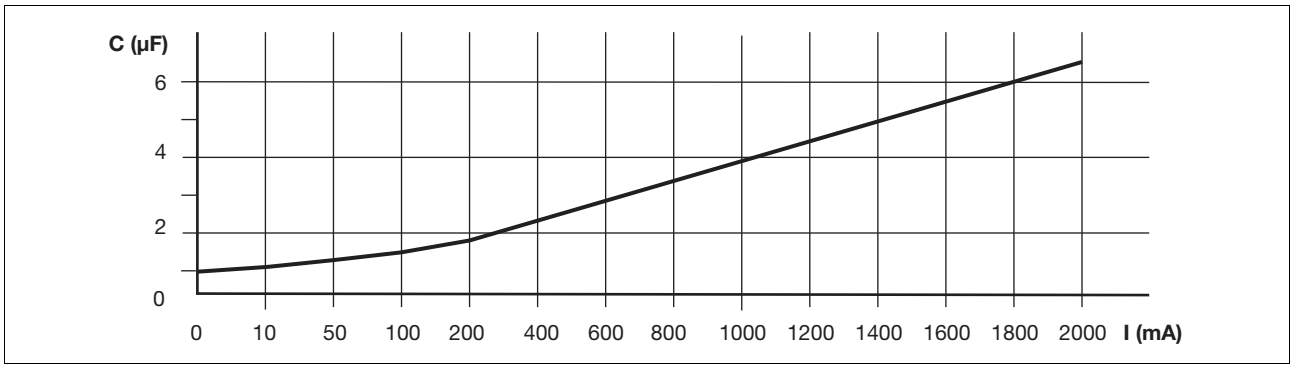
This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Service life graph**




2.2

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




| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **Max. 8.0 W + 2.5 W per expansion module** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Simultaneity channel 1/2/3 | **3 s, two-hand control relay: 0.5 s** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Inputs** | |
| Quantity | **20** |
| Voltage and current | **24 VDC/8 mA** |
| Galvanic isolation | **No** |
| Cascading input | **500 VAC** |


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m1p coated version

| | |
|---|---|
| **Inputs** | |
| Signal level at “0” | **-3 ... +5 VDC** |
| Signal level at “1” | **15 ... 30 VDC** |
| Input delay | **0.6 ... 4 ms** |
| Status indicator | **LED** |
| **Test pulse outputs** | |
| Quantity | **4** |
| Voltage and current | **24 VDC / 0.5 A** |
| Off time during self test | **< 5 ms** |
| Galvanic isolation | **No** |
| Short circuit protection | **Yes** |
| Status indicator | **LED** |
| **Semiconductor outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 3 | <br>**2**<br>**4** |
| Switching capability | **24 VDC / max. 2 A / max. 48 W** |
| Max. permitted overall performance of semiconductor outputs at an ambient temperature of > 50 °C | **96 W** |
| Max. capacitive load | **≥ 1 µF, see diagram** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% - 10%** |
| Off time during self test | **< 300 µs** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Switch-off delay | **< 30 ms** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 2 A** |
| Status indicator | **LED** |
| **Relay outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 2 | <br>**1**<br>**2** |
| Utilisation category in accordance with<br>EN 60947-4-1, 02/01<br><br>EN 60947-5-1, 11/97 | <br>**AC1: 240 V / 6 A / 1440 VA**<br>**DC1: 24 V / 6 A / 144 W**<br>**AC15: 230 V / 3 A / 690 VA**<br>**DC13: 24 V / 3 A / 72 W** |
| Max. permitted total current of relay outputs at an ambient temperature of > 50 °C | **8 A** |
| Contact fuse protection in accordance with EN 60947-5-1, 08/00<br>Blow-out fuse<br>Circuit breaker 24 VDC | <br>**6 A quick or slow**<br>**6 A (characteristic B + C)** |
| Switch-off delay | **50 ms** |
| Status indicator | **LED** |
| **Auxiliary outputs** | |
| Quantity | **1** |
| Voltage and current | **24 VDC / max. 0.5 A / max. 12 W** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... +10%** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 0.5 A** |
| Status indicator | **LED** |

# Base units
## PNOZ m1p coated version

| | |
|---|---|
| **Cascading output as auxiliary output** | |
| Quantity | **1** |
| Voltage and current | **24 VDC / max. 0.2 A / max. 4.8 W** |
| Galvanic isolation | **No** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |
| **Environmental data** | |
| Airgap creepage between<br>relay contacts<br>Relay contacts and other safe circuits | **DIN VDE 0110-1, 04/97**<br>**3 mm**<br>**5.5 mm** |
| Vibration in accordance with **EN 60068-2-6, 04/95**<br>Frequency:<br>Amplitude: | <br>**10 ... 55 Hz**<br>**0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature<br>With UL approval<br>Without UL approval | <br>**0 ... +50 °C**<br>**-25 ... +60 °C** |
| Storage temperature | **-25 ... +70 °C** |
| Corrosive gas check<br>SO2: concentration 10 ppm, duration 10 days, passive<br>H2S: concentration 1 ppm, duration 10 days, passive | <br>**DIN V 40046-36**<br>**DIN V 40046-37** |
| **Mechanical data** | |
| Protection type<br>Mounting (e.g. cabinet)<br>Housing<br>Terminals | <br>**IP54**<br>**IP20**<br>**IP20** |
| DIN rail<br>Top hat rail<br>Recess width | <br>**35 x 7.5 EN 50022**<br>**27 mm** |
| Maximum cable runs<br>Per input<br>Sum of individual cable runs at the test pulse output | <br>**1 km**<br>**40 km** |
| Cross section of external conductors<br>Rigid single-core, flexible multi-core or multi-core<br>With crimp connector<br>Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1)<br>auxiliary output (X2), cascading output<br>Relay outputs (X3)<br>Flexible multi-core with plastic sleeve<br>Relay outputs (X3) | <br><br><br><br>**0.5 ... 1.5 mm$^2$**<br>**0.5 ... 2.5 mm$^2$**<br><br>**0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws)<br>Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1),<br>auxiliary output (X2), cascading output<br>Relay outputs (X3) | <br><br>**0.2 ... 0.25 Nm**<br>**0.4 ... 0.5 Nm** |
| Housing material<br>Housing<br>Front | <br>**PPO UL 94 V0**<br>**ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 135 x 121 mm** |
| Weight with connector | **530 g** |

**Order reference**

| Type | Features | Order no. |
|---|---|---|
| PNOZ m1p coated version | Base unit | 773 105 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m2p

Base units from the PNOZmulti modular safety system

**Approvals**

| | PNOZ m2p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  - 1 safety output in accordance with EN 954-1, Cat. 4 or 2 safety outputs in accordance with EN 954-1, Cat. 2
- Semiconductor outputs:
  - 2 safety outputs in accordance with EN 954-1, Cat. 4 or 4 safety outputs in accordance with EN 954-1, Cat. 3
  - 1 auxiliary output
- 4 test pulse outputs
- 1 cascading input and output can also be used as standard outputs
- For applications on mechanical presses
- 20 inputs for connecting:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Reset button
  - Light beam devices
  - Scanner
  - Enable switch
  - PSEN
  - Operating mode selector switch
  - Safety mats
- Muting function
- Connectable:
  - 8 expansion modules on the right
  - 1 fieldbus module on the left
  - 4 expansion modules on the left
- LED for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to detect shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

**Unit description**

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The unit is designed for applications on mechanical presses. All of the functions required for a press are available. These include:

- Operating modes
  - Set-up mode
  - Single stroke
  - Automatic
- Monitoring a mechanical camshaft
- Run monitoring
- Monitoring electrosensitive protective equipment (pulse mode)
- Driving and monitoring a press safety valve

**Chip card**

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see chapter containing the order references).

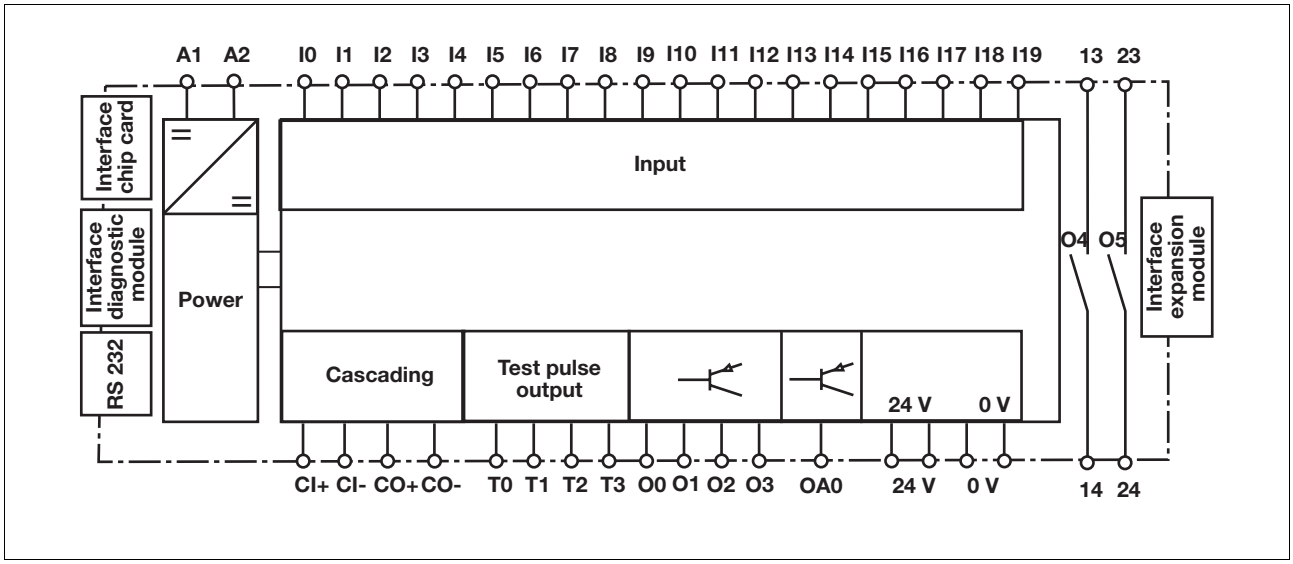
**Safety features**

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.
- The safety outputs are tested periodically using a disconnection test.

# Base units
## PNOZ m2p

**Block diagram**








Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m2p

**Function description**

The function of the inputs and 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.

**Wiring**

The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a particular safety function and the outputs that will switch this safety function.
Please note:

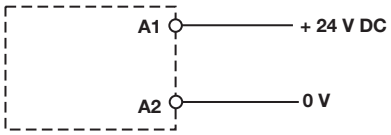
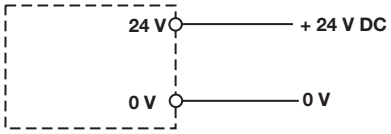
- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- 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. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.

  Where test pulses are used for the safety mat, they may not be reused for other purposes.
  Safety mats are supported from Version 1.3 of the base unit.

# Base units
## PNOZ m2p

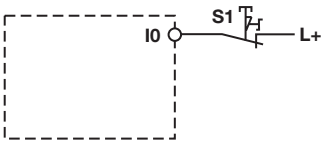
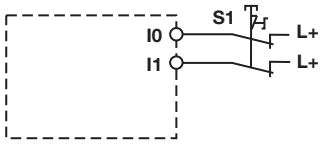
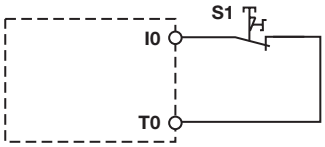
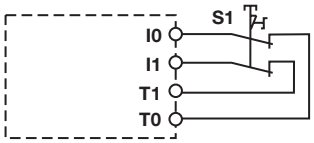
### Preparing for operation

▸ Supply voltage

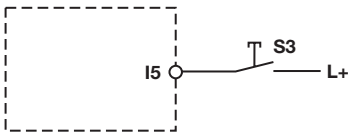
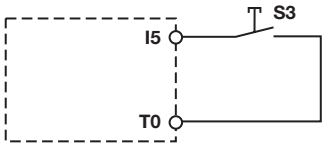
| Supply voltage | AC | DC |
|---|---|---|
| For the safety system<br>(connector X7) | |  |
| For the semiconductor outputs<br>(connector X2)<br>Must always be present, even if the semiconductor outputs are not used | |  |

### Connection examples

▸ Input circuit

| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

▸ Reset circuit

| Reset circuit | Input circuit without detection of shorts across contacts | Input circuit with detection of shorts across contacts |
|---|---|---|
| |  |  |

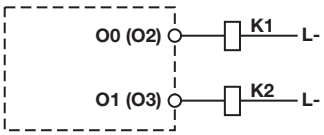
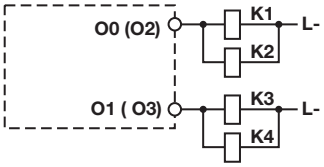
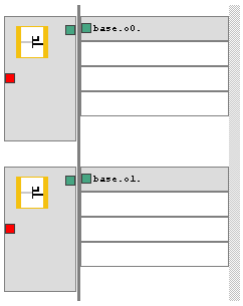




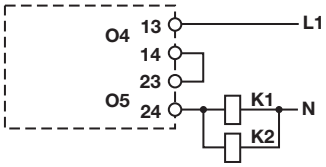
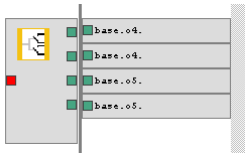
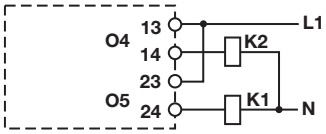
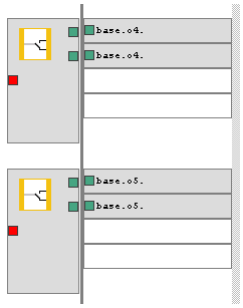
Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m2p

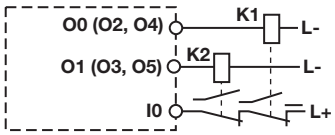
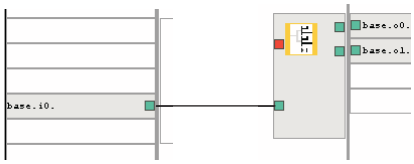
### Semiconductor outputs

| | | |
|---|---|---|
| Redundant output |  | |
| Single output |  |  |

### Relay outputs

| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |

### Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

### Key

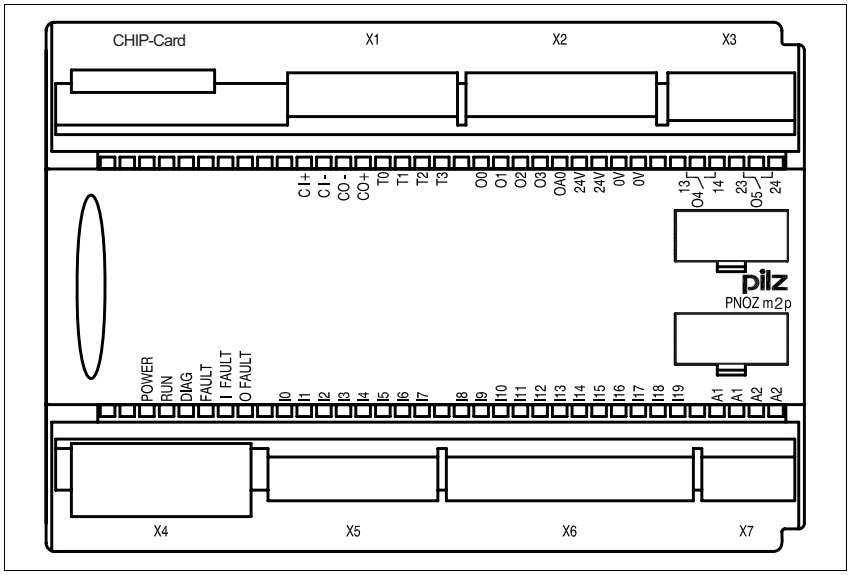
| | |
|---|---|
| S1 | E-STOP pushbutton |
| S3 | Reset button |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m2p

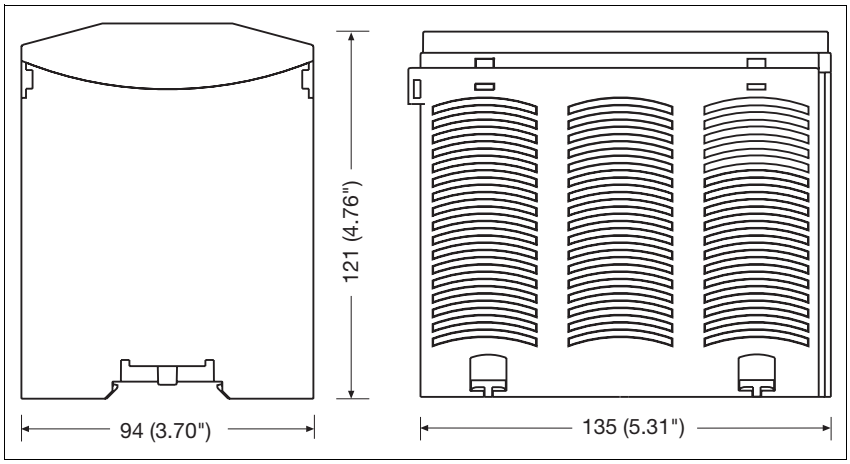
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions







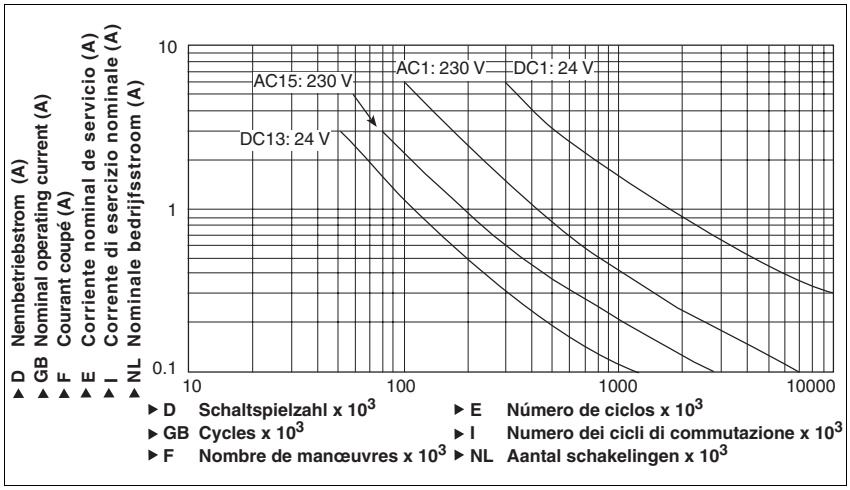

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m2p

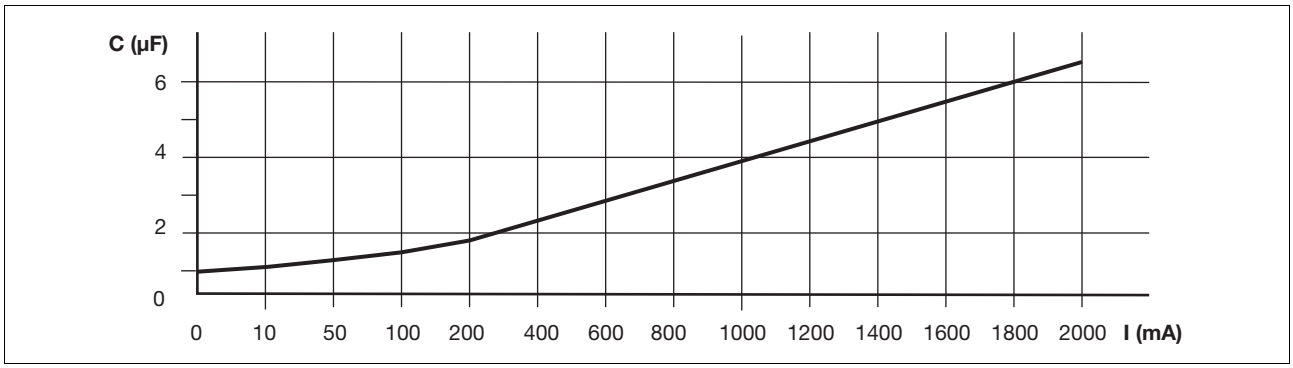
**Notice**

This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Service life graph**




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




| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **Max. 8.0 W + 2.5 W per expansion module** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Simultaneity channel 1/2/3 | **3 s, two-hand control relay: 0.5 s** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Inputs** | |
| Quantity | **20** |
| Voltage and current | **24 VDC/8 mA** |
| Galvanic isolation | **No** |
| Cascading input | **500 VAC** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m2p

| | |
|---|---|
| **Inputs** | |
| Signal level at “0” | **-3 ... +5 VDC** |
| Signal level at “1” | **15 ... 30 VDC** |
| Input delay | **0.6 ... 4 ms** |
| Status indicator | **LED** |
| **Test pulse outputs** | |
| Quantity | **4** |
| Voltage and current | **24 VDC / 0.5 A** |
| Off time during self test | **< 5 ms** |
| Galvanic isolation | **No** |
| Short circuit protection | **Yes** |
| Status indicator | **LED** |
| **Semiconductor outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 3 | <br>**2**<br>**4** |
| Switching capability | **24 VDC / max. 2 A / max. 48 W** |
| Max. capacitive load | **See diagram** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% - 10%** |
| Off time during self test | **< 300 µs** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Switch-off delay | **< 30 ms** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 2 A** |
| Status indicator | **LED** |
| **Relay outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 2 | <br>**1**<br>**2** |
| Utilisation category in accordance with<br>EN 60947-4-1, 02/01<br><br>EN 60947-5-1, 11/97 | <br>**AC1: 240 V / 6 A / 1440 VA**<br>**DC1: 24 V / 6 A / 144 W**<br>**AC15: 230 V / 3 A / 690 VA**<br>**DC13: 24 V / 3 A / 72 W** |
| Contact fuse protection in accordance with EN 60947-5-1, 08/00<br>Blow-out fuse<br>Circuit breaker 24 VDC | <br>**6 A quick or slow**<br>**6 A (characteristic B + C)** |
| Switch-off delay | **50 ms** |
| Status indicator | **LED** |
| **Auxiliary outputs** | |
| Quantity | **1** |
| Voltage and current | **24 VDC / max. 0.5 A / max. 12 W** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... +10%** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 0.5 A** |
| Status indicator | **LED** |
| **Cascading output as auxiliary output** | |
| Quantity | **1** |
| Voltage and current | **24 VDC / max. 0.2 A / max. 4.8 W** |
| Galvanic isolation | **No** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base units
## PNOZ m2p

| Environmental data | |
|---|---|
| Airgap creepage between | **DIN VDE 0110-1, 04/97** |
| relay contacts | **3 mm** |
| Relay contacts and other safe circuits | **5.5 mm** |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Maximum cable runs | |
| Per input | **1 km** |
| Sum of individual cable runs at the test pulse output | **40 km** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | |
| Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1) | |
| auxiliary output (X2), cascading output | **0.5 ... 1.5 mm$^2$** |
| Relay outputs (X3) | **0.5 ... 2.5 mm$^2$** |
| Flexible multi-core with plastic sleeve | |
| Relay outputs (X3) | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | |
| Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1), | |
| auxiliary output (X2), cascading output | **0.2 ... 0.25 Nm** |
| Relay outputs (X3) | **0.4 ... 0.5 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 135 x 121 mm** |
| Weight with connector | **530 g** |

**Order reference**

| Type | Features | Order no. |
|---|---|---|
| PNOZ m2p | Base unit | 773 120 |

# Expansion modules





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules


| Contents | Page |
|---|---|
| **Expansion modules** | |
| PNOZ ma1p | 2.3-2 |
| PNOZ mi1p | 2.3-8 |
| PNOZ mi1p coated version | 2.3-13 |
| PNOZ mi2p | 2.3-18 |
| PNOZ mo1p | 2.3-22 |
| PNOZ mo1p coated version | 2.3-28 |
| PNOZ mo2p | 2.3-34 |
| PNOZ mo2p coated version | 2.3-40 |
| PNOZ mo3p | 2.3-46 |
| PNOZ mo4p | 2.3-52 |
| PNOZ mo4p coated version | 2.3-58 |
| PNOZ mc0p | 2.3-64 |
| PNOZ mc1p | 2.3-68 |
| PNOZ mc1p coated version | 2.3-72 |
| PNOZ mc3p | 2.3-77 |
| PNOZ mc4p | 2.3-81 |
| PNOZ mc4p coated version | 2.3-85 |
| PNOZ mc5p | 2.3-89 |
| PNOZ mc5.1p | 2.3-93 |
| PNOZ mc6p | 2.3-97 |
| PNOZ mc6p coated version | 2.3-101 |
| PNOZ mc7p | 2.3-105 |
| PNOZ mc8p | 2.3-109 |
| PNOZ mc9p | 2.3-113 |
| PNOZ ml1p | 2.3-117 |
| PNOZ ms1p | 2.3-124 |
| PNOZ ms2p | 2.3-131 |

# Expansion modules
## PNOZ ma1p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ ma1p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

2.3

**Unit features**

- 2 safe analogue inputs for current or voltage measurement (configurable)
- Voltage range: -10,24 ... +10.2375 V
- Current range: 0 ... 25.59 mA
- Resolution
  - Voltage measurement: 13 Bit (signed 12 Bit)
  - Current measurement: 12 Bit
- Range monitoring (4 range limits can be configured)
- Threshold value monitoring (8 threshold values can be configured)
- Max. 4 PNOZ ma1p units can be connected to the base unit
- LED indicators for
  - Operating status
  - Status of the input signals (Ch0, Ch1)
  - Errors

**Unit description**

The expansion module is an analogue input module. It provides 2 safe analogue inputs for current or voltage measurement. For current measurement, both inputs can be used independently. For voltage measurement, both inputs must always be wired. The analogue inputs are suitable for connecting transducers or input devices with standardised 10 V voltage signals or 20 mA current signals. The analogue inputs are designed as differential inputs. Each analogue input has a signal range of –10 VDC to +10 VDC or 0 mA to 25 mA.
The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

**System requirements**

- PNOZmulti Configurator: from Version 5.3.0
- Base unit PNOZ m1p: from Version 5.6
- Base unit PNOZ m2p: from Version 2.6

Please contact Pilz if you have an older version.

**Safety features**

The PNOZ ma1p expansion module fulfils the following safety requirements:
The circuit is redundant with built-in self-monitoring.

- The safety function remains effective in the case of a component failure.

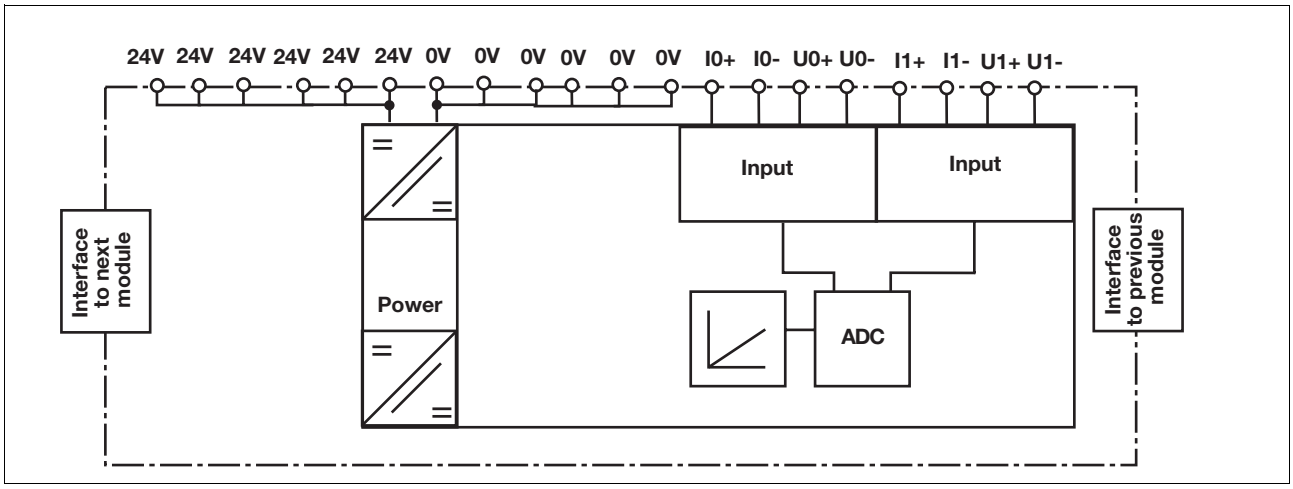
**The analogue input module can be used for current measurement for applications up to SIL3.**
For applications in accordance with SIL2 or SIL3, input devices must be connected that are certified for SIL2 in accordance with IEC 61508. The output signal of the input device must be monitored, i.e. the actual and set value must be compared. If there is any deviation there must be a reaction that the PNOZmulti will recognise and to which it will react.

- **SIL2 applications:**
  SIL2 applications are only possible for current measurement. If the analogue input module is to be used for current measurement on SIL2 applications, both inputs can be used independently for current measurement.
- **SIL 3 applications:**
  If the analogue input module is to be used for SIL3 applications, both inputs must be configured and then combined to form a SIL3 input. To do this, connect a suitable input device to each input. The analogue input module will then check the feasibility of the input signals, i.e. the values measured from both input signals are compared.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de
NSG-D-2-407-2008-03

# Expansion modules
## PNOZ ma1p

**Block diagram**




**Function description**

The analogue input module monitors analogue input signals. It can measure both current and voltage.
The input signals are collected and read in at each input through two channels and are converted into digital signals. The resolution is 13 Bit for voltage measurement, 12 Bit for current measurement.

**Monitoring types**
In the PNOZmulti Configurator you can define limit values, which are to be monitored:

- **Range monitoring**
  With range monitoring you can define the permitted value range. You can define up to 4 range limits (e.g. < 3 mA monitored for input device error). Depending on the selected condition ("greater than" or "less than"), the ENBL output bit and output bits 1 - 8 for threshold value monitoring are set to "0" if the recorded value exceeds or drops below a range limit. An entry is added to the error stack.
  Exception: If "automatic reset" type has been selected, no entry will be added to the error stack.
- **Threshold value monitoring**
  You can define up to 8 switching thresholds, which can be used to monitor certain process variables (e.g. different temperature values). The thresholds can be configured with or without scaling. 2 threshold values are configured per threshold. One threshold value defines when the relevant output bit (1 ... 8) is set to "1". The second threshold value defines when the output bit is reset to "0". No entry is added to the error stack.

**Evaluate analogue values**
The **exact analogue values** are made available to the base unit to forward to a fieldbus. This value is transmitted through a single channel and is not safety-related. It can be used for diagnostic purposes.

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

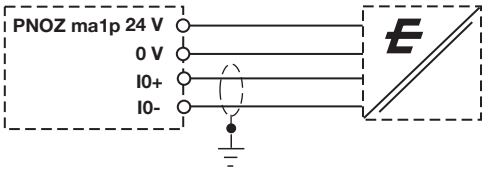
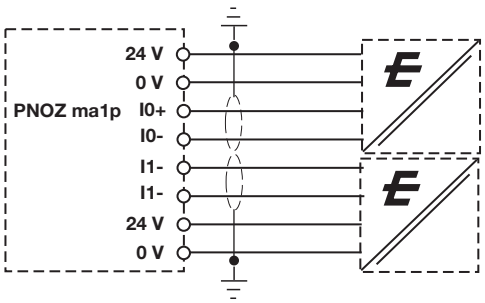
# Expansion modules
## PNOZ ma1p

**Wiring**

Please note the following when preparing for commissioning:
- The wiring is defined in the circuit diagram of the PNOZmulti Configurator.
- The power supply that feeds the expansion module and the input device must meet the regulations for extra low voltages with safe separation (SELV, PELV).
- 6 connection terminals are available for each of the supply connections 24 V and 0 V. This means that the supply voltage can be looped through several connections and the input device can be supplied.
- Use shielded, twisted pair cable for the connections on the input current circuits.
- Separate the supply voltage cable from the analogue input current lines.
- If the analogue input module is used to measure current, the voltage inputs must be short-circuited.
- For transducers located outside the control cabinet: Where the cable enters the control cabinet, the cable shield must be connected to the earth potential over a wide surface area and with low impedance (connect in star).
- Use copper wiring that can withstand temperatures of 60/75 °C.
- The torque setting of the screws on the connection terminals is specified in the "Technical details" section.

**Preparing for operation**

- Connection to transducer

| Example for current measurement | |
|---|---|
| SIL2 application |  |
| SIL3 application |  |

Please note:
- The transducers are SIL2 certified
- The voltage supply to the input device is optional
- With current measurement, the voltage inputs U+ - U- must be short-circuited.



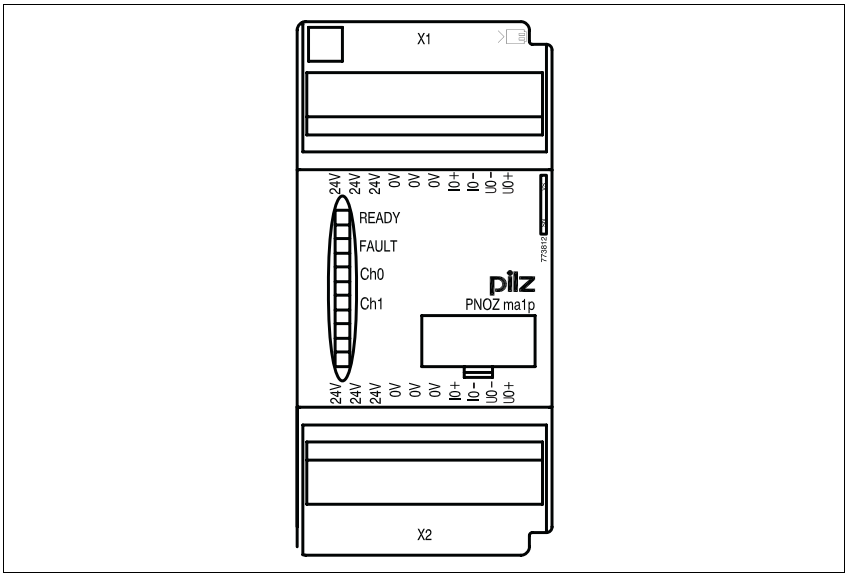
Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ma1p

### Notice

This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

### Terminal configuration

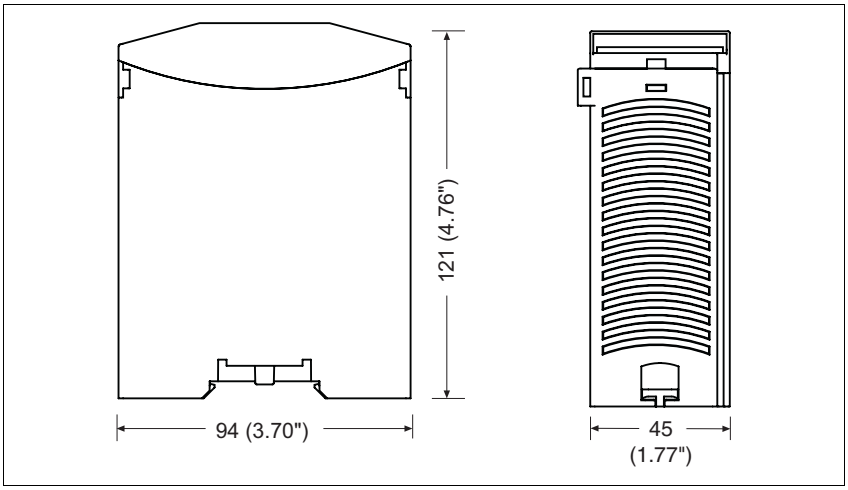



### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

Please note for installation:
**CAUTION!**
Electrostatic discharge can damage components on the expansion module PNOZ ma1p. Ensure against discharge before touching the PNOZ ma1p, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.

### Dimensions



# Expansion modules
## PNOZ ma1p

| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage | |
| Supply voltage $U_B$ DC | **24 V** |
| Voltage tolerance | **-15 %/+20 %** |
| Power consumption at $U_B$ DC | **2 W** |
| Residual ripple DC | **5 %** |
| **Timers** | |
| Switch-on delay | **5 s** |
| Max. reaction time when the input signal changes | **100 ms** |
| Supply interruption before de-energisation | **20 ms** |
| **Inputs** | |
| Number of analogue inputs | **2** |
| Type of analogue inputs | **Voltage**, **Current** |
| Max.measurement error at 25 °C | **0,5 %** |
| Temperature coefficient* | **0.0025 %/K** |
| Max. measurement error at full temperature range* | **0,5 %** |
| Greatest transient deviation during el. interference test* | **1.0 %** |
| Max. measurement error in the cas of a potential module error | **1,5 %** |
| Max. voltage between inputs I0 and I1 with current or voltage measurement | **+/- 15 V** |
| Analogue input filter | **First order** |
| Cutoff frequency | **80 Hz** |
| Filter time constant | **2.0 ms** |
| Galvanic isolation between the inputs | **no** |
| **Current measurement** | |
| Signal range | **0.00 - 25.59 mA** |
| Value range | **0 - 4095 d** |
| Resolution | **12 Bit** |
| Value of least significant bit (LSB) | **6.25 µA** |
| Input impedance | **100 Ohm** |
| Max. continuous current | **50 mA** |
| **Voltage measurement** | |
| Signal range | **-10.2400 - 10.2375 V** |
| Value range | **-4096 - 4095 d** |
| Resolution | **13 Bit** |
| Value of least significant bit (LSB) | **5 mV** |
| Min. input impedance | **290 kOhm** |
| **Environmental data** | |
| EMC | **EN 61000-4-2**, **EN 61000-4-3**, **EN 61000-4-4**, **EN 61000-4-5**, **EN 61000-4-6**, **EN 61000-6-2**, **EN 61000-6-4** |
| Vibration to **EN 60068-2-6** | |
| Frequency | **10 - 55 Hz** |
| Amplitude | **0.35 mm** |
| Climatic suitability | **EN 60068-2-14**, **EN 60068-2-1**, **EN 60068-2-2**, **EN 60068-2-30**, **EN 60068-2-78** |
| Airgap creepage in accordance with | **EN 60664-1** |
| Ambient temperature | **0 - 60 °C** |
| Storage temperature | **-25 - 70 °C** |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ma1p

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Cross section of external conductors with screw terminals | |
| Rigid single-core, flexible multi-core or multi-core with crimp connector | **0.5 … 1.5 mm2, 22-14 AWG** |
| Torque setting with screw terminals | **0.25 Nm** |
| Stripping length | **9 mm** |
| Dimensions | |
| Height | **94.0 mm** |
| Width | **45.0 mm** |
| Depth | **121.0 mm** |
| Weight | **200 g** |

*in relation to the measuring range

The standards current on 2007-08 apply.

**Order reference**

| Type | | | Order no. |
|---|---|---|---|
| PNOZ ma1p | Expansion module | 2 analogue inputs | 773 812 |

# Expansion modules
## PNOZ mi1p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mi1p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Unit features**

- 8 inputs for connecting:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Reset button
  - Light barrier
  - Scanner
  - Enable switch
  - PSEN
  - Operating mode selector switch
- Can be configured in the PNOZmulti Configurator
- LED indicator for:
  - Status of the PNOZmulti safety system
- Max. 8 PNOZ mi1p units can be connected to the base unit
- Test pulse outputs used to detect shorts across the inputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

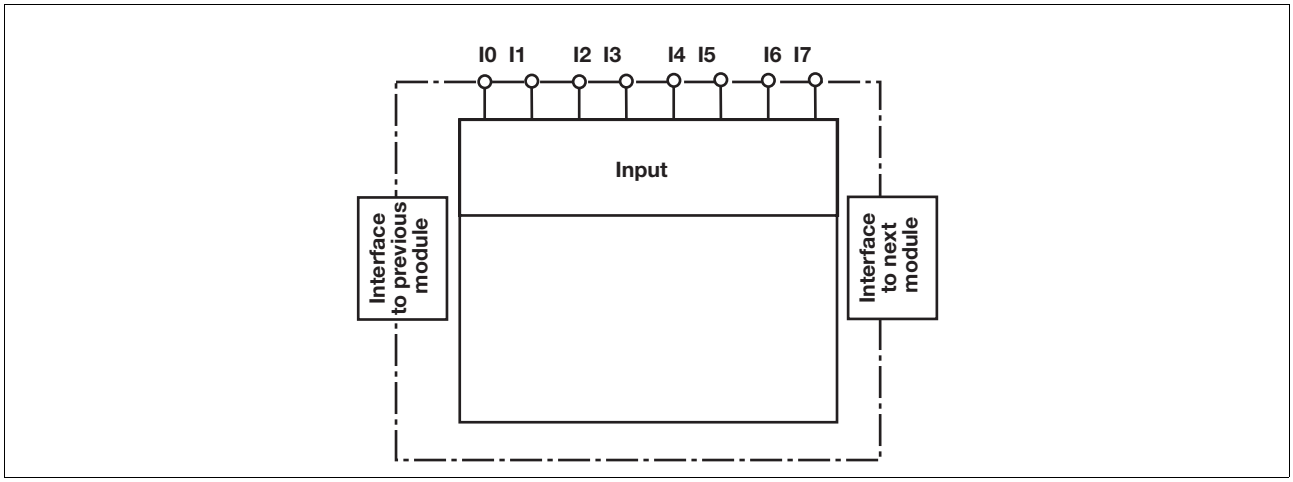
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

**Safety features**

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

**Block diagram**






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

NSG-D-2-369-2007-09

# Expansion modules
## PNOZ mi1p

**Function description**

The expansion module provides additional inputs.
The function of the inputs 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.

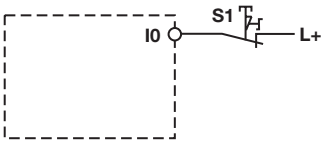
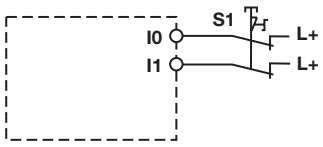
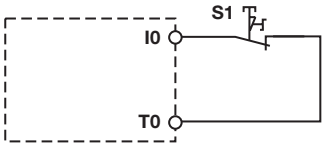
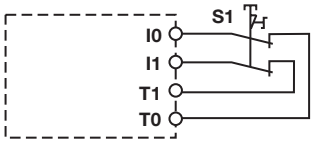
**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Connection terminals I0 ... I7 are inputs
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- The test pulse outputs on the base unit must be used to detect shorts across contacts.
- Use copper wire that can withstand 75 °C.

# Expansion modules
## PNOZ mi1p

### Preparing for operation

- Input circuit

| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| Example:<br>E-STOP<br>without detection of shorts across contacts |  |  |
| Example:<br>E-STOP<br>with detection of shorts across contacts |  |  |

- Key

| | |
|---|---|
| S1 | E-STOP pushbutton |

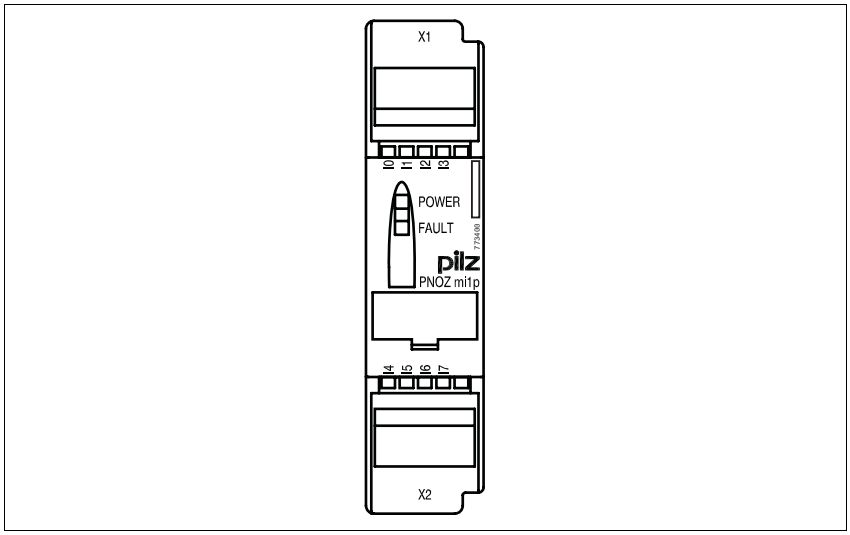




Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mi1p

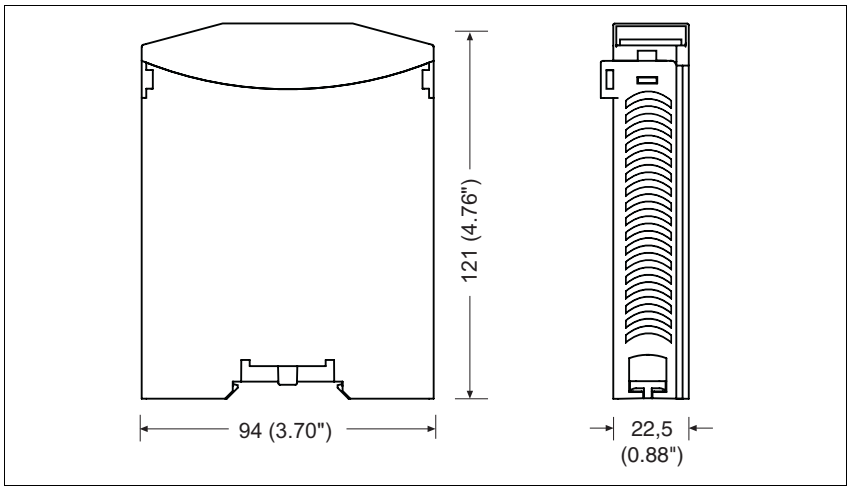
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mi1p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Power consumption at $U_B$ without load | **Max. 8.0 W + 2.5 W per expansion module** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Simultaneity channel 1/2/3 | **3 s, two-hand control relay: 0.5 s** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Inputs** | |
| Quantity | **8** |
| Voltage and current | **24 VDC/8 mA** |
| Galvanic isolation | **No** |
| Signal level at “0” | **-3 ... +5 VDC** |
| Signal level at “1” | **15 ... 30 VDC** |
| Input delay | **0.6 ... 4 ms** |
| Status indicator | **LED** |
| **Environmental data** | |
| Airgap creepage | **DIN VDE 0110-1, 04/97** |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **EN 60068-2-78, 10/01** |
| EMC | **EN 60947-5-1, 11/97** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **130 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mi1p | Expansion module | 8 inputs | 773 400 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mi1p coated version

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mi1p coated version |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Unit features**

- 8 inputs for connecting:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Reset button
  - Light beam devices
  - Scanner
  - Enable switch
  - PSEN
  - Operating mode selector switch
- Can be configured in the PNOZmulti Configurator
- LED for:
  - Status of the PNOZmulti safety system
- Max. 8 PNOZ mi1p units can be connected to the base unit
- Test pulse outputs used to detect shorts across the inputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

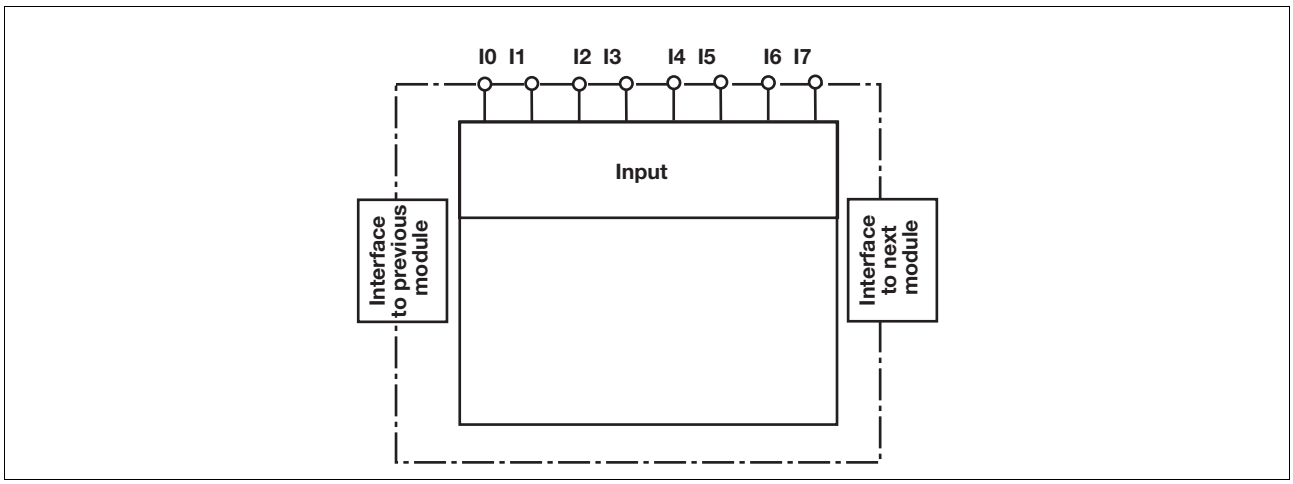
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

**Safety features**

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

**Block diagram**



# Expansion modules
## PNOZ mi1p coated version

**Function description**

The expansion module provides additional inputs.
The function of the inputs 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.



**Wiring**

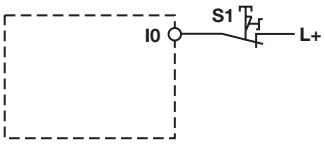
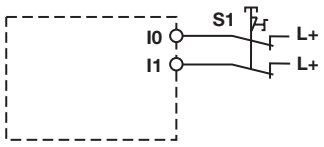
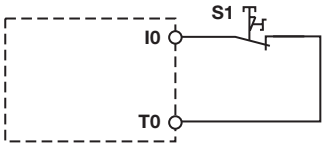
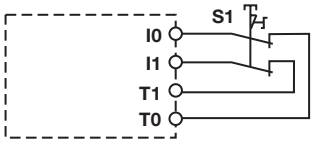
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Connection terminals I0 ... I7 are inputs
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- The test pulse outputs on the base unit must be used to detect shorts across contacts.
- Use copper wire that can withstand 75 °C.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mi1p coated version

### Preparing for operation

- Input circuit

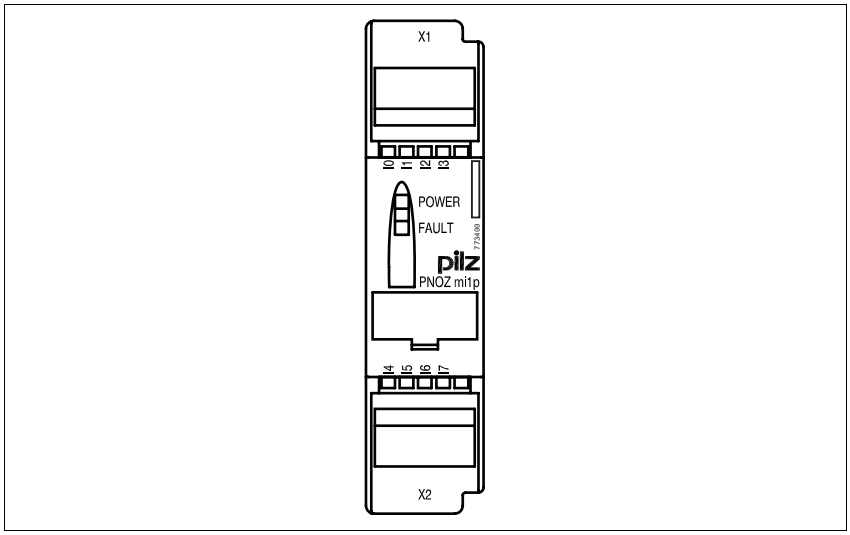
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| Example:<br>E-STOP<br>without detection of shorts across contacts |  |  |
| Example:<br>E-STOP<br>with detection of shorts across contacts |  |  |

- Key

| | |
|---|---|
| S1 | E-STOP pushbutton |

# Expansion modules
## PNOZ mi1p coated version

**Terminal configuration**

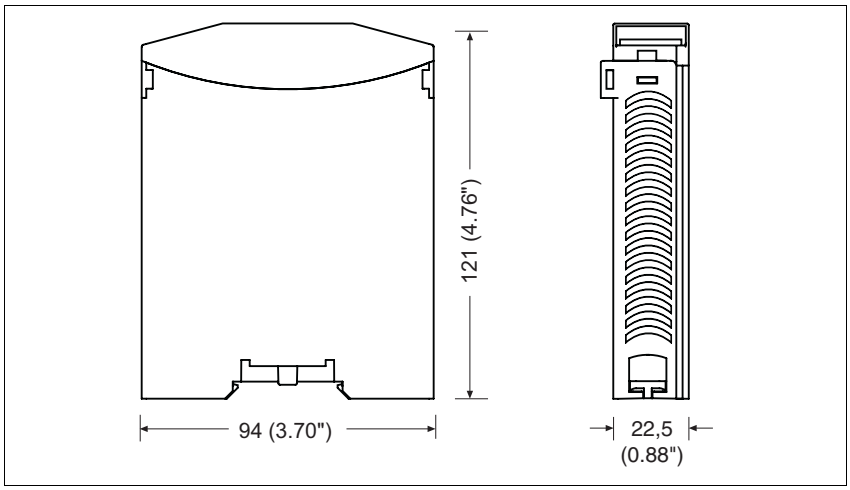





**Installation**

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

**Dimensions**






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mi1p coated version

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Power consumption at $U_B$ without load | **Max. 8.0 W + 2.5 W per expansion module** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Simultaneity channel 1/2/3 | **3 s, two-hand control relay: 0.5 s** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Inputs** | |
| Quantity | **8** |
| Voltage and current | **24 VDC/8 mA** |
| Galvanic isolation | **No** |
| Signal level at “0” | **-3 ... +5 VDC** |
| Signal level at “1” | **15 ... 30 VDC** |
| Input delay | **0.6 ... 4 ms** |
| Status indicator | **LED** |
| **Environmental data** | |
| Airgap creepage | **DIN VDE 0110-1, 04/97** |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **EN 60068-2-78, 10/01** |
| EMC | **EN 60947-5-1, 11/97** |
| Ambient temperature | **0 ... +50 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **130 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mi1p coated version | Expansion module | 8 inputs | 773 405 |

# Expansion modules
## PNOZ mi2p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Unit features**

- 8 inputs for standard functions
- Can be configured in the PNOZmulti Configurator
- LED indicator for:
  – Status of the PNOZmulti safety system
- Max. 8 PNOZ mi1p units can be connected to the base unit
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

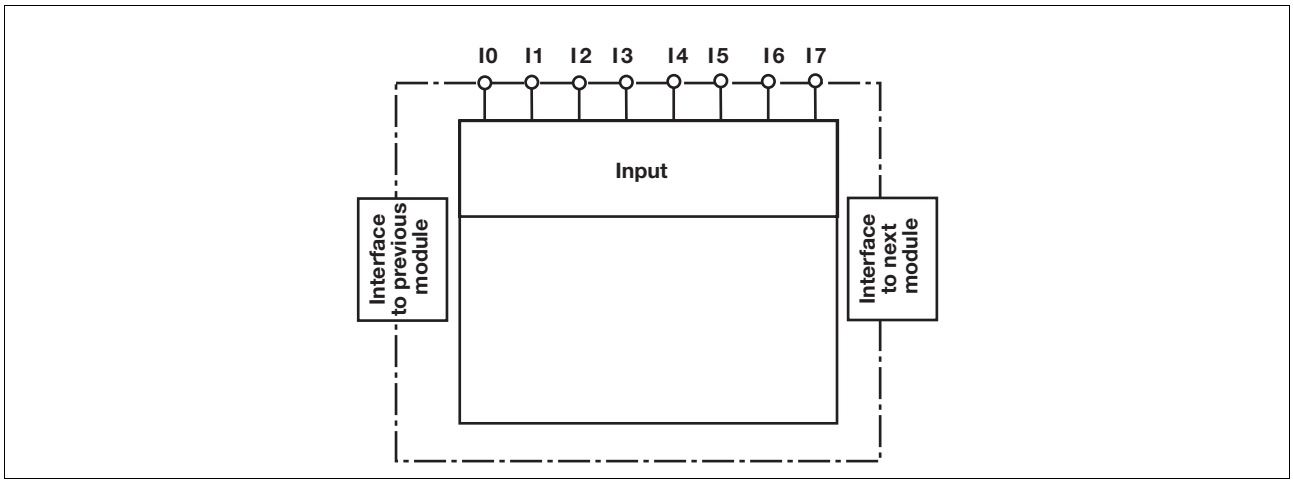
**Unit description**

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The expansion module may not be used for safety-related functions.

