
**Technical Catalogue PNOZmulti**
**Version 2017-02**

PILZ
THE SPIRIT OF SAFETY

- Configurable safety systems PNOZmulti
- Configurable compact control systems PNOZmulti Mini
- Configurable control systems PNOZmulti 2




# Contents

# Contents

# Introduction

Many functions, one solution – the configurable systems PNOZmulti bridge the gap between classic safety relays and programmable control systems. The configurable systems PNOZmulti are convincing, with numerous benefits. The software tool PNOZmulti Configurator, for example, impresses with its simple handling: install, open, work intuitively. You also have the widest range of diagnostic options – for high plant availability and low downtimes. The variety of fieldbus and communication options is a huge benefit with PNOZmulti. It means the system can be used independently from the higher level operational control system. Various expansion modules offer maximum flexibility of application.

This technical catalogue describes the structure of the three configurable systems PNOZmulti:

- **Configurable safety systems PNOZmulti**
- **Configurable small control systems PNOZmulti Mini**
- **Configurable control systems PNOZmulti 2.**

The units in the PNOZmulti systems are described in a detailed data sheet, which will help you with module selection and enable project configuration.
**Please refer to the units' operating manual for information on installation and operation.**

Further information on the systems can be found in the following documents:

- Installation Manual PNOZmulti
- Safety manual PNOZmulti
- Communications interfaces PNOZmulti/PNOZmulti 2
- Special Applications PNOZmulti

## System description

# System description

# System description
## Overview

### Configurable small controllers PNOZmulti

The configurable small controllers PNOZmulti are suitable for implementing multiple safety functions on a plant or machine. Thanks to its modular structure, PNOZmulti can be adapted to the size of the plant and machinery. With a large number of the most diverse modules and a variety of base units, you can design your application with the utmost flexibility. 3 different PNOZmulti systems are available, depending on your requirement.

- **Configurable safety systems PNOZmulti**

  The configurable safety systems PNOZmulti are the classic units among the configurable systems. They are suitable for use from four safety functions upwards. The systems are characterised by a comprehensive range of module and communication options.

- **Configurable compact controllers PNOZmulti Mini**

  The configurable small control systems PNOZmulti Mini are mainly used from three safety functions upwards. The small control systems have a lower number of expansion modules than PNOZmulti and PNOZmulti 2.

- **Configurable control systems PNOZmulti 2**

  The configurable control systems PNOZmulti 2 are suitable for use from four safety functions upwards. They accommodate the full function range of the "classic" PNOZmulti on