**Block diagram**








Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mi2p

**Function description**

The expansion module provides additional inputs for standard functions. The function of the inputs 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.

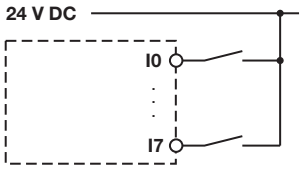
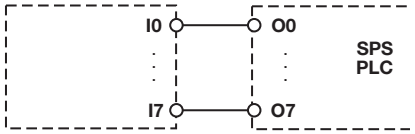
**Wiring**

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

Please note:
- Information given in the “Technical details” must be followed.
- Connection terminals I0 ... I7 are inputs
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- Use copper wire that can withstand 75 °C.

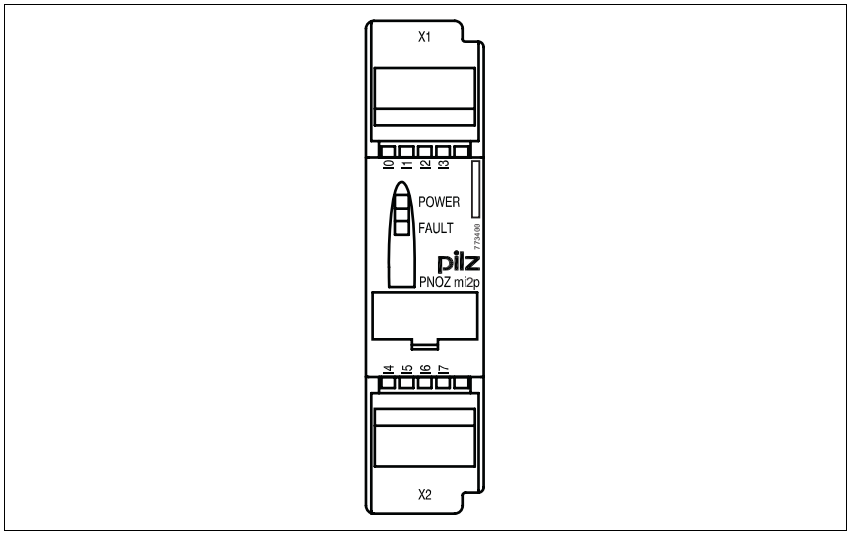
**Preparing for operation**

- Input circuit

| Input circuit | Contact | Semiconductor |
|---|---|---|
| **Non**-safety-related |  |  |

# Expansion modules
## PNOZ mi2p

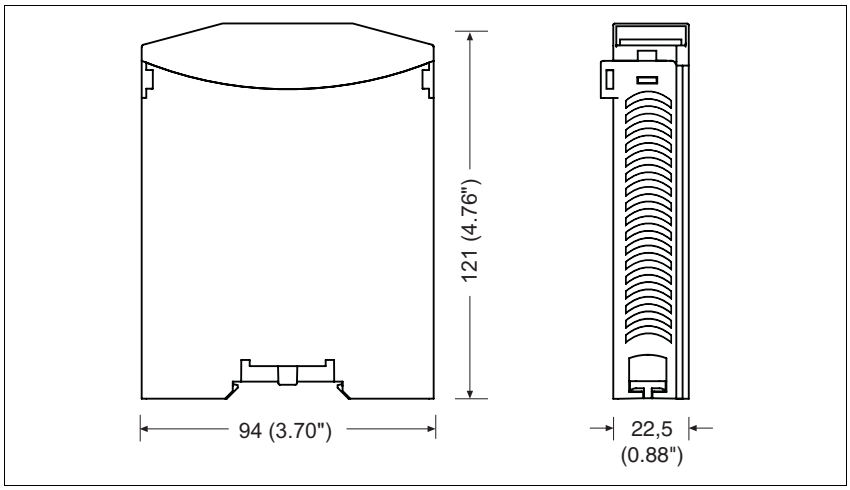
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mi2p

**NOTICE** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Power consumption at $U_B$ without load | **Max. 8.0 W + 2.5 W per expansion module** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Inputs** | |
| Quantity | **8** |
| Voltage and current | **24 VDC/8 mA** |
| Galvanic isolation | **No** |
| Signal level at “0” | **-3 ... +5 VDC** |
| Signal level at “1” | **15 ... 30 VDC** |
| Input delay | **0.6 ... 4 ms** |
| Status indicator | **LED** |
| **Environmental data** | |
| Airgap creepage | **DIN VDE 0110-1, 04/97** |
| Vibration in accordance with **EN 60068-2-6, 01/00** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **EN 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 11/97** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **130 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mi2p | Expansion module | 8 standard inputs | 773 410 |

# Expansion modules
## PNOZ mo1p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

### Approvals

| | PNOZ mo1p |
|---|---|
| c UL us LISTED | ◆ |
| TÜV | ◆ |
| CCC | ◆ |

### Unit features

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  - 2 safety outputs in accordance with EN 954-1, Cat. 4 or 4 safety outputs in accordance with EN 954-1, Cat. 3
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mo1p units can be connected to the base unit

### Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

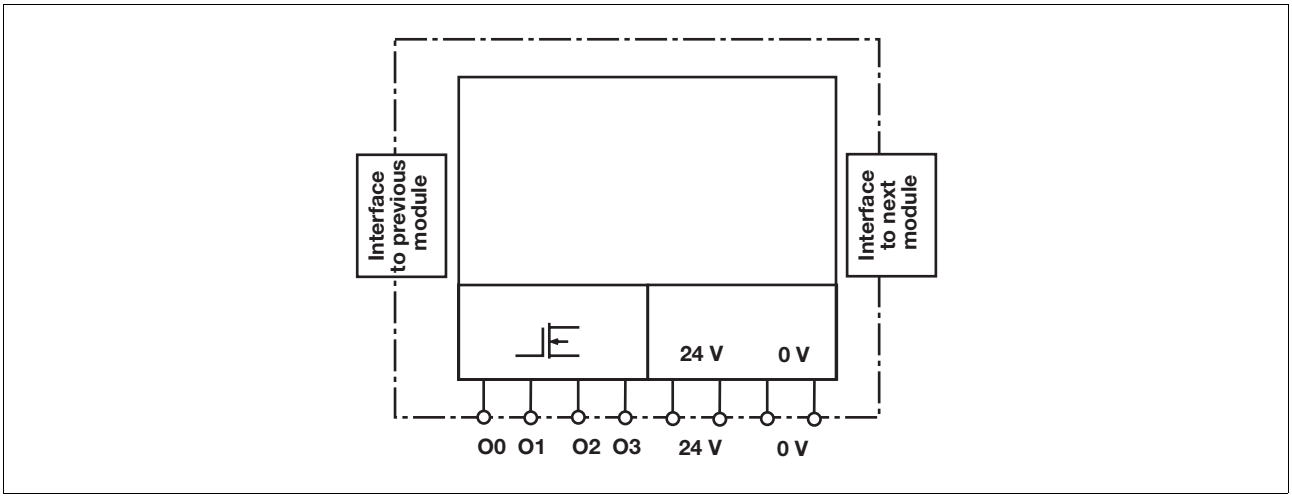
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

### Safety features

The relay conforms to the following safety criteria:

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

### Block diagram





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de
NSG-D-2-362-2006-02

# Expansion modules
## PNOZ mo1p

**Function description**

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.

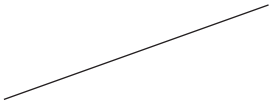
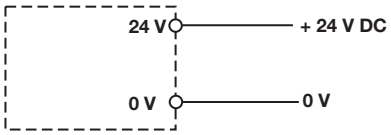
**Wiring**

The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs O0 to O3 are semiconductor outputs.
- Use copper wire that can withstand 75 °C.

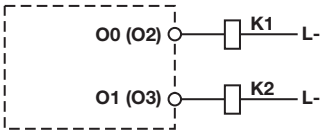
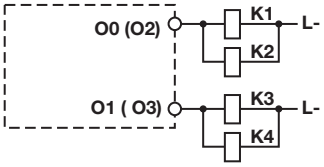
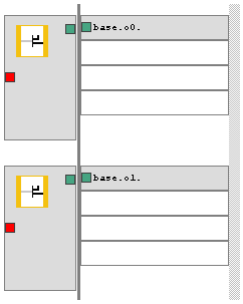
# Expansion modules
## PNOZ mo1p

### Preparing for operation

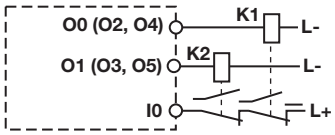
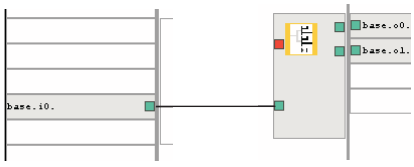
▸ Supply voltage

| Supply voltage | AC | DC |
|---|---|---|
| |  |  |

▸ Semiconductor outputs

| | | |
|---|---|---|
| Redundant output |  | |
| Single output |  |  |

▸ Feedback loop

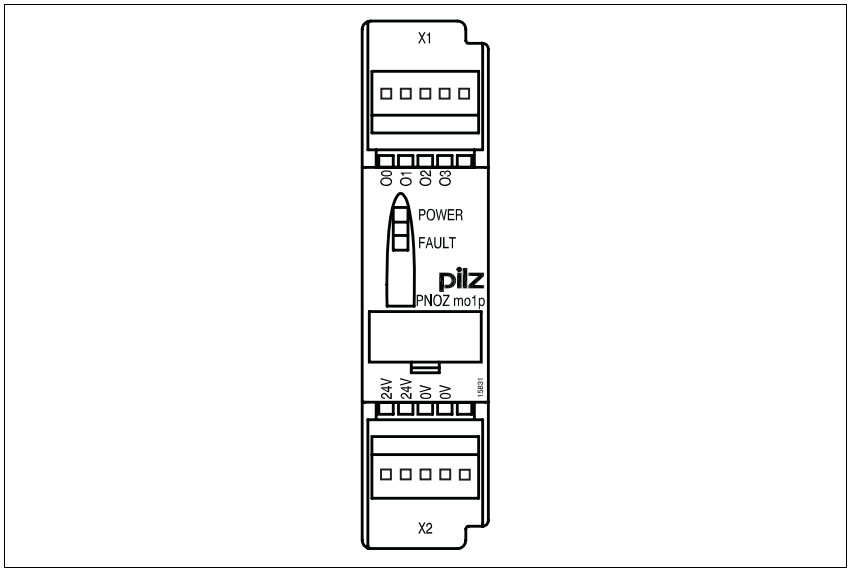
| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo1p

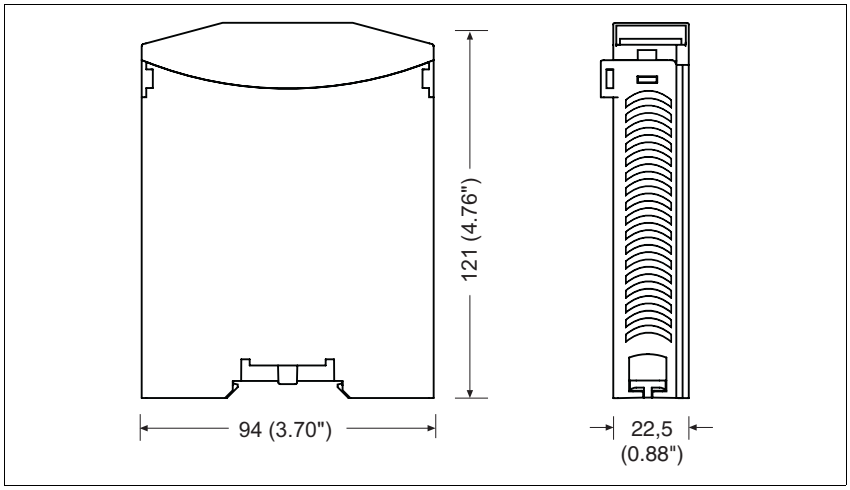
### Terminal configuration




### Installation

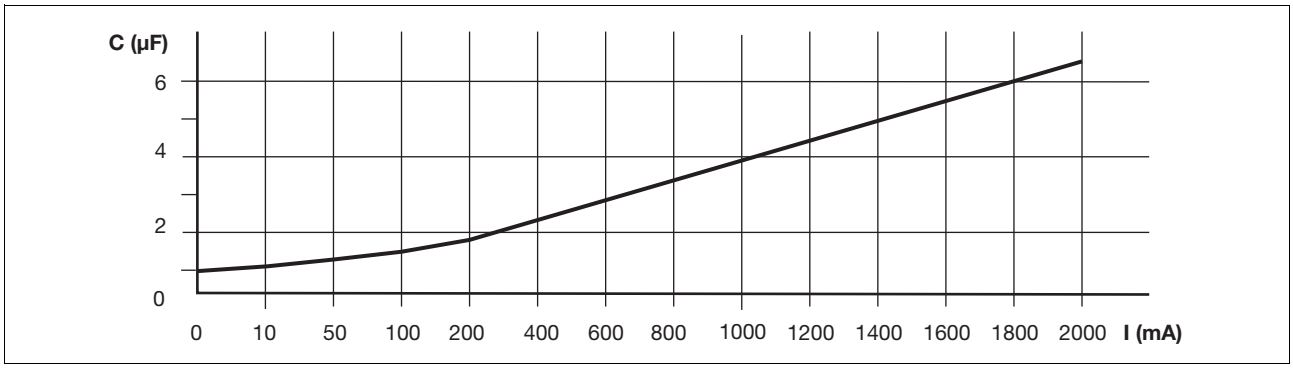
- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mo1p

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




**Notice**

This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

2.3

| **Technical details** | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **< 2.5 W** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Semiconductor outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 3 | <br>**2**<br>**4** |
| Switching capability | **24 VDC / max. 2 A / max. 48 W** |
| Max. capacitive load | **See diagram** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% - 10%** |
| Off time during self test | **< 300 µs** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Switch-off delay | **< 30 ms** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 2 A** |
| Status indicator | **LED** |
| **Environmental data** | |
| Airgap creepage | **DIN VDE 0110-1, 04/97** |
| Vibration in accordance with **EN 60068-2-6, 01/00**<br>Frequency:<br>Amplitude: | <br>**10 ... 55 Hz**<br>**0.35 mm** |


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo1p

| Environmental data | |
|---|---|
| Climatic suitability | **EN 60068-2-78, 10/01** |
| EMC | **EN 60947-5-1, 11/97** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **150 g** |



**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mo1p | Expansion module | 2 or 4 semiconductor outputs, safe | 773 500 |

# Expansion modules
## PNOZ mo1p coated version

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mo1p coated version |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  – 2 safety outputs in accordance with EN 954-1, Cat. 4 or 4 safety outputs in accordance with EN 954-1, Cat. 3
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mo1p units can be connected to the base unit

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

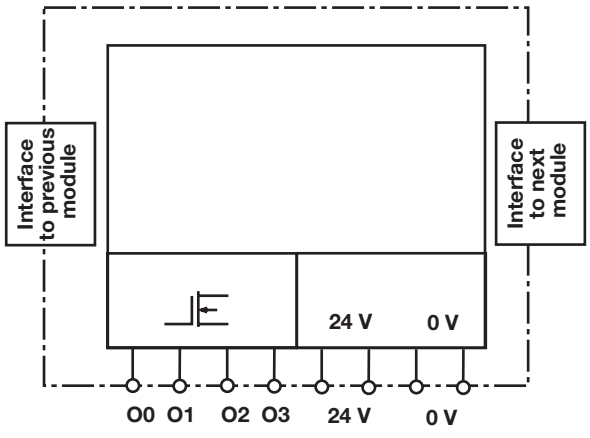
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

**Safety features**

The relay conforms to the following safety criteria:

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

**Block diagram**





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo1p coated version

**Function description**

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.

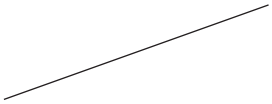
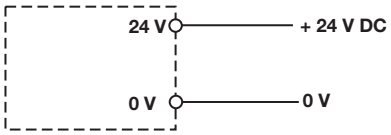
**Wiring**

The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs O0 to O3 are semiconductor outputs.
- Use copper wire that can withstand 75 °C.

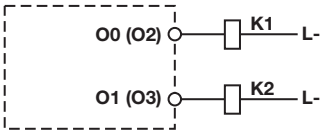
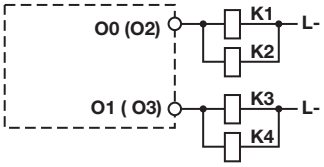
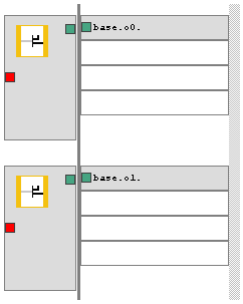
# Expansion modules
## PNOZ mo1p coated version

### Preparing for operation

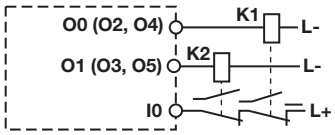
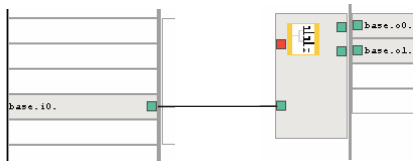
▸ Supply voltage

| Supply voltage | AC | DC |
|---|---|---|
| |  |  |

▸ Semiconductor outputs

| | | |
|---|---|---|
| Redundant output |  | |
| Single output |  |  |

▸ Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

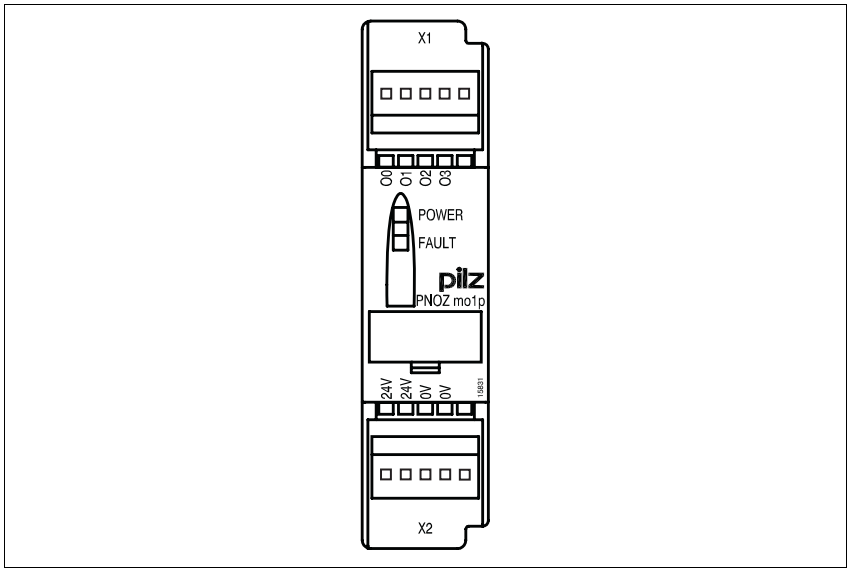
2.3



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo1p coated version

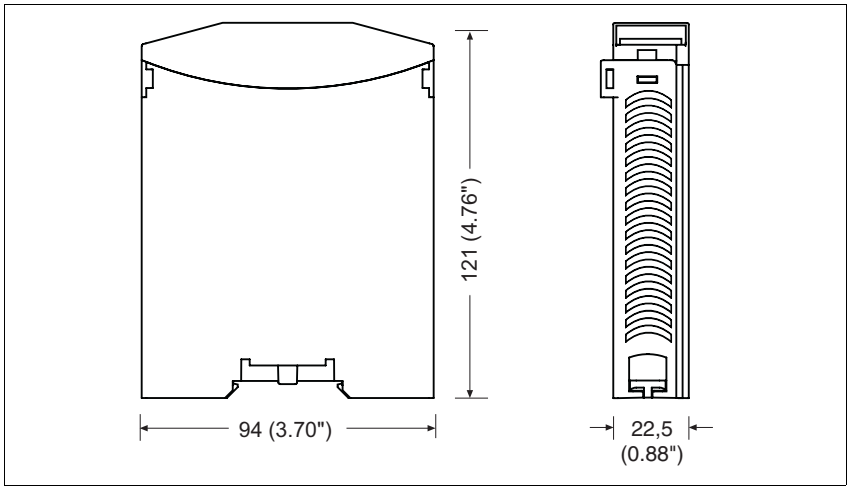
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

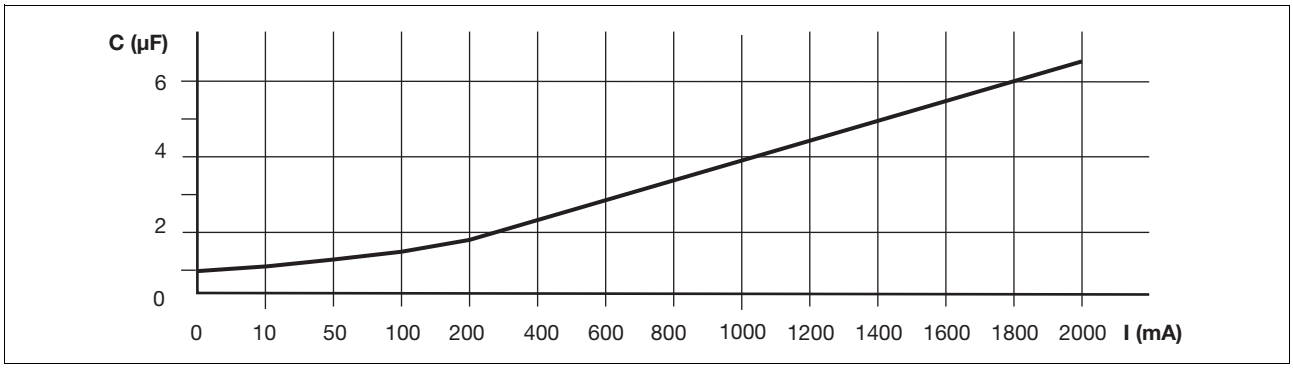
### Dimensions




2.3

# Expansion modules
## PNOZ mo1p coated version

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




**Notice**

This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

2.3

| **Technical details** | |
|---|---|
| | |
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **< 2.5 W** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Semiconductor outputs** | |
| Quantity<br>For EN 954-1, 12/96, Cat. 4<br>For EN 954-1, 12/96, Cat. 3 | <br>**2**<br>**4** |
| Switching capability | **24 VDC / max. 2 A / max. 48 W** |
| Max. capacitive load | **See diagram** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% - 10%** |
| Off time during self test | **< 300 µs** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Switch-off delay | **< 30 ms** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 2 A** |
| Status indicator | **LED** |
| **Environmental data** | |
| Airgap creepage | **DIN VDE 0110-1, 04/97** |
| Vibration in accordance with **EN 60068-2-6, 01/00**<br>Frequency:<br>Amplitude: | <br>**10 ... 55 Hz**<br>**0.35 mm** |


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo1p coated version

| Environmental data | |
|---|---|
| Climatic suitability | **EN 60068-2-78, 10/01** |
| EMC | **EN 60947-5-1, 11/97** |
| Ambient temperature | **0 ... +50 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **150 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mo1p coated version | Expansion module | 2 semiconductor outputs, safe | 773 505 |

# Expansion modules
## PNOZ mo2p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

### Approvals

| | PNOZ mo2p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

### Unit features

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  – 1 safety output in accordance with EN 954-1, Cat. 4 or 2 safety outputs in accordance with EN 954-1, Cat. 2
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mo2p units can be connected to the base unit

### Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

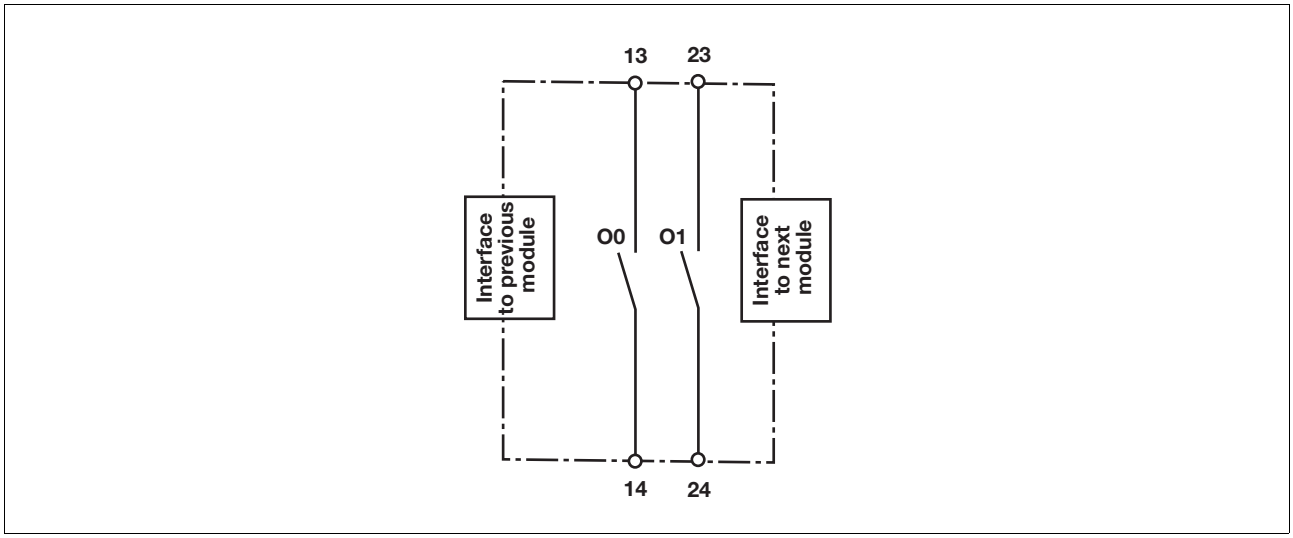
### Safety features

- A defective relay contact will be detected during switching.

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.

### Block diagram





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo2p

**Function description**

The expansion module provides additional relay 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.

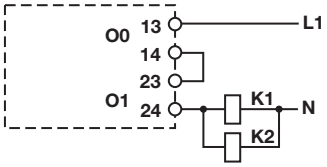
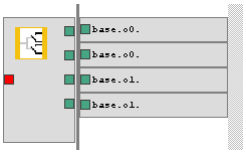
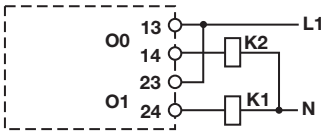
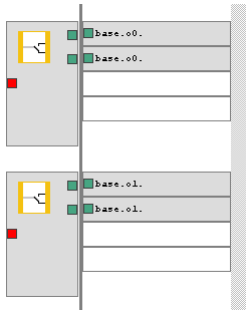
**Wiring**

The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs O0 and O1 are relay outputs.
- Use copper wire that can withstand 75 °C.

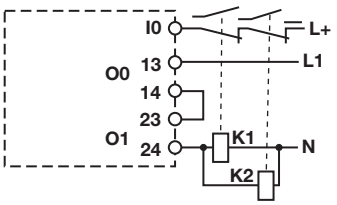
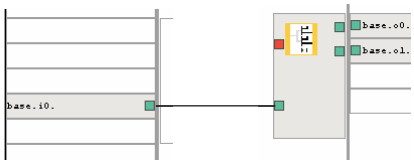
# Expansion modules
## PNOZ mo2p

### Preparing for operation

▸ Relay outputs

| | | |
|---|---|---|
| Redundant |  |  |
| Single |  |  |

▸ Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

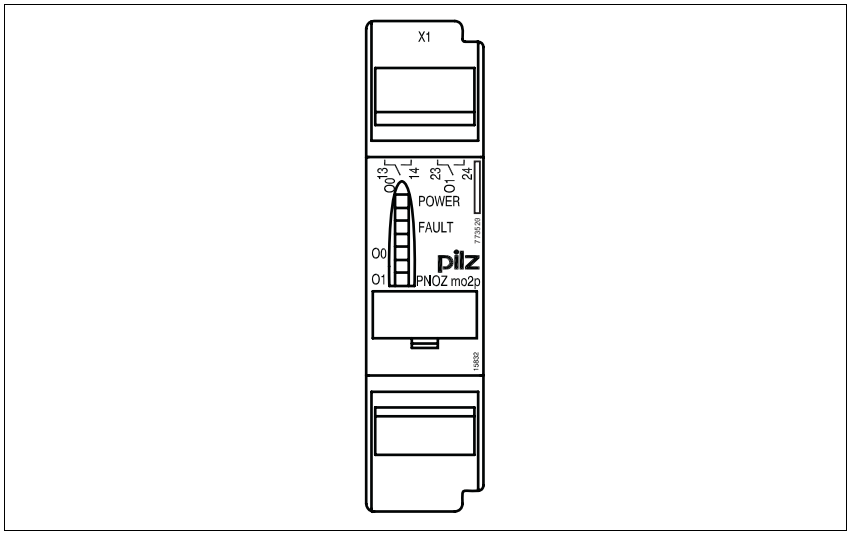
2.3



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo2p

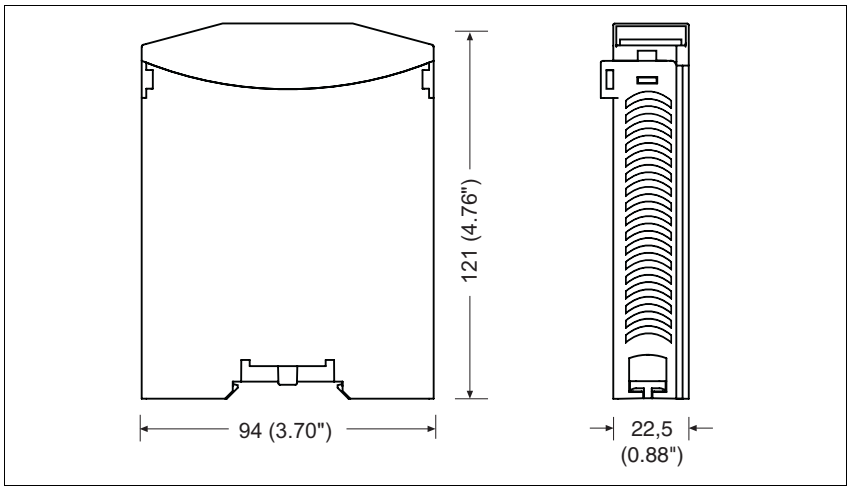
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mo2p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **< 2.5 W** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Relay outputs** | |
| Quantity | |
| For EN 954-1, 12/96, Cat. 4 | **1** |
| For EN 954-1, 12/96, Cat. 2 | **2** |
| Utilisation category in accordance with | |
| EN 60947-4-1, 02/01 | **AC1: 240 V / 6 A / 1440 VA**<br>**DC1: 24 V / 6 A / 144 W** |
| EN 60947-5-1, 11/97 | **AC15: 230 V / 3 A / 690 VA**<br>**DC13: 24 V / 3 A / 72 W** |
| Airgap creepage between | **DIN VDE 0110-1, 04/97** |
| relay contacts | **3 mm** |
| Relay contacts and other safe circuits | **5.5 mm** |
| Contact fuse protection in accordance with EN 60947-5-1, 08/00 | |
| Blow-out fuse | **6 A quick or slow** |
| Circuit breaker 24 VDC | **6 A (characteristic B + C)** |
| Switch-off delay | **50 ms** |
| Status indicator | **LED** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 2.5 mm$^2$** |
| Flexible multi-core with plastic sleeve | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | **0.4 ... 0.5 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **170 g** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo2p

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mo2p | Expansion module | 1 or 2 relay outputs, positive-guided | 773 520 |

# Expansion modules
## PNOZ mo2p coated version

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mo2p coated version |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  – 1 safety output in accordance with EN 954-1, Cat. 4 or 2 safety outputs in accordance with EN 954-1, Cat. 2
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mo2p units can be connected to the base unit

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

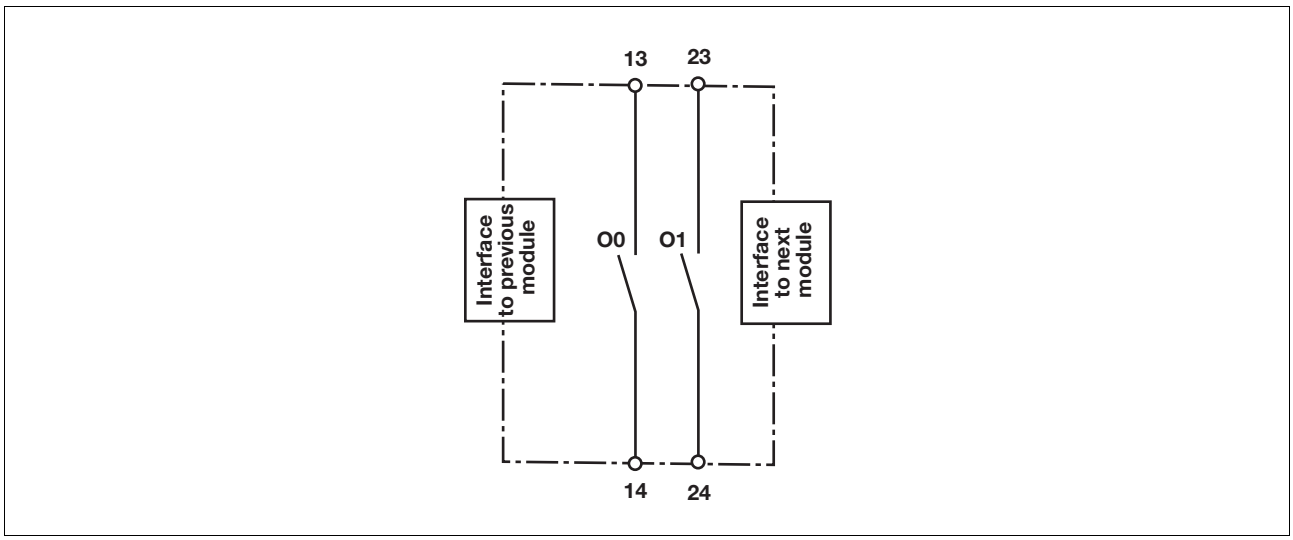
**Safety features**

- A defective relay contact will be detected during switching.

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.

**Block diagram**





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo2p coated version

**Function description**

The expansion module provides additional relay 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.

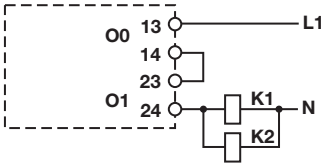
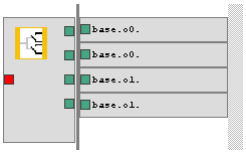
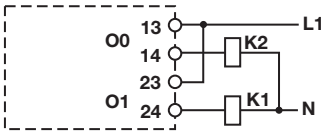
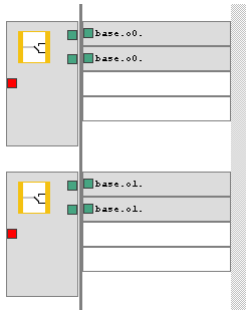
**Wiring**

The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs O0 and O1 are relay outputs.
- Use copper wire that can withstand 75 °C.

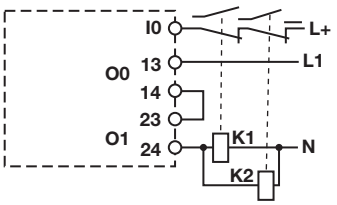
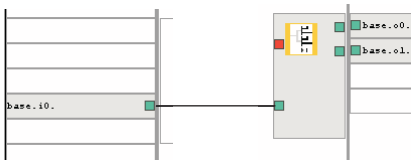
# Expansion modules
## PNOZ mo2p coated version

### Preparing for operation

▸ Relay outputs

| | | |
|---|---|---|
| Redundant |  |  |
| Single |  |  |

▸ Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

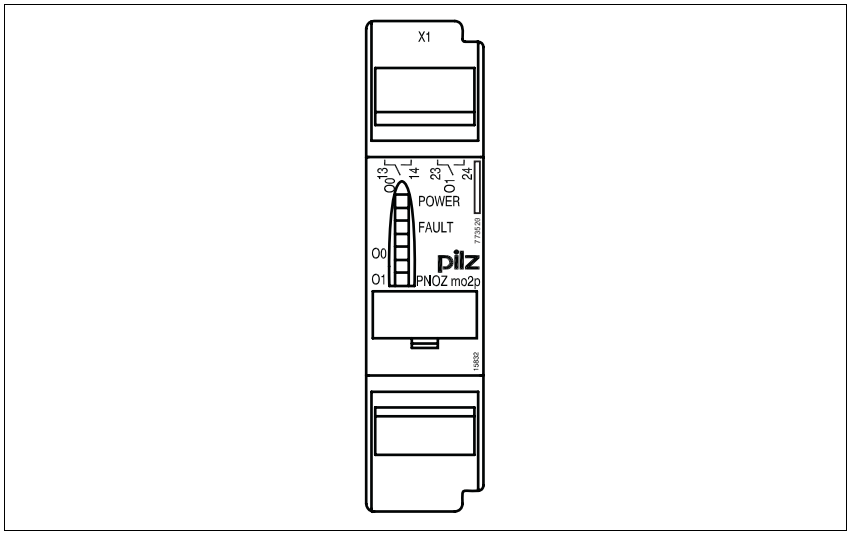




Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo2p coated version

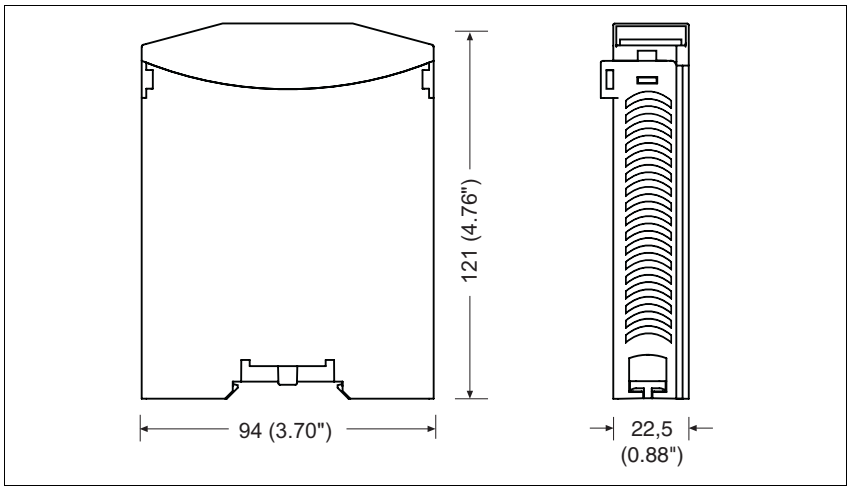
**Terminal configuration**




**Installation**

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

**Dimensions**



# Expansion modules
## PNOZ mo2p coated version

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| **Technical details** | |
|---|---|
| | |
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **< 2.5 W** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Relay outputs** | |
| Quantity | |
| For EN 954-1, 12/96, Cat. 4 | **1** |
| For EN 954-1, 12/96, Cat. 2 | **2** |
| Utilisation category in accordance with | |
| EN 60947-4-1, 02/01 | **AC1: 240 V / 6 A / 1440 VA**<br>**DC1: 24 V / 6 A / 144 W** |
| EN 60947-5-1, 11/97 | **AC15: 230 V / 3 A / 690 VA**<br>**DC13: 24 V / 3 A / 72 W** |
| Airgap creepage between | **DIN VDE 0110-1, 04/97** |
| relay contacts | **3 mm** |
| Relay contacts and other safe circuits | **5.5 mm** |
| Contact fuse protection in accordance with EN 60947-5-1, 08/00 | |
| Blow-out fuse | **6 A quick or slow** |
| Circuit breaker 24 VDC | **6 A (characteristic B + C)** |
| Switch-off delay | **50 ms** |
| Status indicator | **LED** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | **0 ... +50 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 2.5 mm$^2$** |
| Flexible multi-core with plastic sleeve | **0.5 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | **0.4 ... 0.5 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **170 g** |





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo2p coated version

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mo2p coated version | Expansion module | 1 or 2 relay outputs, positive-guided | 773 525 |

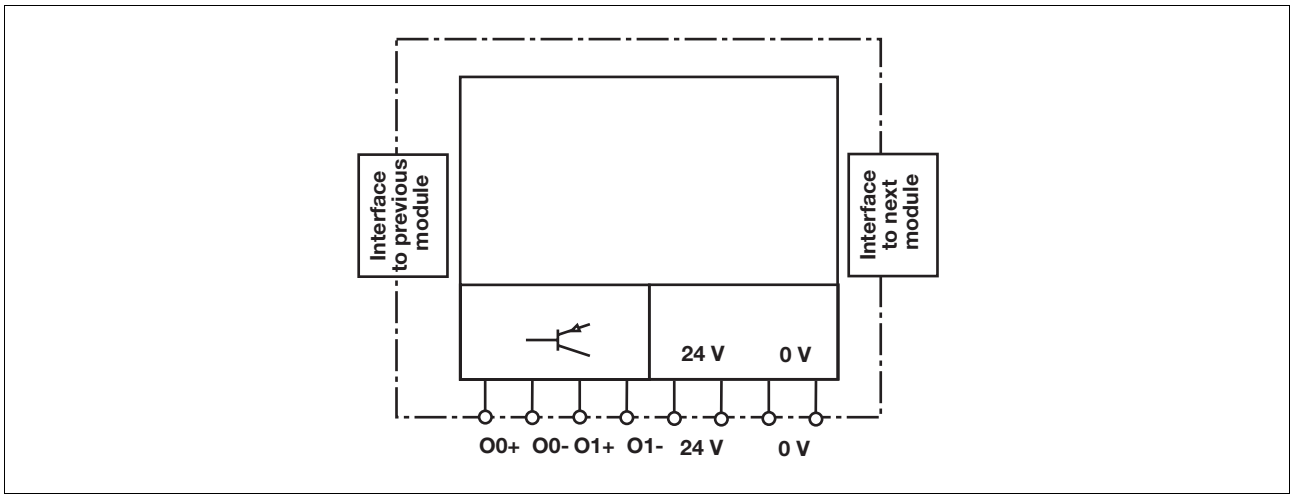
# Expansion modules
## PNOZ mo3p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mo3p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Block diagram**




**Unit features**

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  – 2 dual-pole safety outputs in accordancewith EN 954-1, Cat. 4
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mo3p units can be connected to the base unit

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

**System requirements**

- Base unit PNOZ m1p/PNOZmulti Configurator: From Version 4.0
- PNOZ m2p: From Version 1.0

Please contact Pilz if you have an older version.

**Safety features**

- The safety outputs are checked periodically via tests.

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo3p

**Function description**

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.

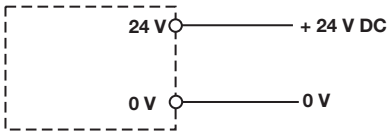
**Wiring**

The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs O0+, O0- and O1+, O1- are dual-pole semiconductor outputs.
- Use copper wire that can withstand 75 °C.

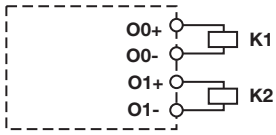
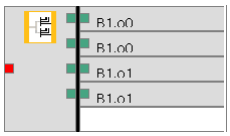
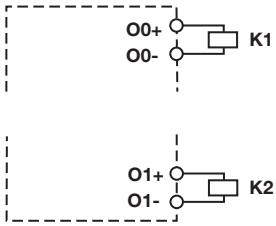
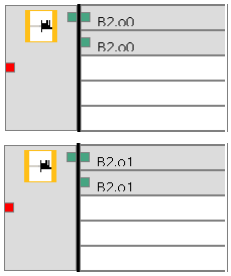
# Expansion modules
## PNOZ mo3p

### Preparing for operation

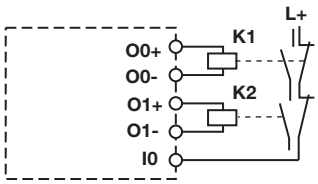
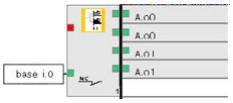
▸ Supply voltage

| Supply voltage | AC | DC |
|---|---|---|
| | |  |

▸ Semiconductor outputs

| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |

▸ Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

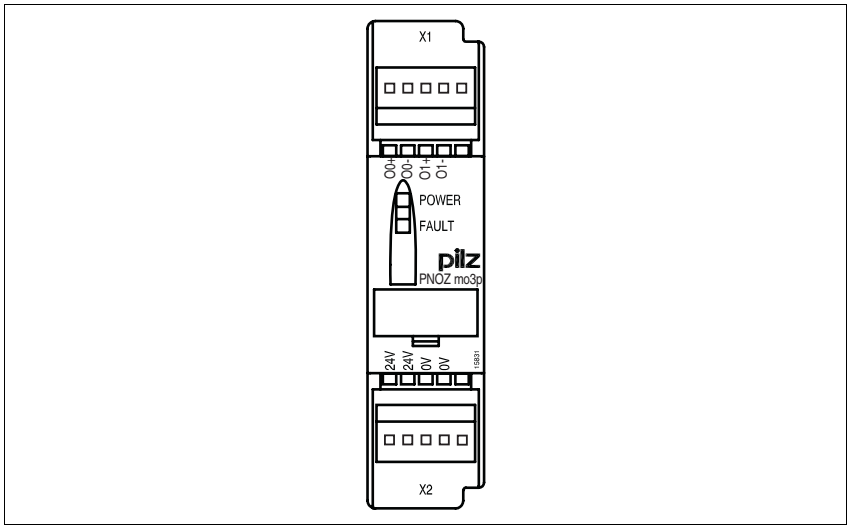
2.3



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo3p

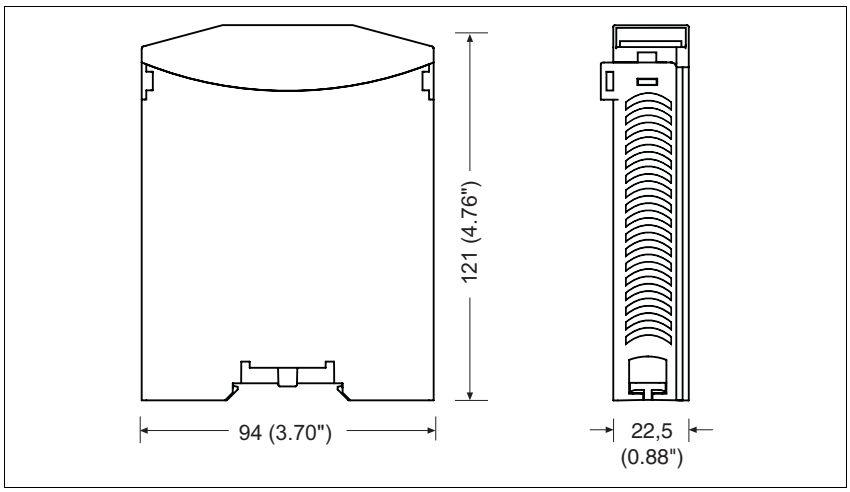
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mo3p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Power consumption at $U_B$ without load | **< 0.35 W** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Semiconductor outputs - dual-pole** | |
| Quantity For EN 954-1, 12/96, Cat. 4 | **2** |
| Switching capability | **24 VDC / max. 2 A / max. 48 W** |
| Max. capacitive load | **1 µF** |
| External supply voltage ($U_A$) | **24 VDC** |
| Voltage tolerance ($U_A$) | **-15% - 10%** |
| Off time during self test | **< 300 µs** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Switch-off delay | **< 30 ms** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 2 A** |
| Open circuit detection | **> 3 kOhm** |
| Status indicator | **LED** |
| **Environmental data** | |
| Airgap creepage between relay contacts<br>Relay contacts and other safe circuits | **DIN VDE 0110-1, 04/97**<br>**3 mm**<br>**5.5 mm** |
| Vibration in accordance with **EN 60068-2-6, 04/95**<br>Frequency:<br>Amplitude: | <br>**10 ... 55 Hz**<br>**0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature<br>With UL approval<br>Without UL approval (with forced convection) | <br>**0 ... +55 °C**<br>**0 ... +60 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type<br>Mounting (e.g. cabinet)<br>Housing<br>Terminals | <br>**IP54**<br>**IP20**<br>**IP20** |
| DIN rail<br>Top hat rail<br>Recess width | <br>**35 x 7.5 EN 50022**<br>**27 mm** |
| Cross section of external conductors<br>Rigid single-core, flexible multi-core or multi-core<br>With crimp connector | <br><br>**0.5 ... 1.5 mm²** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material<br>Housing<br>Front | <br>**PPO UL 94 V0**<br>**PC/ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **125 g** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

NSG-D-2-366-2008-08

# Expansion modules
## PNOZ mo3p

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mo3p | Expansion module | 2 dual-pole semiconductor outputs, safe | 773 510 |

# Expansion modules
## PNOZ mo4p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

### Approvals

| | PNOZ mo4p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

### Unit features

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  – 2 safety output in accordance with EN 954-1, Cat. 4 or 4 safety outputs in accordance with EN 954-1, Cat. 2
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mo4p units can be connected to the base unit

### Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

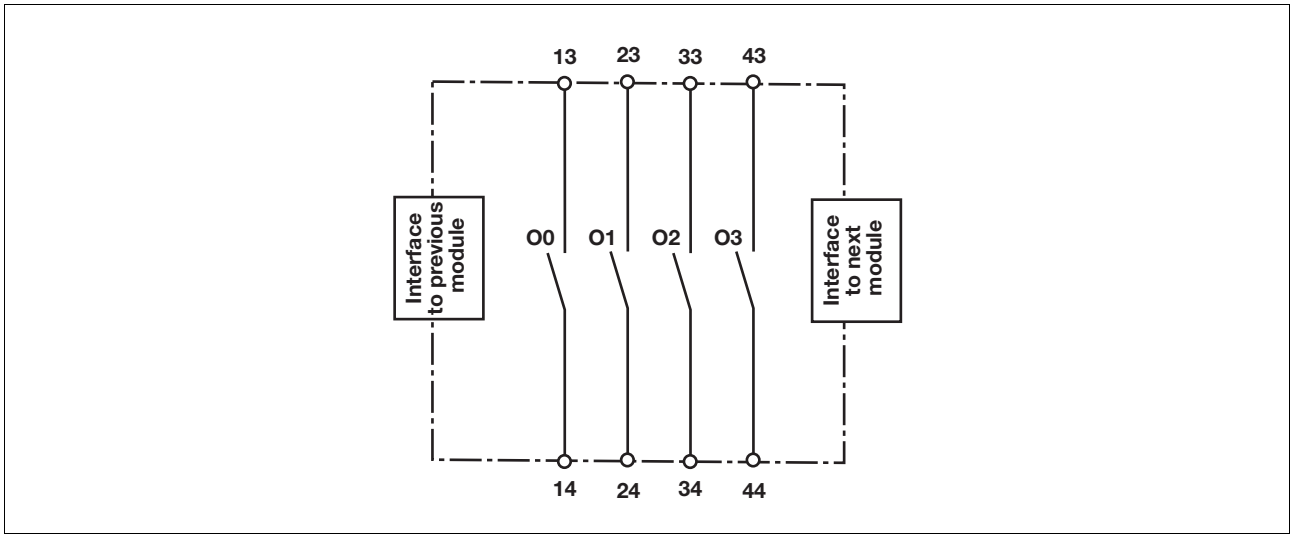
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

### Safety features

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.
- A defective relay contact will be detected during switching.

### Block diagram





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo4p

**Function description**

The expansion module provides additional relay 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.

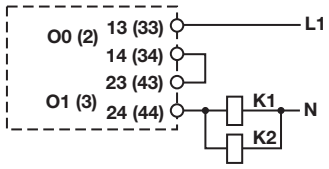
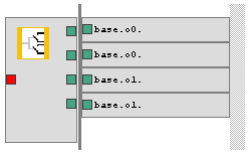
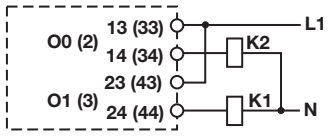
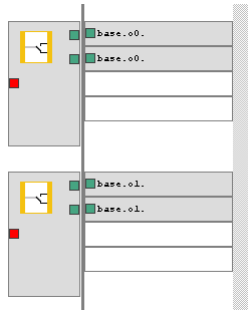
**Wiring**

The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs O0 to O3 are relay outputs.
- Use copper wire that can withstand 75 °C.

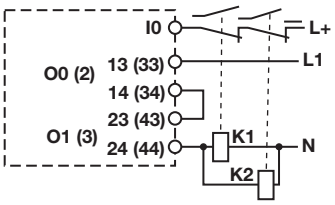
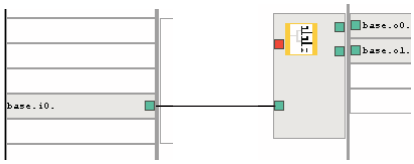
# Expansion modules
## PNOZ mo4p

### Preparing for operation

▸ Relay outputs

| | | |
|---|---|---|
| Redundant |  |  |
| Single |  |  |

▸ Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

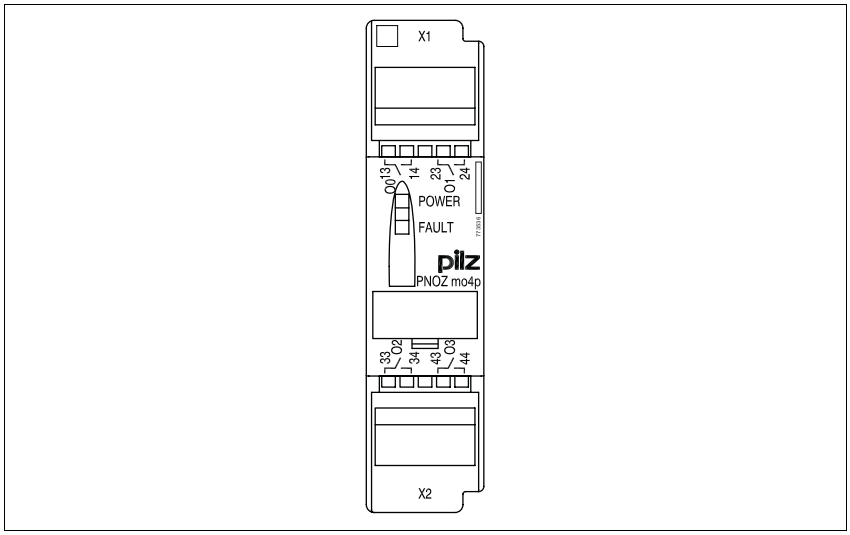
2.3



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo4p

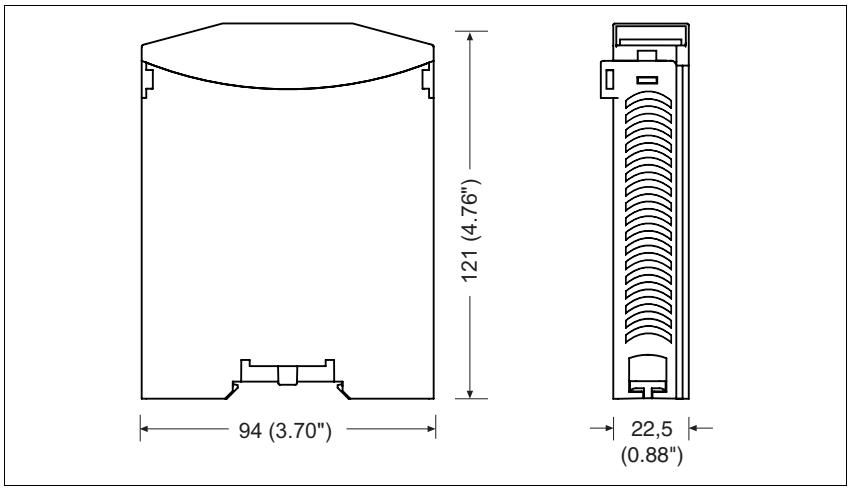
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mo4p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **< 3.5 W per expansion module** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Relay outputs** | |
| Quantity | |
| For EN 954-1, 12/96, Cat. 4 | **2** |
| For EN 954-1, 12/96, Cat. 2 | **4** |
| Utilisation category in accordance with | |
| EN 60947-4-1, 02/01 | **AC1: 240 V / 6 A / 1440 VA**<br>**DC1: 24 V / 6 A / 144 W** |
| EN 60947-5-1, 11/97 | **AC15: 230 V / 3 A / 690 VA**<br>**DC13: 24 V / 3 A / 72 W** |
| Max. total current | **12 A** |
| Airgap creepage between | **DIN VDE 0110-1, 04/97** |
| relay contacts | **3 mm** |
| Relay contacts and other safe circuits | **5.5 mm** |
| Contact fuse protection in accordance with EN 60947-5-1, 08/00 | |
| Blow-out fuse | **6 A quick or slow** |
| Circuit breaker 24 VDC | **6 A (characteristic B + C)** |
| Switch-off delay | **50 ms** |
| Status indicator | **LED** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 01/00** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Maximum cable runs | |
| Per input | **1 km** |
| Sum of individual cable runs at the test pulse output | **40 km** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 2.5 mm$^2$** |
| Flexible multi-core with plastic sleeve | **0.5 ... 1.5 mm$^2$** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo4p

| Mechanical data | |
|---|---|
| Torque setting for connection terminals (screws) | **0.4 ... 0.5 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **205 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mo4p | Expansion module | 2 or 4 relay outputs, positive-guided | 773 536 |

# Expansion modules
## PNOZ mo4p coated version

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mo4p coated version |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  – 2 safety output in accordance with EN 954-1, Cat. 4 or 4 safety outputs in accordance with EN 954-1, Cat. 2
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mo2p units can be connected to the base unit

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

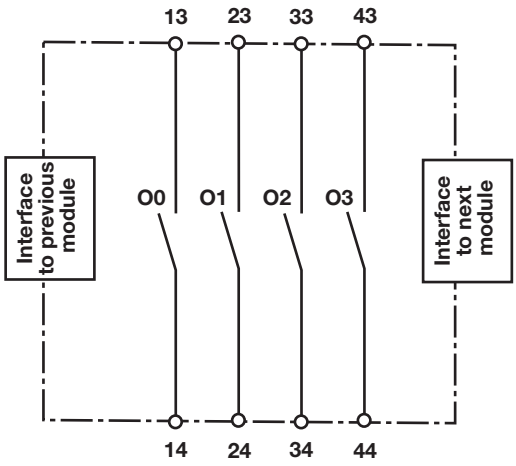
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

**Safety features**

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.
- A defective relay contact will be detected during switching.

**Block diagram**





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo4p coated version

**Function description**

The expansion module provides additional relay 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.

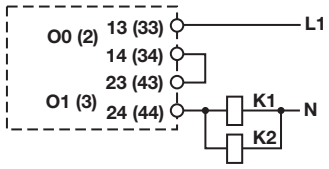
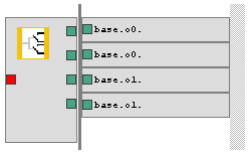
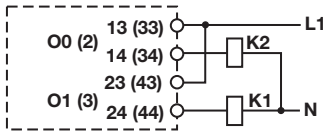
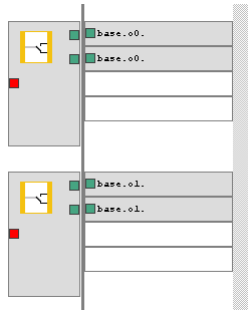
**Wiring**

The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs O0 to O3 are relay outputs.
- Use copper wire that can withstand 75 °C.

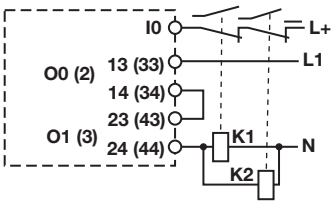
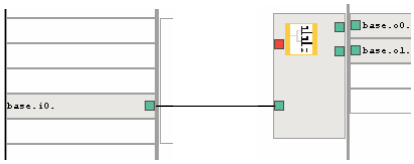
# Expansion modules
## PNOZ mo4p coated version

### Preparing for operation

▸ Relay outputs

| | | |
|---|---|---|
| Redundant |  |  |
| Single-pole |  |  |

▸ Feedback loop

| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

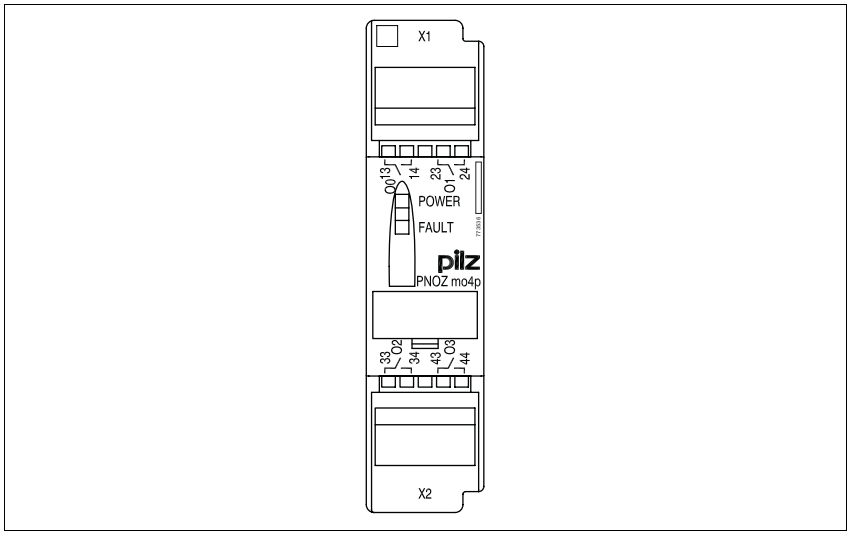
2.3



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo4p coated version

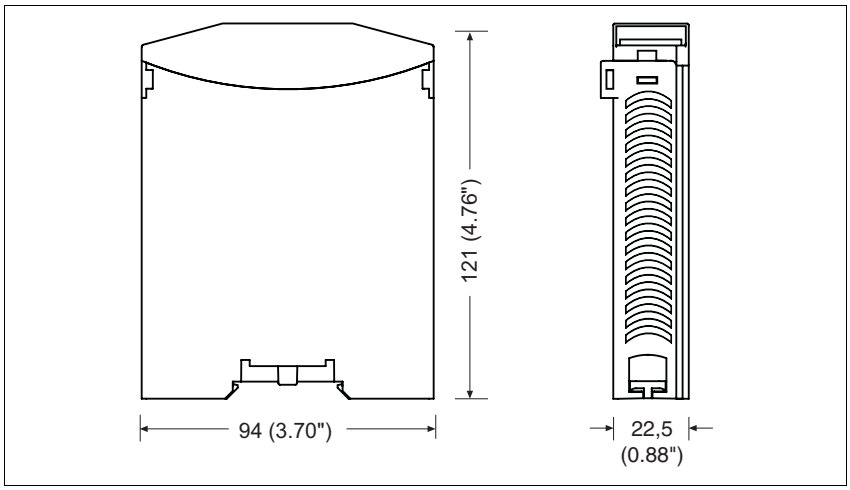
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mo4p coated version

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ without load | **< 3.5 W per expansion module** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Relay outputs** | |
| Quantity | |
| For EN 954-1, 12/96, Cat. 4 | **2** |
| For EN 954-1, 12/96, Cat. 2 | **4** |
| Utilisation category in accordance with | |
| EN 60947-4-1, 02/01 | **AC1: 240 V / 6 A / 1440 VA**<br>**DC1: 24 V / 6 A / 144 W** |
| EN 60947-5-1, 11/97 | **AC15: 230 V / 3 A / 690 VA**<br>**DC13: 24 V / 3 A / 72 W** |
| Max. total current | **12 A** |
| Airgap creepage between | **DIN VDE 0110-1, 04/97** |
| relay contacts | **3 mm** |
| Relay contacts and other safe circuits | **5.5 mm** |
| Contact fuse protection in accordance with EN 60947-5-1, 08/00 | |
| Blow-out fuse | **6 A quick or slow** |
| Circuit breaker 24 VDC | **6 A (characteristic B + C)** |
| Switch-off delay | **50 ms** |
| Status indicator | **LED** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 01/00** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | **0 ... +50 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Maximum cable runs | |
| Per input | **1 km** |
| Sum of individual cable runs at the test pulse output | **40 km** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 2.5 mm$^2$** |
| Flexible multi-core with plastic sleeve | **0.5 ... 1.5 mm$^2$** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mo4p coated version

| Mechanical data | |
|---|---|
| Torque setting for connection terminals (screws) | **0.4 ... 0.5 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **205 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mo4p coated version | Expansion module | 2 or 4 relay outputs, positive-guided | 773 537 |

# Expansion modules
## PNOZ mc0p

Unit not shown

Power supply to supply voltage to fieldbus modules

**Unit features**

- Interface to connect the base unit and a fieldbus module
- Galvanic isolation
- Max. 1 fieldbus module (PNOZ mc5p or PNOZ mc5.1p LWL) can be connected
- Supply voltage 24 VDC
- Status indicators
- Plug-in terminals, either with cage clamp connection or screw connection

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

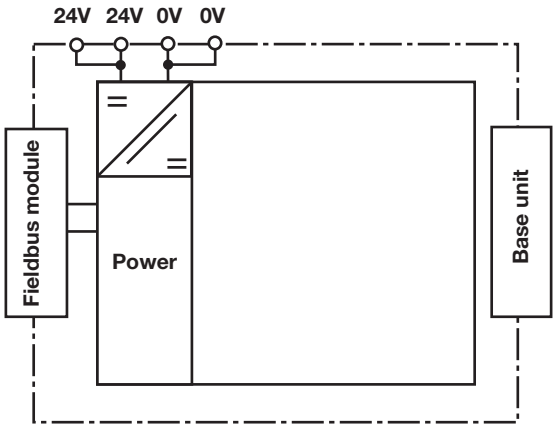
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The expansion module may not be used for safety-related functions.
It may only be used to supply voltage to the following fieldbus modules:

- PNOZ mc5p INTERBUS
- PNOZ mc5.1p INTERBUS LWL

2.3

**Block diagram**





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc0p

### Function description

The PNOZ mc0p power supply provides the fieldbus module with the necessary internal supply voltage. This way the fieldbus module remains available even when the base unit is switched off. The power supply is connected to the base unit and fieldbus module via jumpers. When the 24 VDC supply voltage is applied, the “POWER” LED is lit. The “BASE” LED is lit when supply voltage is applied to the base unit.

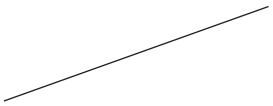
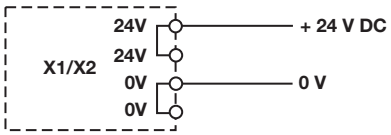
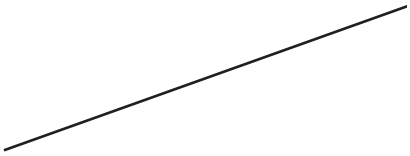
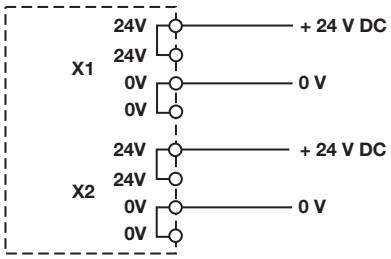
### Wiring

The wiring is defined in the circuit diagram in the Configurator.
Please note:

- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.

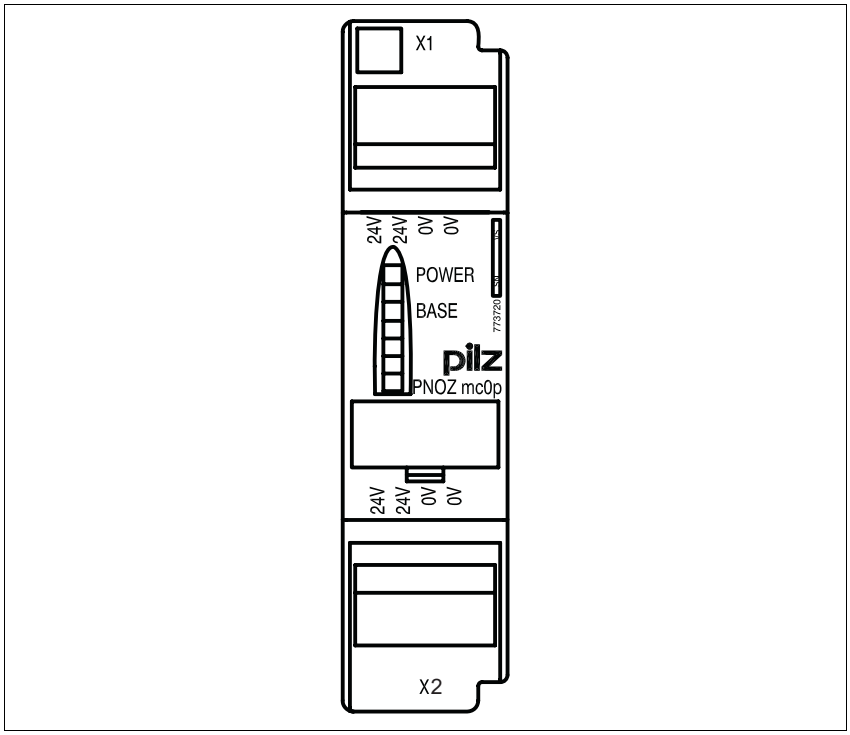
### Preparing for operation

- Supply voltage

| Supply voltage | AC | DC |
|---|---|---|
| **Supply voltage to Interbus master only**:<br>Connect the supply voltage to **X1** or **X2**<br>The fieldbus connection is maintained even when the base unit is switched off.<br>When the Interbus master is restarted, the power to the base unit will need to be reset. |  |  |
| **Supply voltage to Interbus master and base unit**:<br>Example:<br>Connect the supply voltage of the base unit to **X1**<br>Connect the supply voltage of the Interbus master to **X2**<br>The fieldbus connection is maintained even when the base unit is switched off.<br>When the Interbus master is restarted, the fieldbus is available immediately. |  |  |

# Expansion modules
## PNOZ mc0p

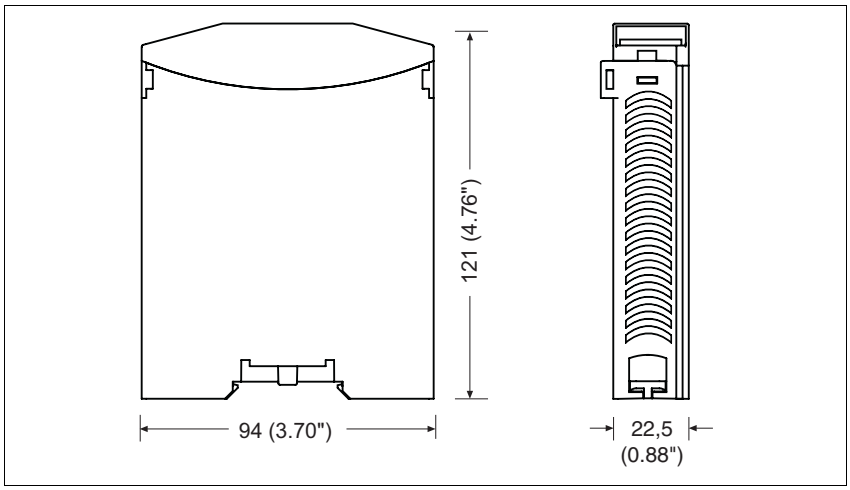
**Terminal configuration**




**Installation**

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

**Dimensions**






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc0p

**NOTICE** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... 20%** |
| Power consumption at $U_B$ without load | **< 5 W** |
| Residual ripple $U_B$ | **±5 %** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| Status indicator | **LED** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Environmental data** | |
| Airgap creepage | **DIN VDE 0110-1, 04/97** |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core With crimp connector | **0.5 ... 1.5 mm²** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **130 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc0p | 24 VDC | Power supply for fieldbus modules | 773 720 |
| PNOZ mi1p | 1 set of cage clamp terminals | | 783 400 |
| PNOZ mi1p | 1 set of screw terminals | | 793 400 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc1p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc1p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  – 16 auxiliary outputs
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mc1p units can be connected to the base unit

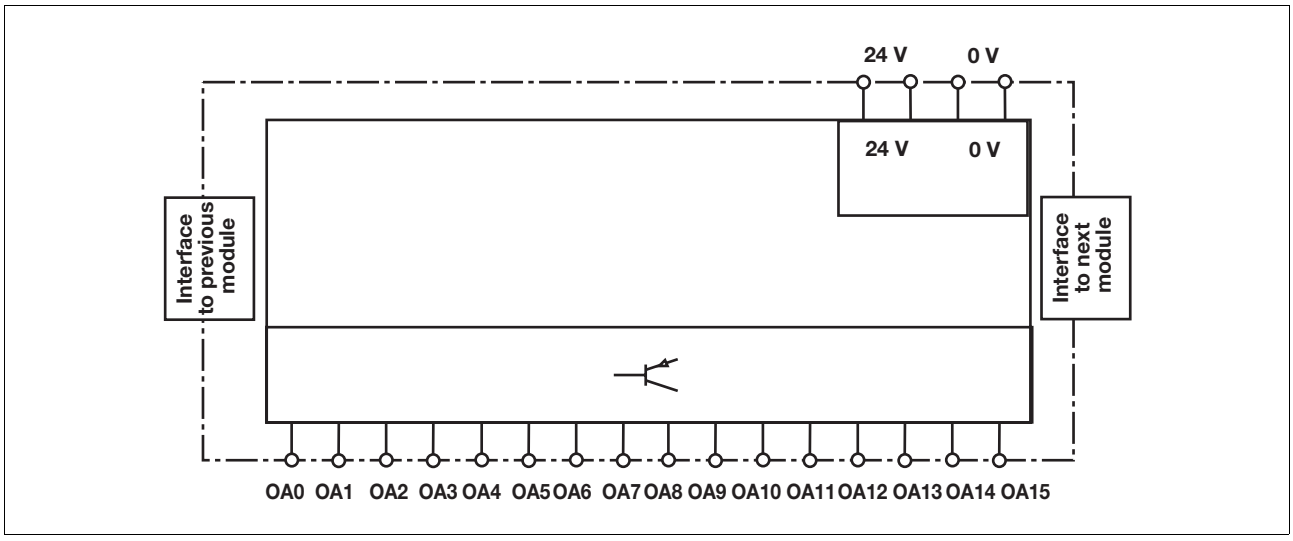
**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The expansion module may not be used for safety-related functions.

**Block diagram**





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc1p

### Function description

The expansion module operates as a signal module with non-safety-related 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.

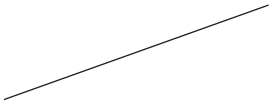
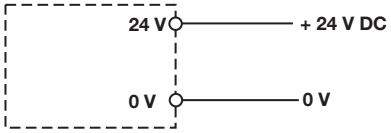
### Wiring

The wiring is defined in the circuit diagram in the Configurator.
Please note:

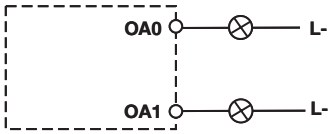
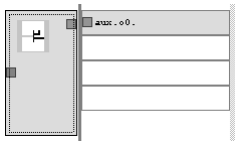
- Information given in the "Technical details" must be followed.
- Outputs OA0 to OA15 are auxiliary outputs using semiconductor technology.
- Use copper wire that can withstand 75 °C.

### Preparing for operation

- Supply voltage

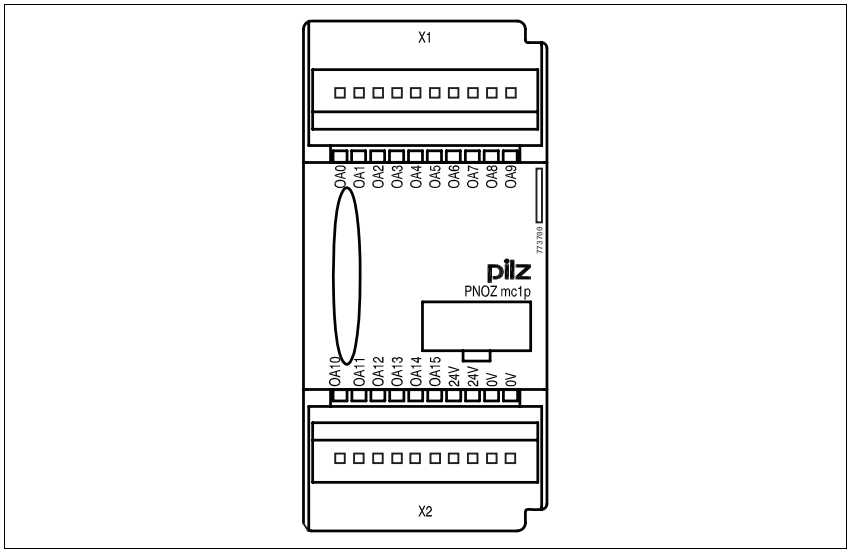
| Supply voltage | AC | DC |
|---|---|---|
| |  |  |

- Semiconductor outputs

| | | |
|---|---|---|
| |  |  |

# Expansion modules
## PNOZ mc1p

### Terminal configuration

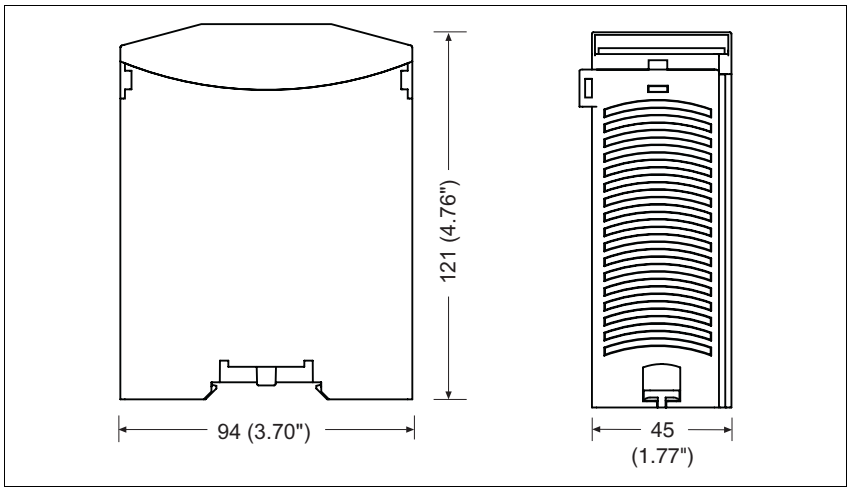



2.3

### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc1p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ | **< 2.5 W** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Auxiliary outputs** | |
| Quantity | **16** |
| Max. capacitive load | **1 µF** |
| Voltage and current | **24 VDC / max. 0.5 A / max. 12 W** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... +10%** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 0.5 A** |
| Status indicator | **LED** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 01/00** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **EN 60068-2-78, 10/01** |
| EMC | **EN 60947-5-1, 11/97** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 1.5 mm²** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 45 x 121 mm** |
| Weight with connector | **185 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc1p | Expansion module | 16 semiconductor outputs, standard | 773 700 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc1p coated version

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc1p coated version |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  – 16 auxiliary outputs
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mc1p units can be connected to the base unit

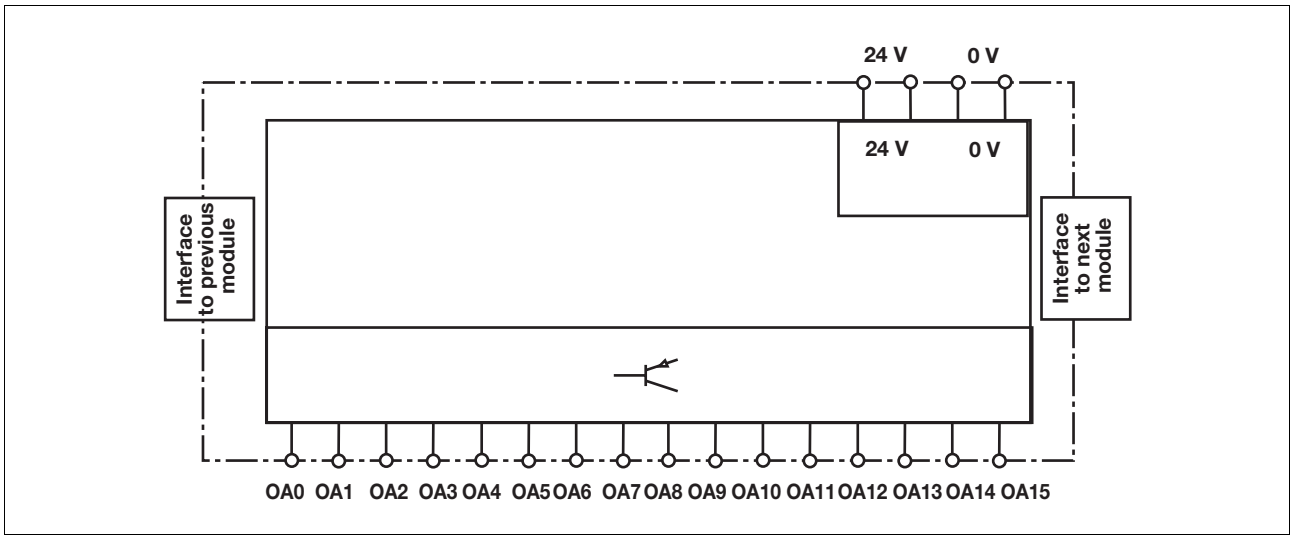
**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The expansion module may not be used for safety-related functions.

**Block diagram**






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

NSG-D-2-372-2008-08

# Expansion modules
## PNOZ mc1p coated version

**Function description**

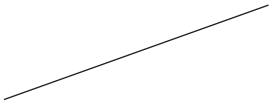
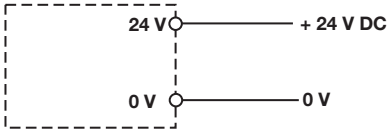
The expansion module operates as a signal module with non-safety-related outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers 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.

**Wiring**

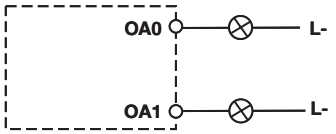
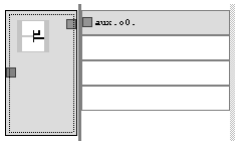
The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs OA0 to OA15 are auxiliary outputs using semiconductor technology.
- Use copper wire that can withstand 75 °C.

**Preparing for operation**

- Supply voltage

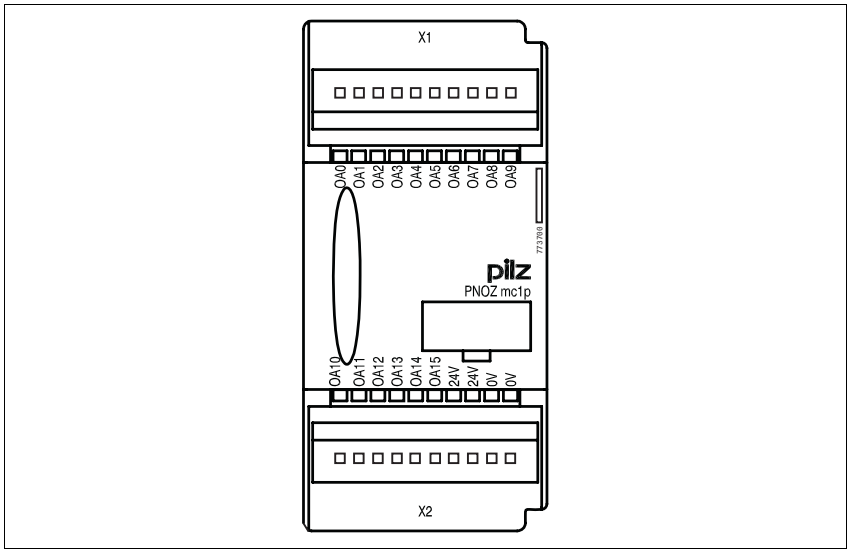
| Supply voltage | AC | DC |
|---|---|---|
| |  |  |

- Semiconductor outputs

| | | |
|---|---|---|
| |  |  |

# Expansion modules
## PNOZ mc1p coated version

**Terminal configuration**

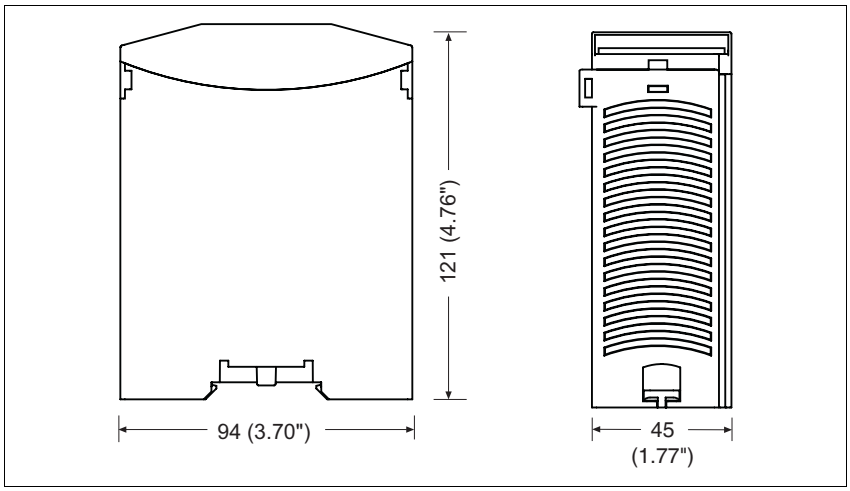



2.3

**Installation**

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

**Dimensions**





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc1p coated version

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| **Technical details** | |
|---|---|
| | |
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ | **< 2.5 W** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Auxiliary outputs** | |
| Quantity | **16** |
| Max. capacitive load | **1 µF** |
| Voltage and current | **24 VDC / max. 0.5 A / max. 12 W** |
| External supply voltage ($U_B$) | **24 VDC** |
| Voltage tolerance | **-15% ... +10%** |
| Galvanic isolation | **Yes** |
| Short circuit protection | **Yes** |
| Residual current at "0" | **< 0.5 mA** |
| Signal level at “1” | **$U_B$ - 0.5 VDC at 0.5 A** |
| Status indicator | **LED** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 01/00** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **EN 60068-2-78, 10/01** |
| EMC | **EN 60947-5-1, 11/97** |
| Ambient temperature | **0 ... +50 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.5 ... 1.5 mm²** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 45 x 121 mm** |
| Weight with connector | **185 g** |

# Expansion modules
## PNOZ mc1p coated version

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc1p coated version | Expansion module | 16 semiconductor outputs, standard | 773 705 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc3p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc3p |
|---|---|
| c UL us LISTED | ◆ |
| CCC | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Connection for PROFIBUS-DP
- Station addresses from 0 ... 99, selected via rotary switch
- Status indicators for communication with PROFIBUS-DP and for errors
- Max. 1 PNOZ mc3p units can be connected to the base unit
- A maximum of 24 outputs on the PNOZmulti safety system can be defined in the PNOZmulti Configurator for communication with PROFIBUS-DP. These outputs can be connected to outputs on
  - Logic elements
  - Time elements
  - Event counters
  - Connection points
  - Inputs on the safety system.

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to PROFIBUS-DP.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.
The unit is designed for use in:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

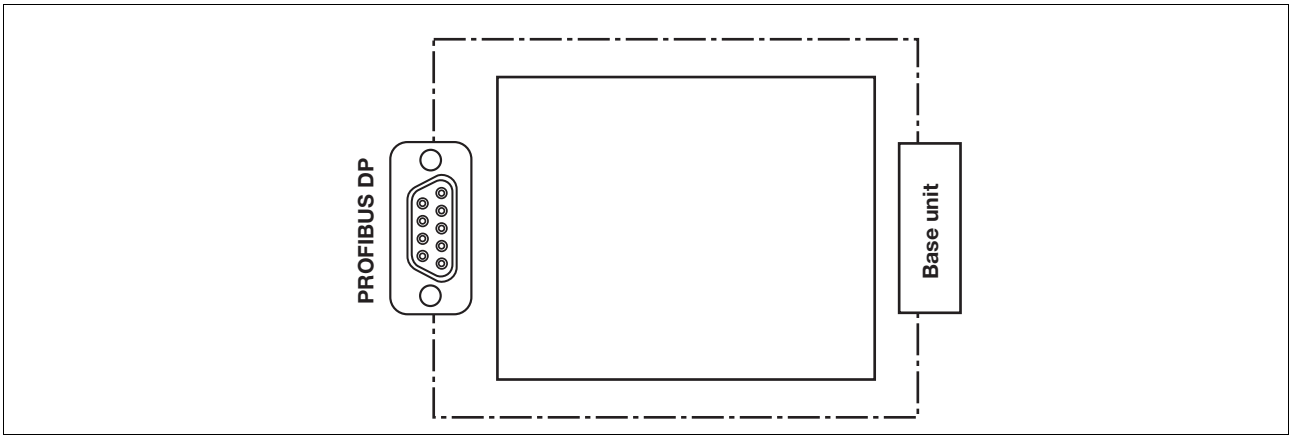
The PNOZ mc3p expansion module is used for communication between the PNOZmulti modular safety system and PROFIBUS-DP.
PROFIBUS-DP is designed for fast data exchange at field level. The PNOZ mc3p expansion module is a passive PROFIBUS-DP subscriber (Slave). The basic functions of communication with PROFIBUS-DP conform to EN 50170. The central controller (Master) reads input information from the slaves and writes output information to the slaves as part of each cycle. As well as the cyclical transfer of usable data, PROFIBUS-DP can also be used for diagnostics and commissioning functions. Data traffic is monitored on the Master/Slave side.
The expansion module may not be used for safety-related functions.

**System requirements**

- PNOZmulti Configurator: From Version 3.0.0
- Base unit PNOZ m1p: From Version 3.0

Please contact Pilz if you have an older version.

**Block diagram**






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

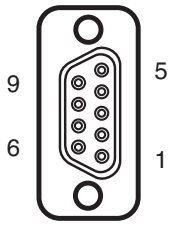
# Expansion modules
## PNOZ mc3p

**Function description**

The data to be transferred via PROFIBUS-DP is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc3p are connected via a jumper. The PNOZ mc3p is also supplied with voltage via this jumper. The station address is set via 2 rotary switches. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc3p is configured and started automatically.

**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which outputs on the safety system will communicate with PROFIBUS-DP. The connection to PROFIBUS-DP is made via a female 9-pin D-Sub connector




1: n.c.
2: n.c.
3: B (RxD/TxD-P)
4: CNTR-P
5: DGND
6: VP
7: n.c.
8: A (RxD/TxD-N)
9: n.c.

n.c. = not connected

Please note:
- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.

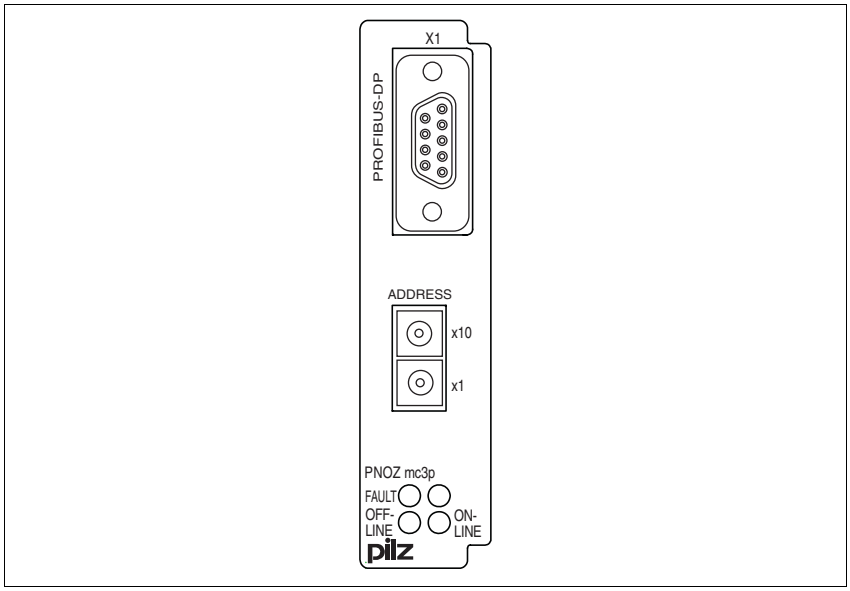
Please note the following when connecting to PROFIBUS-DP:
- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces




Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc3p

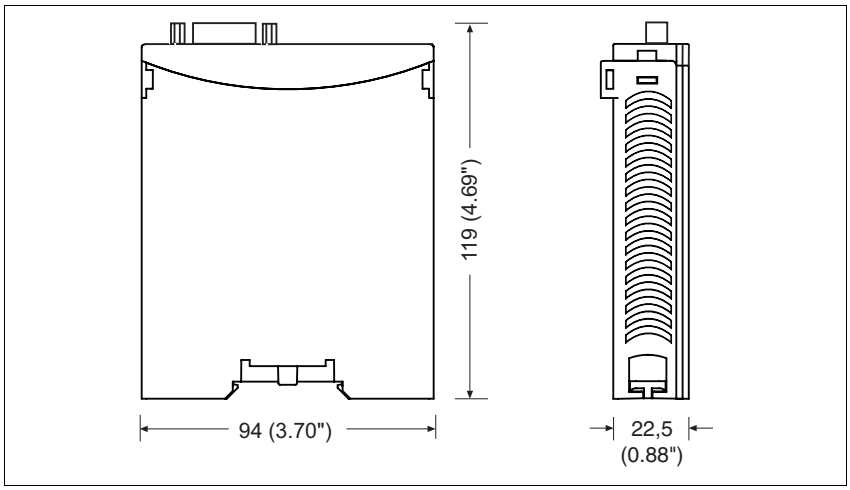
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mc3p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Power consumption at $U_B$ | **max. 2.5 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **PROFIBUS-DP** | |
| Application range | **Non-safety-related applications** |
| Unit type | **Slave** |
| Status indicator | **LED** |
| Station address | **0 ... 99** |
| Transmission rate | **9.6 kBit/s ... 12 MBit/s** |
| Connection | **Female 9-pin D-Sub connector** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 119 mm** |
| Weight with connector | **140 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc3p | Expansion module | Fieldbus module, PROFIBUS-DP | 773 721 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc4p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc4p |
|---|---|
| c UL us LISTED | ◆ |
| CCC | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Connection for DeviceNet
- Station addresses from 0 ... 63, selected via rotary switch
- Status indicators for communication with DeviceNet and for errors
- Max. 1 PNOZ mc4p units can be connected to the base unit
- A maximum of 24 outputs on the PNOZmulti safety system can be defined in the PNOZmulti Configurator for communication with DeviceNet. These outputs can be connected to outputs on
  - Logic elements
  - Time elements
  - Event counters
  - Connection points
  - Inputs on the safety system.

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to DeviceNet.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.
The unit is designed for use in:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

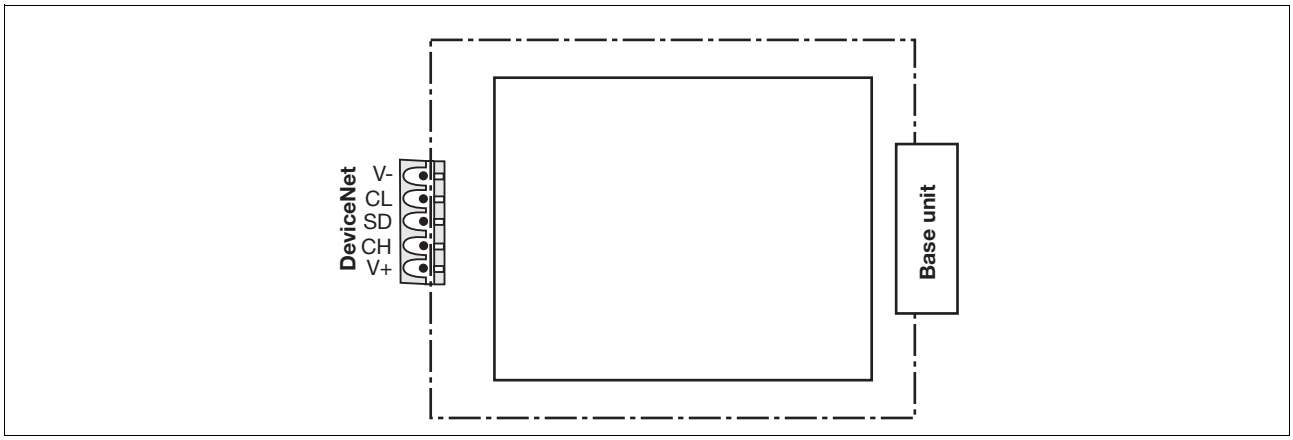
The PNOZ mc4p expansion module is used for communication between the PNOZmulti modular safety system and DeviceNet.
DeviceNet is designed for fast data exchange at field level. The PNOZ mc4p expansion module is a passive DeviceNet subscriber (Slave). The basic communication functions meet the requirements of the DeviceNet specification, Release 2.0. The central controller (master) reads input information from the slaves and writes output information to the slaves as part of each cycle. As well as the cyclical transfer of usable data, the PNOZ mc4p can also be used for diagnostics and commissioning functions.
The expansion module may not be used for safety-related functions.

**System requirements**

- PNOZmulti Configurator: From Version 3.0.0
- Base unit PNOZ m1p: From Version 3.0

Please contact Pilz if you have an older version.

**Block diagram**



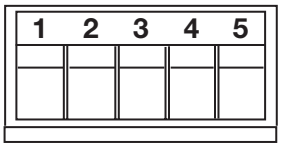
# Expansion modules
## PNOZ mc4p

**Function description**

The data to be transferred via DeviceNet is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc4p are connected via a jumper. The PNOZ mc4p is also supplied with voltage via this jumper. The station address and the transmission rate are set using DIP switches. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc4p is configured and started automatically.

**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which outputs on the safety system will communicate with DeviceNet. The connection to DeviceNet is made via a 5-pin screw connector




1: V-
2: CL (CAN_L)
3: SD
4: CH (CAN_H)
5: V+

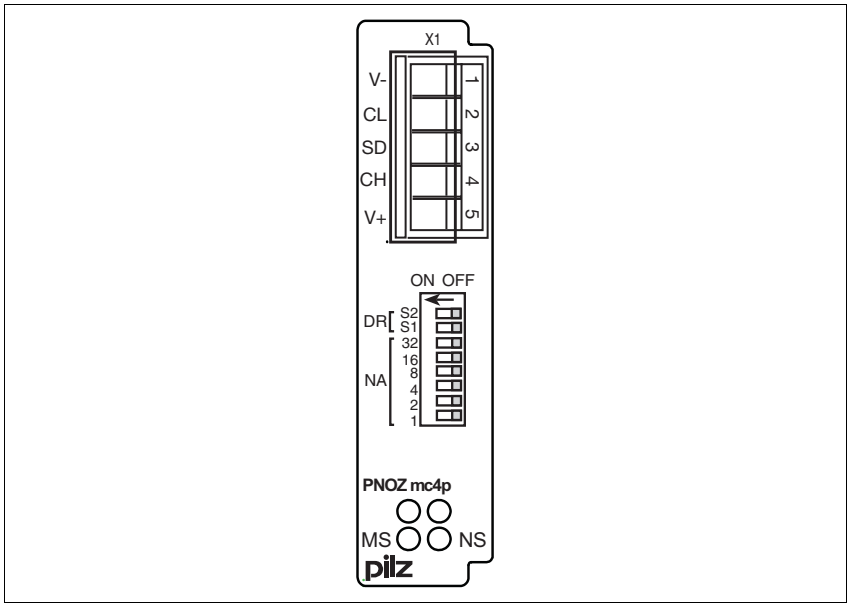
Please note:
- Information given in the "Technical details" must be followed.
- Use copper wire that can withstand 75 °C.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc4p

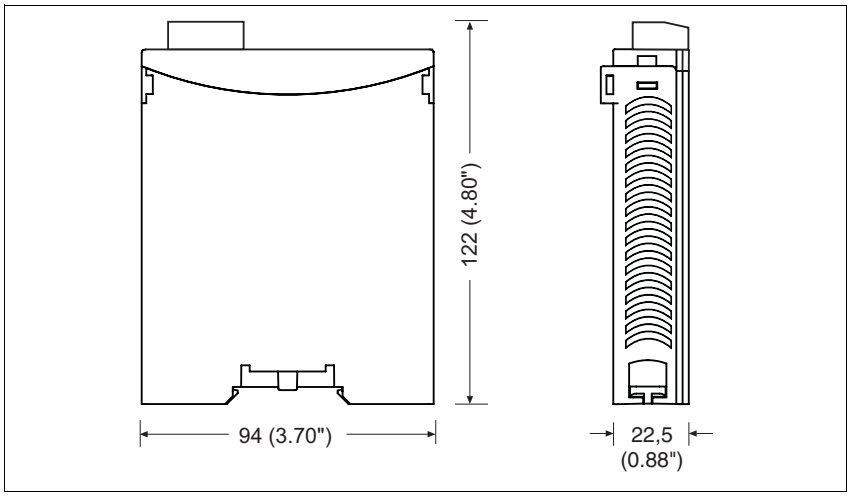
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mc4p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | |
| via base unit | **24 VDC** |
| Power consumption at $U_B$ | **Max 1.6 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **DeviceNet** | |
| Supply voltage V+, V- | **24 VDC** |
| via bus cable | **(11 VDC ... 25 VDC)** |
| Power consumption | **Max 0.75 W** |
| Application range | **Non-safety-related applications** |
| Unit type | **Slave** |
| Status indicator | **LED** |
| Station address | **0 ... 63** |
| Transmission rate | **125, 250, 500 kBit/s** |
| Connection | **5-pin screw connector** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 122 mm** |
| Weight with connector | **146 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc4p | Expansion module | Fieldbus module, DeviceNet | 773 722 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc4p coated version

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc4p coated version |
|---|---|
| c UL us LISTED | ◆ |
| CCC | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Connection for DeviceNet
- Station addresses from 0 ... 63, selected via rotary switch
- Status indicators for communication with DeviceNet and for errors
- Max. 1 PNOZ mc4p can be connected to the base unit
- A maximum of 24 outputs on the PNOZmulti safety system can be defined in the PNOZmulti Configurator for communication with DeviceNet. These outputs can be connected to outputs on
  - Logic elements
  - Time elements
  - Event counters
  - Connection points
  - Inputs on the safety system.

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to DeviceNet.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.
The unit is designed for use in:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

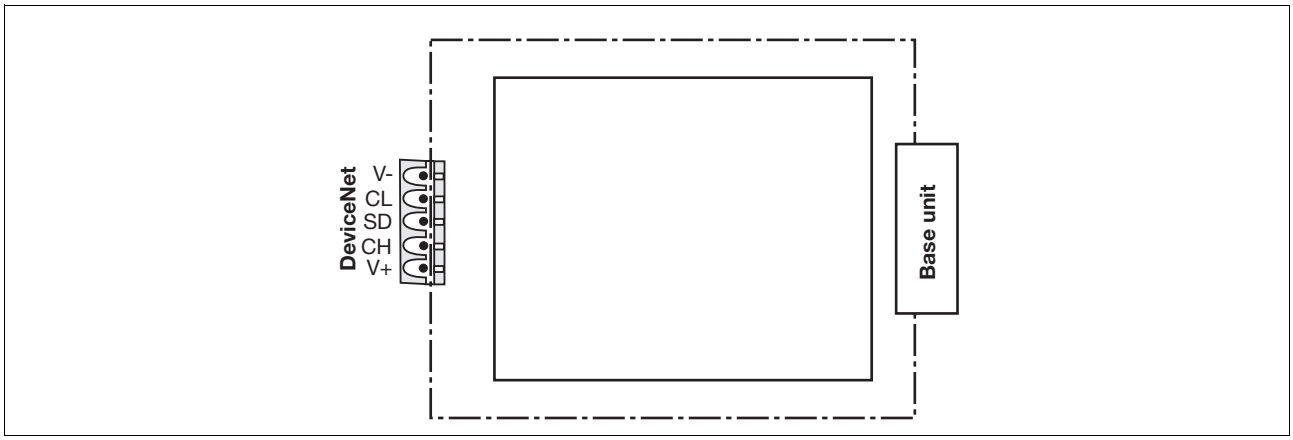
The PNOZ mc4p expansion module is used for communication between the PNOZmulti modular safety system and DeviceNet.
DeviceNet is designed for fast data exchange at field level. The PNOZ mc4p expansion module is a passive DeviceNet subscriber (Slave). The basic communication functions meet the requirements of the DeviceNet specification, Release 2.0. The central controller (master) reads input information from the slaves and writes output information to the slaves as part of each cycle. As well as the cyclical transfer of usable data, the PNOZ mc4p can also be used for diagnostics and commissioning functions.
The expansion module may not be used for safety-related functions.

**System requirements**

- PNOZmulti Configurator: From Version 3.0.0
- Base unit PNOZ m1p: From Version 3.0

Please contact Pilz if you have an older version.

**Block diagram**



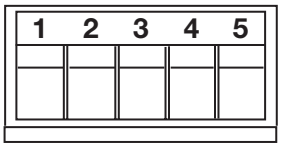
# Expansion modules
## PNOZ mc4p coated version

**Function description**

The data to be transferred via DeviceNet is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc4p are connected via a jumper. The PNOZ mc4p is also supplied with voltage via this jumper. The station address and the transmission rate are set using DIP switches. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc4p is configured and started automatically.

**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which outputs on the safety system will communicate with DeviceNet. The connection to DeviceNet is made via a 5-pin screw connector




1: V-
2: CL (CAN_L)
3: SD
4: CH (CAN_H)
5: V+

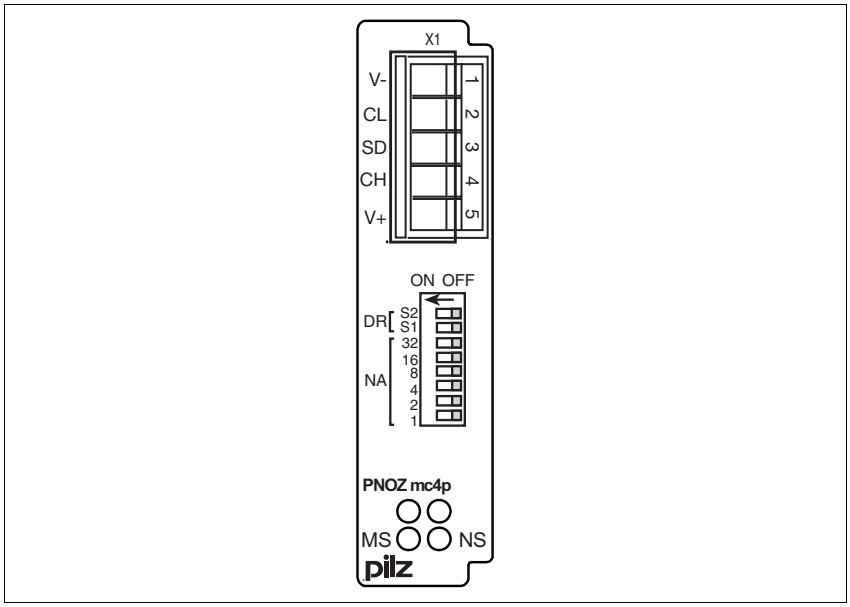
Please note:
- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc4p coated version

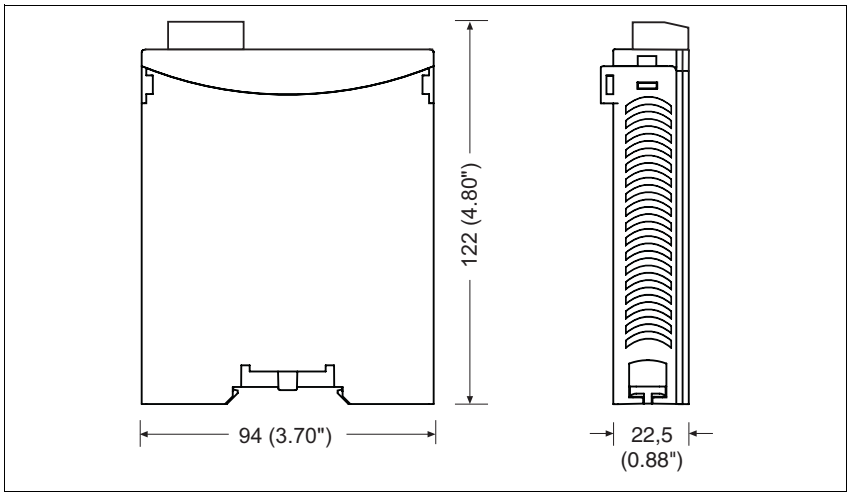
**Terminal configuration**




**Installation**

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

**Dimensions**



# Expansion modules
## PNOZ mc4p coated version

**NOTICE** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | |
| via base unit | **24 VDC** |
| Power consumption at $U_B$ | **Max 1.6 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **DeviceNet** | |
| Supply voltage V+, V- | **24 VDC** |
| via bus cable | **(11 VDC ... 25 VDC)** |
| Power consumption | **Max 0.75 W** |
| Application range | **Non-safety-related applications** |
| Unit type | **Slave** |
| Status indicator | **LED** |
| Station address | **0 ... 63** |
| Transmission rate | **125, 250, 500 kBit/s** |
| Connection | **5-pin screw connector** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +50 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 122 mm** |
| Weight with connector | **146 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc4p coated version | Expansion module | Fieldbus module, DeviceNet | 773 729 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc5p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc5p |
|---|---|
| c UL us LISTED | ◆ |
| CCC | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Connection for INTERBUS
- Transmission rate, selectable between 500 kBit/s and 2 MBit/s
- Status indicators for communication with INTERBUS and for errors
- Max. 1 PNOZ mc5p units can be connected to the base unit
- A maximum of 24 outputs on the PNOZmulti safety system can be defined in the PNOZmulti Configurator for communication with INTERBUS. These outputs can be connected to outputs on
  - Logic elements
  - Time elements
  - Event counters
  - Connection points
  - Inputs on the safety system.

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to INTERBUS.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.

The unit is designed for use in:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

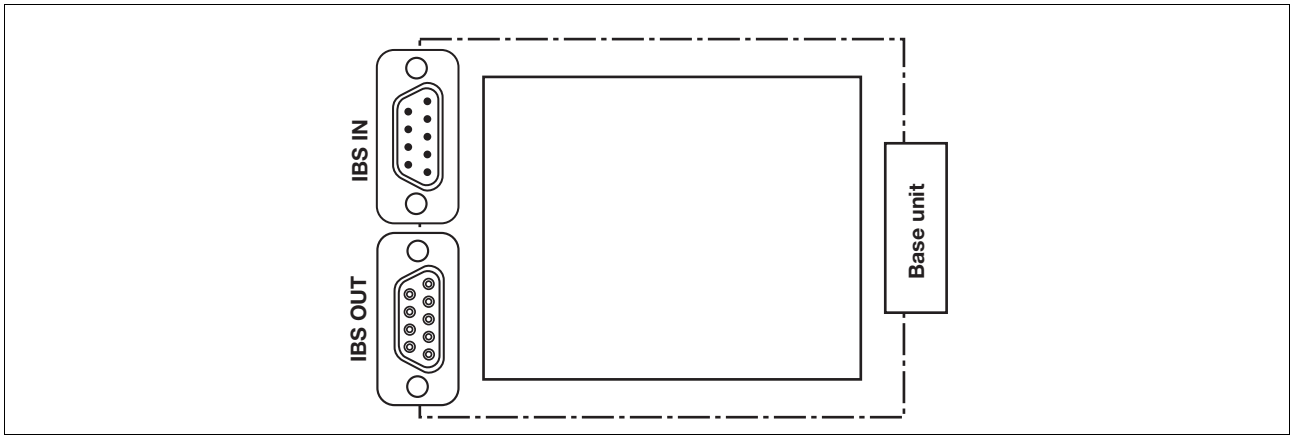
The PNOZ mc5p expansion module is used for communication between the PNOZmulti modular safety system and INTERBUS.
INTERBUS is designed for fast data exchange at field level. The PNOZ mc5p expansion module is a passive INTERBUS subscriber (Slave). The basic functions of communication with INTERBUS conform to EN 50254. The central controller (Master) reads input information from the slaves and writes output information to the slaves as part of each cycle. As well as the cyclical transfer of usable data, the PNOZ mc5p can also be used for diagnostics and commissioning functions.
The expansion module may not be used for safety-related functions.

**System requirements**

- PNOZmulti Configurator: From Version 3.0.0
- Base unit PNOZ m1p: From Version 3.0

Please contact Pilz if you have an older version.

**Block diagram**






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

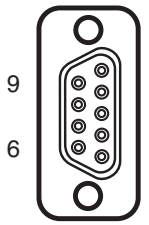
# Expansion modules
## PNOZ mc5p

**Function description**

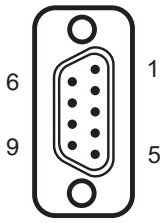
The data to be transferred via INTERBUS is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc5p are connected via a jumper. The PNOZ mc5p is also supplied with voltage via this jumper. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc5p is configured and started automatically.

**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which outputs on the safety system will communicate with INTERBUS. The connection to INTERBUS is made via two female 9-pin D-Sub screw connectors




1: DO2
2: DI2
3: GND
4: n.c.
5: GND
6: /DO2
7: /DI2
8: n.c.
9: RBST




1: DO1
2: DI1
3: GND
4: n.c.
5: n.c.
6: /DO1
7: /DI1
8: n.c.
9: n.c.

n. c. = not connected

Please note:
- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.

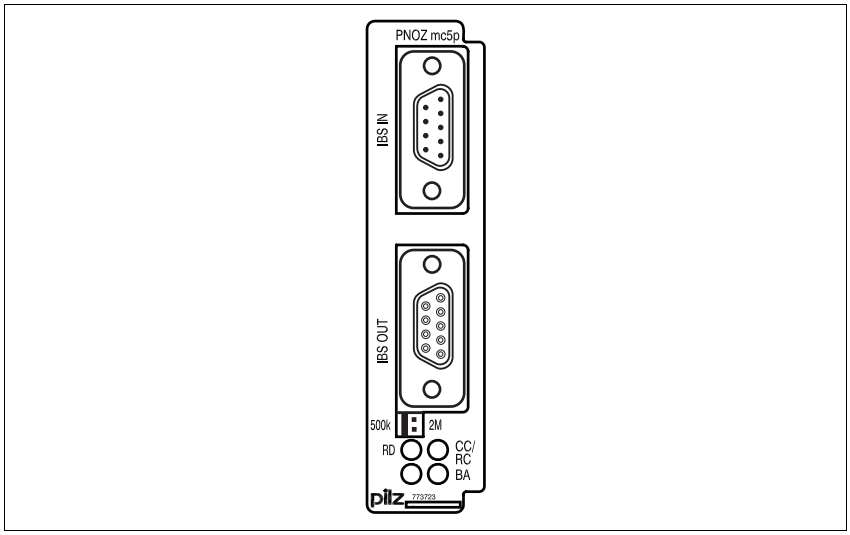
Please note the following when connecting to INTERBUS:
- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc5p

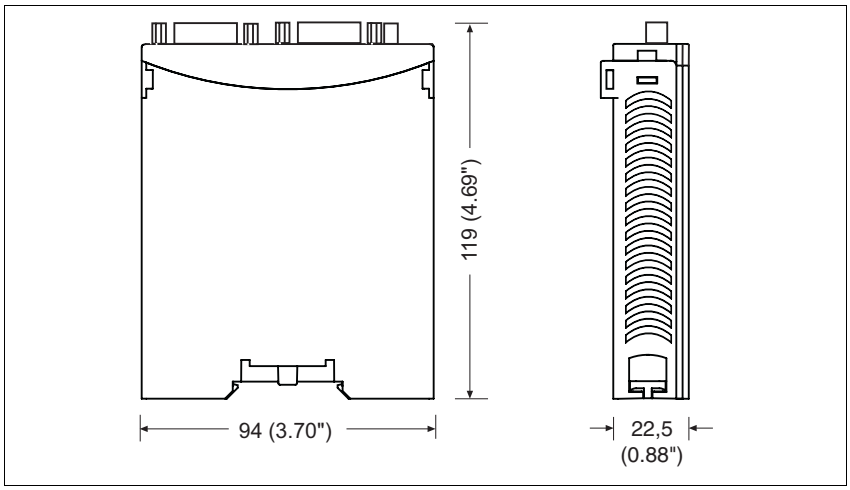
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mc5p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | |
| via base unit | **24 VDC** |
| Power consumption at $U_B$ | **Max 2.5 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **INTERBUS** | |
| Application range | **Non-safety-related applications** |
| Unit type | **Slave** |
| Status indicator | **LED** |
| Transmission rate | **500 kBit/s, 2 MBit/s** |
| Connection | |
| IBS IN | **Male 9-pin D-Sub connector** |
| IBS OUT | **Female 9-pin D-Sub connector** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 119 mm** |
| Weight with connector | **153 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc5p | Expansion module | Fieldbus module, INTERBUS | 773 723 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc5.1p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

### Approvals

| | PNOZ mc5.1p |
|---|---|
| CCC | ◆ |

### Unit features

- Can be configured in the PNOZmulti Configurator
- Connection for INTERBUS with fibre-optic cable
- Transmission rate, selectable between 500 kBit/s and 2 MBit/s
- Status indicators for communication with INTERBUS and for errors
- F-SMA connection technology
- Max. 1 PNOZ mc5.1p can be connected to the base unit
- In the PNOZmulti Configurator, 24 inputs (standard) and 24 outputs (standard) can be configured for communication via a fieldbus.

### Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to INTERBUS FO.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.
The unit is designed for use in:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

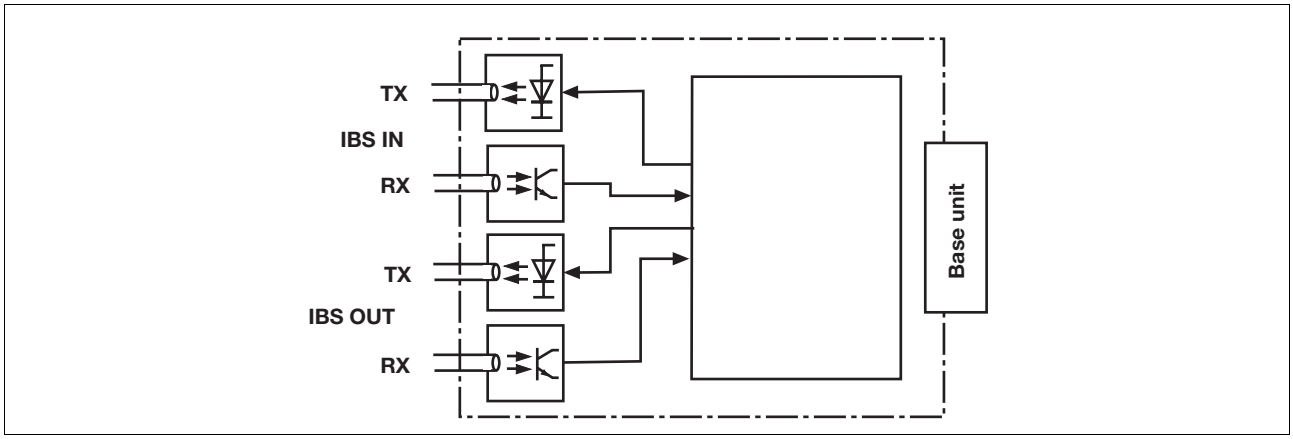
The PNOZ mc5.1p expansion module is used for communication between the PNOZmulti modular safety system and INTERBUS FO.
INTERBUS FO is designed for fast data exchange at field level. The PNOZ mc5.1p expansion module is a passive INTERBUS FO subscriber (Slave). The basic functions of communication with INTERBUS FO conform to EN 50254. The central controller (Master) reads input information from the slaves and writes output information to the slaves as part of each cycle. As well as the cyclical transfer of usable data, the PNOZ mc5.1p can also be used for diagnostics and commissioning functions.
The expansion module may not be used for safety-related functions.

### System requirements

- PNOZmulti Configurator: From Version 3.0.0
- Base unit PNOZ m1p: From Version 3.0

Please contact Pilz if you have an older version.

### Block diagram



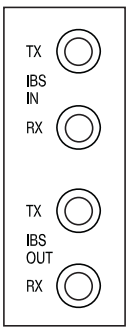
# Expansion modules
## PNOZ mc5.1p

**Function description**

The data to be transferred via INTERBUS FO is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc5.1p are connected via a jumper. The PNOZ mc5.1p is also supplied with voltage via this jumper. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc5.1p is configured and started automatically.

**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which inputs and outputs on the safety system will communicate with INTERBUS FO. The PNOZ mc5.1p features RX and TX F-SMA screw connections for IBS IN and RX and TX for IBS OUT for connecting to the INTERBUS FO.




**Key**:
**IBS IN**: Remote bus IN
**IBS OUT**: Remote bus OUT
**TX**: Transmitter
**RX**: Receiver

Please note:
Information given in the “Technical details” must be followed.

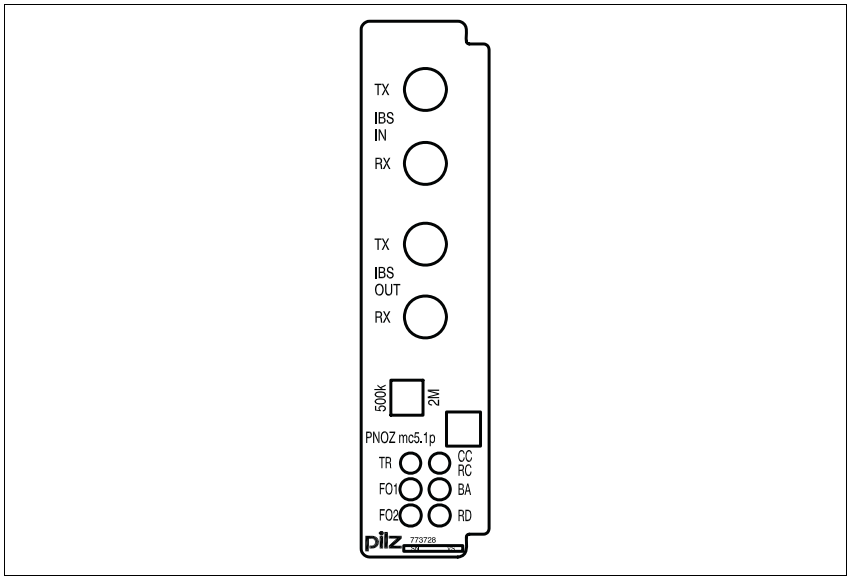


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

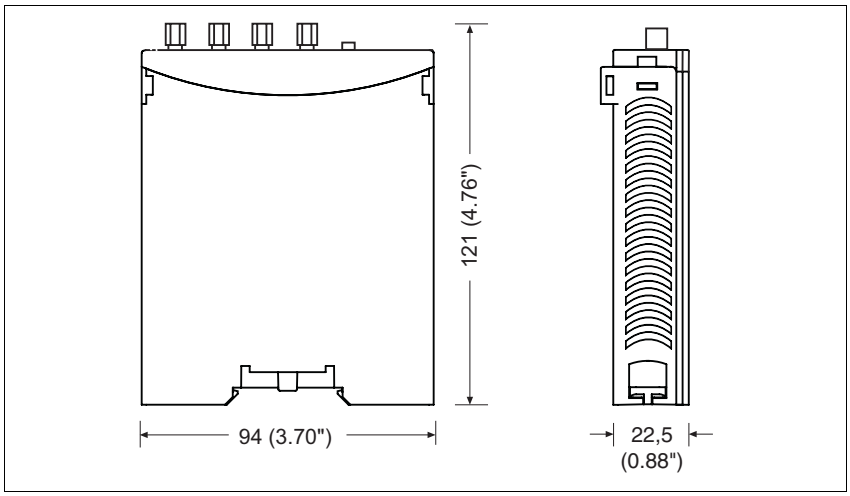
NSG-D-2-384-2006-02

# Expansion modules
## PNOZ mc5.1p

### Terminal configuration




### Dimensions




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

# Expansion modules
## PNOZ mc5.1p

**NOTICE** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | |
| via base unit | **24 VDC** |
| Power consumption at $U_B$ | **Max 2 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **INTERBUS** | |
| Application range | **Non-safety-related applications** |
| Unit type | **Slave** |
| Status indicator | **LED** |
| Transmission rate | **500 kBit/s, 2 MBit/s** |
| Connection | |
| IBS IN | **FSMA screw connections** |
| IBS OUT | **FSMA screw connections** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **132 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc5.1p | Expansion module | Fieldbus module, INTERBUS FO | 773 728 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc6p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc6p |
|---|---|
| c UL us LISTED | ◆ |
| CC | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Connection for CANopen
- Station addresses from 0 ... 99, selected via rotary switch
- Status indicators for communication with CANopen and for errors
- Max. 1 PNOZ mc6p units can be connected to the base unit
- A maximum of 24 outputs on the PNOZmulti safety system can be defined in the PNOZmulti Configurator for communication with CANopen. These outputs can be connected to outputs on
  - Logic elements
  - Time elements
  - Event counters
  - Connection points
  - Inputs on the safety system.

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to CANopen.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.

The unit is designed for use in:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

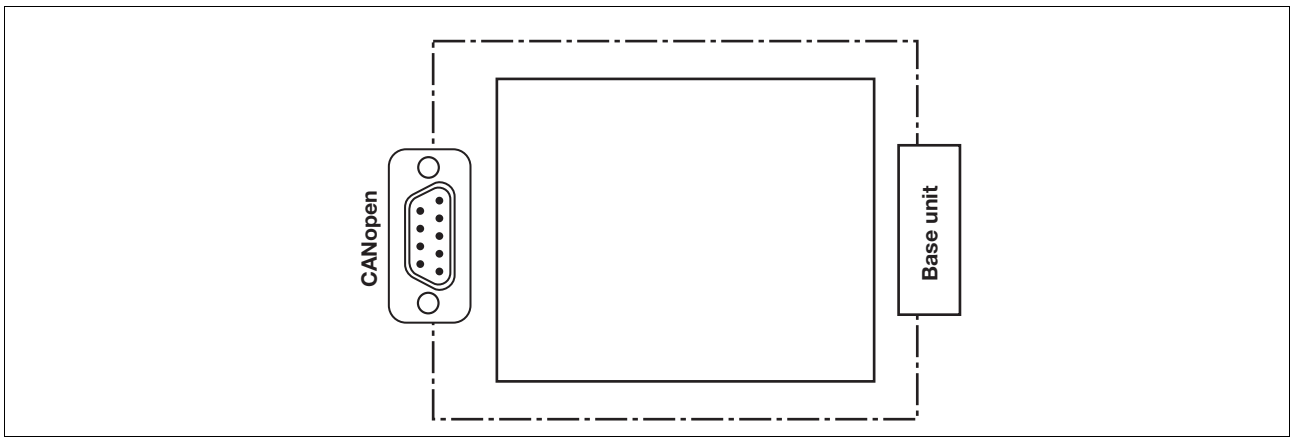
The PNOZ mc6p expansion module is used for communication between the PNOZmulti modular safety system and CANopen.
CANopen is designed for fast data exchange at field level. The PNOZ mc6p expansion module is a passive CANopen subscriber (Slave). The basic communication functions conform to CiA DS-301 V3.0. The central controller (Master) reads input information from the slaves and writes output information to the slaves as part of each cycle. As well as the cyclical transfer of usable data, the PNOZ mc6p can also be used for diagnostics and commissioning functions.
The expansion module may not be used for safety-related functions.

**System requirements**

- PNOZmulti Configurator: From Version 3.0.0
- Base unit PNOZ m1p: From Version 3.0

Please contact Pilz if you have an older version.

**Block diagram**



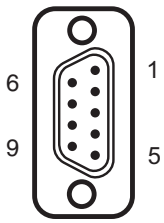
# Expansion modules
## PNOZ mc6p

**Function description**

The data to be transferred via CANopen is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc6p are connected via a jumper. The PNOZ mc6p is also supplied with voltage via this jumper. The station address is set via 2 rotary switches. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc6p is configured and started automatically.

**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which outputs on the safety system will communicate with CANopen. The connection to CANopen is made via a male 9-pin D-Sub connector




1: n.c.
2: CAN_L
3: n.c.
4: n.c.
5: CAN_SHLD
6: n.c.
7: CAN_H
8: n.c.
9: n.c.

n.c. = not connected

Please note:
- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.

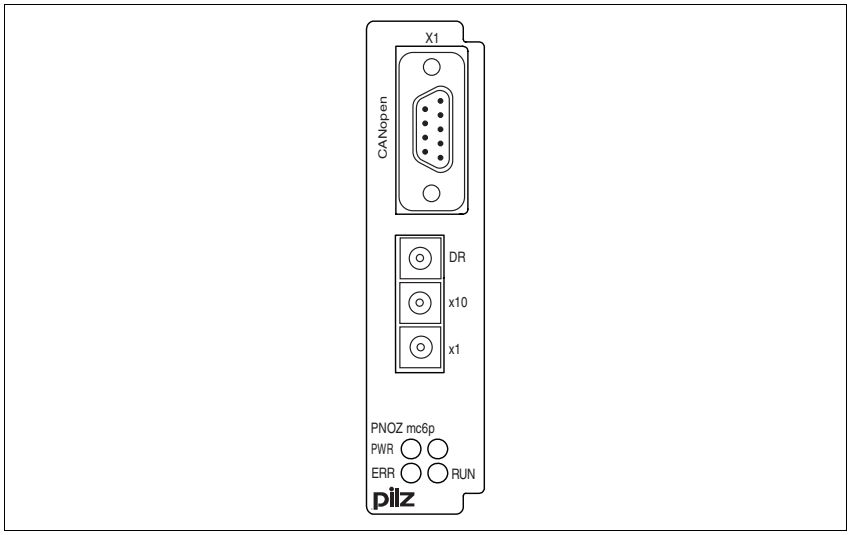
Please note the following when connecting to CANopen:
- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces




Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc6p

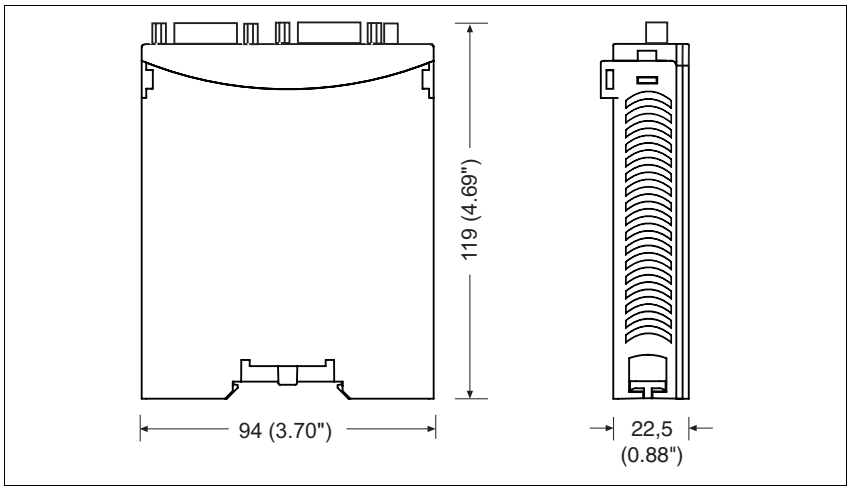
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mc6p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Power consumption at $U_B$ | **Max 2.5 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **CANopen** | |
| Application range | **Non-safety-related applications** |
| Unit type | **Slave** |
| Status indicator | **LED** |
| Station address | **0 ... 99** |
| Transmission rate | **10, 20, 50, 125, 250, 500, 800 kBit/s, 1 MBit/s** |
| Connection | **Male 9-pin connector** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 119 mm** |
| Weight with connector | **145 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc6p | Expansion module | Fieldbus module, CANopen | 773 724 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc6p coated version

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc6p coated version |
|---|---|
| c UL us LISTED | ◆ |
| CC | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Connection for CANopen
- Station addresses from 0 ... 99, selected via rotary switch
- Status indicators for communication with CANopen and for errors
- Max. 1 PNOZ mc6p units can be connected to the base unit
- A maximum of 24 outputs on the PNOZmulti safety system can be defined in the PNOZmulti Configurator for communication with CANopen. These outputs can be connected to outputs on
  - Logic elements
  - Time elements
  - Event counters
  - Connection points
  - Inputs on the safety system.

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to CANopen.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.

The unit is designed for use in:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

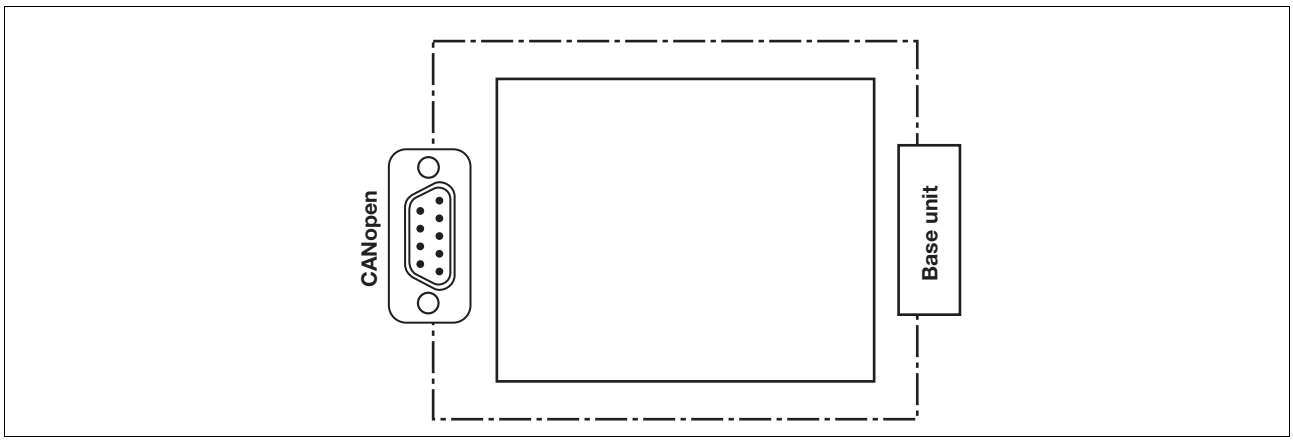
The PNOZ mc6p expansion module is used for communication between the PNOZmulti modular safety system and CANopen.
CANopen is designed for fast data exchange at field level. The PNOZ mc6p expansion module is a passive CANopen subscriber (Slave). The basic communication functions conform to CiA DS-301 V3.0. The central controller (Master) reads input information from the slaves and writes output information to the slaves as part of each cycle. As well as the cyclical transfer of usable data, the PNOZ mc6p can also be used for diagnostics and commissioning functions.
The expansion module may not be used for safety-related functions.

**System requirements**

- PNOZmulti Configurator: From Version 3.0.0
- Base unit PNOZ m1p: From Version 3.0

Please contact Pilz if you have an older version.

**Block diagram**



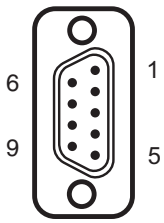
# Expansion modules
## PNOZ mc6p coated version

**Function description**

The data to be transferred via CANopen is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc6p are connected via a jumper. The PNOZ mc6p is also supplied with voltage via this jumper. The station address is set via 2 rotary switches. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc6p is configured and started automatically.

**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which outputs on the safety system will communicate with CANopen. The connection to CANopen is made via a male 9-pin D-Sub connector




1: n.c.
2: CAN_L
3: n.c.
4: n.c.
5: CAN_SHLD
6: n.c.
7: CAN_H
8: n.c.
9: n.c.

n.c. = not connected

Please note:
- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.

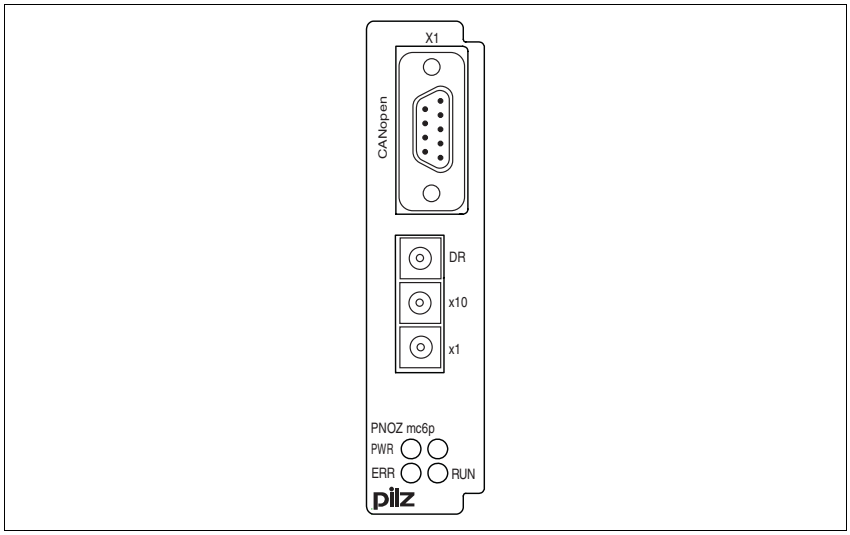
Please note the following when connecting to CANopen:
- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc6p coated version

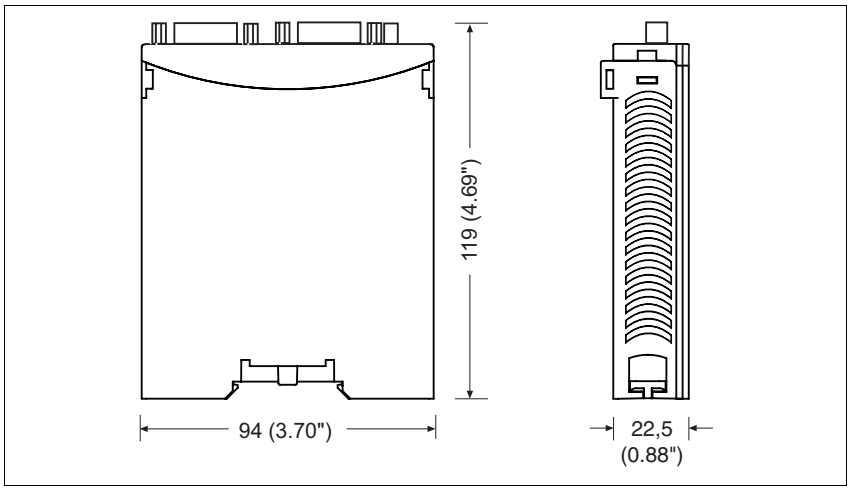
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mc6p coated version

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Power consumption at $U_B$ | **Max 2.5 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **CANopen** | |
| Application range | **Non-safety-related applications** |
| Unit type | **Slave** |
| Status indicator | **LED** |
| Station address | **0 ... 99** |
| Transmission rate | **10, 20, 50, 125, 250, 500, 800 kBit/s, 1 MBit/s** |
| Connection | **Male 9-pin connector** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +50 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 119 mm** |
| Weight with connector | **145 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc6p coated version | Expansion module | Fieldbus module, CANopen | 773 727 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc7p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc7p |
|---|---|
| c UL us LISTED | ◆ |
| CCC | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Connection for CC-Link
- Station addresses from 0 ... 63, selected via rotary switch
- Status indicators for communication with CC-Link and for errors
- Max. 1 PNOZ mc7p units can be connected to the base unit
- Station type: Remote Device
- Assigned stations: 2
- A maximum of 24 outputs on the PNOZmulti safety system can be defined in the PNOZmulti Configurator for communication with CC-Link.

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to CC-Link.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.
The unit is designed for use in:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

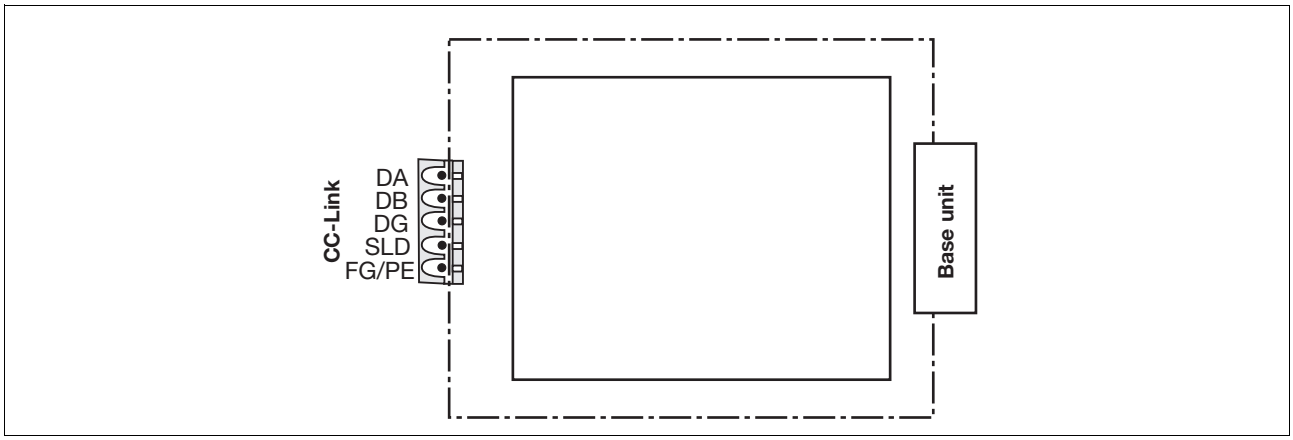
The PNOZ mc7p expansion module is used for communication between the PNOZmulti modular safety system and CC-Link.
CC-Link is designed for fast data exchange at field level. The expansion module PNOZ mc7p is a passive CC-Link subscriber (Slave). The basic communication functions conform to CC-Link Ver.1.10. The central controller (Master) reads input information from the slaves and writes output information to the slaves as part of each cycle. As well as the cyclical transfer of usable data, CC-Link can also be used for diagnostics and commissioning functions.
The expansion module may not be used for safety-related functions.

**System requirements**

- PNOZmulti Configurator: From Version 3.0.0
- Base unit PNOZ m1p: From Version 3.0

Please contact Pilz if you have an older version.

**Block diagram**






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

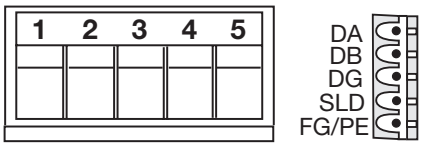
# Expansion modules
## PNOZ mc7p

**Function description**

The data to be transferred via CC-Link is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc7p are connected via a jumper. The PNOZ mc7p is also supplied with voltage via this jumper. The station address is set via 2 rotary switches. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc7p is configured and started automatically.

**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which outputs on the safety system will communicate with CC-Link. The connection to CC-Link is made via a 5-pin screw connector.




**DA DB DG SLD FG/ PE**

1: DA (Channel A)
2: DB (Channel B)
3: DG (Earth)
4: SLD (Cable shield)
5: FG/PE (Functional earth)

Please note:
- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.

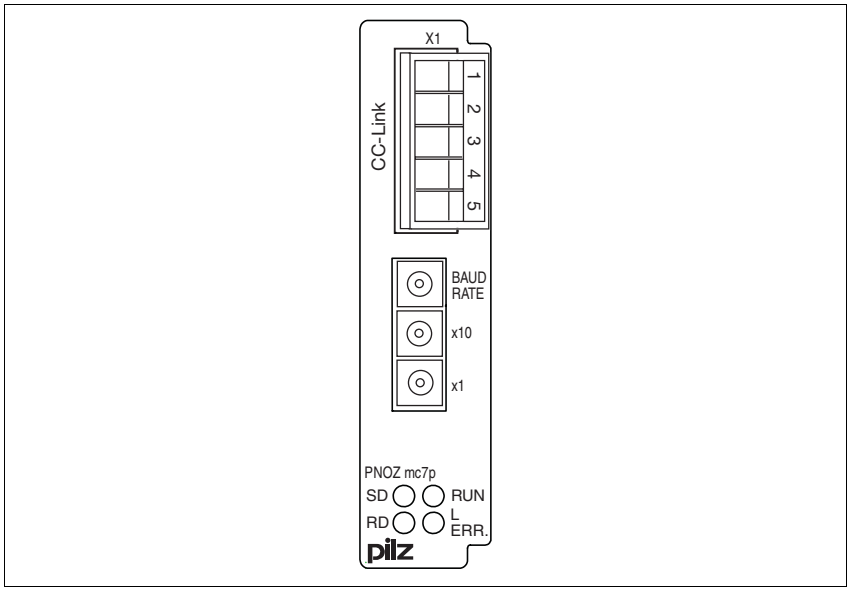
Please note the following when connecting to CC-Link:
- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc7p

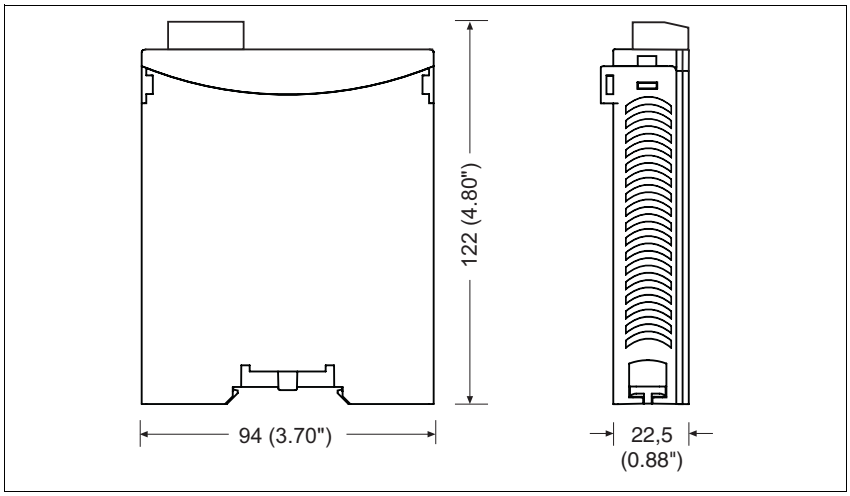
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mc7p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Power consumption at $U_B$ | **Max 2.5 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **CC-Link** | |
| Application range | **Non-safety-related applications** |
| Unit type | **Slave** |
| Status indicator | **LED** |
| Station address | **0 ... 63** |
| Assigned stations | **2** |
| Transmission rate | **156, 625 kBit/s, 2.5; 5; 10 MBit/s** |
| Connection | **5-pin screw connector** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 122 mm** |
| Weight with connector | **150 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc7p | Expansion module | Fieldbus module, CC-Link | 773 726 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc8p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc8p |
|---|---|
| CC | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Connection for Ethernet IP and Modbus TCP
- Transmission rate 10 MBit/s (10BaseT) and 100 MBit/s (100BaseTX)
- IP address is set via DIP switches on the front of the unit
- Status indicators for communication and for errors
- Max. 1 PNOZ mc8p can be connected to the base unit
- A maximum of 24 inputs and 24 outputs on the PNOZmulti safety system can be defined in the PNOZmulti Configurator for communication with Ethernet IP and Modbus TCP.

**Unit description**

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to Ethernet IP and Modbus TCP.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.
The unit is designed for use in:

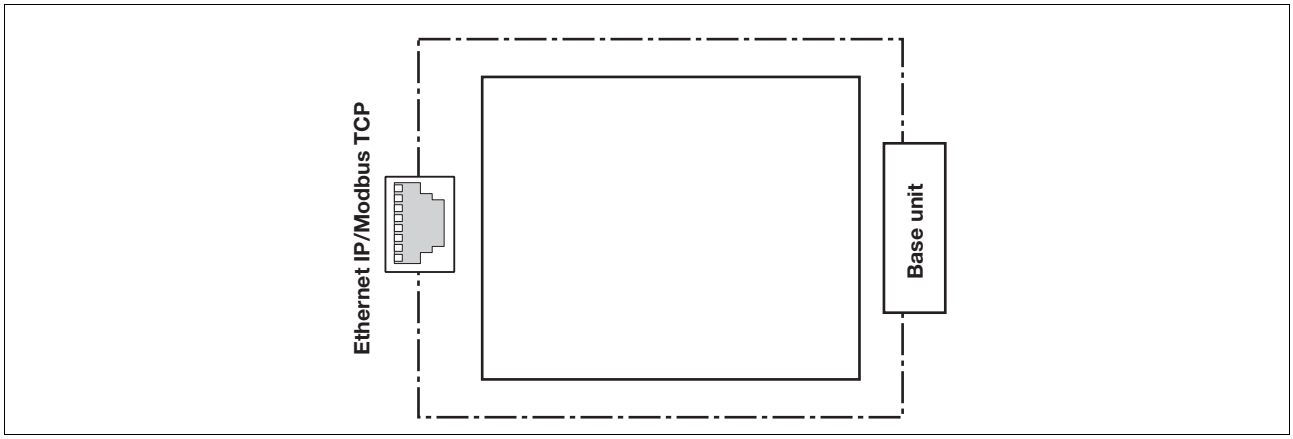
- E-STOP installations
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The PNOZ mc8p expansion module is used for communication between the PNOZmulti modular safety system and Ethernet IP plus Modbus TCP.
Ethernet IP and Modbus TCP is designed for fast data exchange at field level. The PNOZ mc8p expansion module is a passive Ethernet IP (Adapter) or Modbus TCP (Slave) subscriber. The basic functions of communication with Ethernet IP and Modbus TCP conform to IEEE 802.3.
The central controller (master) reads input information from the slaves and writes output information to the slaves as part of each cycle. As well as the cyclical transfer of usable data, the PNOZ mc8p can also be used for diagnostics and commissioning functions.
The expansion module may not be used for safety-related functions.

**System requirements**

- PNOZmulti Configurator: From Version 4.0.2
- Base unit PNOZ m0p: From Version 1.1
- Base unit PNOZ m1p: From Version 4.1
- Base unit PNOZ m2p: From Version 1.1

**Block diagram**






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

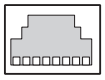
# Expansion modules
## PNOZ mc8p

**Function description**

The data to be transferred via Ethernet IP or Modbus TCP is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc8p are connected via a jumper. The PNOZ mc8p is also supplied with voltage via this jumper. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc8p is configured and started automatically.

**Verdrahtung**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which inputs and outputs on the safety system will communicate with Ethernet IP and Modbus TCP. The connection to Ethernet IP and Modbus TCP is made via RJ45 connectors.



8 1

| Pin | Standard |
|---|---|
| 1 | TD+ (Transmit+) |
| 2 | TD- (Transmit-) |
| 3 | RD+ (Receive+) |
| 4 | n.c. |
| 5 | n.c. |
| 6 | RD- (Receive-) |
| 7 | n.c. |
| 8 | n.c. |

n.c.: not connected

Please note:
- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.

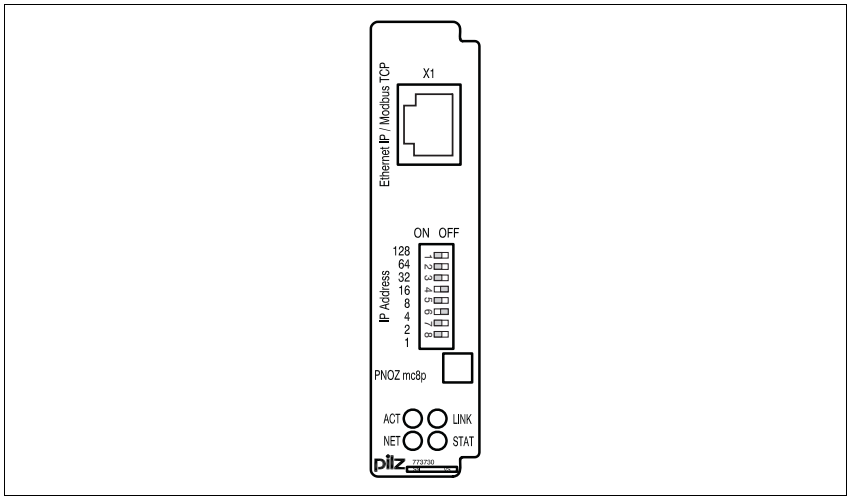
Please note the following when connecting to Ethernet IP and Modbus TCP:
- The following minimum requirements of the connection cable and connector must be met:
  - Only use standard industrial Ethernet cable and connectors.
  - Only use double-shielded twisted pair cable and shielded RJ45 connectors (industrial connectors).
  - 10BaseT or 100BaseTX cable in accordance with the Ethernet standard (min. Category 5)
- Measures to protect against interference:
  Ensure the requirements for the industrial use of Ethernet are met (IEEE 802.3u).



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc8p

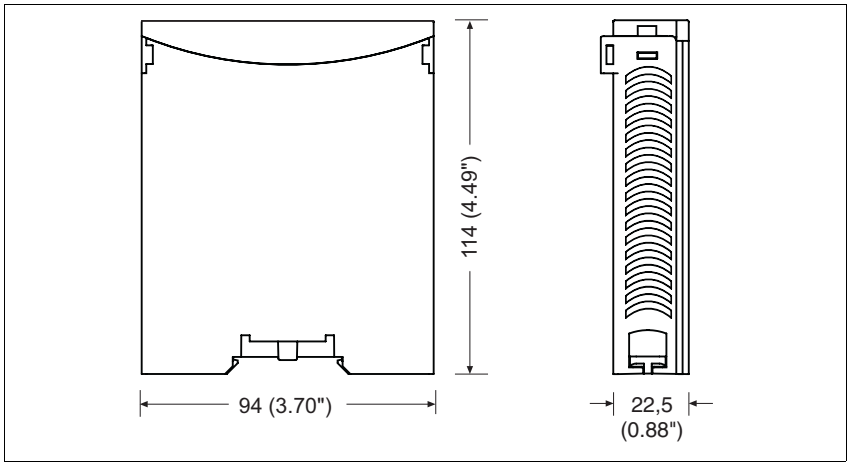
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mc8p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

**Technical details**

| | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | |
| via base unit | **24 VDC** |
| Power consumption at $U_B$ | **Max 2.5 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **Ethernet IP/Modbus TCP** | |
| Application range | **Non-safety-related applications** |
| Unit type | |
| Ethernet IP | **Adapter** |
| Modbus TCP | **Slave** |
| Status indicator | **LED** |
| Connection | |
| Ethernet IP/Modbus TCP | **RJ45 socket** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +50 °C** |
| With forced convection | **0 ... +60 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 114 mm** |
| Weight with connector | **140 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc8p | Expansion module | Fieldbus module, Ethernet IP, Modbus TCP | 773 730 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc9p

Expansion module for connection to a base unit from the PNOZmulti modular safety system

**Approvals**

| | PNOZ mc9p |
|---|---|
| CC | ◆ |

**Unit features**

- Can be configured in the PNOZmulti Configurator
- Connection for PROFINET IO
- Transmission rate 100 MBit/s (100BaseTX)
- Status indicators for communication and for errors
- Max. 1 PNOZ mc9p can be connected to the base unit
- A maximum of 24 inputs and 24 outputs on the PNOZmulti safety system can be defined in the PNOZmulti Configurator for communication with PROFINET IO.

**Unit description**

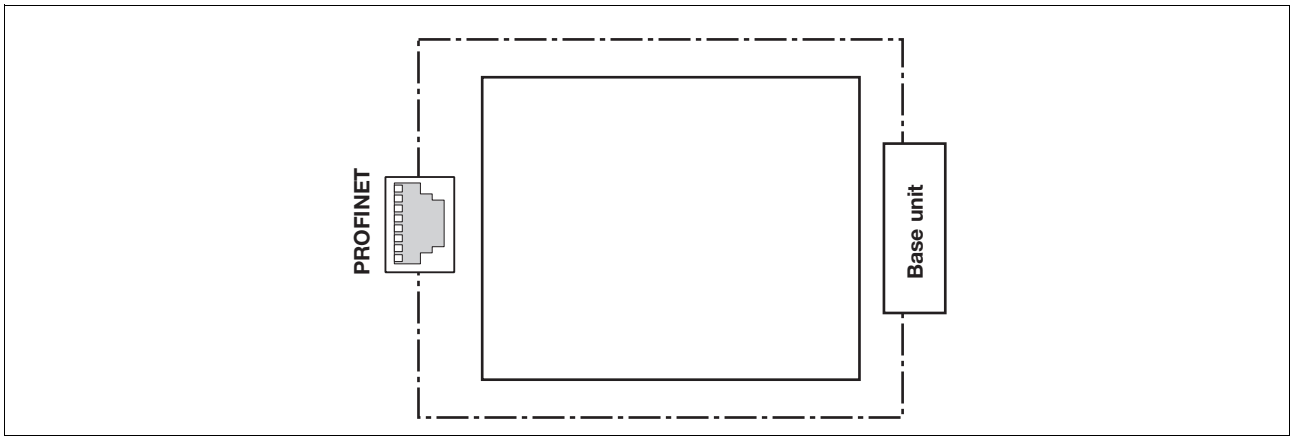
The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to PROFINET IO.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.
The unit is designed for use in:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The PNOZ mc9p expansion module is used for communication between the PNOZmulti modular safety system and PROFINET IO.
PROFINET IO is designed for fast data exchange at field level. The PNOZ mc9p expansion module is a passive PROFINET IO subscriber. The basic communication functions with PROFINET IO conform to the System Description published by the PROFIBUS User Group. The central controller (master) reads input information from the slaves and writes output information to the slaves as part of each cycle.
The expansion module may not be used for safety-related functions.

**System requirements**

- PNOZmulti Configurator: From Version 5.0.0
- Base unit PNOZ m0p: From Version 2.2
- Base unit PNOZ m1p: From Version 5.2
- Base unit PNOZ m2p: From Version 2.2

**Block diagram**



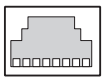
# Expansion modules
## PNOZ mc9p

**Function description**

The data to be transferred via PROFINET IO is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc9p are connected via a jumper. The PNOZ mc9p is also supplied with voltage via this jumper. After the supply voltage is switched on or the PNOZmulti safety system is reset, the PNOZ mc9p is configured and started automatically.

**Wiring**

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which inputs and outputs on the safety system will communicate with PROFINET IO. The connection to PROFINET IO is made via RJ45 connectors.



8 1

| Pin | Standard |
|---|---|
| 1 | TD+ (Transmit+) |
| 2 | TD- (Transmit-) |
| 3 | RD+ (Receive+) |
| 4 | n.c. |
| 5 | n.c. |
| 6 | RD- (Receive-) |
| 7 | n.c. |
| 8 | n.c. |

n.c.: not connected

Please note:
- Information given in the "Technical details" must be followed.
- Use copper wire that can withstand 75 °C.

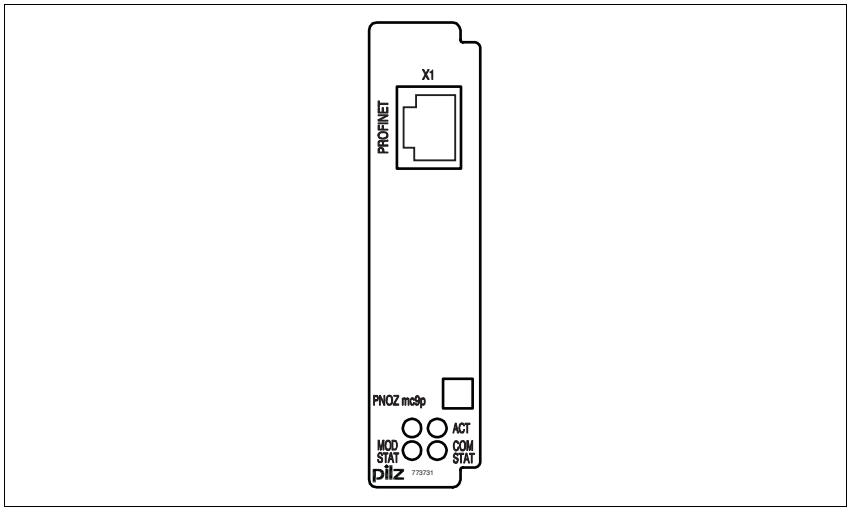
Please note the following when connecting to PROFINET IO:
- The following minimum requirements of the connection cable and connector must be met:
  - Only use standard industrial Ethernet cable and connectors.
  - Only use double-shielded twisted pair cable and shielded RJ45 connectors (industrial connectors).
  - 100BaseTX cable in accordance with the Ethernet standard (min. Category 5)
- Measures to protect against interference:
  Ensure the requirements for the industrial use of PROFINET IO are met, as stated in the Installation Manual published by the User Group.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mc9p

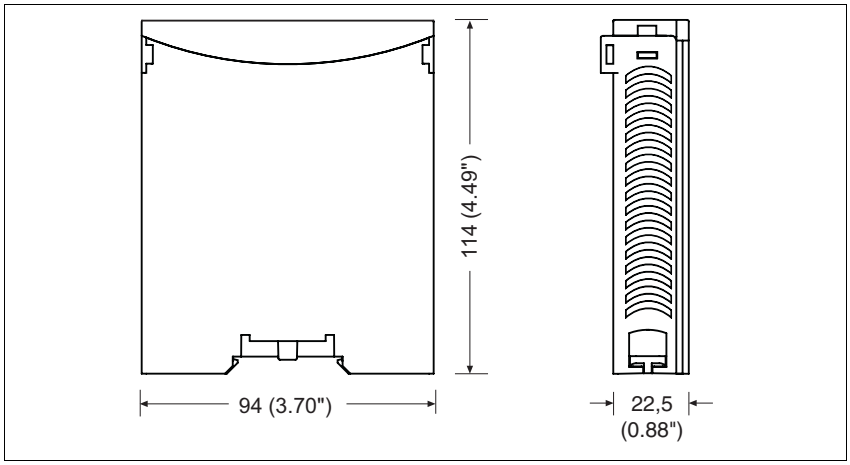
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ mc9p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Power consumption at $U_B$ | **Max 2.5 W** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| **PROFINET IO** | |
| Application range | **Non-safety-related applications** |
| Unit type PROFINET IO | **Slave** |
| Status indicator | **LED** |
| Transmission rate | **100 MBit/s** |
| Connection | **RJ45 socket** |
| Galvanic isolation | **Yes** |
| Test voltage | **500 VAC** |
| **Environmental data** | |
| Vibration in accordance with **EN 60068-2-6, 04/95** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86** |
| EMC | **EN 61000-6-2, 10/01** |
| Ambient temperature | **0 ... +50 °C** |
| With forced convection | **0 ... +60 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 114 mm** |
| Weight with connector | **140 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ mc9p | Expansion module | Fieldbus module, PROFINET IO | 773 731 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ml1p

Connection module for the safe connection of two PNOZmulti safety systems

### Approvals

| | PNOZ ml1p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

### Unit features

- Can be configured in the PNOZmulti Configurator
- Point-to-point connection via 4-core shielded, twisted-pair cable
- 32 virtual inputs and 32 virtual outputs
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 4 PNOZ ml1p units can be connected to the base unit

### Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

### System requirements

- PNOZmulti Configurator: from Version 5.2.0
- Base unit PNOZ m0p: From Version 2.3
- Base unit PNOZ m1p: From Version 5.3
- Base unit PNOZ m2p: From Version 2.3

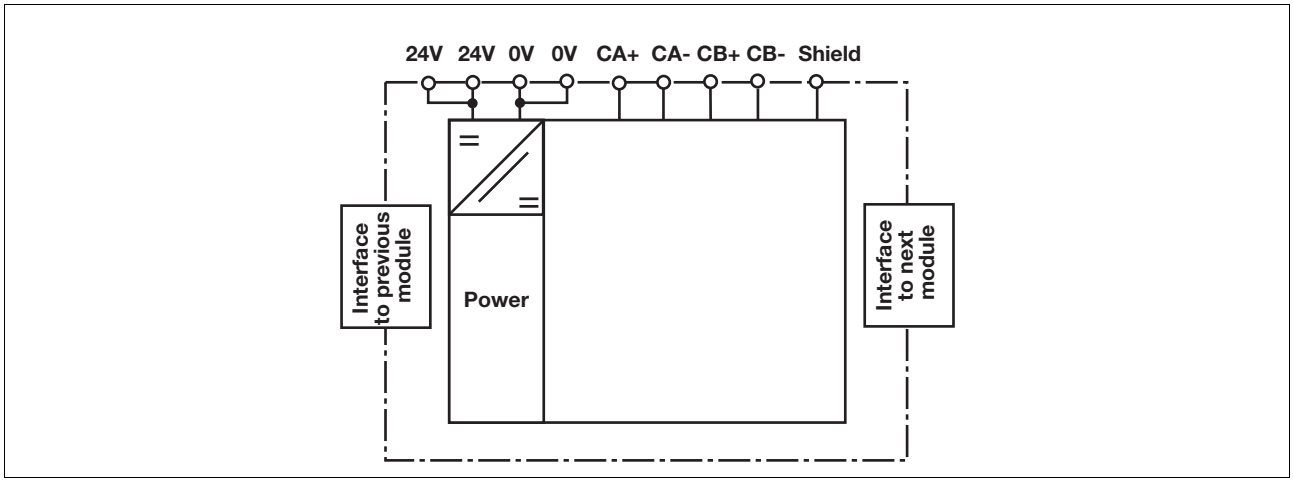
Please contact Pilz if you have an older version.

### Safety features

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

### Block diagram






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ml1p

**Function description**

The PNOZ ml1p connection module is used for the safe transfer of 32 virtual inputs and 32 virtual outputs between two PNOZmulti systems. One connection module is assigned to each base unit. Data is exchanged cyclically.

The function of the inputs and 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.

**Data exchange:**
- Data is exchanged cyclically.
- After the end of a PNOZmulti cycle, each base unit sends its output data to its connection module. This output data is immediately sent to the connection module on the other base unit.
- At the same time, the base unit reads the input data from the connection module.

**Wiring**

The wiring is defined in the circuit diagram in the Configurator. Inputs and outputs can be selected there.
Please note:
- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.
- Connect the inputs and outputs from two PNOZ ml1p with a 4-core shielded cable. The cables must be twisted in pairs (see “Preparing for operation”).
- Note the crossover cabling, e.g. CA+ with CB+.
- You can use ready-made cable from Pilz to connect two PNOZ ml1p. The plug-in connection terminals are either designed as cage clamp terminals or screw terminals (see order references).
- Cable shield:
  – Please note: Always connect the shield to both connection modules (**Shield** terminal).
  – The shield of the connection cable may only be connected to the **Shield** terminals on both PNOZ ml1p. Do **not** connect the shield to the equipotential bonding bar, for example.

**Connection of multiple base units:**
Any number of base units can be connected via PNOZ ml1p connection modules. Two PNOZ ml1p are required for the connection between two base units. However, only a maximum of 4 connection modules may be connected to any one base unit.

**Data transmission time:**
The $t_{BUS}$ data transmission time is the time between the virtual output at base unit 1 being set and the virtual input at base unit 2 becoming available (see "Technical details").

**The maximum reaction time for series connection of n base units**
is the time between the activation of a safety function at the input on one base unit and the switching of an output on the connected base unit.
- The maximum reaction time $t_{SUM}$ includes the following times:
  $t_{ON}$: Input delay = 4 ms
  $t_{COND}$: Switch-off delay of semiconductor output = 30 ms
  $t_{REL}$: Switch-off delay of relay output = 50 ms
  $t_{BUS}$: Data transmission time between two base units = 35 ms
  n: Number of connections between base units

The maximum reaction time $t_{SUM}$ for series connection of n base units
- With semiconductor outputs:
  $tS_{UM} = t_{ON} + (n * t_{BUS}) + t_{COND}$
- With relay outputs:
  $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{REL}$
- Input delay and switch-off delay are only included once in the reaction time. The data transmission time between the connection modules is multiplied by the number of connections.
- Please refer to the connection examples under “Preparing for operation”.

**Caution!**
For signals that are forwarded or received via the PNOZ ml1p, the overall reaction time, e.g. the maximum reaction time of the series connection of n base units, must always be considered in the risk assessment.
The risk assessment must consider all hazards as regards the reaction time and the safety distance. The overall reaction time must not delay the transfer to a safe condition by more than the permitted time.

**Virtual inputs and outputs:**
Inputs and outputs for both PNOZmulti systems are assigned in the PNOZmulti Configurator. Inputs and outputs with the same number are assigned to each other, e.g. output o5 on one PNOZmulti system to input i5 on the other PNOZmulti system.

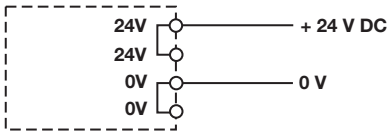


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ml1p

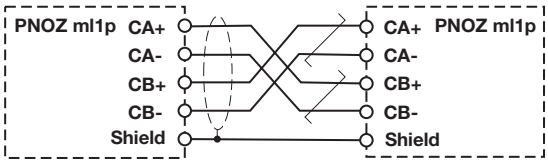
### Preparing for operation

- Supply voltage

| Supply voltage | AC | DC |
|---|---|---|
| | |  |

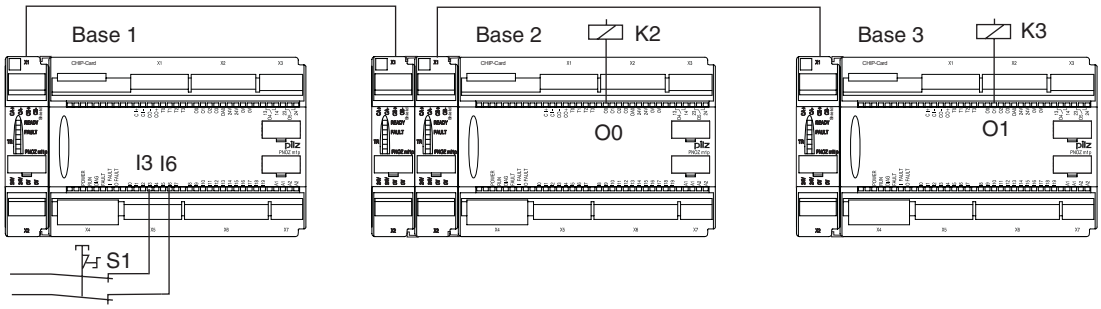


- Connection of two PNOZmulti base units via PNOZ ml1p





- Connection example 1
  Series connection of 3 base units
  Reaction time $t_{SUM}$ between base unit Base 1 and Base 2:
  Input delay $t_{ON}$ at I3 and I6 + data transmission time 1 * $t_{BUS}$ through connection module + switch-off delay $t_{COND}$ of semiconductor output at O0
  $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$
  $t_{SUM}$ = 4 ms + (1 * 35 ms ) + 30 ms = 69 ms
  Reaction time $t_{SUM}$ between base unit Base 1 and Base 3:
  Input delay $t_{ON}$ at I3 and I6 + data transmission time 2 * $t_{BUS}$ through connection modules + switch-off delay $t_{COND}$ of semiconductor output at O1
  $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$
  $t_{SUM}$ = 4 ms + (2 * 35 ms ) + 30 ms = 104 ms



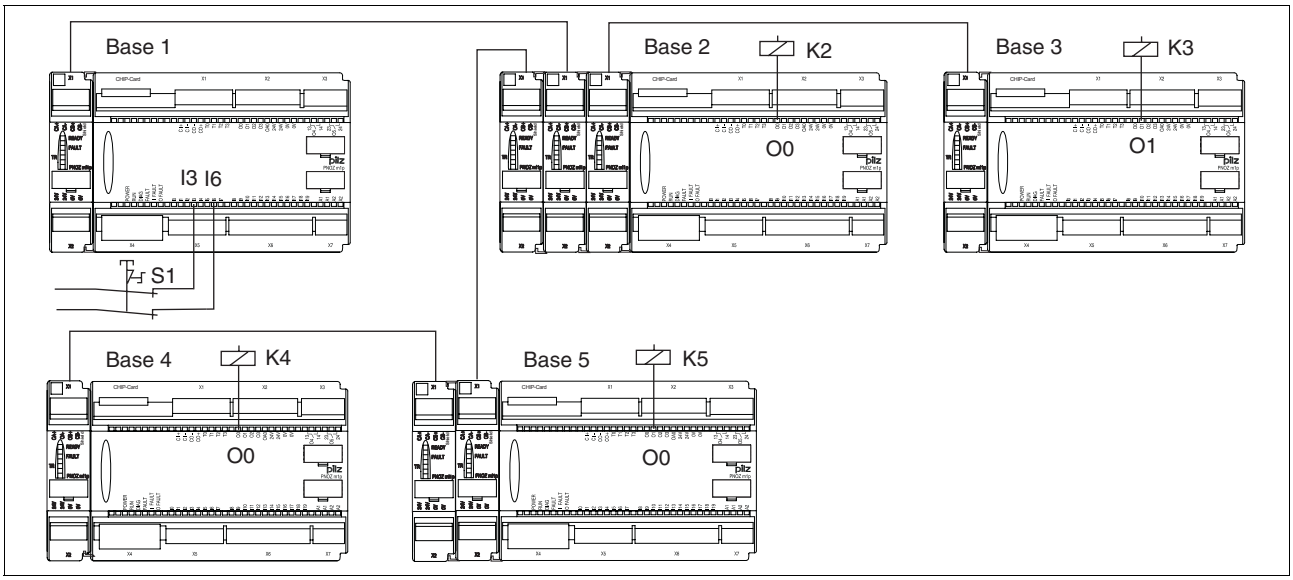




Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ml1p

- Connection example 2
  Connection of 5 base units. The reaction times are calculated in the same way as application example 1. After pressing S1 on Base 1, the semiconductor outputs switch after the following reaction times $t_{SUM}$:
  O0 on Base 1: 69 ms
  O1 on Base 3: 104 ms
  O0 on Base 4: 139 ms
  O0 on Base 5: 104 ms



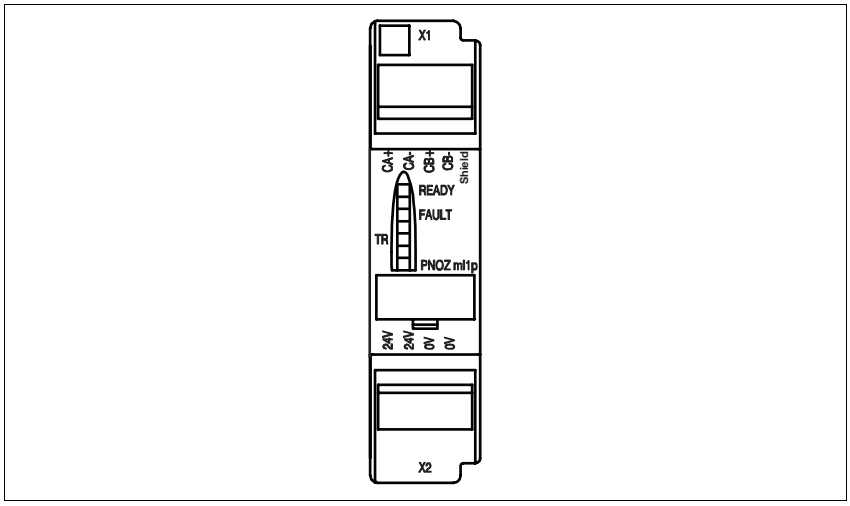





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ml1p

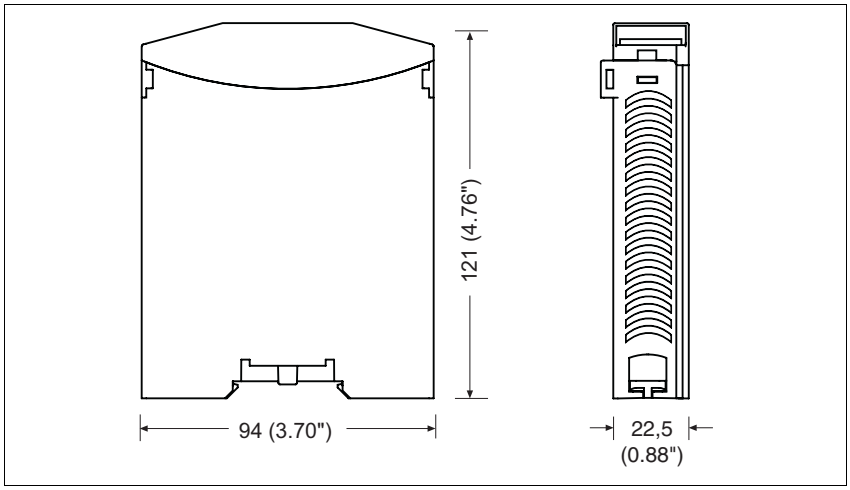
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ ml1p

**NOTICE** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| **Technical details** | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) | **24 VDC** |
| Power consumption at $U_B$ | **5 W** |
| Galvanic isolation | **Yes** |
| Test voltage | **2 kV** |
| **Times** | |
| Switch-on delay | **5 s (after $U_B$ is applied)** |
| Supply interruption before de-energisation | **Min. 20 ms** |
| Data transmission time | **Max. 35 ms** |
| **Inputs** | |
| Number of virtual inputs | **32** |
| Input delay | **30 ms** |
| **Outputs** | |
| Number of virtual outputs | **32** |
| **Environmental data** | |
| Airgap creepage | **DIN VDE 0110-1, 04/97** |
| Vibration in accordance with **EN 60068-2-6, 01/00** | |
| Frequency: | **10 ... 55 Hz** |
| Amplitude: | **0.35 mm** |
| Climatic suitability | **EN 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 11/97** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Maximum cable runs between two PNOZ ml1p | **100 m** |
| Cross section of external conductors | |
| Rigid single-core, flexible multi-core or multi-core | |
| With crimp connector | **0.2 ... 1.5 mm$^2$** |
| Torque setting for connection terminals (screws) | **0.2 ... 0.25 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 22.5 x 121 mm** |
| Weight with connector | **130 g** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ mI1p

**Order reference**

| Type | Features | | | Terminals | Order no. |
|---|---|---|---|---|---|
| PNOZ mI1p | | Expansion module | | | 773 540 |
| PNOZ mIi1p | | Cable | 5 m | With screw terminals | 773 890 |
| PNOZ mIi1p | | Cable | 10 m | With screw terminals | 773 891 |
| PNOZ mIi1p | | Cable | 50 m | With screw terminals | 773 892 |
| PNOZ mIi1p | | Cable | 5 m | With cage clamp terminals | 773 893 |
| PNOZ mIi1p | | Cable | 10 m | With cage clamp terminals | 773 894 |
| PNOZ mIi1p | | Cable | 50 m | With cage clamp terminals | 773 895 |
| PNOZ mi1p | | 1 set of cage clamp terminals | | | 783 400 |
| PNOZ mi1p | | 1 set of screw terminals | | | 793 400 |

# Expansion modules
## PNOZ ms1p

Speed monitor for connection to a base unit from the PNOZmulti modular safety system

### Approvals

| | PNOZ ms1p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |



### Unit features

- Monitoring of 2 independent axes
- Connection per axis
  - 1 incremental encoder or
  - 2 proximity switches or
  - 1 incremental encoder and 1 proximity switch
- Measured variables:
  - Standstill
  - Speed (8 values can be set)
  - Direction of rotation
- Axis types, input device types and reset mode can be selected in the PNOZmulti Configurator
- Status indicators for
  - Supply voltage
  - Incremental encoders
  - Proximity switches
  - Axis status, standstill and excess speed
  - Faults on the system
- Proximity switch connection technology: Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Incremental encoder connection technology:
  RJ-45 female connector
- Galvanic isolation between the connections X1, X12 and X22
- Max. 4 speed monitors can be connected to the base unit

### Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It monitors standstill, speed and direction of rotation up to Category 3 of EN 954-1.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

### System requirements

- PNOZmulti Configurator: from Version 5.1.0
- Base unit PNOZ m1p: from Version 5.2
- Base unit PNOZ m2p: from Version 2.2

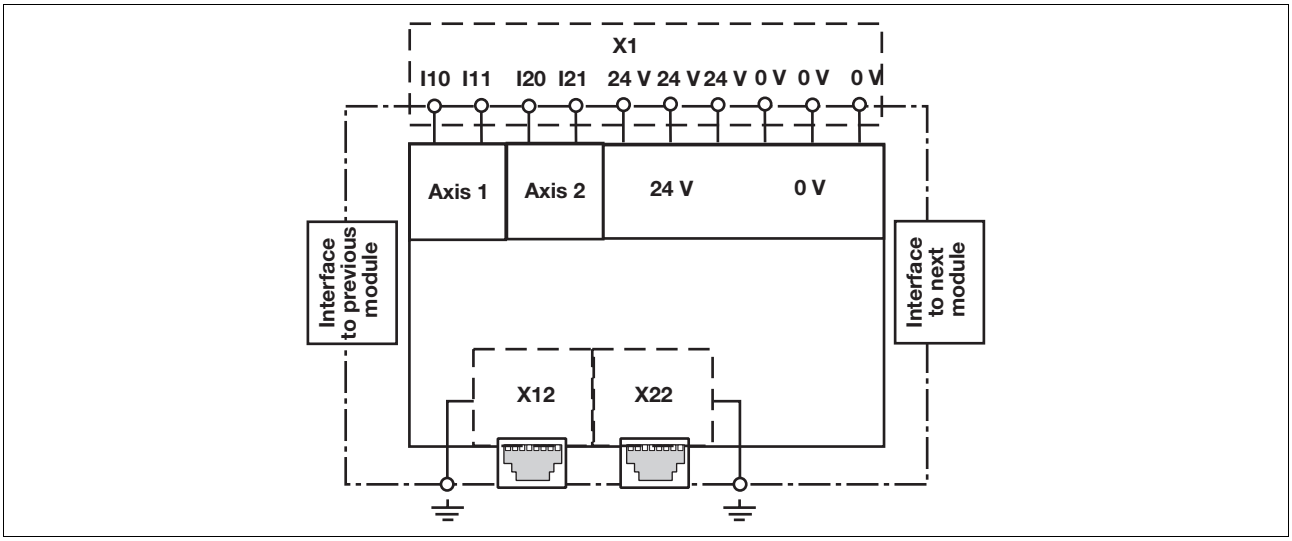
Please contact Pilz if you have an older version.

### Safety features

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

### Block diagram






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

NSG-D-2-379-2006-10

# Expansion modules
## PNOZ ms1p

**Function description**

The speed monitor can independently monitor two axes for standstill, speed and direction of rotation. The speed monitor signals the status of the monitored values to the base unit. Depending on the safety circuit loaded, the values can be transferred from the base unit, e.g. to a relay output on the safety system. Incremental encoders and/or proximity detectors can be used to record the values.

**Wiring**

The wiring is defined in the circuit diagram in the Configurator.
Details of the input type, axis type and reset mode, plus the values for standstill, speed monitoring and direction of rotation are also defined in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Use copper wire that can withstand 75 °C.

**Proximity switches**

- Only “pnp” type proximity switches may be used (N/O contact, positive-switching)
- The proximity switches must be positioned in such a way that at least one is energised (carries a high signal).
- The proximity switches must be offset in such a way that the recorded signals overlap.

The outputs of both the proximity switches for axis 1 are connected to terminals I10 and I11; both the outputs of the proximity switches for axis 2 are connected to terminals I20 und I21. If only one axis is to be monitored, either terminals I10 and I11 or terminals I20 and I21 will remain free. The proximity switch must always be connected to a 0 V terminal on the speed monitor. The 0 V terminals are linked internally.
The proximity switches require a 24 VDC supply. To reduce the amount of wiring involved, this supply voltage can be connected to one of the “24 V” terminals on the PNOZ ms1p. As all 3 “24 V” terminals are linked internally, 24 V will be present at all 3 terminals. The proximity switches can therefore be connected directly to the 24 V terminals on the speed monitor, rather than the power supply.

**Incremental encoders**

- Only incremental encoders with a differential output of the following type are permitted
  - Sin/Cos
  - TTL (RS 422)

The incremental encoders are connected via an adapter or are connected directly to the speed monitor (see data sheets: "Connection cable, adapter for PNOZ ms1p"). The adapter is connected between the incremental encoder and the drive. The output on the adapter is connected to the RJ-45 female connector on the speed monitor. The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.

**Incremental encoder and proximity switch on one axis**

From Version 2.0 of the PNOZ ms1p/ PNOZ ms2p speed monitor, an incremental encoder and a proximity switch may be configured on one axis to increase availability. That way the speed monitor can monitor 3 signals on one axis: Track A and track B of the incremental encoder plus the proximity switch:
Standstill monitoring
Standstill is detected when at least two of these signals fall below the standstill frequency.
Monitoring for broken shearpins
A broken shearpin is detected when
- Both tracks of the incremental encoder signal “Standstill”

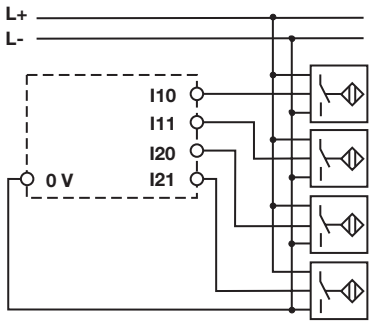
and
- The proximity switch signals “Rotating shaft”

This status will only lead to a safe condition if the option for broken shearpin monitoring has been activated in the configuration.

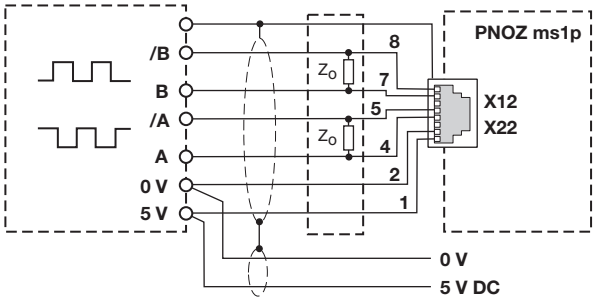
# Expansion modules
## PNOZ ms1p

**Preparing for operation**

- Proximity switch




- Incremental encoder

| | |
|---|---|
| Encoder type 1 Vss, 5 V-TTL<br>Terminate incremental encoder mit<br>$Z_o$ = 120 Ohm |  |



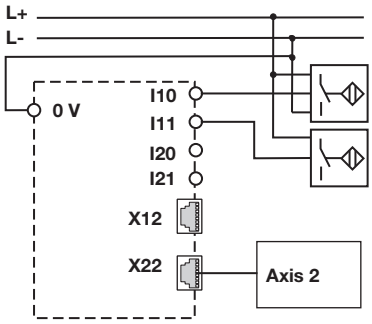
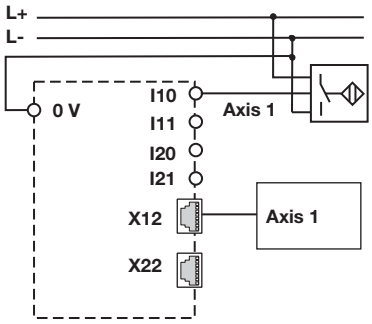




Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

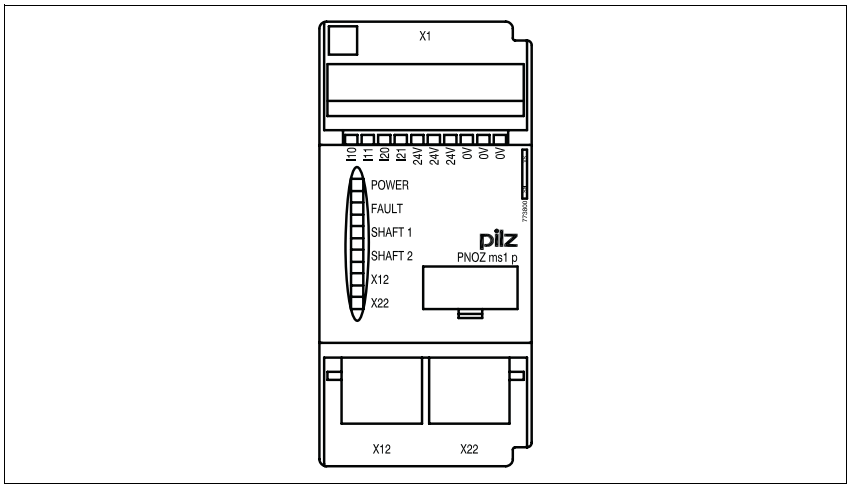
# Expansion modules
## PNOZ ms1p

- Proximity switch and incremental encoder

| | |
|---|---|
| Proximity switch and incremental encoder on various axes<br>Axis 1:<br>Proximity switch at I10, I11<br>**or**<br>Incremental encoder at X12<br>Axis 2:<br>Proximity switch at I20, I21<br>**or**<br>Incremental encoder at X22 |  |
| Proximity switch and incremental encoder on one axis<br>Axis 1:<br>Proximity switch at I10 (I11 remains free)<br>**and**<br>Incremental encoder at X12<br>Axis 2:<br>Proximity switch at I20 (I21 remains free)<br>**and**<br>Incremental encoder at X22 |  |

# Expansion modules
## PNOZ ms1p

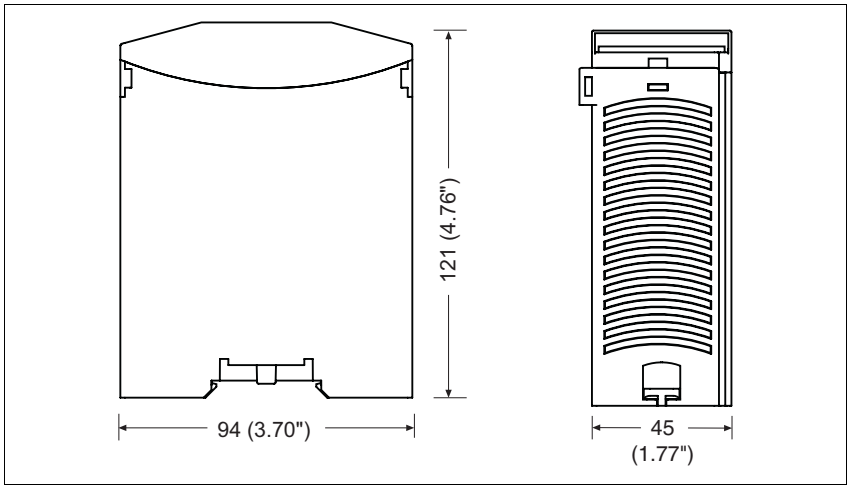
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions








Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ms1p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| **Technical details** | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ via base unit | **Typ. 1 W** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| Configurable switch-off delay | **0 ... 2500 ms** |
| Response time<br>f ≥ 100 Hz:<br>Configurable switch-off delay +<br>Switch-off delay PNOZ m1p +<br>f < 100 Hz:<br>Configurable switch-off delay +<br>Switch-off delay PNOZ m1p + | <br><br><br>**10 ms**<br><br><br>**10 ms + 1/f** |
| **Proximity switch input** | |
| Number of inputs | **4 (2 axes)** |
| Signal level at the inputs<br>"1" Signal (high)<br>"0" Signal (low) | <br>**11 V … 30 V**<br>**-3 … 5 V** |
| Input resistance | **3 kOhm** |
| Input's frequency range | **0 … 3 kHz** |
| Configurable monitoring frequency<br>Without hysteresis<br>With hysteresis | <br>**0.1 Hz ... 3 kHz**<br>**0.2 Hz ... 3 kHz** |
| Connection type | **Cage clamp terminals** |
| Cross section of external conductors<br>Rigid single-core, flexible multi-core or multi-core<br>With crimp connector<br>Flexible multi-core with plastic sleeve | <br><br>**0.5 ... 2.5 mm²**<br>**0.5 ... 1.5 mm²** |
| **Incremental encoder input** | |
| Number of inputs | **2 (2 axes)** |
| Supply voltage for incremental encoders | **5 V +/-10 %, typ. 30 mA** |
| Signal level at the inputs | **0.5 $V_{ss}$ … 5 $V_{ss}$** |
| Phase position for the differential signals A, /A and B | **90° ±30°** |
| Overload protection | **-30 V ... +30 V** |
| Input resistance | **10 kOhm** |
| Input's frequency range | **0 … 500 kHz** |
| Configurable monitoring frequency<br>Without hysteresis<br>With hysteresis | <br>**0.1 Hz ... 500 kHz**<br>**0.2 Hz ... 500 kHz** |
| Connection type | **RJ-45 female connector** |
| **Environmental data** | |
| Airgap creepage | **DIN VDE 0110-1, 04/97** |
| Vibration in accordance with **EN 60068-2-6, 04/95**<br>Frequency:<br>Amplitude: | <br>**10 ... 55 Hz**<br>**0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86**<br>**DIN CEI 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |

# Expansion modules
## PNOZ ms1p

| Mechanical data | |
|---|---|
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Torque setting for connection terminals (screws) | **0.4 ... 0.5 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 45 x 121 mm** |
| Weight with connector | **200 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ ms1p | Expansion module | Speed monitor | 773 800 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ms2p

Speed monitor for connection to a base unit from the PNOZmulti modular safety system

### Approvals

| | PNOZ ms2p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

### Unit features

- Monitoring of 2 independent axes
- Connection per axis
  - 1 incremental encoder or
  - 2 proximity switches or
  - 1 incremental encoder and 1 proximity switch
- Measured variables:
  - Standstill
  - Speed (8 values can be set)
  - Direction of rotation
- Axis types, input device types and reset mode can be selected in the PNOZmulti Configurator
- Status indicators for
  - Supply voltage
  - Incremental encoders
  - Proximity switches
  - Axis status, standstill and excess speed
  - Faults on the system
- Proximity switch connection technology: Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Incremental encoder connection technology:
  RJ-45 female connector
- Galvanic isolation between the connections X1, X12 and X22
- Max. 4 speed monitors can be connected to the base unit

### Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It monitors standstill, speed and direction of rotation up to Category 3 of EN 954-1.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

### System requirements

- PNOZmulti Configurator: from Version 5.1.0
- Base unit PNOZ m1p: from Version 5.2
- Base unit PNOZ m2p: from Version 2.2

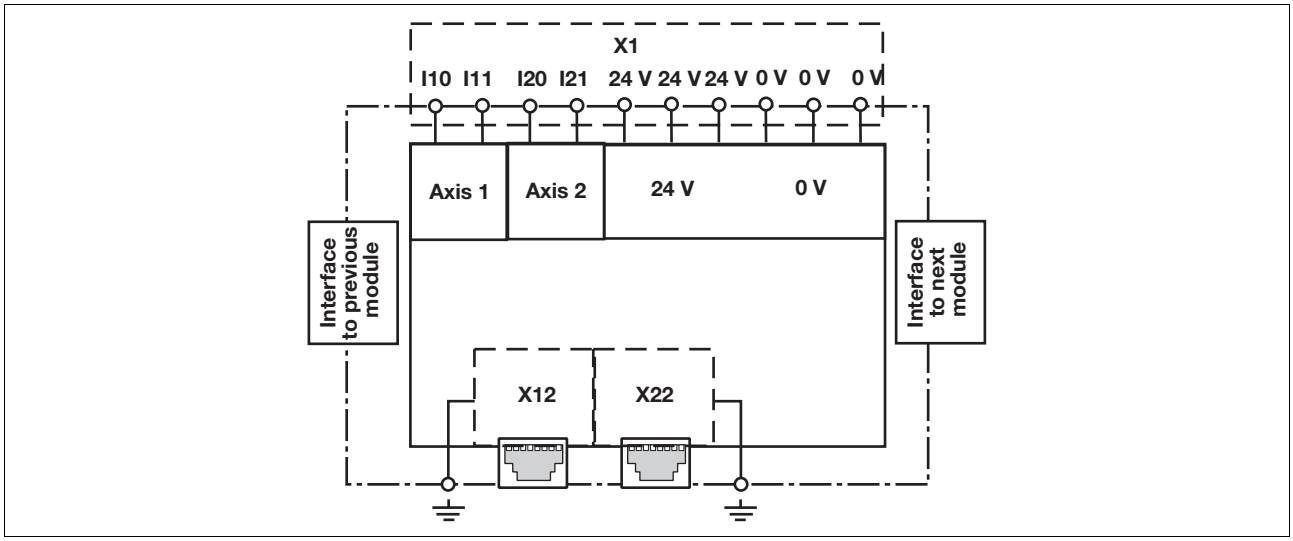
Please contact Pilz if you have an older version.

### Safety features

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

### Block diagram



# Expansion modules
## PNOZ ms2p

**Function description**

The speed monitor can independently monitor two axes for standstill, speed and direction of rotation. The speed monitor signals the status of the monitored values to the base unit. Depending on the safety circuit loaded, the values can be transferred from the base unit, e.g. to a relay output on the safety system. Incremental encoders and/or proximity detectors can be used to record the values.

**Wiring**

The wiring is defined in the circuit diagram in the Configurator.
Details of the input type, axis type and reset mode, plus the values for standstill, speed monitoring and direction of rotation are also defined in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Use copper wire that can withstand 75 °C.

**Proximity switches**

- Only “pnp” type proximity switches may be used (N/O contact, positive-switching)
- The proximity switches must be positioned in such a way that at least one is energised (carries a high signal).
- The proximity switches must be offset in such a way that the recorded signals overlap.

The outputs of both the proximity switches for axis 1 are connected to terminals I10 and I11; both the outputs of the proximity switches for axis 2 are connected to terminals I20 und I21. If only one axis is to be monitored, either terminals I10 and I11 or terminals I20 and I21 will remain free. The proximity switch must always be connected to a 0 V terminal on the speed monitor. The 0 V terminals are linked internally.
The proximity switches require a 24 VDC supply. To reduce the amount of wiring involved, this supply voltage can be connected to one of the “24 V” terminals on the PNOZ ms1p. As all 3 “24 V” terminals are linked internally, 24 V will be present at all 3 terminals. The proximity switches can therefore be connected directly to the 24 V terminals on the speed monitor, rather than the power supply.

**Incremental encoders**

- Only incremental encoders with a differential output of the following type are permitted
  - Sin/Cos
  - TTL (RS 422)
  - HTL (24 V)

The incremental encoders are connected via an adapter or are connected directly to the speed monitor (see data sheets: "Connection cable, adapter for PNOZ ms1p"). The adapter is connected between the incremental encoder and the drive. The output on the adapter is connected to the RJ-45 female connector on the speed monitor. The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.

**Incremental encoder and proximity switch on one axis**

From Version 2.0 of the PNOZ ms1p/ PNOZ ms2p speed monitor, an incremental encoder and a proximity switch may be configured on one axis to increase availability. That way the speed monitor can monitor 3 signals on one axis: Track A and track B of the incremental encoder plus the proximity switch:
Standstill monitoring
Standstill is detected when at least two of these signals fall below the standstill frequency.
Monitoring for broken shearpins
A broken shearpin is detected when
- Both tracks of the incremental encoder signal “Standstill”

and
- The proximity switch signals “Rotating shaft”

This status will only lead to a safe condition if the option for broken shearpin monitoring has been activated in the configuration.

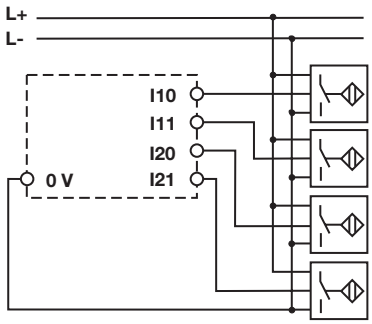


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

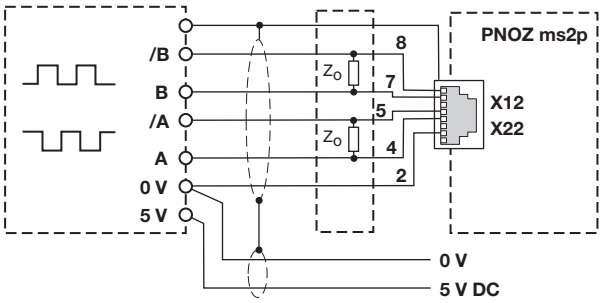
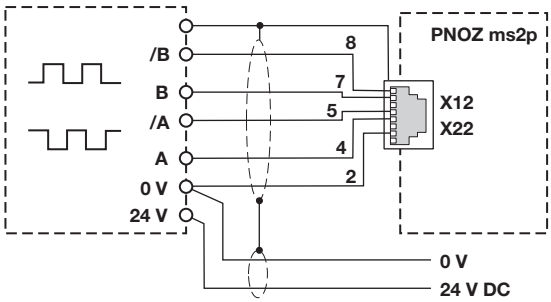
# Expansion modules
## PNOZ ms2p

**Preparing for operation**

- Proximity switch

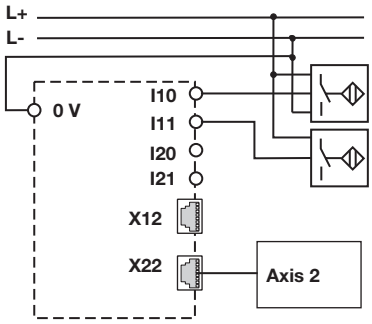
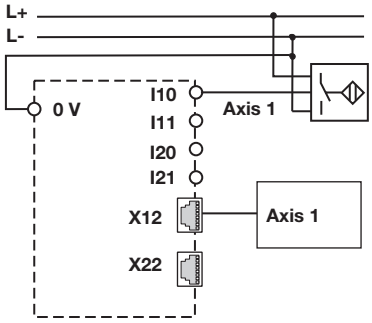



- Incremental encoder

| | |
|---|---|
| Encoder type 1 Vss, 5 V-TTL<br>Terminate incremental encoder mit<br>$Z_o$ = 120 Ohm |  |
| Encoder type 24 V-HTL<br>Do **not** terminate incremental encoder with<br>$Z_o$ = 120 Ohm |  |

# Expansion modules
## PNOZ ms2p

- Proximity switch and incremental encoder

| | |
|---|---|
| Proximity switch and incremental encoder on various axes<br>Axis 1:<br>Proximity switch at I10, I11<br>**or**<br>Incremental encoder at X12<br>Axis 2:<br>Proximity switch at I20, I21<br>**or**<br>Incremental encoder at X22 |  |
| Proximity switch and incremental encoder on one axis<br>Axis 1:<br>Proximity switch at I10 (I11 remains free)<br>**and**<br>Incremental encoder at X12<br>Axis 2:<br>Proximity switch at I20 (I21 remains free)<br>**and**<br>Incremental encoder at X22 |  |

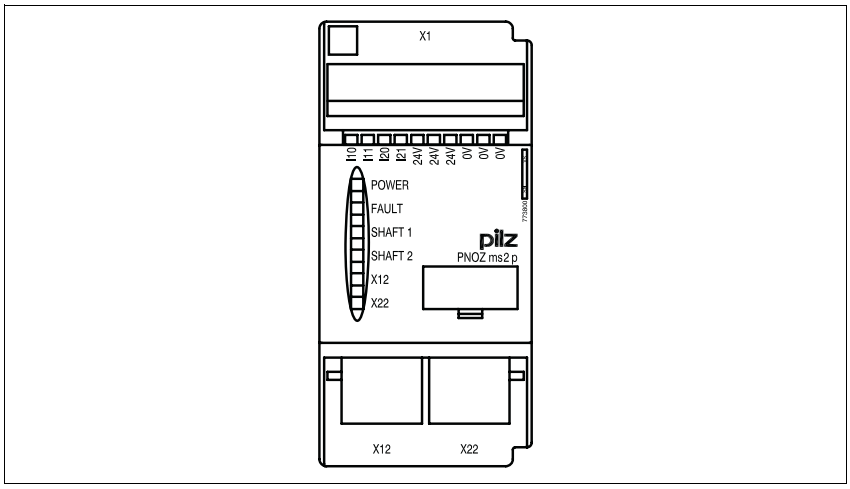




Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ms2p

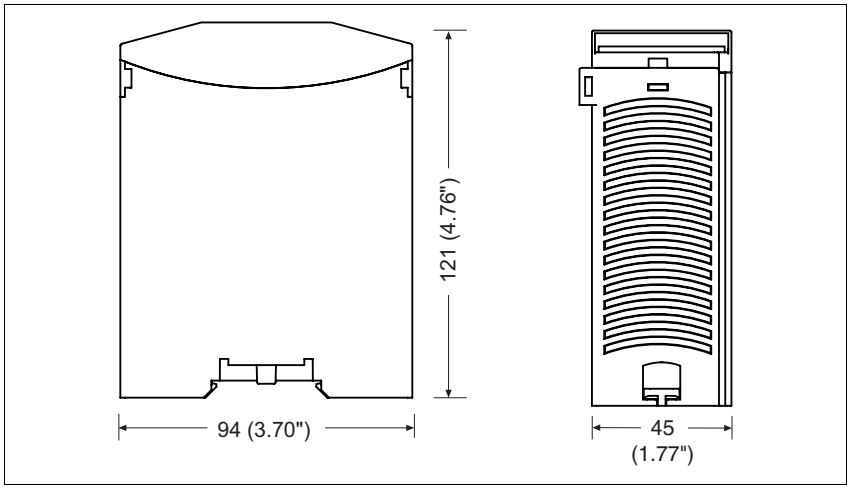
### Terminal configuration




### Installation

- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.
- To comply with EMC requirements, the DIN rail must have a low impedance connection to the control cabinet housing.

### Dimensions



# Expansion modules
## PNOZ ms2p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| Technical details | |
|---|---|
| **Electrical data** | |
| Supply voltage ($U_B$) via base unit | **24 VDC** |
| Voltage tolerance | **-15% ... 10%** |
| Power consumption at $U_B$ via base unit | **Typ. 1 W** |
| Residual ripple $U_B$ | **+/- 5 %** |
| **Times** | |
| Supply interruption before de-energisation | **Min. 20 ms** |
| Configurable switch-off delay | **0 ... 2500 ms** |
| Response time<br>f ≥ 100 Hz:<br>Configurable switch-off delay +<br>Switch-off delay PNOZ m1p +<br>f < 100 Hz:<br>Configurable switch-off delay +<br>Switch-off delay PNOZ m1p + | <br><br><br>**10 ms**<br><br><br>**10 ms + 1/f** |
| **Proximity switch input** | |
| Number of inputs | **4 (2 axes)** |
| Signal level at the inputs<br>"1" Signal (high)<br>"0" Signal (low) | <br>**11 V … 30 V**<br>**-3 … 5 V** |
| Input resistance | **3 kOhm** |
| Input's frequency range | **0 … 3 kHz** |
| Configurable monitoring frequency<br>Without hysteresis<br>With hysteresis | <br>**0.1 Hz ... 3 kHz**<br>**0.2 Hz ... 3 kHz** |
| Connection type | **Cage clamp terminals** |
| Cross section of external conductors<br>Rigid single-core, flexible multi-core or multi-core<br>With crimp connector<br>Flexible multi-core with plastic sleeve | <br><br>**0.5 ... 2.5 mm²**<br>**0.5 ... 1.5 mm²** |
| **Incremental encoder input** | |
| Number of inputs | **2 (2 axes)** |
| Supply voltage for incremental encoders | **Independent** |
| Signal level at the inputs | **0.5 $V_{SS}$ … 30 $V_{SS}$** |
| Phase position for the differential signals A, /A and B | **90° ±30°** |
| Overload protection | **-30 V ... +30 V** |
| Input resistance | **20 kOhm** |
| Input's frequency range | **0 … 500 kHz** |
| Configurable monitoring frequency<br>Without hysteresis<br>With hysteresis | <br>**0.1 Hz ... 500 kHz**<br>**0.2 Hz ... 500 kHz** |
| Connection type | **RJ-45 female connector** |
| **Environmental data** | |
| Airgap creepage | **DIN VDE 0110-1, 04/97** |
| Vibration in accordance with **EN 60068-2-6, 04/95**<br>Frequency:<br>Amplitude: | <br>**10 ... 55 Hz**<br>**0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3, 12/86**<br>**DIN CEI 60068-2-3, 12/86** |
| EMC | **EN 60947-5-1, 01/00** |
| Ambient temperature | **0 ... +55 °C** |
| Storage temperature | **-25 ... +70 °C** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ms2p

| Mechanical data | |
|---|---|
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Torque setting for connection terminals (screws) | **0.4 ... 0.5 Nm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions (H x W x D) | **94 x 45 x 121 mm** |
| Weight with connector | **220 g** |

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ ms2p | Expansion module | Speed monitor | 773 810 |

# Adapter for PNOZ ms1p and PNOZ ms2p





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

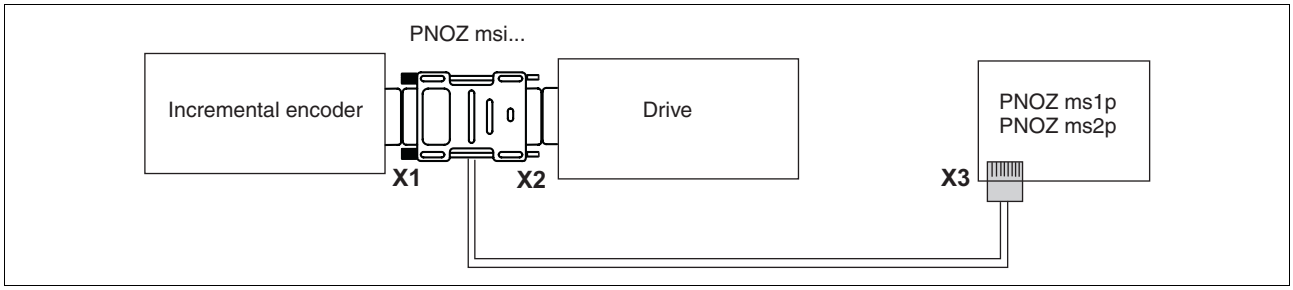
# Adapter for PNOZ ms1p and PNOZ ms2p


| Contents | Page |
|---|---|
| **Adapter for PNOZ ms1p and PNOZ ms2p** | |
| PNOZ msi1Ap, PNOZ msi1Bp, PNOZ msi3Ap, PNOZ msi3Bp | 2.4-2 |
| PNOZ msi6p | 2.4-4 |
| PNOZ msi9p, PNOZ msi10p, PNOZ msi11p | 2.4-6 |
| PNOZ msi S09, PNOZ msi S16, PNOZ msi S25 | 2.4-8 |

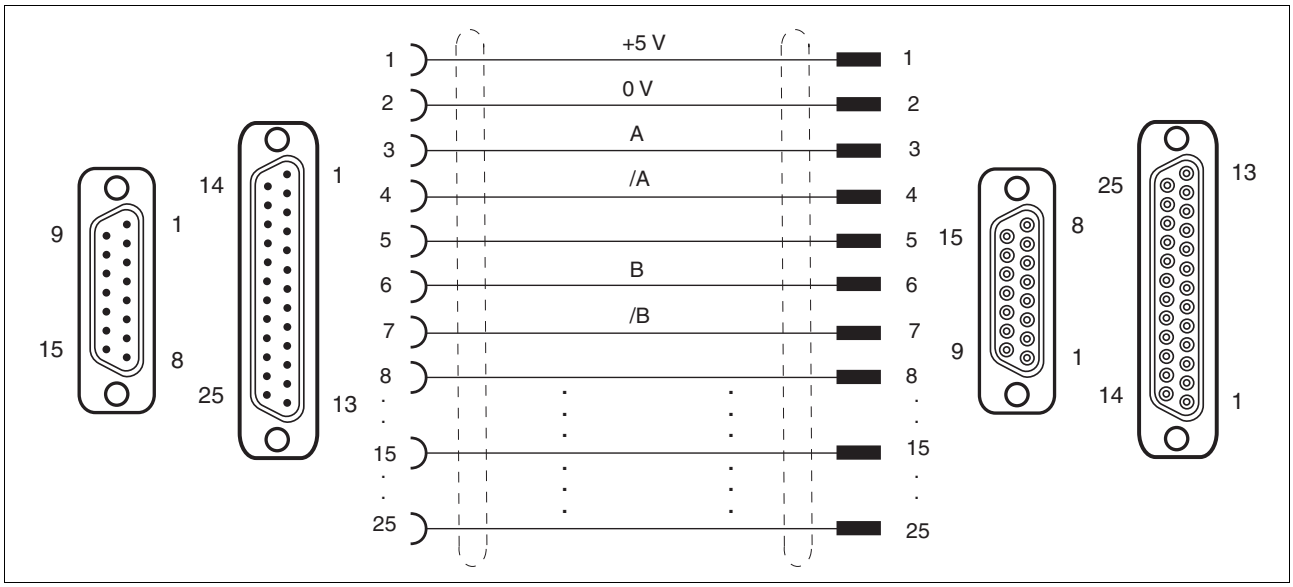
# Adapter for PNOZ ms1p and PNOZ ms2p

## PNOZ msi1Ap, PNOZ msi1Bp, PNOZ msi3Ap, PNOZ msi3Bp

### Connection




### Pin assignment




### Unit types

Various versions are available:

- PNOZ msi1Ap
  25-pin D-Sub connector and cable runs of 2.5 m
- PNOZ msi1Ap
  25-pin D-Sub connector and cable runs of 5 m
- PNOZ msi1Bp
  25-pin D-Sub connector and cable runs of 2.5 m
- PNOZ msi1Bp
  25-pin D-Sub connector and cable runs of 5 m
- PNOZ msi3Ap
  15-pin D-Sub connector and cable runs of 2.5 m
- PNOZ msi3Bp
  15-pin D-Sub connector and cable runs of 2.5 m

| Technical details | |
|---|---|
| **Environmental data** | |
| Connector X1 | **15/25-pin male D-Sub connector** |
| Connector X2 | **15/25-pin female D-Sub connector** |
| Connector X3 | **RJ-45 connector** |
| Condensation | **Not permitted** |
| Ambient temperature | **0 ... +60° C** |
| Storage temperature | **-25 ... +70° C** |
| Protection type | **IP20** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

NSG-D-2-382-2008-08

# Adapter for PNOZ ms1p and PNOZ ms2p

## PNOZ msi1Ap, PNOZ msi1Bp, PNOZ msi3Ap, PNOZ msi3Bp

| Environmental data | |
|---|---|
| Cable type | **CAT 6 flexible, silicone-free** |
| Cable runs L | **2500 mm/5000 mm** |
| Fixing screws | **UNC 4-40** |
| Weight | **PNOZ msi1Ap: 190 g** Order no. : 773840<br>**PNOZ msi1Ap: 280 g** Order no. : 773844<br>**PNOZ msi1Bp: 190 g** Order no. : 773841<br>**PNOZ msi1Bp: 280 g** Order no. : 773839<br>**PNOZ msi3Ap: 175 g**<br>**PNOZ msi3Bp: 175 g** |

**Order reference**

| Type | D-Sub | L | Order no. |
|---|---|---|---|
| PNOZ msi1Ap | 25-pin | 2.5 m | 773 840 |
| PNOZ msi1Ap | 25-pin | 5.0 m | 773 844 |
| PNOZ msi1Bp | 25-pin | 2.5 m | 773 841 |
| PNOZ msi1Bp | 25-pin | 5.0 m | 773 839 |
| PNOZ msi3Ap | 15-pin | 2.5 m | 773 842 |
| PNOZ msi3Bp | 15-pin | 2.5 m | 773 843 |

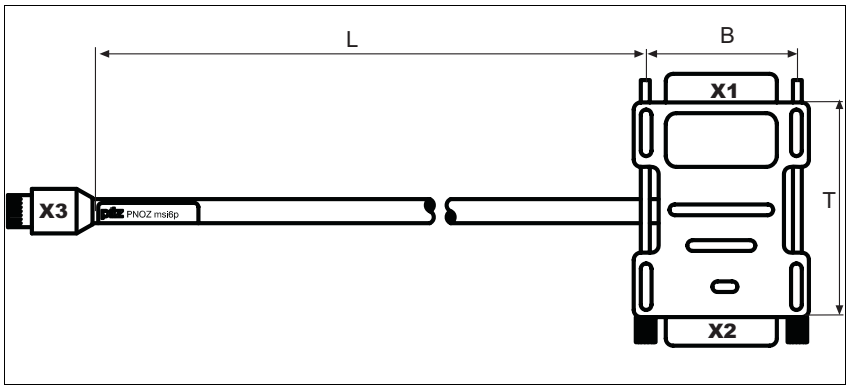
# Adapter for PNOZ ms1p and PNOZ ms2p
## PNOZ msi6p

**Description**

The connection cable is used to connect an incremental encoder to the PNOZ ms2p speed monitor.

The contacts on connectors X1 and X2 are connected and have the same assignment. The signals that are relevant for the speed monitor are recorded in parallel and are fed to the RJ-45 connector via the cable. These signals use the following pins on connectors X1 and X2:

| Signal | Pin No. |
|---|---|
| A | 2 |
| /A | 1 |
| B | 4 |
| /B | 3 |
| Vcc | nc |
| GND | 9 |




**Technical details**

| Environmental data | |
|---|---|
| Connector X1 | **Male 9-pin D-Sub connector** |
| Connector X2 | **Female 9-pin D-Sub connector** |
| Connector X3 | **RJ-45 connector** |
| Fixing screws | **M3** |
| Ambient temperature | **0 ... +60 °C** |
| Storage temperature | **-25 ... +70 °C** |
| Protection type | **IP51** |
| Dimensions W/D | **31.5 mm/40.0 mm** |
| Cable runs L | **7500 mm** Order no.: 773859<br>**2500 mm** Order no.: 773860<br>**1500 mm** Order no.: 773861 |
| Weight | **325 g** Order no.: 773859<br>**125 g** Order no.: 773860<br>**95 g** Order no.: 773861 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

NSG-D-2-389-2008-08

# Adapter for PNOZ ms1p and PNOZ ms2p
PNOZ msi6p

**Order reference**

| Type | Features | Order no. |
|---|---|---|
| PNOZ msi6p | 7500 mm | 773 859 |
| PNOZ msi6p | 2500 mm | 773 860 |
| PNOZ msi6p | 1500 mm | 773 861 |

# Adapter for PNOZ ms1p and PNOZ ms2p

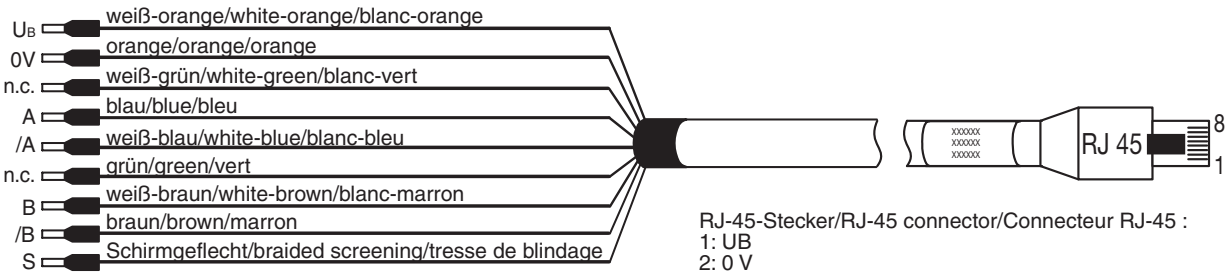
## PNOZ msi9p, PNOZ msi10p, PNOZ msi11p

**Description**

The connection cables PNOZ msi9p, PNOZ msi10p and PNOZ msi11p are used to connect an incremental encoder or adapter to the speed monitor PNOZ ms1p or PNOZ ms2p.
The connection to the speed monitor is made via the RJ-45 connector.

The cable cores for connecting the incremental encoder or adapter feature wires with crimp connectors. The cable cores are labelled.

**Terminal assignment**




RJ-45-Stecker/RJ-45 connector/Connecteur RJ-45 :
1: UB
2: 0 V
3. n.c.
4: A
5: /A
6: n.c.
7: B
8: /B
S: Schirm/Screen/Blindage

n.c. = nicht belegt/not connected/non utilisé

2.4

**Technical details**

**Environmental data**

| | |
|---|---|
| Cable runs | |
| PNOZ msi9p | **5.0 m** |
| PNOZ msi10p | **2.5 m** |
| PNOZ msi11p | **1.5 m** |
| Cable type | **CAT6, flexible, silicone-free** |
| Colour coding in accordance with | **EIA/TIA 568B** |
| Temperature resistance of insulation material | **max. 60° C** |
| Climatic suitability | **EN 60068-2-78** |
| Condensation | **Not permitted** |
| Ambient temperature | **0 ... +60 °C** |
| Storage temperature | **-25 ... +70 °C** |
| Protection type | **IP20** |
| Weight | |
| PNOZ msi9p | **180 g** |
| PNOZ msi10p | **90 g** |
| PNOZ msi11p | **75 g** |

**Order reference**

| Type | L | Order no. |
|---|---|---|
| PNOZ msi9p | 5.0 m | 773 856 |
| PNOZ msi10p | 2.5 m | 773 854 |
| PNOZ msi11p | 1.5 m | 773 855 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

NSG-D-2-381-2008-08

# Adapter for PNOZ ms1p and PNOZ ms2p

PNOZ msi9p, PNOZ msi10p, PNOZ msi11p

**Order reference for accessories**

| Type | Features | Order no. |
|---|---|---|
| PNOZ msi S09 | 9-pin | 773 870 |
| PNOZ msi S15 | 15-pin | 773 871 |
| PNOZ msi S25 | 25-pin | 773 872 |

# Adapter for PNOZ ms1p and PNOZ ms2p

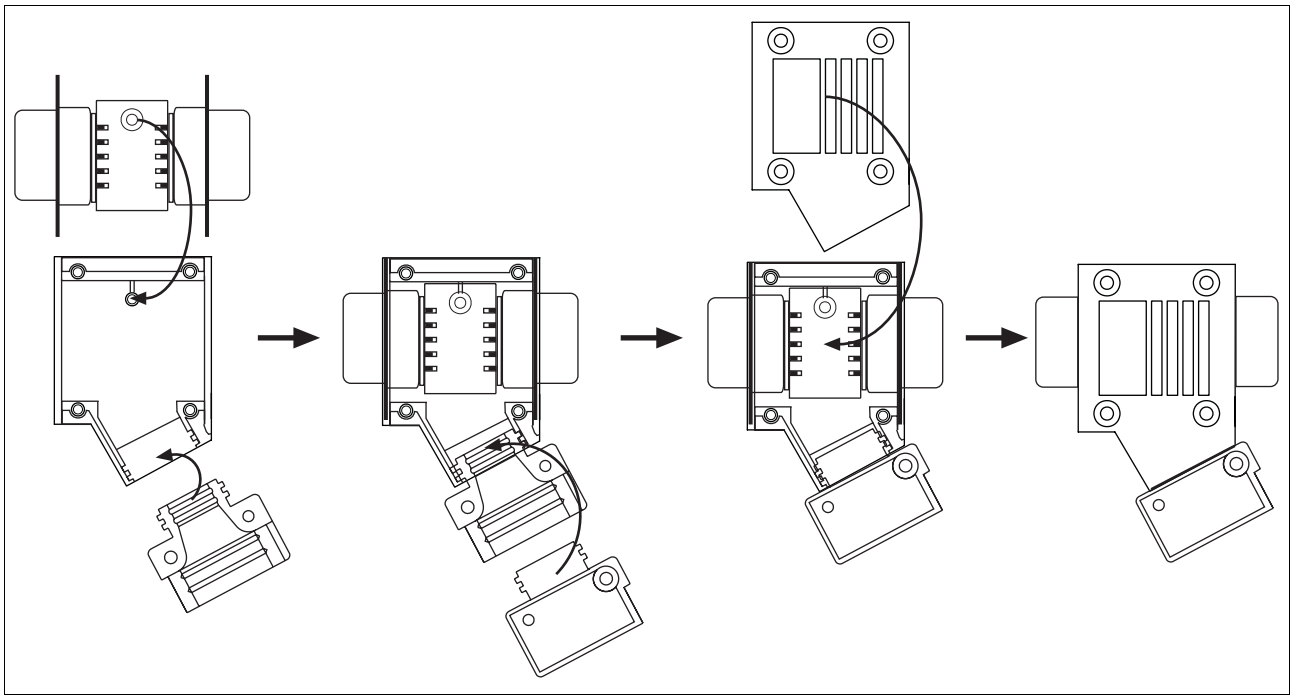
## PNOZ msi S09, PNOZ msi S16, PNOZ msi S25

**Description**

The PNOZ msi connector sets are used to connect frequency converters to the speed monitor PNOZ ms1p or PNOZ ms2p.

The contacts on the female D-SUB connector and the male D-SUB connector are connected via the PCB and have the same assignment. The signals that are relevant for the speed monitor are recorded in parallel and are fed to the RJ-45 connector via the cable. (Pilz adapter cable, see order reference for accessories).

The individual connector set components are assembled as shown in the diagram:





| Supplied with the connector sets | |
|---|---|
| Adapter housing | **9, 15 or 25-pin** |
| male D-SUB connector | **9, 15 or 25-pin** |
| female D-SUB connector | **9, 15 or 25-pin** |
| PCB for adapter housing | **9, 15 or 25-pin** |
| Cable clip | **1 piece** |

| Technical details | |
|---|---|
| **Plug-in connector** | |
| Supply voltage in accordance with VDE 0110 | **125 VAC** |
| Volume resistance | **≤3 mOhm** |
| Test voltage | **1000 V, eff** |
| Ambient temperature | **-55 ... +125 °C** |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Adapter for PNOZ ms1p and PNOZ ms2p

## PNOZ msi S09, PNOZ msi S16, PNOZ msi S25

| Plug-in connector | |
|---|---|
| Insulator material | **PBTP UL 94 V-0** |
| Housing material | **Steel, Sn over Ni** |
| Dimensions (H x W x D) | **44 mm x 30 mm x 17.6 mm** Order no.: 773870<br>**52.3 mm x 30 mm x 17.6 mm** Order no.: 773871<br>**66.2 mm x 30 mm x 17.6 mm** Order no.: 773872 |
| Weight | **90 g** Order no.: 773870<br>**100 g** Order no.: 773871<br>**115 g** Order no.: 773872 |

| Adapter housing | |
|---|---|
| Housing material | **Zinc diecasting** |
| Protection type | **IP40** |

**Order reference**

| Type | Features | Order no. |
|---|---|---|
| PNOZ msi S09 | 9-pin | 773 870 |
| PNOZ msi S15 | 15-pin | 773 871 |
| PNOZ msi S25 | 25-pin | 773 872 |

**Order reference for accessories**

| Type | Features | Order no. |
|---|---|---|
| PNOZ msi10p | Adapter cable 2.5 m | 773 854 |
| PNOZ msi11p | Adapter cable 1.5 m | 773 855 |

# Software





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Software


| Contents | Page |
|---|---|
| **Software** | |
| PNOZmulti Configurator | 2.5-2 |

# Software
## PNOZmulti Configurator

PNOZmulti Configurator is a graphic tool for the configuration and programming of the PNOZmulti modular safety system.

**Features**

- Graphic configuration of safety circuit
- Project configuration, configuration generation, documentation, commissioning
- Data transfer via serial interface or chip card
- User interface in German, English, French, Italian, Spanish, Japanese, Chinese (selectable)
- For Windows 2000 and XP and Vista

**Description**

The PNOZmulti Configurator is a graphic tool for the configuration and programming of the PNOZmulti modular safety system.
The elements of the safety circuit are depicted as icons on the Configurator user interface.
The safety circuit can be created quickly and easily using drag & drop.
The PNOZmulti Configurator downloads the complete safety circuit to the modular PNOZmulti via a chip card or via the serial interface.
The safety circuit can also be uploaded from the modular PNOZmulti to the PNOZmulti Configurator for revision.

Safety functions that can be created using the PNOZmulti Configurator include, for example:

- E-STOP
- Two-hand button
- Enable switch
- Operating mode selector switch
- Press functions
- Light beam device
- Light grid
- Safety mat
- Speed monitoring
- Muting

Users can configure fieldbus inputs and outputs in conjunction with the fieldbus modules. These inputs and outputs can only be used for standard functions.
Virtual inputs and outputs can be configured via the serial interface. These inputs and outputs are treated in the same manner as fieldbus inputs and outputs.
Inputs and outputs for standard functions are supported.

The PNOZmulti Configurator contains a wide range of test and diagnostic options, such as:

- Dynamic program display
- Diagnostic word for evaluating the element status
- Display PNOZmulti error stack

The project can be protected through passwords.

**System requirements**

- Operating system: Windows(r) 2000 or XP or Vista
- Processor: Min. 800 MHz processor
- RAM: Min. 512 MB
- Hard drive: 20 GB; min. 15 GB of available disk space
- Support for Super VGA graphics
- CD-ROM drive

**Order reference**

| Software licences | Features | | Order no. |
|---|---|---|---|
| PNOZmulti Configurator | Software | CD and manual | 773 000 |
| PNOZmulti Configurator | Software | CD | 773 000D |
| PNOZmulti Configurator | Software | Basic Licence | 773 010B |
| PNOZmulti Configurator | Software | User Licence | 773 010K |
| PNOZmulti Configurator | Software | Project Licence | 773 010G |
| PNOZmulti Configurator | Software | Basic Upgrade Licence | 773 010U |
| PNOZmulti Configurator | Software | User Upgrade Licence | 773 010V |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Software
## PNOZmulti Configurator

| Software licences | Features | | Order no. |
|---|---|---|---|
| PNOZmulti Configurator | Software | Project Upgrade Licence | 773 010W |
| PNOZmulti Configurator | Software | Time Limited Licence, 2 months | 773 010S |
| PNOZmulti Configurator | Software | Time Limited Licence, 3 months | 773 010R |
| PNOZmulti Configurator | Software | Time Limited Licence, 4 months | 773 010Q |

**Order guidelines**
**Basic Licence:** Single user licence, issued to one owner (company name and location/project must be stated)
**User Licence** Discounted licence for an additional workstation, issued to the owner of a basic licence
**Basic Upgrade Licence:** Discounted licence enabling owners of a basic licence to change to a newer version of the software
**User Upgrade Licence:** Discounted licence enabling owners of a user licence to change to a newer version of the software
**Time Limited Licence, 2 months:** Basic licence restricted to 2 months
**Time Limited Licence, 3 months:** Basic licence restricted to 3 months
**Time Limited Licence, 4 months:** Basic licence restricted to 4 months

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

more than automation
safe automation

| Contents | Page |
|---|---|
| **Applications** | |
| Safety assessments | 3.0-2 |
| Base unit configuration | 3.0-3 |
| Using connection points | 3.0-4 |
| E-STOP and light guard, Category 4, EN 954-1 | 3.0-11 |
| Two-hand with override, Category 4, EN 954-1 | 3.0-16 |
| Star-delta start-up, Category B, EN 954-1 | 3.0-23 |
| Motor ON/OFF, Category B, EN 954-1 | 3.0-27 |

# Safety assessments

Before using a unit it is necessary to perform a safety assessment in accordance with the Machinery Directive. The units as individual components guarantee functional safety, but not the safety of the entire application. You should therefore define the safety requirements for the plant as a whole, and also define how these will be implemented from a technical and organisational standpoint (e.g. refer to BIA [BG Institute for Occupational Safety] Report 6/97).

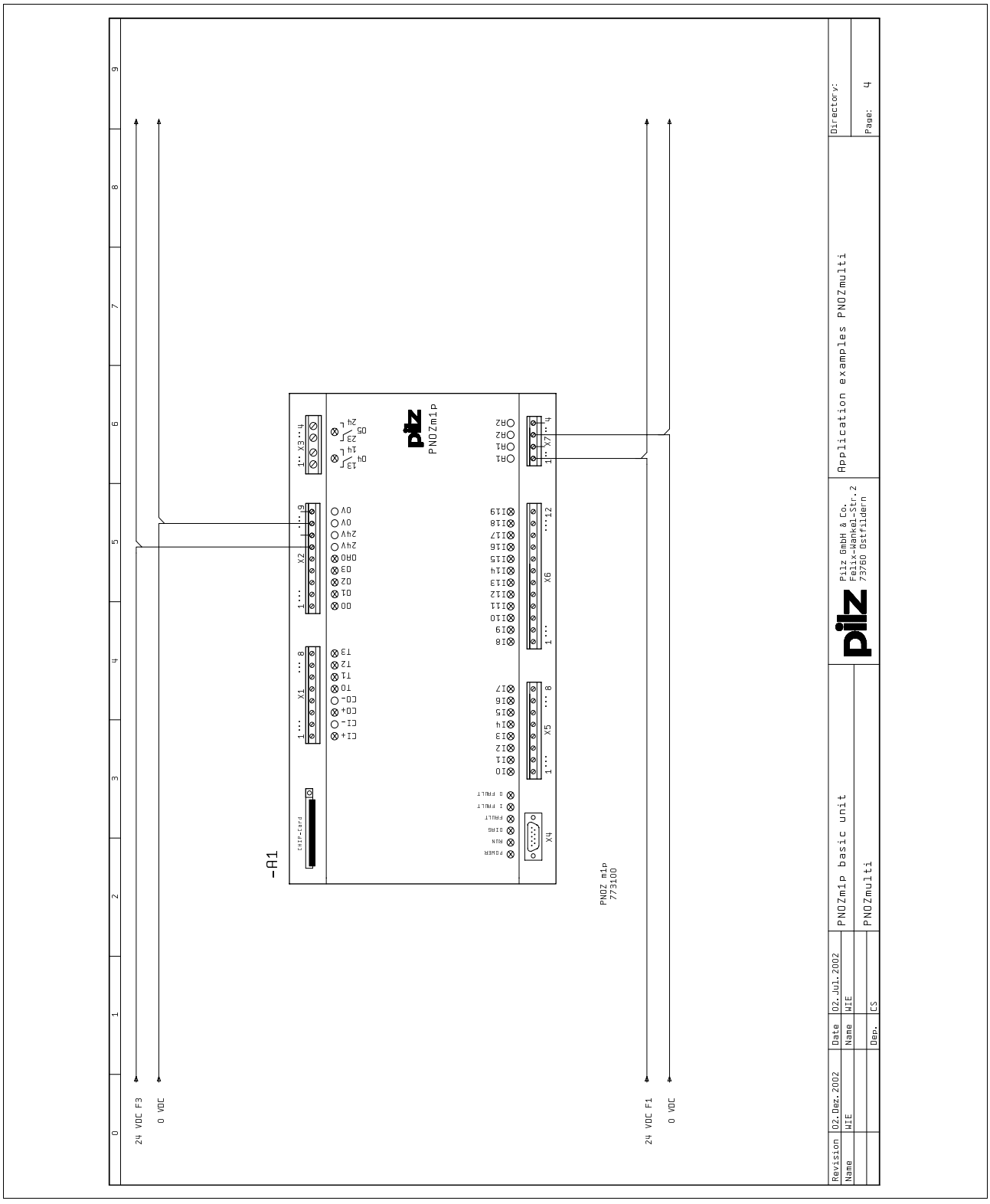
**Base unit configuration**

All the applications use the PNOZ m1p. Details of how the unit is wired are given just once, at the start of the chapter.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Base unit configuration



# Using connection points

**Features**

- 3 E-STOP buttons
- 2 light curtains
- Dual-channel with detection of shorts across contacts
- 3 instantaneous load shutdowns

**Description**

This example illustrates the use of connection point elements in the PNOZmulti Configurator. Connection point elements enable you to create wiring diagrams that extend over several pages in the PNOZmulti Configurator.
Three E-STOP buttons are AND-linked. If none of the buttons are operated, there will be a high signal at output A1.o0. A connection point is used to AND-link the result of the AND operation to the signal from light curtain 2. The signal at output A1.o2 will only be high if no E-STOP button has been operated and the light curtain is not interrupted.
A connection point is used to AND-link light curtain 1 to E-STOP button 1. The signal at output A1.01 will only be high if E-STOP button 1 has not been operated and the light curtain is not interrupted.

**Feedback loop**

The feedback loop is not used.

**Reset**

The unit is ready for operation when the conditions at the inputs have been met (automatic reset).

**Safety assessment**

- A short circuit between 24 VDC and inputs A1.i0 ... A1.i9 will be detected as an error. The safety outputs will carry a low signal.
- A short circuit between 24 VDC and a safety output will be detected and the safety outputs will carry a low signal.

**Configuration, page 1**

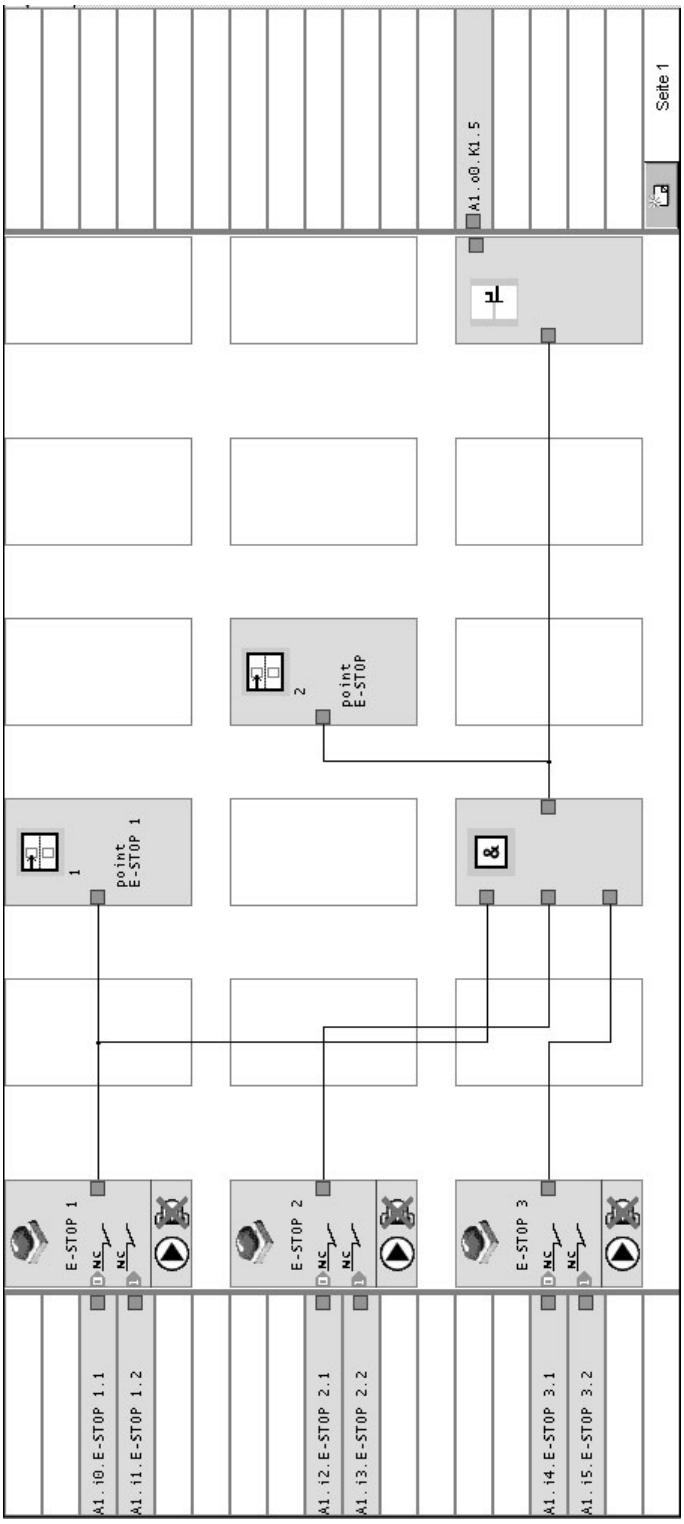
- 3 E-STOP
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i0, A1.i2, A1.i4 - test pulse 0, A1.i1, A1.i3, A1.i5 - test pulse 1)
  - Automatic reset
- 2 connection point elements
  - Source connection point 1 and source connection point 2
- AND element
  - 3 inputs
- Output
  - Safety output, semiconductor type
  - Single-pole

**Continued overleaf**



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Using connection points



# Using connection points

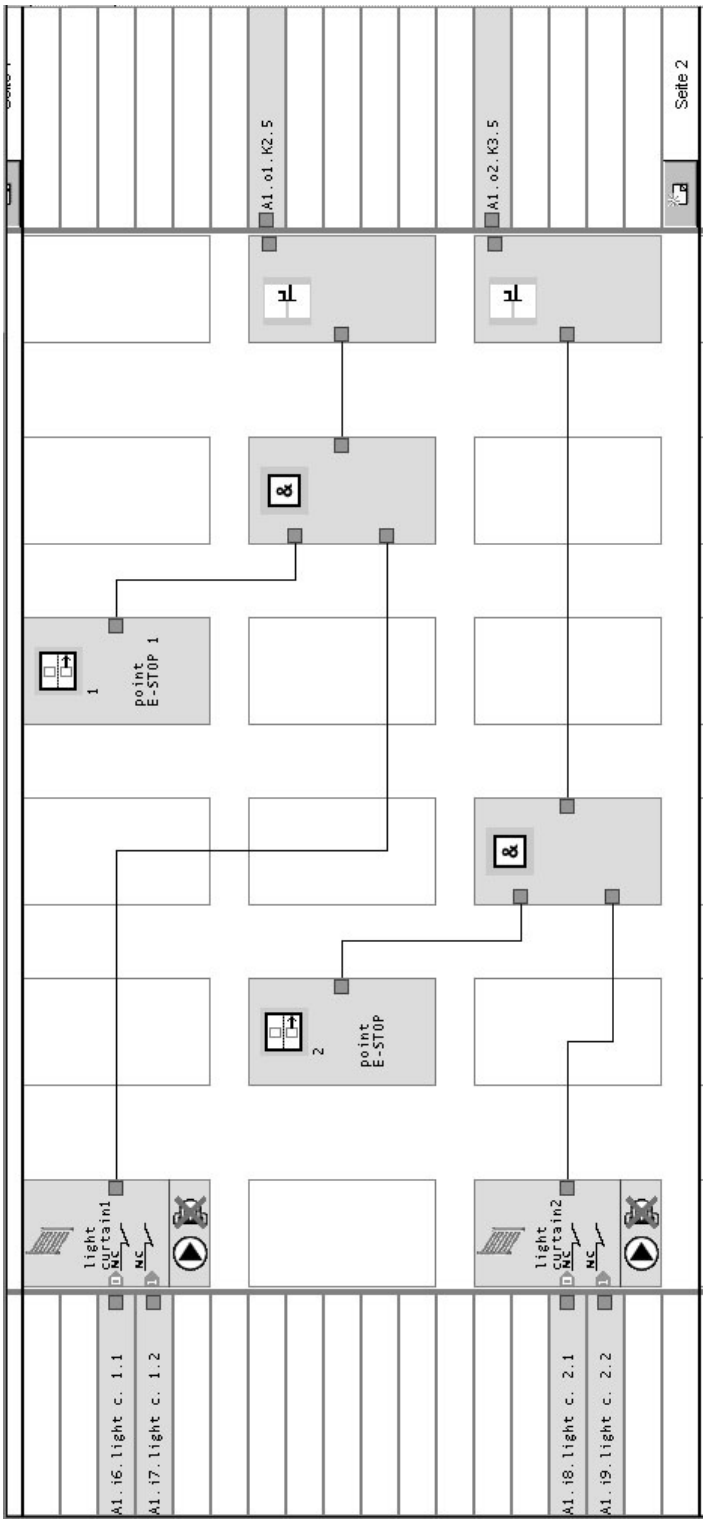
**Configuration, page 2**

- 2 light curtains
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i6, A1.i8 - test pulse 0, A1.i7, A1.i9 - test pulse 1)
  - Automatic reset
- 2 connection point elements
  - Destination connection point 1 and destination connection point 2
- 2 AND elements
  - 2 inputs
- 2 outputs
  - Safety output, semiconductor type
  - Single-pole

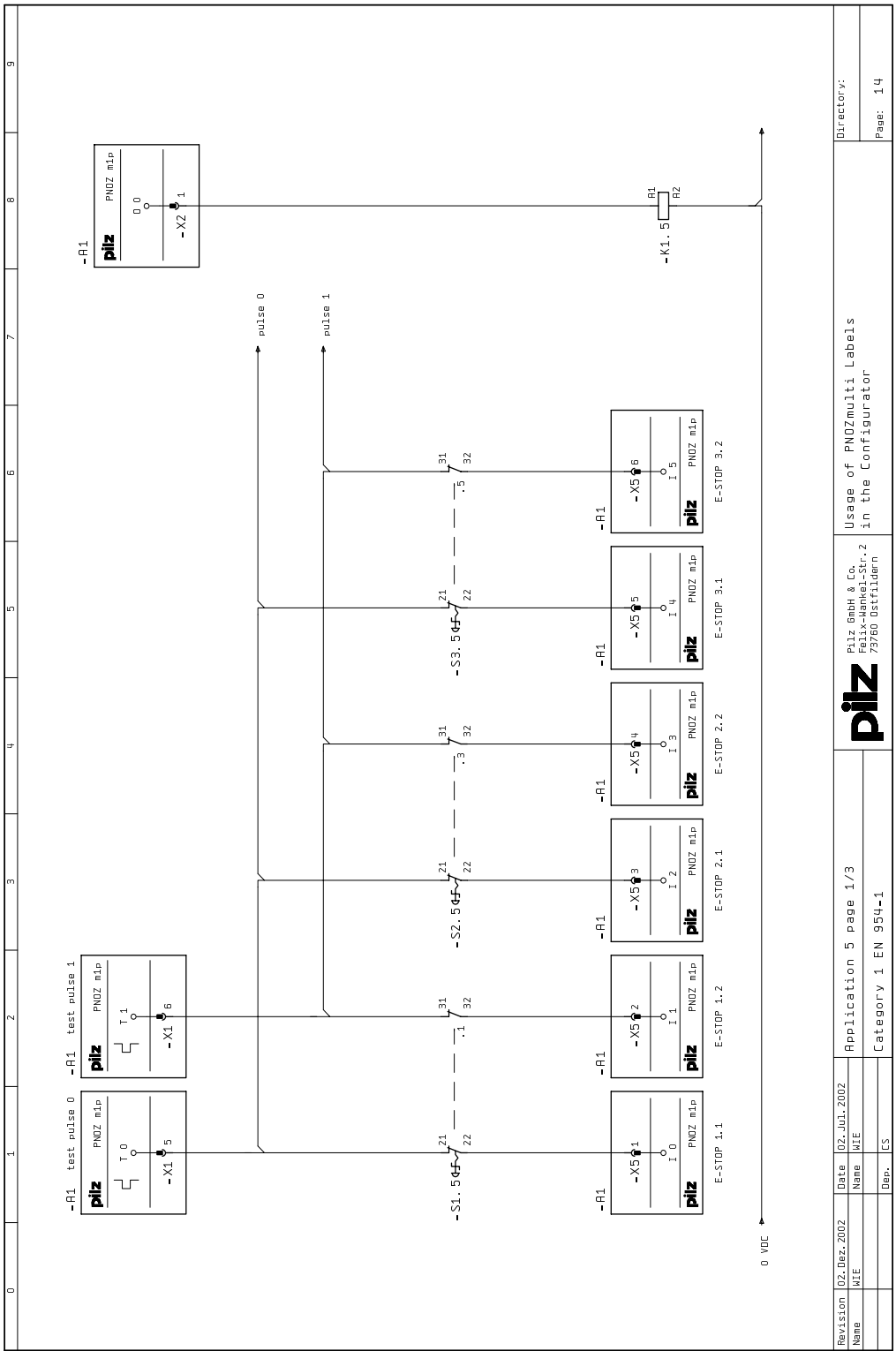


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Using connection points



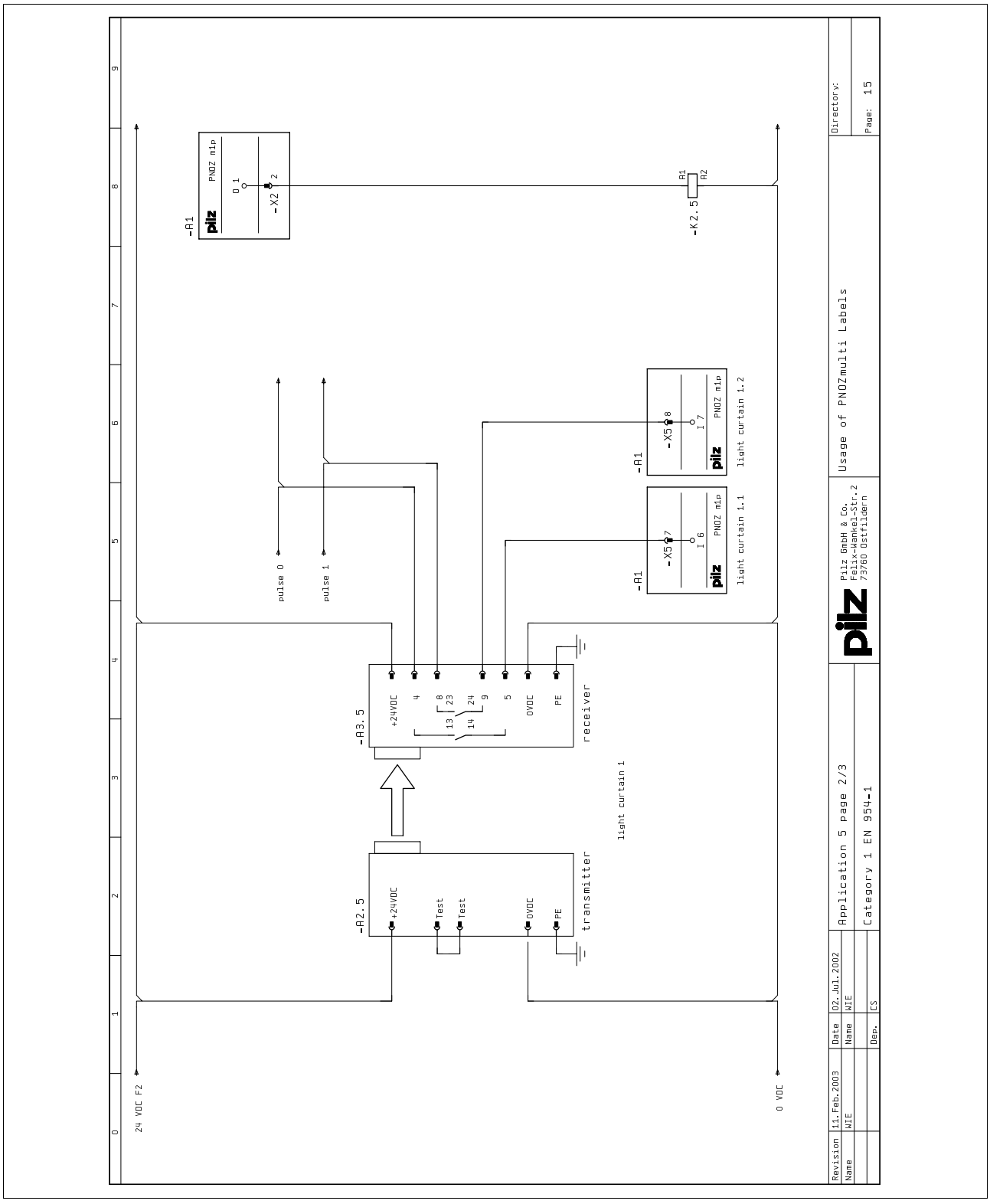
# Using connection points



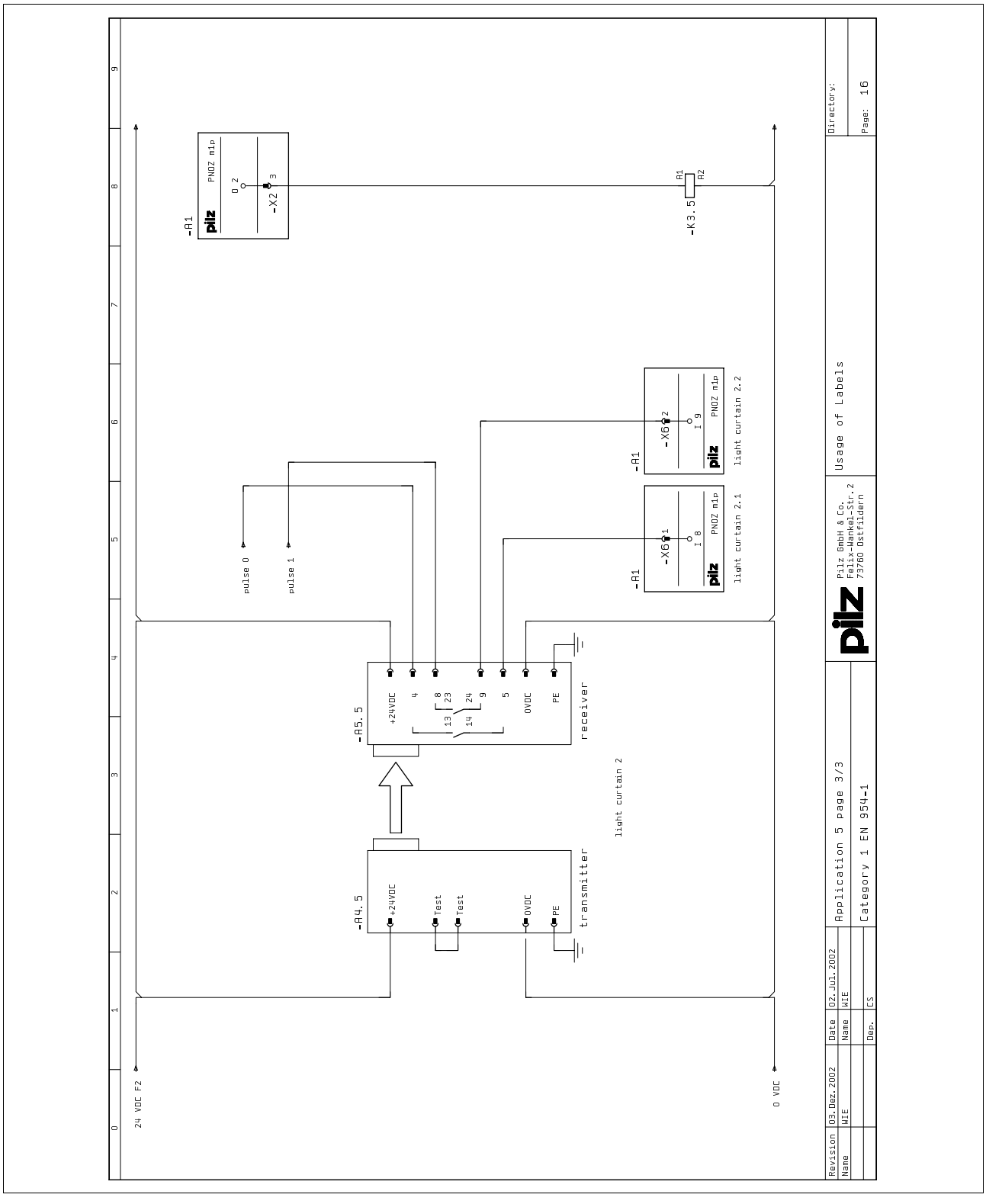



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Using connection points



# Using connection points








Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# E-STOP and light guard, Category 4, EN 954-1

**Features**

- 1 E-STOP button
- 1 light curtain
- Dual-channel with detection of shorts across contacts
- 1 PLC enabling signal
- 1 instantaneous controller enable
- 1 delayed load shutdown

**Description**

A light curtain is used to protect a hazardous area. The machine's motor will only be switched on if:

- The light curtain is not interrupted and
- The E-STOP button has not been operated.

If these safety conditions are met, a pulse (not safety-related) at the enable input will start the motor and the controller will be enabled.
If the light curtain is interrupted or the E-STOP button is operated, the signal at outputs A1.o0, A1.o4 and A1.o5 will switch from high to low. The controller enable will be interrupted and the motor will switch off after a delay of 0.5 s.

**Feedback loop**

The N/C contacts KM1.2 and KM2.2 on contactors KM1.2 and KM2.2 are connected to the feedback loop input A1.i8.

**Reset**

If the conditions for starting the motor have been met and the feedback loop is closed, the PLC enabling pulse must be sent. This pulse (monitored reset) enables plant operation.

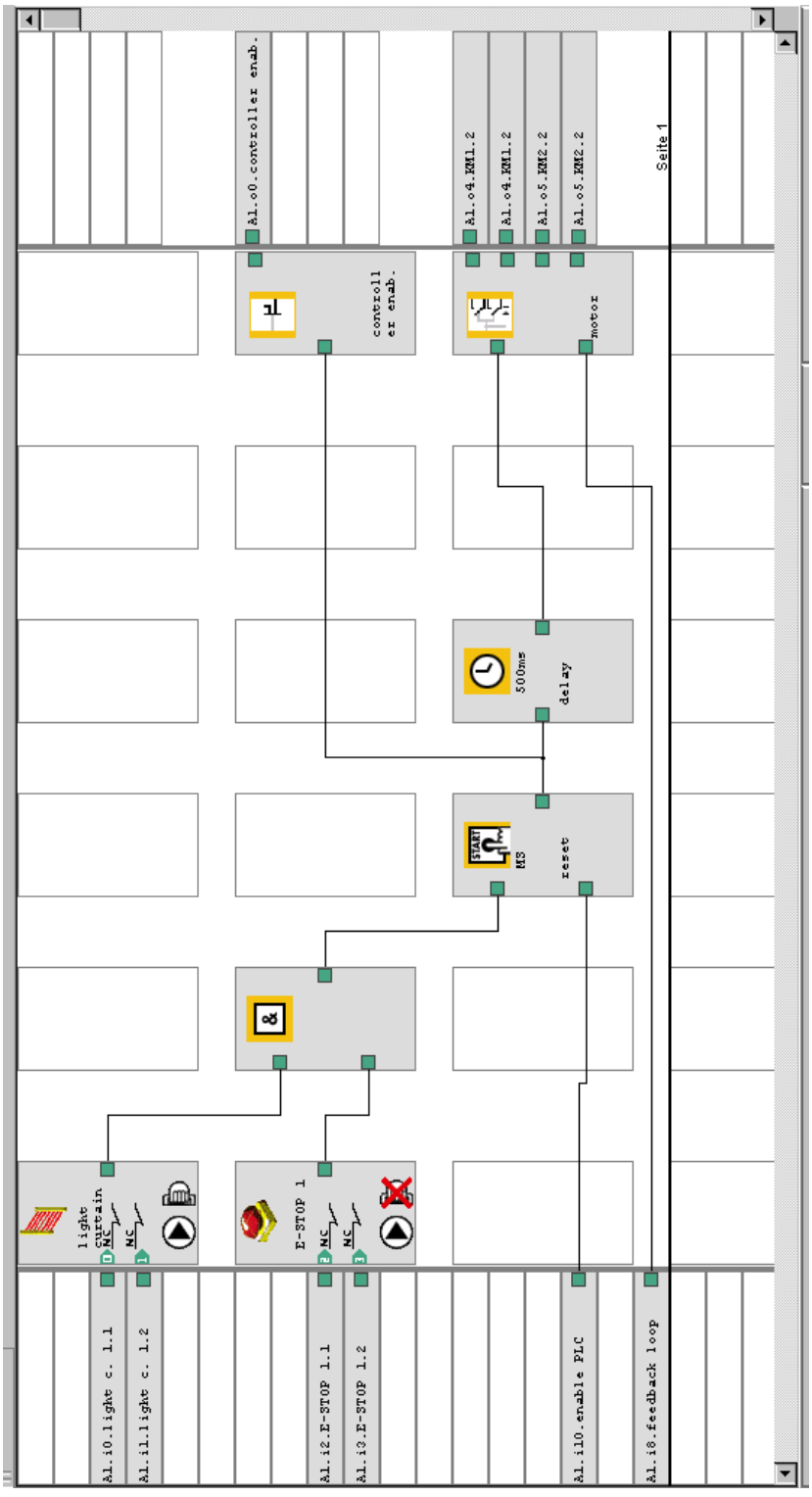
**Safety assessment**

- The PNOZ m1p and contactors
- KM1.2 and KM2.2 must be installed in a single location.
- If a switch contact (A1.i0 ... A1.i3) is overridden, this will be detected as an error at the next operation. Safety outputs A1.o4 and A1.o5 will carry a low signal.
- A short circuit between 24 VDC and inputs A1.i0 ... A1.i3 will be detected as an error. All the safety outputs will carry a low signal.
- A short circuit between 24 VDC and a safety output will be detected and all the safety outputs will carry a low signal.

**Configuration**

- Light curtain
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i0 - test pulse 0, A1.i1 - test pulse 1)
  - Automatic reset
  - Start-up test
- E-STOP
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i2 - test pulse 2, A1.i3 - test pulse 3)
  - Automatic reset
- AND element
  - 2 inputs
- Reset element
  - Monitored reset
- Delay element
  - 500 ms
- Motor output
  - Safety output, relay type
  - Redundant
  - Use feedback loop
- Controller enable output
  - Safety output, semiconductor type
  - Single-pole

# E-STOP and light guard, Category 4, EN 954-1

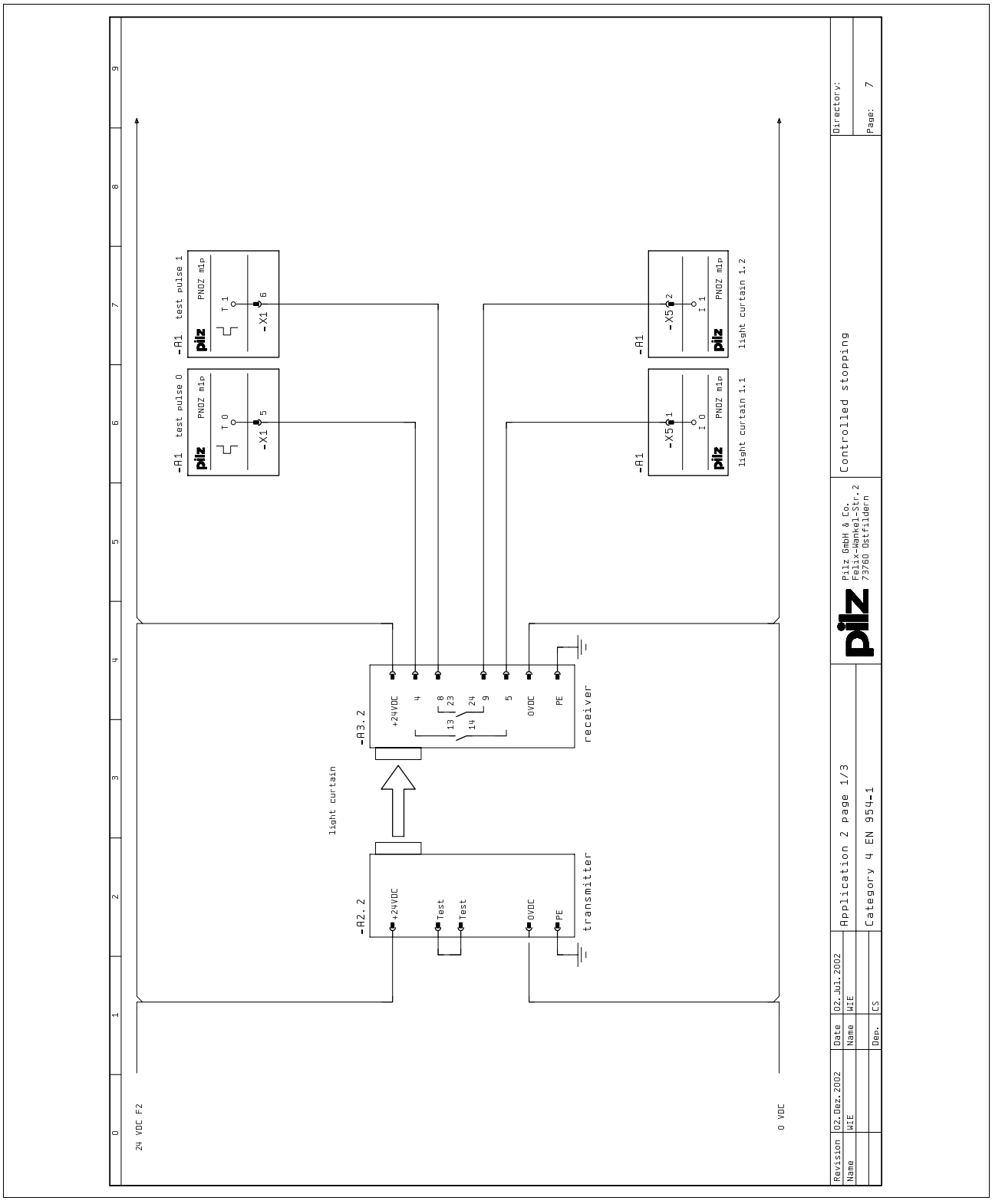




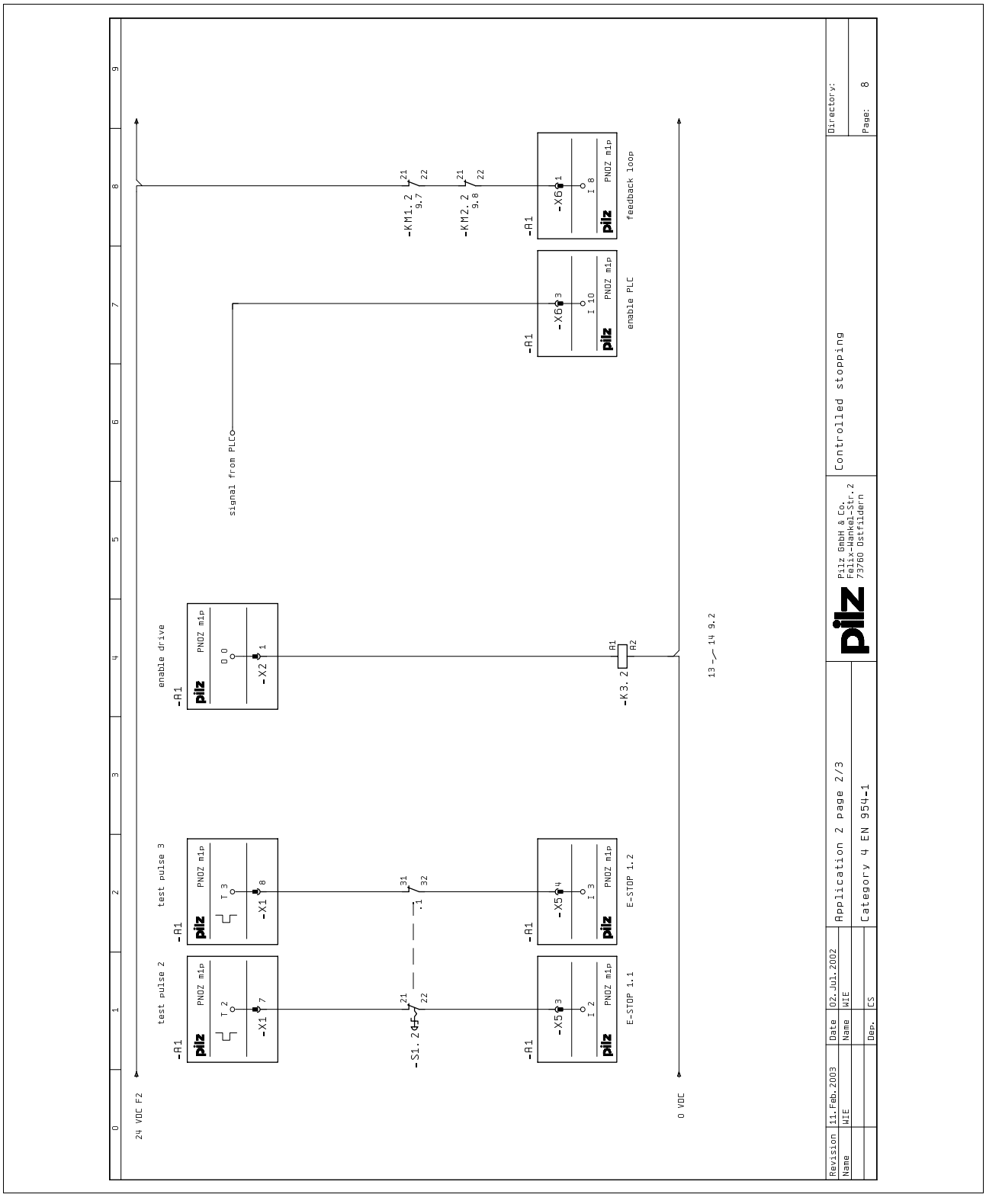



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

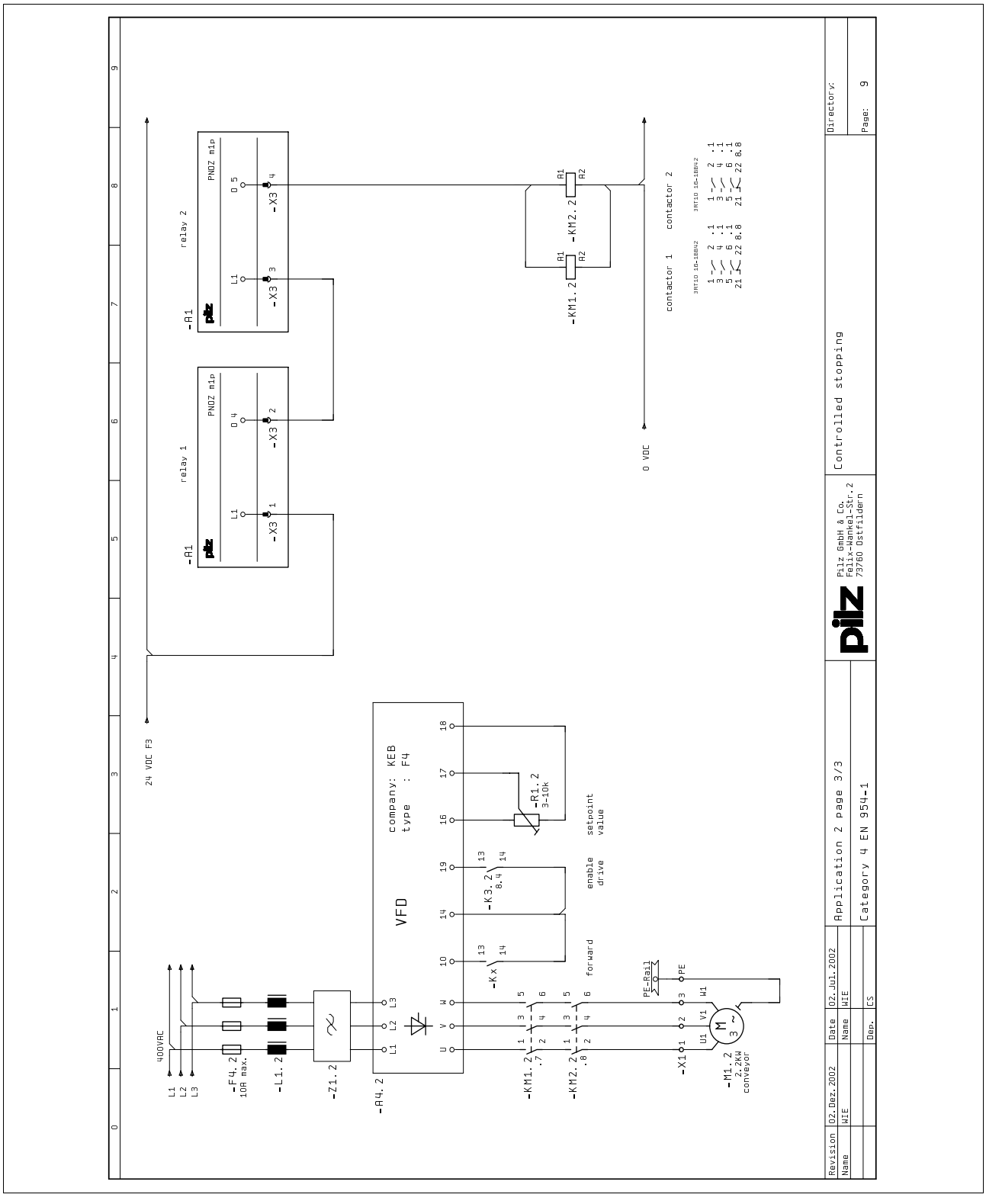
# E-STOP and light guard, Category 4, EN 954-1



# E-STOP and light guard, Category 4, EN 954-1



# E-STOP and light guard, Category 4, EN 954-1



# Two-hand with override, Category 4, EN 954-1

**Features**

- 1 operating mode selector switch
- 1 E-STOP button
- 2 two-hand controls
- Dual-channel with detection of shorts across contacts
- 1 instantaneous load shutdown

**Description**

A machine can be operated by one or two people. The machine is enabled via two-hand buttons.
The machine's motor is switched on if:

- The E-STOP button has not been operated
  and
- The operating mode selector switch is in position “0” and both two-hand buttons are operated or
  The operating mode selector switch is in position “1” and two-hand button 2 is operated.

If one of these conditions is not met, the signal at output A1.o0 will switch from high to low and the motor will be switched off. The status of the operating mode selector switch is signalled at outputs A1.o1 and A1.o3.

**Feedback loop**

The N/C contacts KM1.3 and KM2.3 on contactors KM1.3 and KM2.3 are connected to the feedback loop input A1.i11.

**Reset**

E-STOP monitoring must be activated through the reset button S6.3 (manual reset). If the conditions for starting the motor have been met and the feedback loop is closed, operation of the plant is enabled.

**Safety assessment**

- If a switch contact (A1.i0 ... A1.i14) is overridden, this will be detected as an error at the next operation. Safety outputs A1.o0 and A1.o2 will carry a low signal.
- A short circuit between 24 VDC and inputs A1.i0, A1.i1, A1.i3 ... A1.i10 will be detected as an error. The safety outputs will carry a low signal.
- A short circuit between 24 VDC and the reset input A1.i12 will be detected.
- A short circuit between 24 VDC and the override input A1.i13 or A1.i14 will be detected.
- A short circuit between 24 VDC and a safety output will be detected and the safety outputs will carry a low signal.
- It must be possible to protect the operating mode selector switch from unauthorised operation.

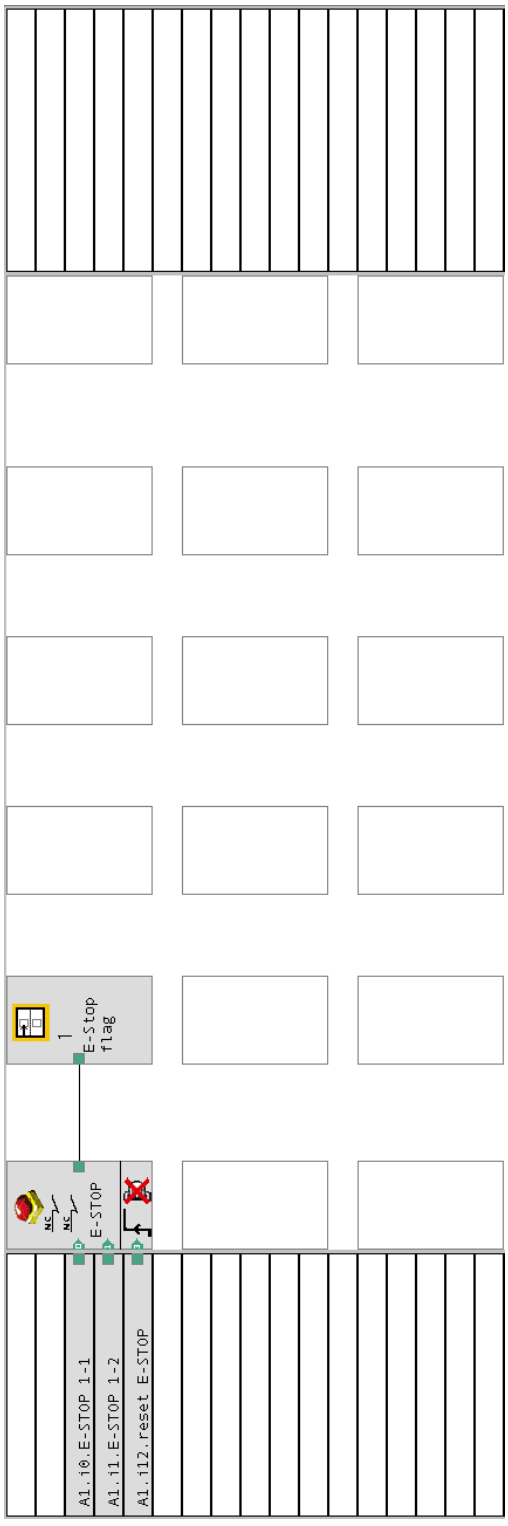
**Configuration, page 1**

- E-STOP
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i0 - test pulse 0, A1.i1 - test pulse 1)
  - Manual reset (A1.i12 - test pulse 3)
- Connection point
  - Source connection point 1



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Two-hand with override, Category 4, EN 954-1



# Two-hand with override, Category 4, EN 954-1

**Configuration, page 2**

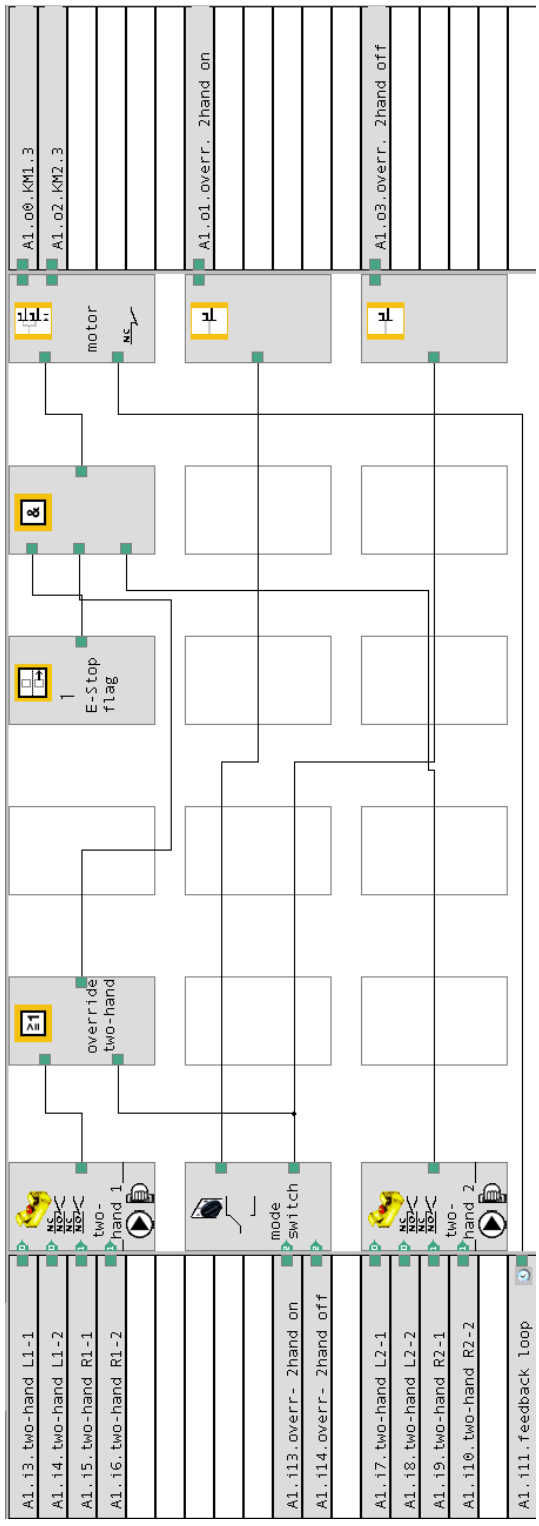
- Two-hand button
  - Switch type 6 (N/O - N/C)
  - Detection of shorts between contacts (A1.i3, A1.i4 and A1.i7, A1.i8 - test pulse 0A1.i5, A1.i6 and A1.i9, A1.i10 - test pulse 1)
- Operating mode selector switch
  - Switch type 9
  - Detection of shorts between contacts (A1.i13, A1.i14 - test pulse 2)
- Connection point
  - Source connection point 1
- OR element
  - 2 inputs
- AND element
  - 3 inputs
- Motor output
  - Safety output, semiconductor type
  - Redundant
  - Use feedback loop
- Two-hand on output
  - Safety output, semiconductor type
  - Single-pole
- Two-hand off output
  - Safety output, semiconductor type
  - Single-pole





Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

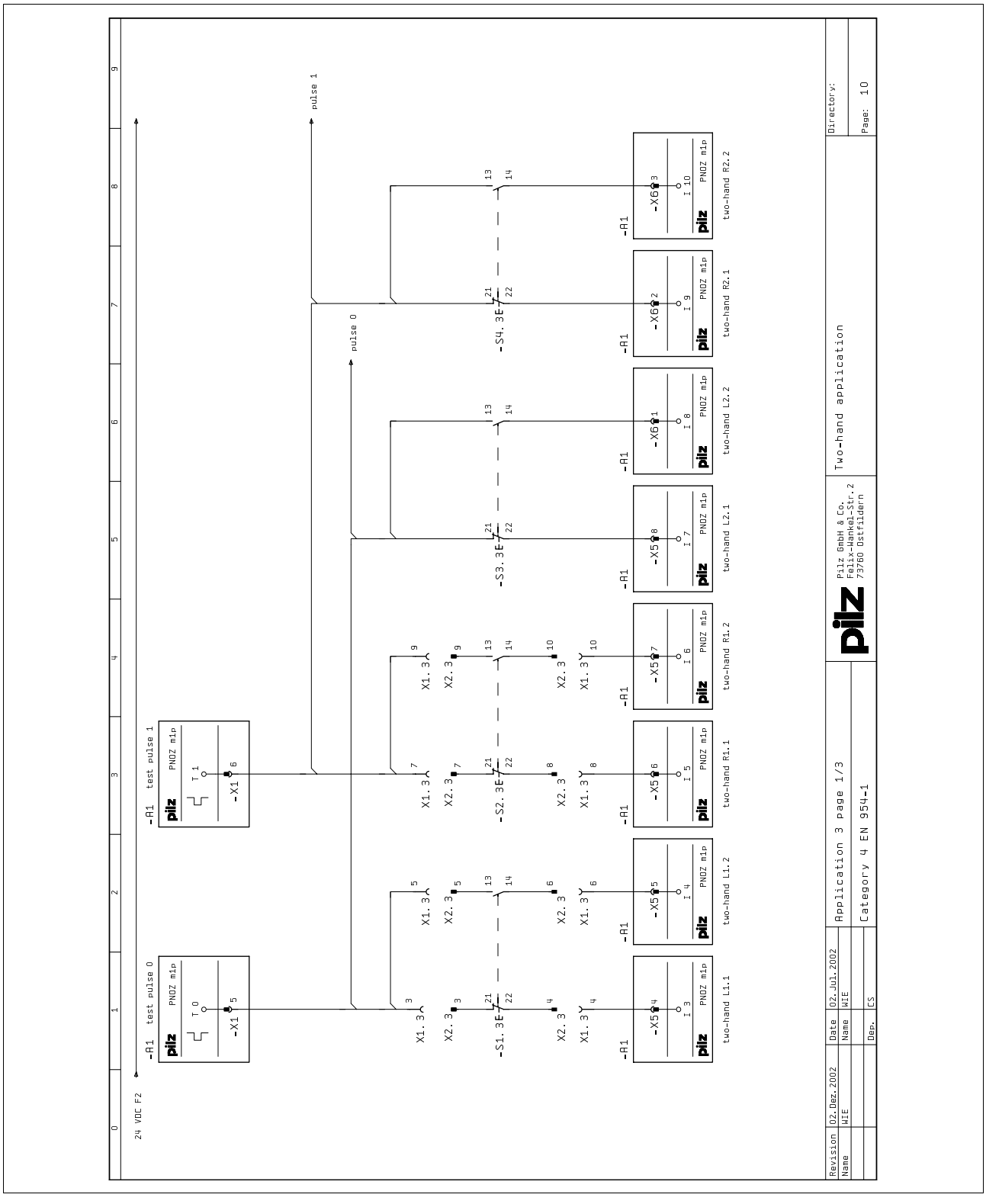
# Two-hand with override, Category 4, EN 954-1






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Two-hand with override, Category 4, EN 954-1

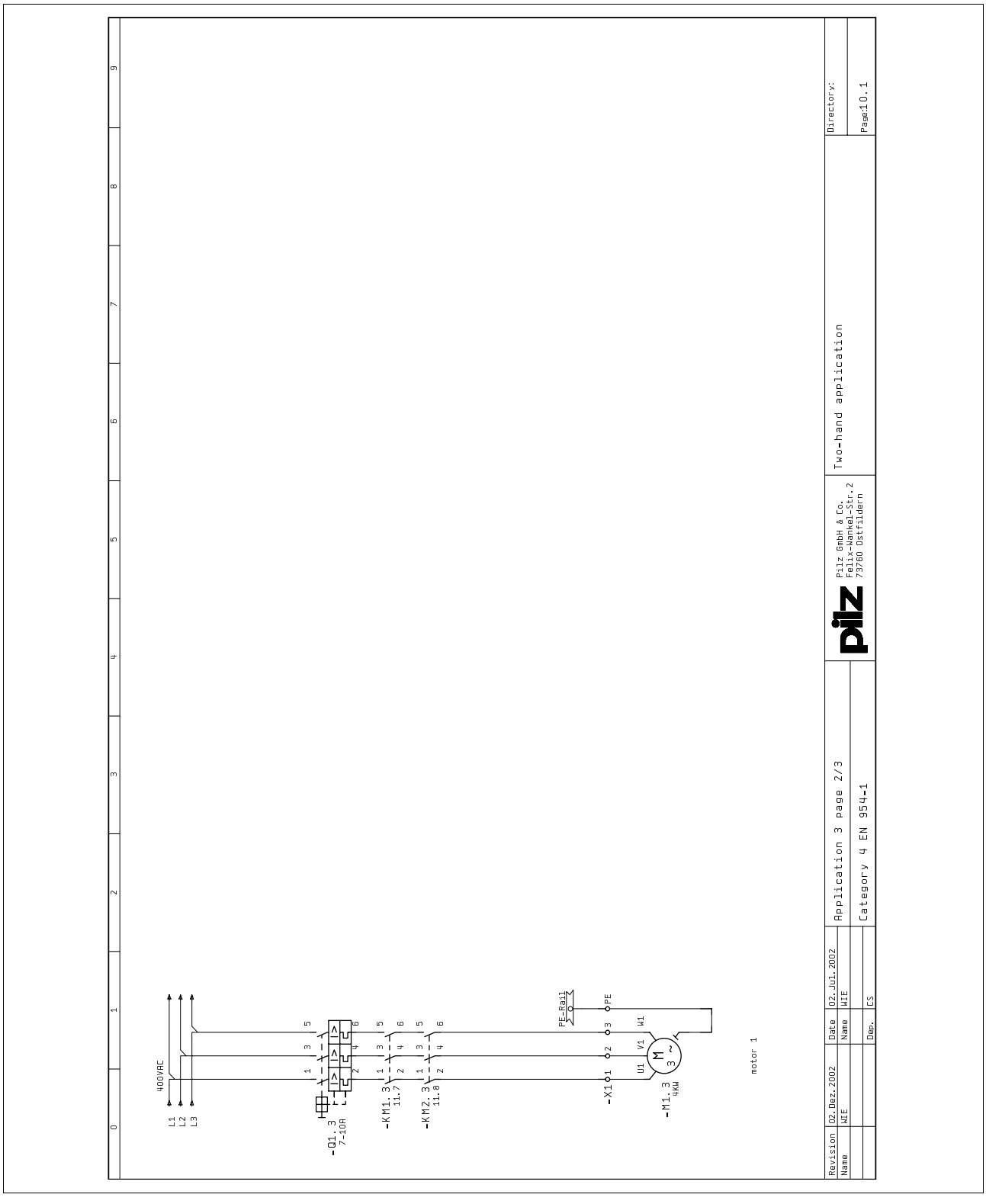




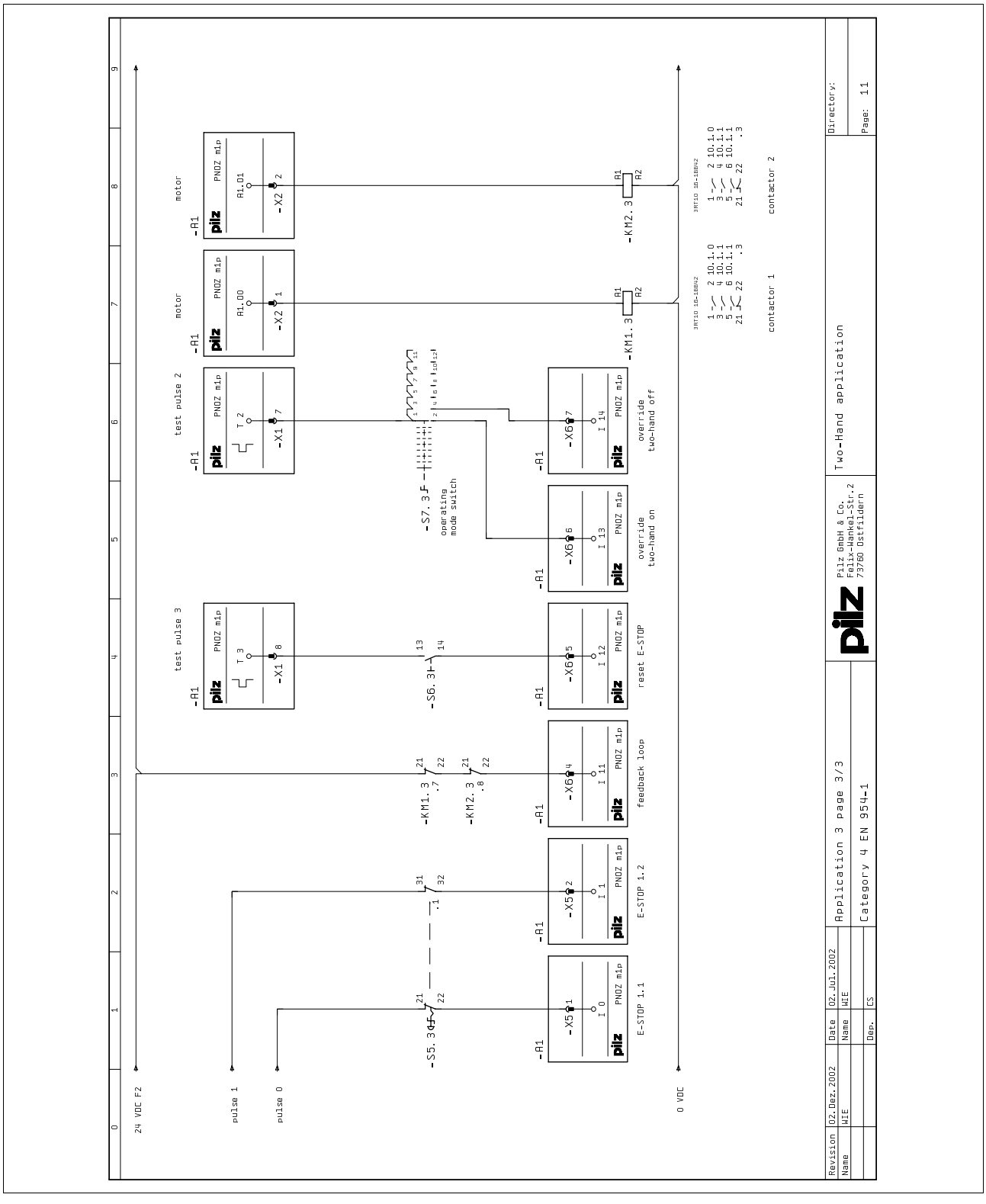



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Two-hand with override, Category 4, EN 954-1



# Two-hand with override, Category 4, EN 954-1






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Star-delta start-up, Category B, EN 954-1

**Features**

- 1 reset module
- 2 logic connections
- 3 semiconductor outputs
- 1 instantaneous load shutdown
- 2 load shutdowns with a 5 s delay

**Description**

When the motor is switched on, after a 5 second delay it is possible to switch between a star and a delta connection. A high signal at input A1.i4 selects a star connection, a high signal at input A1.i5 selects a delta connection.

**Feedback loop**

The feedback loop is not used.

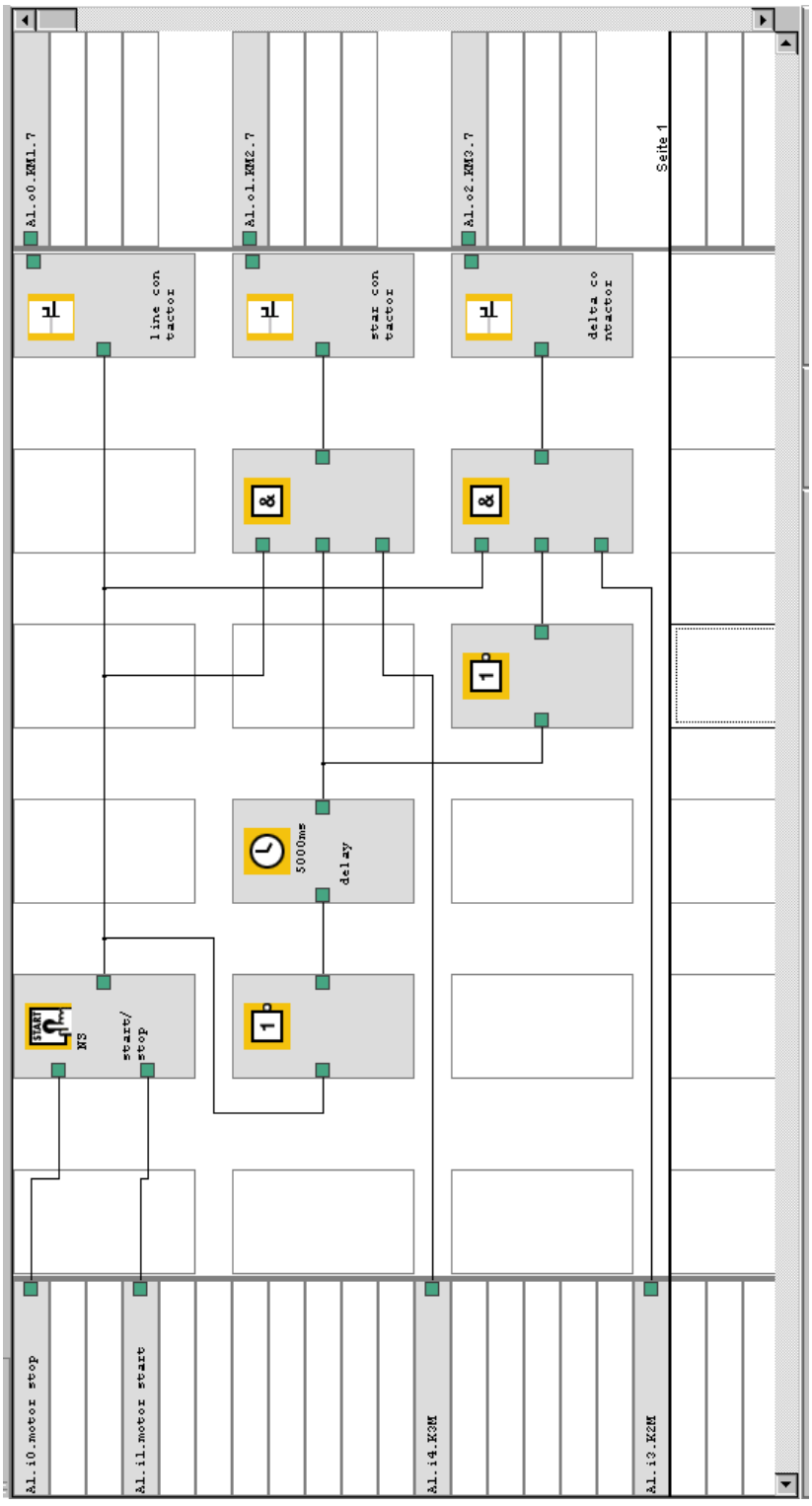
**Reset**

The PNOZ m1p is ready for operation once supply voltage is applied. If there is a high signal at input A1.i0, the application can be activated through a signal change from low to high at input A1.i1.

**Configuration**

- 1 reset element
  - Non-monitored reset
- 1 delay element
  - 5000 ms
- 2 AND elements
  - 3 inputs
- 2 negation elements
  - 1 input
- 3 outputs
  - Safety output, semiconductor type
  - Single-pole

# Star-delta start-up, Category B, EN 954-1

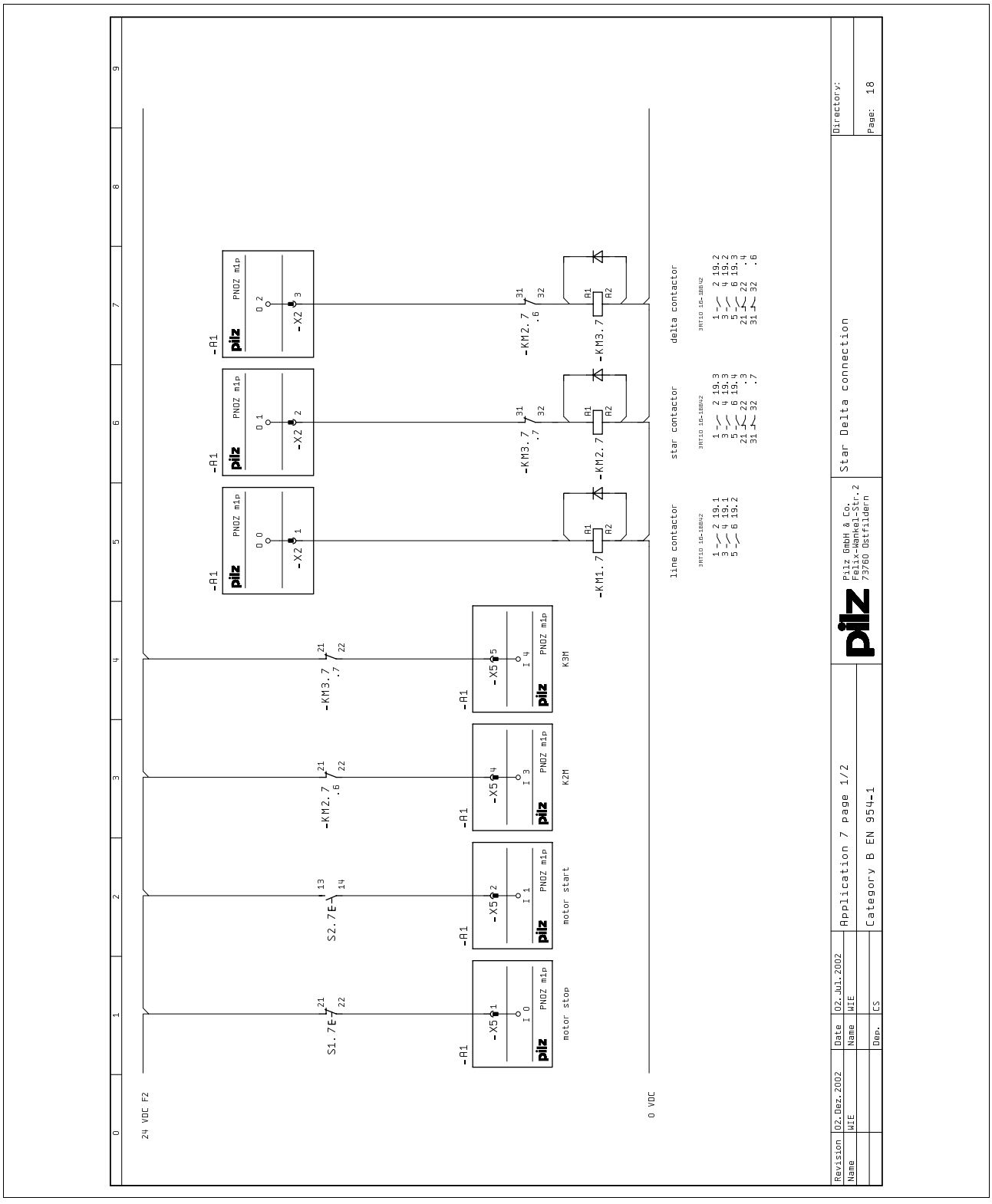




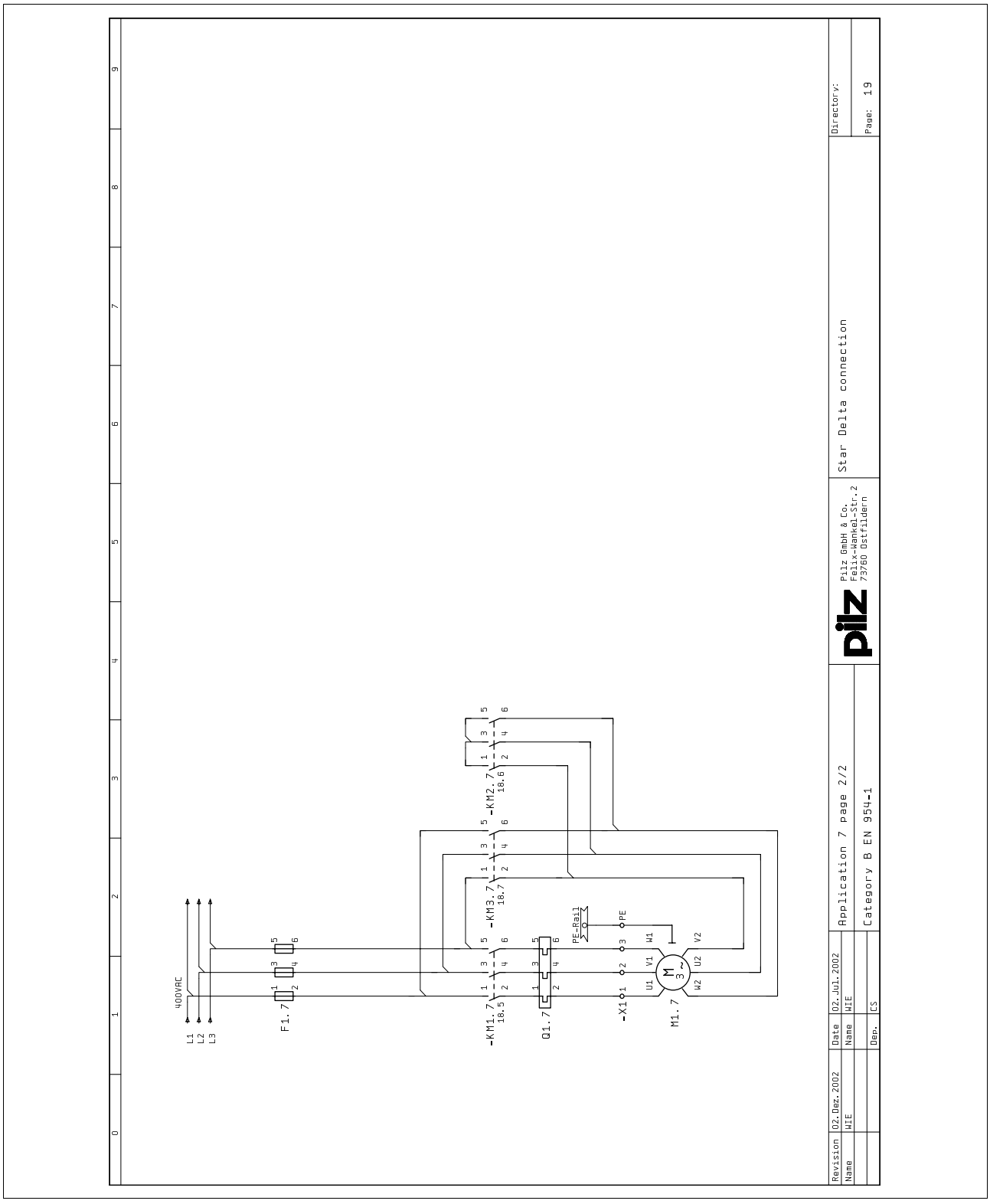



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Star-delta start-up, Category B, EN 954-1



# Star-delta start-up, Category B, EN 954-1






Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Motor ON/OFF, Category B, EN 954-1

**Features**

- 1 E-STOP button
- 1 logic connection
- 2 instantaneous load shutdowns

**Description**

A motor can be switched on or off if the E-STOP button has not been operated. Pressing the E-STOP button stops the motor immediately.

**Feedback circuit**

The feedback loop is not used.

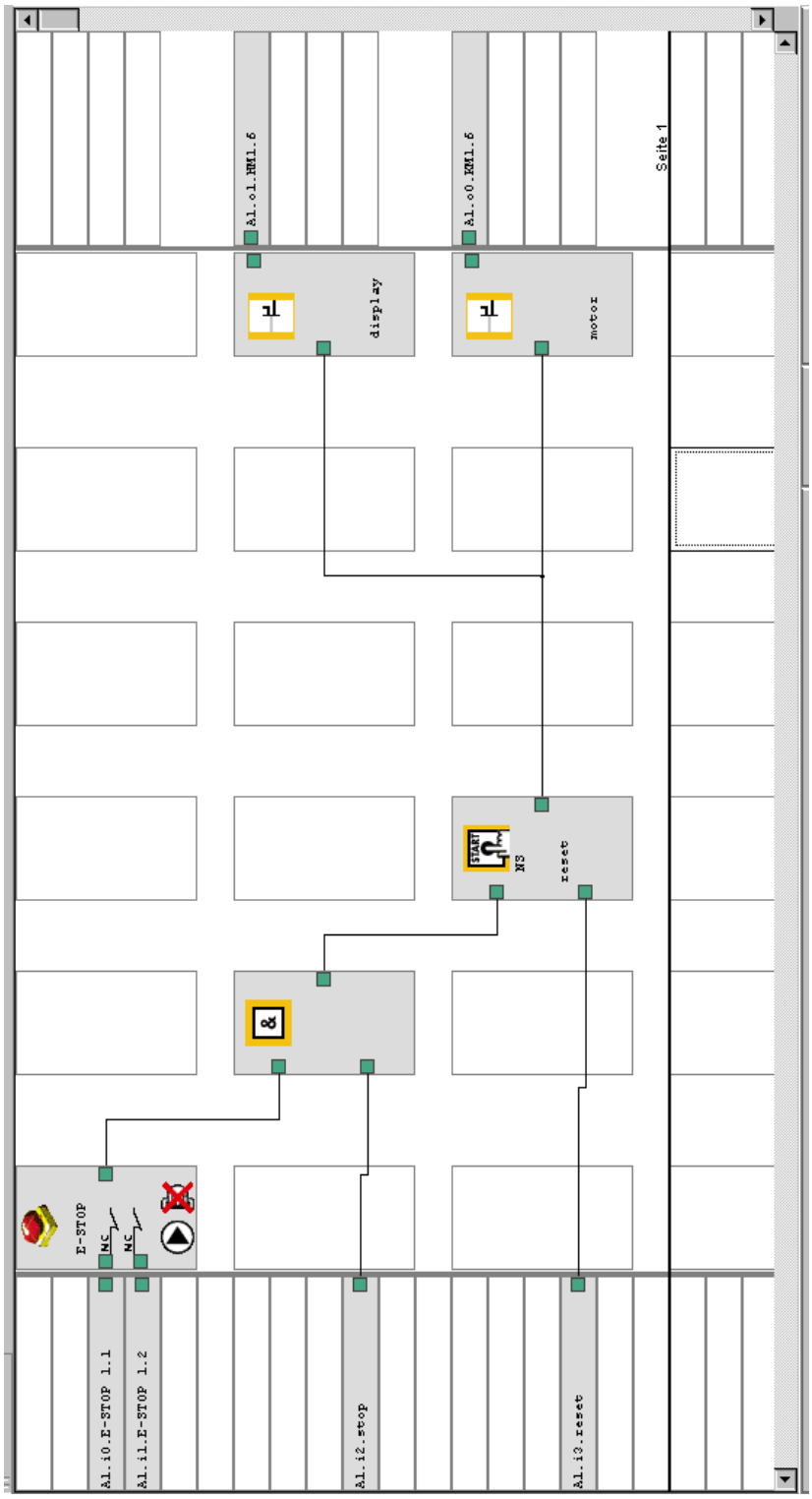
**Reset**

If the E-STOP button has not been operated and there is a high signal at input A1.i2, the application can be activated through a pulse edge at input A1.i3.

**Configuration**

- E-STOP
  - Switch type 3 (2 N/C)
  - Automatic reset
- AND element
  - 2 inputs
- Reset element
  - 2 inputs
- 2 outputs
  - Safety output, semiconductor type
  - Single-pole

# Motor ON/OFF, Category B, EN 954-1

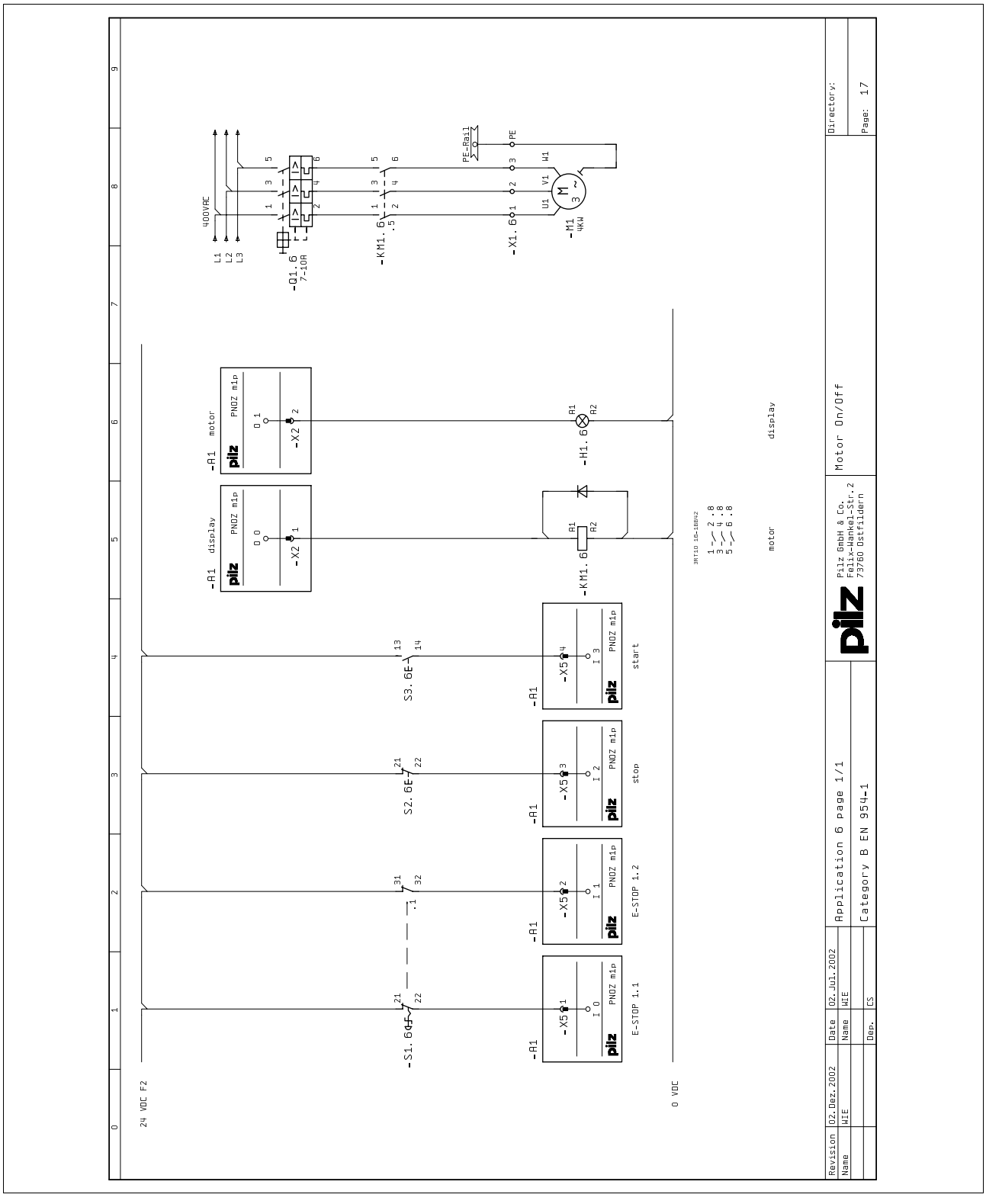







Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Motor ON/OFF, Category B, EN 954-1



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

pilz
more than automation
safe automation

| Contents | Page |
|---|---|
| **Accessories** | |
| Software, chip card | 4.0-2 |
| Cable, adapter | 4.0-3 |
| Connectors, terminals | 4.0-4 |

# Software, chip card

| Description | Order no. |
|---|---|
| **Tool Kit, chip card** | |
| Tool Kit in carry case, consisting of:<br>PNOZmulti Configurator software and manual, German (773 000), chip card and set of 10 labels, chip card reader, programming cable, magnetic safety switch, 5 m connection cable, bracket | 779 000 |
| Chip card, 8 kByte, x 1 | 779 201 |
| Chip card, 8 kByte, x 10 | 779 200 |
| Chip card, 32 kByte, x 1 | 779 211 |
| Chip card, 32 kByte, x 10 | 779 212 |
| Chip card holder | 779 240 |
| Chip card reader | 779 230 |
| Labels for chip card, x 10 | 779 250 |
| **Software, licences** | |
| PNOZmulti Configurator, software on CD plus manual | 773 000 |
| PNOZmulti Configurator, software on CD | 773 000D |
| PNOZmulti Configurator, Basic Licence | 773 010B |
| PNOZmulti Configurator, User Licence | 773 010K |
| PNOZmulti Configurator, Project Licence | 773 010G |
| PNOZmulti Configurator, Multi User Licence | 773 010M |
| PNOZmulti Configurator, Basic Upgrade Licence | 773 010U |
| PNOZmulti Configurator, User Upgrade Licence | 773 010V |
| PNOZmulti Configurator, Project Upgrade Licence | 773 010W |
| PNOZmulti Configurator, Multi User Upgrade Licence | 773 010N |
| PNOZmulti Configurator, Time Limited Licence, 2 months | 773 010S |
| PNOZmulti Configurator, Time Limited Licence, 3 months | 773 010R |
| PNOZmulti Configurator, Time Limited Licence, 4 months | 773 010Q |
| PNOZmulti Service Tool, Basic Licence | 773 011B |
| PNOZmulti Service Tool, User Licence | 773 011K |
| PNOZmulti Service Tool, Project Licence | 773 011G |
| PNOZmulti Service Tool, Multi User Licence | 773 011M |
| PNOZmulti Service Tool, Basic Upgrade Licence | 773 011U |
| PNOZmulti Service Tool, User Upgrade Licence | 73 011V |
| PNOZmulti Service Tool, Project Upgrade Licence | 773 011W |
| PNOZmulti Service Tool, Multi User Upgrade Licence | 773 011N |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Cable, adapter

| Name | Order no. |
|---|---|
| **Cable, adapter** | |
| PNOZ msi1Ap adapter and cable, 25-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p | 773 840 |
| PNOZ msi1Ap adapter and cable, 25-pin, 5,0 m for PNOZ ms1p/PNOZ ms2p | 773 844 |
| PNOZ msi1Bp adapter and cable, 25-pin, 2,5 m for PNOZ ms1p/PNOZ ms2p | 773 841 |
| PNOZ msi1Bp adapter and cable, 25-pin, 5,0 m for PNOZ ms1p/PNOZ ms2p | 773 839 |
| PNOZ msi3Ap adapter and cable, 15-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p | 773 842 |
| PNOZ msi3Bp adapter and cable, 15-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p | 773 843 |
| PNOZ msi5p adapter and cable, Bos/Rex, 15-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p | 773 857 |
| PNOZ msi5p adapter and cable, Bos/Rex, 15-pin, 1.5 m for PNOZ ms1p/PNOZ ms2p | 773 858 |
| PNOZ msi6p adapter and cable, Elau, 9-pin, 7.5 m for PNOZ ms2p | 773 859 |
| PNOZ msi6p adapter and cable, Elau, 9-pin, 2.5 m for PNOZ ms2p | 773 860 |
| PNOZ msi6p adapter and cable, Elau, 9-pin, 1.5 m for PNOZ ms2p | 773 861 |
| PNOZ msi7p adapter and cable, SEW, 15-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p | 773 864 |
| PNOZ msi7p adapter and cable, SEW, 15-pin, 1.5 m for PNOZ ms1p/PNOZ ms2p | 773 865 |
| PNOZ msi8p adapter and cable, Lenze, 9-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p | 773 862 |
| PNOZ msi8p adapter and cable, Lenze, 9-pin, 1.5 m for PNOZ ms1p/PNOZ ms2p | 773 863 |
| PNOZ msi9p adapter cable, 5.0 m for PNOZ ms1p/PNOZ ms2p | 773 856 |
| PNOZ msi10p adapter cable, 2.5 m for PNOZ ms1p/PNOZ ms2p | 773 854 |
| PNOZ msi11p adapter cable, 1.5 m for PNOZ ms1p/PNOZ ms2p | 773 855 |
| PNOZ msi S09 9-pin adapter for PNOZ ms1p/PNOZ ms2p, connector set | 773 870 |
| PNOZ msi S15 15-pin adapter for PNOZ ms1p/PNOZ ms2p, connector set | 773 871 |
| PNOZ msi S25 25-pin adapter for PNOZ ms1p/PNOZ ms2p, connector set | 773 872 |

# Connectors, terminals

| Description | Order no. |
|---|---|
| **Terminator, jumper** | |
| Terminator | 779 110 |
| Terminator, coated version | 779 112 |
| Jumper | 774 639 |
| Jumper, coated version | 774 640 |
| **Connection terminals** | |
| 1 set of cage clamp terminals for PNOZ m0p, PNOZ m1p, PNOZ m2p | 783 100 |
| 1 set of screw terminals for PNOZ m0p, PNOZ m1p, PNOZ m2p | 793 100 |
| 1 set of cage clamp terminals for PNOZ mi1p, PNOZ mi2p, PNOZ ml1p, PNOZ mc0p | 783 400 |
| 1 set of screw terminals for PNOZ mi1p, PNOZ mi2p, PNOZ ml1p, PNOZ mc0p | 793 400 |
| 1 set of cage clamp terminals for PNOZ mo1p | 783 400 |
| 1 set of screw terminals for PNOZ mo1p | 793 400 |
| 1 set of cage clamp terminals for PNOZ mo2p | 783 520 |
| 1 set of screw terminals for PNOZ mo2p | 793 520 |
| 1 set of cage clamp terminals for PNOZ mo3p | 783 400 |
| 1 set of screw terminals for PNOZ mo3p | 793 400 |
| 1 set of cage clamp terminals for PNOZ mo4p | 783 536 |
| 1 set of screw terminals for PNOZ mo4p | 793 536 |
| 1 set of cage clamp terminals for PNOZ mc1p, PNOZ ma1p | 783 700 |
| 1 set of screw terminals for PNOZ mc1p, PNOZ ma1p | 793 700 |
| 1 set of cage clamp terminals for PNOZ ms1p, PNOZ ms2p | 783 800 |
| 1 set of screw terminals for PNOZ ms1p, PNOZ ms2p | 793 800 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Connectors, terminals

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

more than automation
safe automation

| Contents | | Page |
|---|---|---|
| **Order reference** | | |
| Products | | |
| | Alphabetically by type | 5.1-2 |
| | Numerically by order number | 5.1-4 |

pilz
more than automation
safe automation

# Products
## Alphabetically by type

| Type | Features | | | Order no. | Page |
|---|---|---|---|---|---|
| PNOZ m0p | Base unit | | | 773 110 | 2.2-2 |
| PNOZ m1p | Base unit | | | 773 100 | 2.2-11 |
| PNOZ m1p coated version | Base unit | | | 773 105 | 2.2-20 |
| PNOZ m2p | Base unit | | | 773 120 | 2.2-29 |
| PNOZ ma1p | Expansion module | | 2 analogue inputs | 773 812 | 2.3-2 |
| PNOZ mc0p 24 VDC | | | Power supply for fieldbus modules | 773 720 | 2.3-64 |
| PNOZ mc1p | Expansion module | | 2 semiconductor outputs, standard | 773 700 | 2.3-68 |
| PNOZ mc1p coated version | Expansion module | | 2 semiconductor outputs, standard | 773 705 | 2.3-72 |
| PNOZ mc3p | Expansion module | | Fieldbus module, PROFIBUS-DP | 773 721 | 2.3-77 |
| PNOZ mc4p | Expansion module | | Fieldbus module, DeviceNet | 773 722 | 2.3-81 |
| PNOZ mc4p coated version | Expansion module | | Fieldbus module, DeviceNet | 773 729 | 2.3-85 |
| PNOZ mc5.1p | Expansion module | | Fieldbus module, INTERBUS FO | 773 728 | 2.3-93 |
| PNOZ mc5p | Expansion module | | Fieldbus module, INTERBUS | 773 723 | 2.3-89 |
| PNOZ mc6p | Expansion module | | Fieldbus module, CANopen | 773 724 | 2.3-97 |
| PNOZ mc6p coated version | Expansion module | | Fieldbus module, CANopen | 773 727 | 2.3-101 |
| PNOZ mc7p | Expansion module | | Fieldbus module, CC-Link | 773 726 | 2.3-105 |
| PNOZ mc8p | Expansion module | | Fieldbus module, Ethernet IP, Modbus TCP | 773 730 | 2.3-109 |
| PNOZ mc9p | Expansion module | | Fieldbus module, PROFINET IO | 773 731 | 2.3-113 |
| PNOZ mi1p | Expansion module | | 8 inputs | 773 400 | 2.3-8 |
| PNOZ mi1p | 1 set of cage clamp terminals | | | 783 400 | 2.3-64 |
| PNOZ mi1p | 1 set of screw terminals | | | 793 400 | 2.3-64 |
| PNOZ mi1p coated version | Expansion module | | 8 inputs | 773 405 | 2.3-13 |
| PNOZ mi2p | Expansion module | | 8 standard inputs | 773 410 | 2.3-18 |
| PNOZ ml1p | Expansion module | | | 773 540 | 2.3-117 |
| PNOZ mli1p | Cable | 5 m | With screw terminals | 773 890 | 2.3-117 |
| PNOZ mli1p | Cable | 10 m | With screw terminals | 773 891 | 2.3-117 |
| PNOZ mli1p | Cable | 50 m | With screw terminals | 773 892 | 2.3-117 |
| PNOZ mli1p | Cable | 5 m | With cage clamp terminals | 773 893 | 2.3-117 |
| PNOZ mli1p | Cable | 10 m | With cage clamp terminals | 773 894 | 2.3-117 |
| PNOZ mli1p | Cable | 50 m | With cage clamp terminals | 773 895 | 2.3-117 |
| PNOZ mo1p | Expansion module | | 2 or 4 semiconductor outputs, safe | 773 500 | 2.3-22 |
| PNOZ mo1p coated version | Expansion module | | 2 semiconductor outputs, safe | 773 505 | 2.3-28 |
| PNOZ mo2p | Expansion module | | 1 or 2 relay outputs, positive-guided | 773 520 | 2.3-34 |
| PNOZ mo2p coated version | Expansion module | | 1 or 2 relay outputs, positive-guided | 773 525 | 2.3-40 |
| PNOZ mo3p | Expansion module | | 2 dual-pole semiconductor outputs, safe | 773 510 | 2.3-46 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Products
## Alphabetically by type

| Type | Features | | Order no. | Page |
|---|---|---|---|---|
| PNOZ mo4p | Expansion module | 2 or 4 relay outputs, positive-guided | 773 536 | 2.3-52 |
| PNOZ mo4p coated version | Expansion module | 2 or 4 relay outputs, positive-guided | 773 537 | 2.3-58 |
| PNOZ ms1p | Expansion module | Speed monitor | 773 800 | 2.3-124 |
| PNOZ ms2p | Expansion module | Speed monitor | 773 810 | 2.3-131 |
| PNOZmulti Configurator | Software | CD and manual | 773 000 | 2.5-2 |
| PNOZmulti Configurator | Software | User Licence | 773 010K | 2.5-2 |
| PNOZmulti Configurator | Software | Basic Upgrade Licence | 773 010U | 2.5-2 |
| PNOZmulti Configurator | Software | User Upgrade Licence | 773 010V | 2.5-2 |
| PNOZmulti Configurator | Software | Time Limited Licence, 3 months | 773 010R | 2.5-2 |
| PNOZmulti Configurator | Software | CD | 773 000D | 2.5-2 |
| PNOZmulti Configurator | Software | Basic Licence | 773 010B | 2.5-2 |
| PNOZmulti Configurator | Software | Project Licence | 773 010G | 2.5-2 |
| PNOZmulti Configurator | Software | Project Upgrade Licence | 773 010W | 2.5-2 |
| PNOZmulti Configurator | Software | Time Limited Licence, 2 months | 773 010S | 2.5-2 |
| PNOZmulti Configurator | Software | Time Limited Licence, 4 months | 773 010Q | 2.5-2 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Products
## Numerically by order number

| Order no. | Type | Features | | Page |
|---|---|---|---|---|
| 773 000 | PNOZmulti Configurator | Software | CD and manual | 2.5-2 |
| 773 000D | PNOZmulti Configurator | Software | CD | 2.5-2 |
| 773 010B | PNOZmulti Configurator | Software | Basic Licence | 2.5-2 |
| 773 010G | PNOZmulti Configurator | Software | Project Licence | 2.5-2 |
| 773 010K | PNOZmulti Configurator | Software | User Licence | 2.5-2 |
| 773 010Q | PNOZmulti Configurator | Software | Time Limited Licence, 4 months | 2.5-2 |
| 773 010R | PNOZmulti Configurator | Software | Time Limited Licence, 3 months | 2.5-2 |
| 773 010S | PNOZmulti Configurator | Software | Time Limited Licence, 2 months | 2.5-2 |
| 773 010U | PNOZmulti Configurator | Software | Basic Upgrade Licence | 2.5-2 |
| 773 010V | PNOZmulti Configurator | Software | User Upgrade Licence | 2.5-2 |
| 773 010W | PNOZmulti Configurator | Software | Project Upgrade Licence | 2.5-2 |
| 773 100 | PNOZ m1p | Base unit | | 2.2-11 |
| 773 105 | PNOZ m1p coated version | Base unit | | 2.2-20 |
| 773 110 | PNOZ m0p | Base unit | | 2.2-2 |
| 773 120 | PNOZ m2p | Base unit | | 2.2-29 |
| 773 400 | PNOZ mi1p | Expansion module | 8 inputs | 2.3-8 |
| 773 405 | PNOZ mi1p coated version | Expansion module | 8 inputs | 2.3-13 |
| 773 410 | PNOZ mi2p | Expansion module | 8 standard inputs | 2.3-18 |
| 773 500 | PNOZ mo1p | Expansion module | 2 or 4 semiconductor outputs, safe | 2.3-22 |
| 773 505 | PNOZ mo1p coated version | Expansion module | 2 semiconductor outputs, safe | 2.3-28 |
| 773 510 | PNOZ mo3p | Expansion module | 2 dual-pole semiconductor outputs, safe | 2.3-46 |
| 773 520 | PNOZ mo2p | Expansion module | 1 or 2 relay outputs, positive-guided | 2.3-34 |
| 773 525 | PNOZ mo2p coated version | Expansion module | 1 or 2 relay outputs, positive-guided | 2.3-40 |
| 773 536 | PNOZ mo4p | Expansion module | 2 or 4 relay outputs, positive-guided | 2.3-52 |
| 773 537 | PNOZ mo4p coated version | Expansion module | 2 or 4 relay outputs, positive-guided | 2.3-58 |
| 773 540 | PNOZ ml1p | Expansion module | | 2.3-117 |
| 773 700 | PNOZ mc1p | Expansion module | 2 semiconductor outputs, standard | 2.3-68 |
| 773 705 | PNOZ mc1p coated version | Expansion module | 2 semiconductor outputs, standard | 2.3-72 |
| 773 720 | PNOZ mc0p 24 VDC | | Power supply for fieldbus modules | 2.3-64 |
| 773 721 | PNOZ mc3p | Expansion module | Fieldbus module, PROFIBUS-DP | 2.3-77 |
| 773 722 | PNOZ mc4p | Expansion module | Fieldbus module, DeviceNet | 2.3-81 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Products
## Numerically by order number

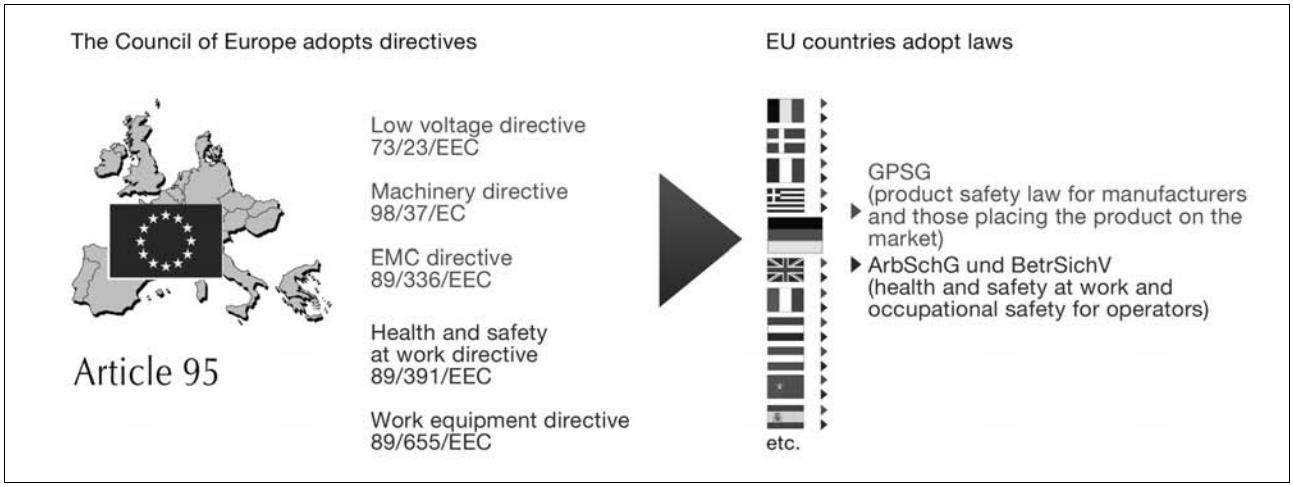
| Order no. | Type | Features | | | Page |
|---|---|---|---|---|---|
| 773 723 | PNOZ mc5p | Expansion module | | Fieldbus module, INTERBUS | 2.3-89 |
| 773 724 | PNOZ mc6p | Expansion module | | Fieldbus module, CANopen | 2.3-97 |
| 773 726 | PNOZ mc7p | Expansion module | | Fieldbus module, CC-Link | 2.3-105 |
| 773 727 | PNOZ mc6p coated version | Expansion module | | Fieldbus module, CANopen | 2.3-101 |
| 773 728 | PNOZ mc5.1p | Expansion module | | Fieldbus module, INTERBUS FO | 2.3-93 |
| 773 729 | PNOZ mc4p coated version | Expansion module | | Fieldbus module, DeviceNet | 2.3-85 |
| 773 730 | PNOZ mc8p | Expansion module | | Fieldbus module, Ethernet IP, Modbus TCP | 2.3-109 |
| 773 731 | PNOZ mc9p | Expansion module | | Fieldbus module, PROFINET IO | 2.3-113 |
| 773 800 | PNOZ ms1p | Expansion module | | Speed monitor | 2.3-124 |
| 773 810 | PNOZ ms2p | Expansion module | | Speed monitor | 2.3-131 |
| 773 812 | PNOZ ma1p | Expansion module | | 2 analogue inputs | 2.3-2 |
| 773 890 | PNOZ mli1p | Cable | 5 m | With screw terminals | 2.3-117 |
| 773 891 | PNOZ mli1p | Cable | 10 m | With screw terminals | 2.3-117 |
| 773 892 | PNOZ mli1p | Cable | 50 m | With screw terminals | 2.3-117 |
| 773 893 | PNOZ mli1p | Cable | 5 m | With cage clamp terminals | 2.3-117 |
| 773 894 | PNOZ mli1p | Cable | 10 m | With cage clamp terminals | 2.3-117 |
| 773 895 | PNOZ mli1p | Cable | 50 m | With cage clamp terminals | 2.3-117 |
| 783 400 | PNOZ mi1p | 1 set of cage clamp terminals | | | 2.3-117 |
| 793 400 | PNOZ mi1p | 1 set of screw terminals | | | 2.3-117 |

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

pilz
more than automation
safe automation

| Contents | Page |
|---|---|
| **Standards and directives** | |
| European directives and position of the standards in Europe | 6.1-2 |
| Risk analysis | 6.1-4 |
| Legal regulations outside Europe and standards for functional safety | 6.1-5 |
| Risk parameters and categories in accordance with EN 954-1 | 6.1-6 |
| Safety-related parts of control systems - General principles for design in accordance with EN ISO 13849-1 | 6.1-7 |
| Functional safety and legal position of EN/IEC 61508 | 6.1-9 |
| Functional safety in accordance with EN/IEC 62061 | 6.1-10 |

# European directives and position of the standards in Europe




Incorporation of the directives into domestic law (using Germany as an example)

**European directives**

The concept of a single European internal market in terms of the "New Approach" can be traced right back to the start of the 70s: The low voltage directive is the first piece of European legislation to take into account the approach towards harmonisation of a common single market.

Products that are covered by one or more of the following directives have to apply a CE-mark, i.e. the product must be accompanied by a declaration of conformity. With a declaration of conformity the manufacturer confirms that his product meets all the requirements of the European directives that relate to his product. This means he can launch and sell his product within the scope of the EU without consideration of any national regulations.

- Lifts 95/16/EC
- Construction products 89/106/EEC
- Pressure equipment directive 97/23/EC
- EMC directive 89/336/EEC
- ATEX 94/9/EC
- Appliances burning gaseous fuels 90/396/EEC
- Machinery directive 98/37/EC
- Medical device directive 93/42/EEC
- Low voltage directive 73/23/EEC
- Personal protective equipment 89/686/EEC
- Safety of toys directive 88/378/EEC

The directives are addressed to member states, who are obliged to incorporate the European directives into domestic law. In Germany this is normally achieved through the device safety law.

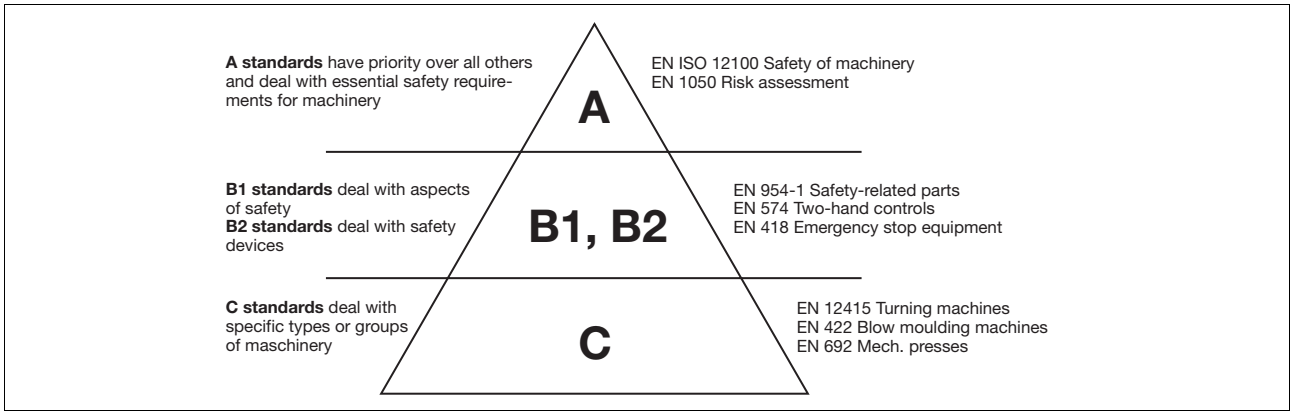
**Position of the standards in Europe**

The legal status of standards is constantly under discussion. Inside Europe, i.e. within the scope of the European directives that are subject to the CE-
makring obligation, a manufacturer is not bound by standards or other specifications. He simply needs to comply with the health and safety requirements of the directive(s). The associated benefits of a division between standards and legislation are obvious: It is easier for legislators to agree on the essential requirements than on technical details. Also, the directives do not regularly have to be adapted to the state of technology; member states can use their own legal system for incorporation and manufacturers are free to select the ways in which they implement the requirements of the directive.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# European directives and position of the standards in Europe




Standards pyramid

So what are the benefits of applying the standards? With so-called harmonised standards with presumption of conformity, there is a shifting of the burden of proof, i.e. if manufacturers apply these standards, it is presumed that they will also comply with the specific requirements of the European directives. The regulatory authorities would therefore need to prove that a manufacturer did not meet the legal requirements.

However, should a manufacturer deviate from the harmonised standards, he himself must prove how he has met the essential safety requirements. This is generally done via a hazard analysis. In practice one would endeavour to apply the harmonised standards, unless the products concerned are highly innovative and no harmonised standards yet exist. The standards for which this “presumption effect” applies can be researched in the Official Journal of the EU (e.g. on the Internet). Standards in Europe are subdivided into what are termed A, B, and C standards.



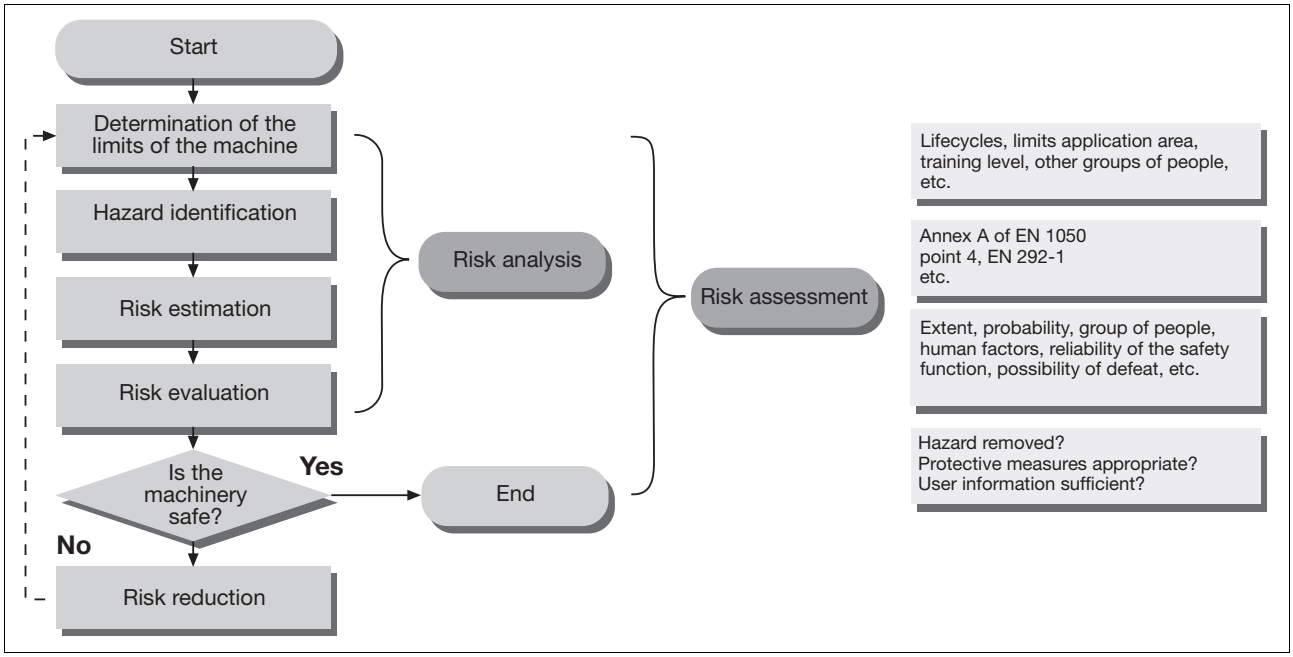
Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Risk analysis

**Risk assessment**

Under the terms of the machinery directive, a machine manufacturer must assess the hazards in order to identify all the hazards that apply to his machine. He must then design and construct the machine to take account of his assessment. This requirement also applies to operators who act as manufacturers under the terms of the machinery directive. For example, this may occur with machines that are interlinked or for machinery that has been upgraded and substantially modified.
EN 1050 contains “Principles for risk assessment” on machinery. These approaches can be called upon as part of a comprehensive analysis. EN 954-1 expands on
EN 1050 with regard to the assessment of safety-related parts of control systems.

The hazards emanating from a machine may be many and varied, so for example, it is necessary to consider not just mechanical hazards through crushing and shearing, but also thermal and electrical hazards and hazards from radiation. Risk reduction is therefore an iterative process, i.e. it is carried out before and during the planning phase and after completion of the plant or machine.




Iterative process in accordance with EN 1050



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Legal regulations outside Europe and standards for functional safety

**Legal regulations outside Europe**

The situation is somewhat different in the USA: people there are mainly familiar with two types of standards: ANSI (American National Standards Institute) and OSHA (Occupational Safety and Health Administration).

OSHA standards are published by the state and compliance is mandatory. ANSI standards, on the other hand, are developed by private organisations and their application is generally not absolutely essential. However, ANSI standards can still be found included as part of a contract. Beyond that ANSI standards are being taken over by OSHA. You can also still come across the NFPA (National Fire Protection Association), which developed NFPA 79 as a counterpart to EN 60204-1, for example. OSHA standards can be compared with the European directives. Unlike the European directives, OSHA standards are more involved with formulating technical specifications than abstract requirements.

The legal basis in the USA can be seen as a mix of product standards, fire codes (NFPA), electrical codes (NEC) and national laws. Local government bodies have the authority to monitor that these codes are being enforced and implemented.

Russia and the CIS states have implemented GOST-R certification for some years now, in other words, technical devices that fall within a specific product area must undergo a certain certification process. Machinery and any corresponding technical accessories undergo a type approval test through a European notified body, for example. This test is generally recognised by a Russian-based approvals body. From the point of view of safety, the same requirements apply as in Europe.

China, on the other hand, has introduced CCC certification. Similar to the position in Russia, technical products are subject to mandatory certification through a national approvals body in China. In addition, production sites are inspected. If a technical device falls with the scope of the product list, which is subdivided into 19 categories, certification is mandatory, otherwise it will be necessary to supply a type of “declaration of no objection” from a national notified body.

Japan is currently in a transition period: The plan is for Japan to adopt the European “new approach” – in other words, to keep standards and legislation separate. At the moment the international ISO and IEC standards are being directly incorporated into national legislation, which is why people are currently confronted with frequent amendments to laws and lengthy implementation periods.

**Standards for functional safety**

Different standards may be called upon to observe functional safety on control systems, depending on the application. In the area of machine safety, EN 954-1 is the main standard named for safety-related control systems. Irrespective of the technology, this applies for the whole chain from the sensor to the actuator. The risk graphs and corresponding risk parameters can be used to estimate the potential risk for danger zones on machinery. The category is then established without the use of risk-reducing measures.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

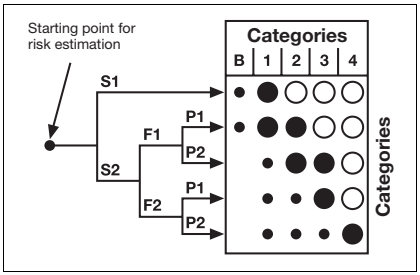
# Risk parameters and categories in accordance with EN 954-1

**Risk parameters**

S = Severity of injury:
1 = Slight (normally reversible) injury
2 = Serious (normally irreversible) injury including death

F = Frequency and/or exposure time to the hazard:?
1 = Seldom to quite often and/or the exposure time is short
2 = Frequent to continuous and/or the exposure time is long

P = Possibility of avoiding the hazard:
1 = Possible under specific conditions
2 = Scarcely possible




Risk graph from EN 954

**Categories in accordance with EN 954-1**

The control system requirements derived from the risk graph are specified as follows:

**Category B**

Basic category with no special requirements = “good industrial standard”

**Category 1**

Safety-related parts must be designed and constructed using well-tried components and well-tried safety principles.

Well-tried means: the components have been widely used in the past with successful results in similar applications, or they have been manufactured using principles that demonstrate its suitability and reliability for safety-related applications.

Example: safety switch with forced-opening contacts.

Well-tried safety principles are circuits that are constructed in such a way that certain faults can be avoided by the appropriate arrangement or layout of components.

Example: avoiding a short circuit through appropriate separation, avoiding component failures that result from over-dimensioning, using the failsafe principle (on switching off).

Note: The occurrence of a fault can lead to the loss of the safety function.

**Category 2**

Safety-related parts of control systems must be designed so that their safety function(s) are checked at suitable intervals by the machine control system. The safety function(s) must be checked: at the machine start-up and prior to the initiation of any hazardous situation; periodically during operation, if the risk assessment and the kind of operation show that it is necessary.

The initiation of this check may be automatic or manual. Automatically, for example, the check may be initiated by a signal generated from a control system at suitable intervals. The automatic test should be provided by preference. The decision about the type of test depends on the risk assessment and the judgement of the end user or machine builder. If no fault is detected, operation may be approved as a result of the test. If a fault is detected, an output must be generated to initiate appropriate control action. A second, independent shutdown route is required for this.

Notes: In some cases Category 2 is not applicable because the checking of the safety function cannot be applied to all components and devices. Moreover, the cost involved in implementing Category 2 correctly may be considerable, so that it may make better economic sense to implement a different category.

In general Category 2 can be realised with electronic techniques. The system behaviour allows the occurrence of a fault to lead to the loss of the safety function between checks; the loss of the safety function is detected by the check.

**Category 3**

Safety-related parts of control systems must be designed so that a single fault in any of these parts does not lead to the loss of the safety function. Whenever reasonably practicable, the single fault shall be detected at or before the next demand upon the safety function.

This does not mean that all faults will be detected. The accumulation of undetected faults can lead to an unintended output signal and a hazardous situation at the machine.

**Category 4**

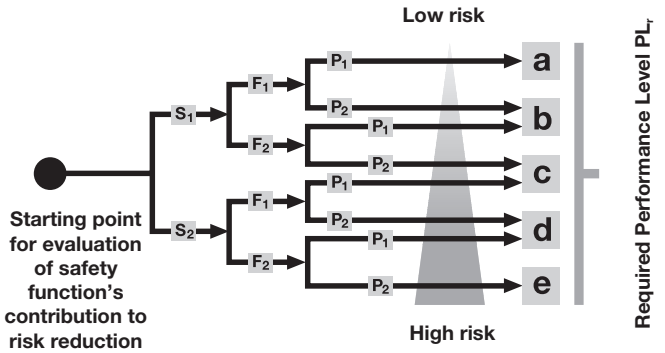
Safety-related parts of control systems must be designed so that a single fault in any of these parts does not lead to a loss of the safety function; the single fault must be detected at or before the next demand upon the safety functions (e.g. immediately at switch on, at the end of a machine operating cycle).
If this detection is not possible, then an accumulation of faults shall not lead to a loss of the safety function.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Safety-related parts of control systems - General principles for design in accordance with EN ISO 13849-1

**Determination of the required Performance Level ($PL_r$)**

- **S – Severity of injury**
  - $S_1$ = Slight (normally reversible injury)
  - $S_2$ = Serious (normally irreversible injury, including death)
- **F – Frequency and/or exposure to a hazard**
  - $F_1$ = Seldom to less often and/or the exposure time is short
  - $F_2$ = Frequent to continuous and/or the exposure time is long
- **P – Possibility of avoiding the hazard or limiting the harm**
  - $P_1$ = Possible under specific conditions
  - $P_2$ = Scarcely possible




## Safety-related parts of control systems – General principles for design in accordance with EN ISO 13849-1

As the successor standard to EN 954-1, EN ISO 13849-1 is based on the familiar categories. Equally, it examines complete safety functions, including all the components involved in their design. EN ISO 13849-1 goes beyond the qualitative approach of EN 954-1 to include a quantitative assessment of the safety functions. A performance level (PL) is used for this, building upon the categories.

Components/devices require the following safety parameters:

- Category (structural requirement)
- PL: Performance level
- MTTFd: Mean time to dangerous failure Mean Time To Dangerous Failure)
- DC: Diagnostic coverage Diagnostic Coverage)
- CCF: Common cause failure Common Cause Failure)

The standard describes how to calculate the performance level (PL) for safety-related parts of control systems, based on designated architectures. EN ISO 13849-1 refers any deviations to IEC 61508.

## Risk assessment in accordance with EN ISO 13849-1

Risk assessment is an iterative process, i.e. it will need to be carried out more than once. The risk must be estimated and the performance level defined for each hazard on which the risk is to be reduced through control measures. The risk is estimated through consideration of the severity of injury (S), the frequency and duration of exposure to the hazard (F) and the possibility of avoiding or limiting the harm (P).

Parameters S, F and P are used on the risk graph to determine the required performance level ($PL_r$) for a safety function. The selection of parameters is no different to the procedure used in EN 954-1 (1996). However, the result is no longer a category but a PL.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

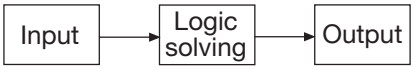
# Safety-related parts of control systems - General principles for design in accordance with EN ISO 13849-1

### Performance level

The performance level (PL) classifies 5 levels of probability of failure. The table shows the relationship between PL and the probability of dangerous failure per hour (PFHD).

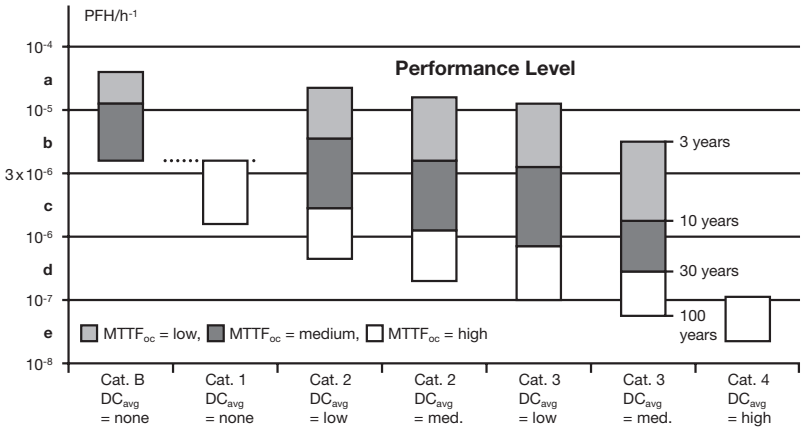
| Performance Levels (PL) in accordance with EN ISO 13849-1 | Probability of a dangerous failure per hour [1/h] |
|---|---|
| a | $10^{-5} < PFH < 10^{-4}$ |
| b | $3 \times 10^{-6} < PFH < 10^{-5}$ |
| c | $10^{-6} < PFH < 3 \times 10^{-6}$ |
| d | $10^{-7} < PFH < 10^{-6}$ |
| e | $10^{-8} < PFH < 10^{-7}$ |

Once the required PL has been established, the PL achieved by the safety function (SRP/CL) is calculated. To do this the SRP/CL can be divided into logical blocks, such as input, logic solving and output for example.




When using a designated architecture or an architecture of similar structure, the achieved PL can be calculated graphically using the bar chart. To do this the architecture of the SRP/CL in divided into categories. $MTTF_D$ and $DC_{avg}$ are also required. From Category 2 onwards, the CCF will also need to be examined. A component's $MTTF_D$ value is usually provided by the manufacturer. The standard provides tables and check lists for calculating the other values.

**Relationship between categories DC, $MTTF_d$ and PL**




It is also possible to calculate the achieved PL of an SRP/CL. The probability of dangerous failure of all the blocks that combine to form the safety function is added up:

$PFH_{System} = PFH_{Input} + PFH_{Logic} + PFH_{Output}$

The PL achieved by an SRP/CL must be at least as high as the PL required by the safety function. If this condition is not met, the safety function must be implemented differently.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Functional safety and legal position of EN/IEC 61508

**Functional safety with ?EN/IEC 61508?**

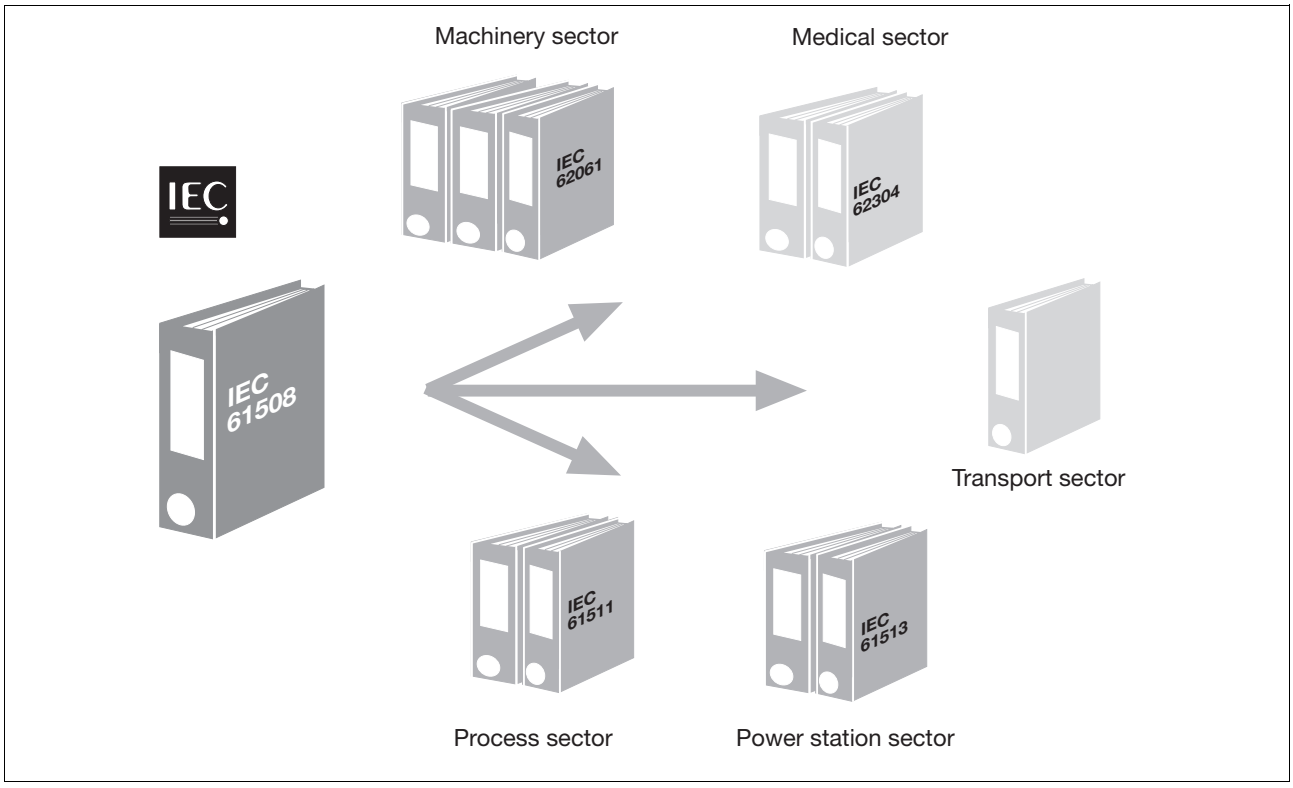
EN/IEC 61508 is regarded as a generic safety standard, which deals with the functional safety of electrical, electronic and programmable electronic systems, irrespective of the application.

One of the main tasks of EN/ IEC 61508 is to serve as a basis for the development of application-oriented standards. Standards' committees are currently busy in the areas of machine safety with EN/IEC 62061, and process safety with EN/IEC 61511. Also under revision is EN 954, the standard harmonised under the scope of the machinery directive, which in future will be listed as EN ISO 13849.

These sector-specific standards are intended to continue the principle approaches of EN/IEC 61508 and to implement the requirements for the relevant application area in a suitably practical manner.

**What is the legal status ?of EN/IEC 61508?**

As EN/IEC 61508 is not listed in the Official Journal of the European Communities for implementation as a European directive, it lacks the so-called “presumption effect”: so if the standard is used on its own, a control system designer cannot presume that the relevant requirements of the specific European directive have been met.




Sector standards from EN/IEC 61508

6.1

# Functional safety in accordance with EN/IEC 62061

**Risk assessment and determination of required Safety Integrity Level (SIL)**

| Consequences | S | Class Cl 3-4 | 5-7 | 8-10 | 11-13 | 14-15 | Frequency and duration | Fr | Probability of hzd. event | Pr | Avoidance | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Death, losing an eye or arm | 4 | SIL 2 | SIL 2 | SIL 2 | SIL 3 | SIL 3 | ≤ 1 hour | 5 | Very high | 5 | | |
| Permanent, losing fingers | 3 | | OM | SIL 1 | SIL 2 | SIL 3 | > 1 h – ≤ 1 day | 5 | Likely | 4 | | |
| Reversible, medical attention | 2 | | | OM | SIL 1 | SIL 2 | > 1 day – ≤ 2 wks | 4 | Possible | 3 | Impossible | 5 |
| Reversible, first aid | 1 | | | | OM | SIL 1 | > 2 wks – ≤ 1 year | 3 | Rarely | 2 | Possible | 3 |
| | | | | | | | > 1 year | 2 | Negligible | 1 | Likely | 1 |

☐ AM = Other measures recommended

**Functional safety of safety-related electrical, electronic and programmable electronic control systems in accordance with EN/IEC 62061**

EN/IEC 62061 represents a sector-specific standard under EN/IEC 61508. It describes the implementation of safety-related electrical control systems on machinery and examines the overall lifecycle from the concept phase through to decommissioning. Quantitative and qualitative examinations of the safety functions form the basis.
Risk estimation is an iterative process, i.e. it will need to be carried out more than once. The risk must be assessed and the SIL defined for each hazard on which the risk is to be reduced through control measures. The risk is estimated through consideration of the severity of injury (Se), the frequency and duration of exposure to the hazard (Fr), probability of occurrence of a hazardous event (Pr) and the possibility of avoiding or limiting the harm (Av).
The required SIL is assigned using the table above, where Cl = Fr + Pr + Av.


Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Functional safety in accordance with EN/IEC 62061

| Safety Integrity Level (SIL) in accordance with EN IEC 62061 | Probability of a dangerous failure per hour [1/h] |
|---|---|
| No special safety requirement | $10^{-5} < PFH < 10^{-4}$ |
| 1 (1 failure in 100 000 h) | $3 \times 10^{-6} < PFH < 10^{-5}$ |
| 1 (1 failure in 100 000 h) | $10^{-6} < PFH < 3 \times 10^{-6}$ |
| 2 (1 failure in 1 000 000 h) | $10^{-7} < PFH < 10^{-6}$ |
| 3 (1 failure in 10 000 000 h) | $10^{-8} < PFH < 10^{-7}$ |

**SIL assignment**

The safety integrity level (SIL) classifies three levels of probability of failure. The table shows the relationship between SIL and the probability of dangerous failure per hour ($PFH_D$).

The SRECS (safety-related electrical control system) is divided into subsystems. The subsystems are assigned to actual devices.

The probability of a dangerous failure is calculated by adding the probabilities of failure of all the subsystems of the SRECS:

$PFH_D = PFH_{D1} + .... + PFH_{Dn}$

The selection or design of the SRECS must always meet the following minimum requirements:

Requirements for hardware safety integrity, comprising

- Architectural constraints for hardware safety integrity
- Requirements for the probability of dangerous random hardware failures

plus requirements for systematic safety integrity, comprising

- Requirements for avoidance of failures and
- Requirements for the control of systematic failures.

The following parameters are required in assessing hardware safety integrity:

$\lambda D$: Dangerous failure rate

T1: Proof test
T2: Diagnostic test interval
DC: Diagnostic coverage
$\beta$: Common cause failure

The calculated probability of failure ($PFH_D$) of each SRECS must be less than the probability of failure required by the safety function. The required probability of failure, depending on the SIL, can be taken from the table. If this condition is not met, the safety function must be implemented differently.

The achieved SIL can only be as high as the lowest SILCL (SIL Claim Limit) of a subsystem involved in performing the safety function.

| Safe failure fraction (SFF) | Hardware fault tolerance 0 | Hardware fault tolerance 1 | Hardware fault tolerance 2 |
|---|---|---|---|
| < 60 % | Not allowed | SIL 1 | SIL 2 |
| 60 % – < 90 % | SIL 1 | SIL 2 | SIL 3 |
| 90 % – < 99 % | SIL 2 | SIL 3 | SIL 3 |
| 99 % | SIL 3 | SIL 3 | SIL 3 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

more than automation
safe automation

| Contents | | Page |
|---|---|---|
| **Service** | | |
| Pre-sales/after sales | | |
| | Services, concepts and solutions | 7.1-2 |
| Business terms and conditions | | |
| | Terms of delivery and payment | 7.1-3 |



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Pre-sales/after sales
## Services, concepts and solutions

We are happy to advise you, in the configuration phase or during commissioning.

**Plant assessment**
Analysis and assessment of the safety-related condition of your plant and machinery. Presentation of basic proposals for improvement.

**Risk assessment**
Assessment of the hazards and risks on plant and machinery, based on norms and standards.

**Safety concept**
Based on the risk analysis, appropriate protective measures can be selected and a safety concept drawn up.

**Safety design**
Pilz undertakes all the tasks required to implement a project: component selection, preparation of circuit diagrams, programming, control cabinet, installation, commissioning.

**CE services**
Co-ordination and implementation of all the activities necessary for the CE conformity of plant and machinery.

**Safety sign-off**
All the relevant safety-related documents are examined, check lists are created and the plant and machinery checked.

**Technical support**
Our engineers can support you in the selection, use and application of our products. They are in constant contact with customers from the widest range of areas and industrial sectors and are happy to answer your queries at any time.

**E-mail:**
**techsupport@pilz.de**

**24-hour hotline:**
**+49 711 3409-444**

**Training and education**
A wide range of seminars and training courses helps to communicate the fundamentals for minimising risk and assuring your success.

**Worldwide representatives**
Our worldwide network of subsidiaries and sales partners ensures comprehensive support and assistance with your questions and problems.

**Internet**
Our homepage at www.pilz.com provides the latest information, electronic shopping, direct dialogue and enquiry functions as well as extensive download options.

**E-Business**
The focus of Pilz's E-Business activities is to strengthen customer orientation through the use of new media and to increase added value via a supplementary business model for Business-to-Business.

**Supply and repair service**
From a fast, economical repair through to a long supply guarantee to safeguard your investment - always expect more from Pilz.

**Certificates and approvals**
Pilz is certified to DIN ISO 9001. International approvals and certification from recognised test houses confirm our products' suitability for worldwide use.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

# Business terms and conditions
## Terms of delivery and payment

The terms of delivery and of payment of the respective Pilz company with whom a sales contract is closed are applied. As a rule this is the Pilz company that places the order. Please select the legal contract partner from the order confirmation.



Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

## AT
Pilz Ges.m.b.H.
Sichere Automation
Modecenterstraße 14
1030 Wien
Austria
Telephone: +43 1 7986263-0
Telefax: +43 1 7986264
E-Mail: pilz@pilz.at

## AU
Pilz Australia
Safe Automation
Suite C1, 756 Blackburn Road
Clayton, Melbourne VIC 3168
Australia
Telephone: +61 3 95446300
Telefax: +61 3 95446311
E-Mail: safety@pilz.com.au

## BE LU
Pilz Belgium
Safe Automation
Bijenstraat 4
9051 Gent (Sint-Denijs-Westrem)
Belgium
Telephone: +32 9 3217570
Telefax: +32 9 3217571
E-Mail: info@pilz.be

## BR
Pilz do Brasil
Automação Segura
Rua Ártico, 123 - Jd. do Mar
09726-300
São Bernardo do Campo - SP
Brazil
Telephone: +55 11 4337-1241
Telefax: +55 11 4337-1242
E-Mail: pilz@pilzbr.com.br

## CH
Pilz Industrieelektronik GmbH
Gewerbepark Hintermättli
Postfach 6
5506 Mägenwil
Switzerland
Telephone: +41 62 88979-30
Telefax: +41 62 88979-40
E-Mail: pilz@pilz.ch

## CN
Pilz Industrial Automation
Trading (Shanghai) Co., Ltd.
Safe Automation
Rm. 704-706
No. 457 Wu Lu Mu Qi (N) Road
Shanghai 200040
China
Telephone: +86 21 62494658
Telefax: +86 21 62491300
E-Mail: sales@pilz.com.cn

## DE
Pilz GmbH & Co. KG
Sichere Automation
Felix-Wankel-Straße 2
73760 Ostfildern
Germany
Telephone: +49 711 3409-0
Telefax: +49 711 3409-133
E-Mail: pilz.gmbh@pilz.de

## DK
Pilz Skandinavien K/S
Safe Automation
Ellegaardvej 25 L
6400 Sonderborg
Denmark
Telephone: +45 74436332
Telefax: +45 74436342
E-Mail: pilz@pilz.dk

## ES
Pilz Industrieelektronik S.L.
Safe Automation
Camí Ral, 130
Polígono Industrial Palou Nord
08400 Granollers
Spain
Telephone: +34 938497433
Telefax: +34 938497544
E-Mail: pilz@pilz.es

## FI
Pilz Skandinavien K/S
Safe Automation
Nuijamiestentie 5 A
00400 Helsinki
Finland
Telephone: +358 9 27093700
Telefax: +358 9 27093709
E-Mail: pilz.fi@pilz.dk

## FR
Pilz France Electronic
1, rue Jacob Mayer
BP 12
67037 Strasbourg Cedex 2
France
Telephone: +33 3 88104000
Telefax: +33 3 88108000
E-Mail: siege@pilz-france.fr

## GB
Pilz Automation Technology
Safe Automation
Willow House, Medlicott Close
Oakley Hay Business Park
Corby
Northants NN18 9NF
United Kingdom
Telephone: +44 1536 460766
Telefax: +44 1536 460866
E-Mail: sales@pilz.co.uk

## IE
Pilz Ireland Industrial Automation
Cork Business and Technology Park
Model Farm Road
Cork
Ireland
Telephone: +353 21 4346535
Telefax: +353 21 4804994
E-Mail: sales@pilz.ie

## IT
Pilz Italia Srl
Automazione sicura
Via Meda 2/A
22060 Novedrate (CO)
Italy
Telephone: +39 031 789511
Telefax: +39 031 789555
E-Mail: info@pilz.it

## JP
Pilz Japan Co., Ltd.
Safe Automation
Shin-Yokohama Fujika Building 5F
2-5-9 Shin-Yokohama
Kohoku-ku
Yokohama 222-0033
Japan
Telephone: +81 45 471-2281
Telefax: +81 45 471-2283
E-Mail: pilz@pilz.co.jp

## KR
Pilz Korea Ltd.
Safe Automation
9F Jo-Yang Bld. 50-10
Chungmuro2-Ga Jung-Gu
100-861 Seoul
Republic of Korea
Telephone: +82 2 2263 9541
Telefax: +82 2 2263 9542
E-Mail: info@pilzkorea.co.kr

## MX
Pilz de Mexico, S. de R.L. de C.V.
Automatización Segura
Circuito Pintores # 170
Cd. Satelite
C.P. 53100
Naucalpan de Juarez, Edo. de Mexico
Mexico
Telephone: +52 55 5572 1300
Telefax: +52 55 5572 4194
E-Mail: info@mx.pilz.com

## NL
Pilz Nederland
Veilige automatisering
Postbus 186
4130 ED Vianen
Netherlands
Telephone: +31 347 320477
Telefax: +31 347 320485
E-Mail: info@pilz.nl

## ...
In many countries we are represented by sales partners.

Please refer to our Homepage for further details or contact our headquarters.

## NZ
Pilz New Zealand
Safe Automation
5 Nixon Road
Mangere
Auckland
New Zealand
Telephone: +64 9 6345350
Telefax: +64 9 6345352
E-Mail: t.catterson@pilz.co.nz

## PT
Pilz Industrieelektronik S.L.
R. Eng Duarte Pacheco, 120
4 Andar Sala 21
4470-174 Maia
Portugal
Telephone: +351 229407594
Telefax: +351 229407595
E-Mail: pilz@pilz.es

## SE
Pilz Skandinavien K/S
Safe Automation
Energigatan 10 B
43437 Kungsbacka
Sweden
Telephone: +46 300 13990
Telefax: +46 300 30740
E-Mail: pilz.se@pilz.dk

## TR
Pilz Emniyet Otomasyon
Ürünleri ve Hizmetleri Tic. Ltd. Şti.
İsmail Paşa Sokak No: 8
Koşuyolu/Kadıköy
34718 İstanbul
Turkey
Telephone: +90 216 5452910
Telefax: +90 216 5452913
E-Mail: pilz.tr@pilz.de

## US CA
Pilz Automation Safety L.P.
7150 Commerce Boulevard
Canton
Michigan 48187
USA
Telephone: +1 734 354 0272
Telefax: +1 734 354 3355
E-Mail: info@pilzusa.com

## www
www.pilz.com

## Technical support
+49 711 3409-444


DAT - I - 010/05


Pilz GmbH & Co. KG
Sichere Automation
Felix-Wankel-Straße 2
73760 Ostfildern, Germany
Telephone: +49 711 3409-0
Telefax: +49 711 3409-133
E-Mail: pilz.gmbh@pilz.de2


more than automation
safe automation


2-1-2-2-006, 2008-08 Printed in Germany


© Pilz GmbH & Co. KG, 2006

Automation Workbench®, Pilz®, PIT®, PMI®, PNOZ®, Primo®, PSS®, SafetyBUS p®, SafetyEYE® are registered trademarks of Pilz GmbH & Co. KG.
Text and graphics in this leaflet are simply intended to give an overview of the system. No responsibility accepted for errors or omissions.

# Data sheets

Pilz GmbH & Co., Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone +49 (7 11) 34 09-0, Telefax +49 (7 11) 34 09-1 33, E-Mail: pilz.gmbh@pilz.de

# Expansion modules
## PNOZ ms3p

Speed monitor for connection to a base unit from the PNOZmulti modular safety system

### Approvals

| | PNOZ ms3p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

### Unit features

- Monitoring of 2 independent axes
- Connection per axis
  - 1 incremental encoder
- Measured variables:
  - Standstill
  - Speed (8 values can be set)
  - Direction of rotation
- Axis types, reset mode can be selected in the PNOZmulti Configurator
- Status indicators for
  - Supply voltage
  - Incremental encoder
  - Axis status, standstill and excess speed
  - Faults on the system
- Incremental encoder connection technology:
  RJ-45 female connector
- Function to deactivate speed monitoring
- Galvanic isolation between the connections X1, X12 and X22
- Max. 4 speed monitors can be connected to the base unit

### Unit description

The expansion module monitors standstill, speed and direction of rotation up to Category 3 of EN 954-1.

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

### System requirements

- PNOZmulti Configurator: From Version 6.1.0
- Base unit PNOZ m1p: From Version 5.7
- Base unit PNOZ m2p: From Version 2.7

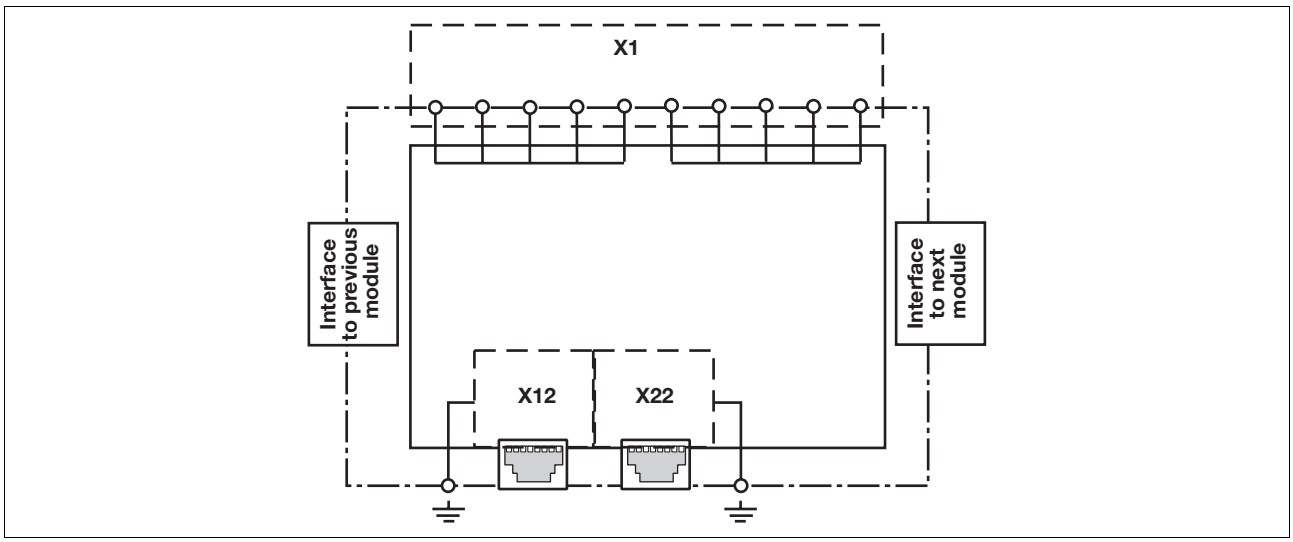
Please contact Pilz if you have an older version.

### Safety features

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

### Block diagram



# Expansion modules
## PNOZ ms3p

**Function description**

The speed monitor can independently monitor two axes for standstill, speed and direction of rotation. The speed monitor signals the status of the monitored values to the base unit. Depending on the safety circuit loaded, the values can be transferred from the base unit, e.g. to a relay output on the safety system. Incremental encoders can be used to record the values.
The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

**Wiring**

- Only incremental encoders with a differential output of the following type are permitted
  - Sin/Cos
  - TTL (RS 422)
  - HTL (24 V)
- Please note the values stated in the technical details

Follow the instructions below when connecting the incremental encoder:

- The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- Only use shielded cables for all connections
- Always connect 0 V on the incremental encoder and speed monitor.
- Position the terminating resistors on the signal lines as close as possible to the input on the speed monitor.

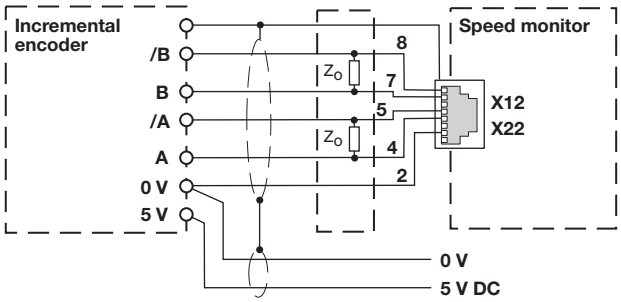
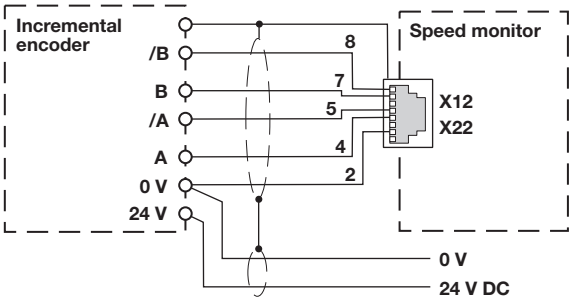
The wiring is defined in the circuit diagram of the PNOZmulti Configurator. Details of the input type, axis type and reset mode, plus the values for standstill, speed monitoring and direction of rotation are also defined in the PNOZmulti Configurator.
Please note:

- Information given in the "Technical details" must be followed.
- Use copper wire that can withstand 75 °C.

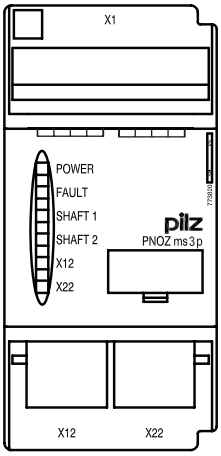
# Expansion modules
## PNOZ ms3p

### Preparing for operation

- Incremental encoders

| | |
|---|---|
| Encoder type 1 Vss, 5 V-TTL<br>Terminate incremental encoder with<br>$Z_o$ = 120 Ohm |  |
| Encoder type 24 V-HTL<br>Do **not** terminate incremental encoder with<br>$Z_o$ = 120 Ohm |  |

### Terminal configuration

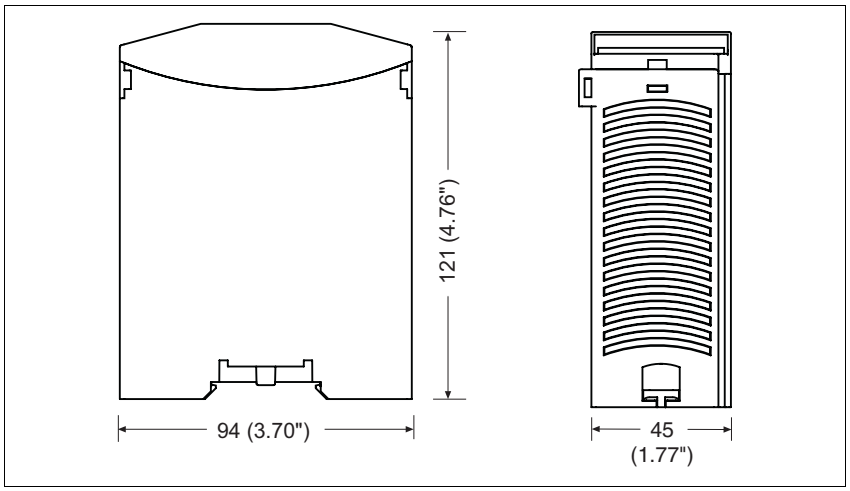


# Expansion modules
## PNOZ ms3p

### Installation

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

### Dimensions



# Expansion modules
## PNOZ ms3p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| **Technical details** | |
|---|---|
| | |
| **Electrical data** | |
| Supply voltage $U_B$ DC | |
| | **5 V** |
| Power consumption at $U_B$ DC | |
| | **1.0 W** |
| Residual ripple DC | **5 %** |
| Status display | **LED** |
| **Times** | |
| Configurable switch-off delay | **0 - 2,500 ms** |
| Response time | |
| f>100 Hz: configurable switch-off delay + switch-off delay on base unit | **10 ms** |
| f<100 Hz: configurable switch-off delay + switch-off delay on base unit | **10 ms** |
| Supply interruption before de-energisation | **20 ms** |
| **Incremental encoder input** | |
| Number of inputs | **2** |
| Phase position for the differential signals A,/A and B,/B | **90° ±30°** |
| Overload protection | **-30 - 30 V** |
| Input resistance | **10 kOhm** |
| Input's frequency range | **0 - 500 kHz** |
| Configurable monitoring frequency | |
| without hysteresis | **0,1 Hz - 500 kHz** |
| with hysteresis | **0,2 Hz - 500 kHz** |
| Connection type (incremental encoder) | **RJ-45-socket, 8-pin** |
| **Environmental data** | |
| Airgap creepage in accordance with **VDE 0110-1** | |
| Climatic suitability | **DIN IEC 60068-2-3** |
| EMC | **EN 60947-5-1** |
| Vibration to **EN 60068-2-6** | |
| Frequency | **10 - 55 Hz** |
| Amplitude | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3** |
| Ambient temperature | **0 - 60 °C** |
| Storage temperature | **-25 - 70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions | |
| Height | **94.0 mm** |
| Width | **45.0 mm** |
| Depth | **121.0 mm** |
| Weight | **220 g** |

# Expansion modules
## PNOZ ms3p

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ ms3p | Expansion module | Speed monitor | 773 820 |

# Expansion modules
## PNOZ ms4p

Speed monitor for connection to a base unit from the PNOZmulti modular safety system

### Approvals

| | PNOZ ms4p |
|---|---|
| c UL us LISTED | ◆ |
| | ◆ |
| | ◆ |

### Unit features

- Monitoring of 1 axis
- Connection: 1 incremental encoder
- Measured variables:
  - Standstill
  - Speed (16 values can be set)
  - Direction of rotation
- Axis types, reset mode can be selected in the PNOZmulti Configurator
- Status indicators for
  - Supply voltage
  - Incremental encoders
  - Axis status, standstill and excess speed
  - Faults on the system
- Incremental encoder connection technology:
  RJ-45 female connector
- Function to deactivate speed monitoring
- Galvanic isolation between the connections X1 and X12
- Max. 4 speed monitors can be connected to the base unit

### Unit description

The expansion module monitors standstill, speed and direction of rotation up to Category 3 of EN 954-1.

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

### System requirements

- PNOZmulti Configurator: from Version 5.1.0
- Base unit PNOZ m1p: from Version 5.2
- Base unit PNOZ m2p: from Version 2.2

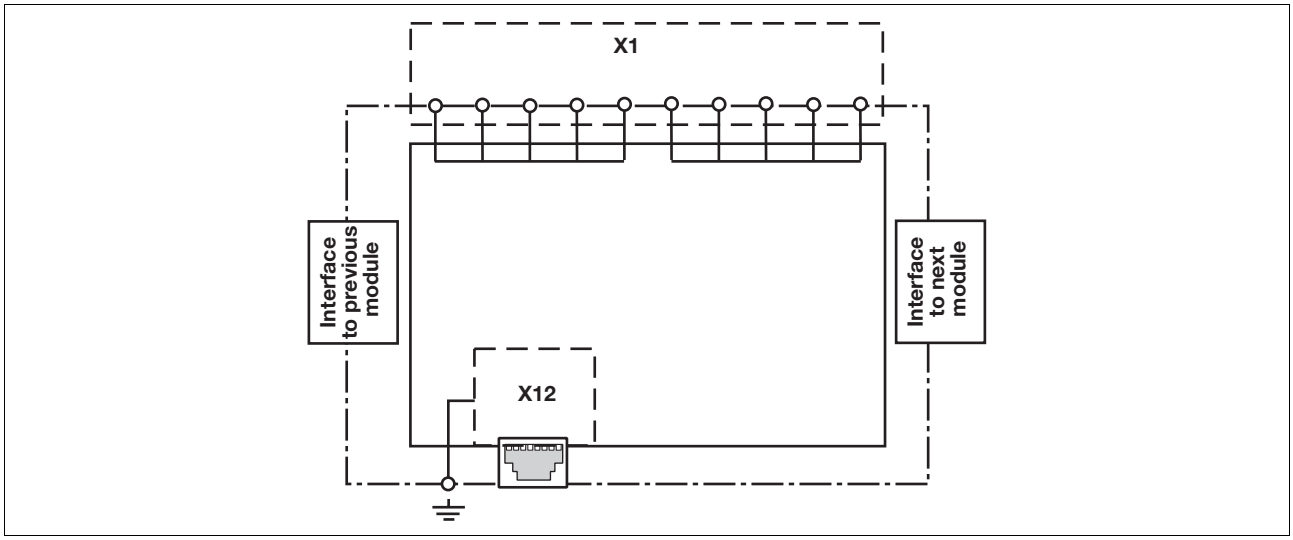
Please contact Pilz if you have an older version.

### Safety features

The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

### Block diagram



# Expansion modules
## PNOZ ms4p

**Function description**

The speed monitor can monitor an axis for standstill, speed and direction of rotation. The speed monitor signals the status of the monitored values to the base unit. Depending on the safety circuit loaded, the values can be transferred from the base unit, e.g. to a relay output on the safety system.
Incremental encoders can be used to record the values.
The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

**Wiring**

- Only incremental encoders with a differential output of the following type are permitted
  - Sin/Cos
  - TTL (RS 422)
  - HTL (24 V)
- Please note the values stated in the technical details

Follow the instructions below when connecting the incremental encoder:

- The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- The incremental encoder on connector X12 monitors the axis.
- Only use shielded cables for all connections
- Always connect 0 V on the incremental encoder and speed monitor.
- Position the terminating resistors on the signal lines as close as possible to the input on the speed monitor.

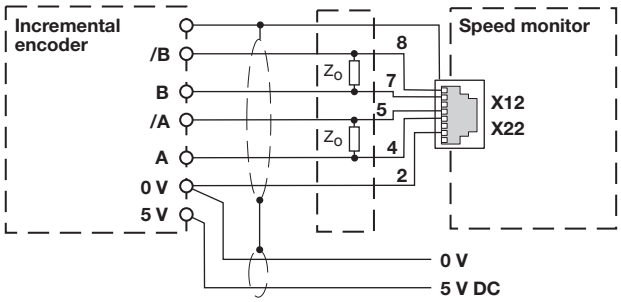
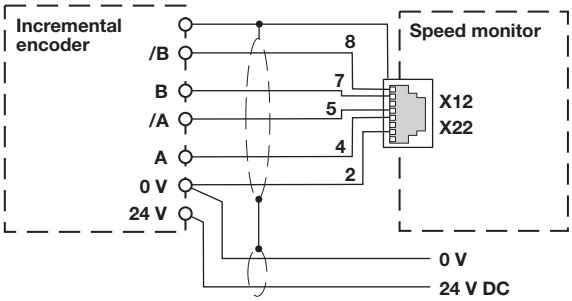
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.
Details of the input type, axis type and reset mode, plus the values for standstill, speed monitoring and direction of rotation are also defined in the PNOZmulti Configurator.
Please note:

- Information given in the "Technical details" must be followed.
- Use copper wire that can withstand 75 °C.

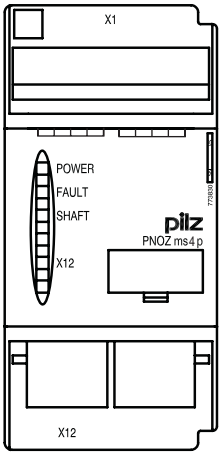
# Expansion modules
## PNOZ ms4p

### Preparing for operation

- Incremental encoders

| | |
|---|---|
| Encoder type 1 Vss, 5 V-TTL<br>Terminate incremental encoder with<br>$Z_o$ = 120 Ohm |  |
| Encoder type 24 V-HTL<br>Do **not** terminate incremental encoder with<br>$Z_o$ = 120 Ohm |  |

### Terminal configuration

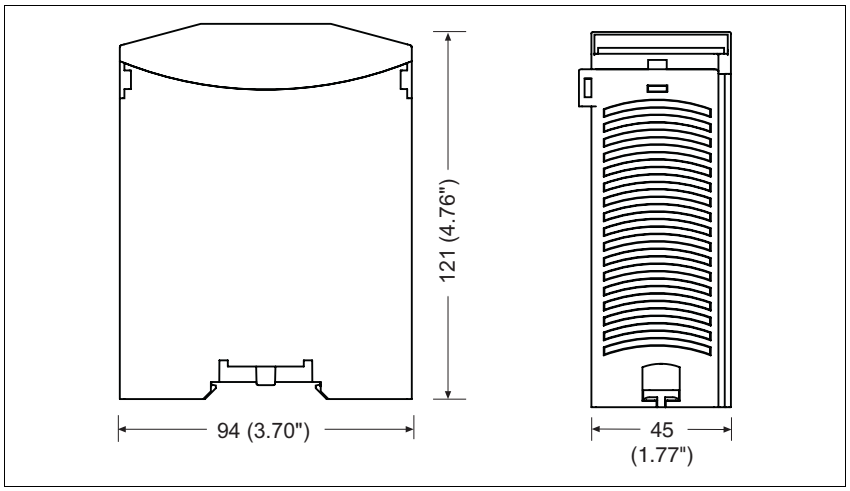


# Expansion modules
## PNOZ ms4p

### Installation

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

### Dimensions



# Expansion modules
## PNOZ ms4p

**Notice** This data sheet is only intended for use during configuration. For installation and operation, please refer to the operating instructions supplied with the unit.

| **Technical details** | |
|---|---|
| | |
| **Electrical data** | |
| Supply voltage $U_B$ DC | |
| | **5 V** |
| Power consumption at $U_B$ DC | |
| | **1.0 W** |
| Residual ripple DC | **5 %** |
| Status display | **LED** |
| **Times** | |
| Configurable switch-off delay | **0 - 2,500 ms** |
| Response time | |
| f>100 Hz: configurable switch-off delay + switch-off delay on base unit * | **10 ms** |
| f<100 Hz: configurable switch-off delay + switch-off delay on base unit * | **10 ms** |
| Supply interruption before de-energisation | **20 ms** |
| **Incremental encoder input** | |
| Number of inputs | **1** |
| Phase position for the differential signals A,/A and B,/B | **90° ±30°** |
| Overload protection | **-30 - 30 V** |
| Input resistance | **10 kOhm** |
| Input's frequency range | **0 - 500 kHz** |
| Configurable monitoring frequency | |
| without hysteresis | **0,1 Hz - 500 kHz** |
| with hysteresis | **0,2 Hz - 500 kHz** |
| Connection type (incremental encoder) | **RJ-45-socket, 8-pin** |
| **Environmental data** | |
| Airgap creepage in accordance with **VDE 0110-1** | |
| Climatic suitability | **DIN IEC 60068-2-3** |
| EMC | **EN 60947-5-1** |
| Vibration to **EN 60068-2-6** | |
| Frequency | **10 - 55 Hz** |
| Amplitude | **0.35 mm** |
| Climatic suitability | **DIN IEC 60068-2-3** |
| Ambient temperature | **0 - 60 °C** |
| Storage temperature | **-25 - 70 °C** |
| **Mechanical data** | |
| Protection type | |
| Mounting (e.g. cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| DIN rail | |
| Top hat rail | **35 x 7.5 EN 50022** |
| Recess width | **27 mm** |
| Housing material | |
| Housing | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions | |
| Height | **94.0 mm** |
| Width | **45.0 mm** |
| Depth | **121.0 mm** |
| Weight | **220 g** |

# Expansion modules
## PNOZ ms4p

**Order reference**

| Type | Features | | Order no. |
|---|---|---|---|
| PNOZ ms4p | Expansion module | Speed monitor | 773 831 |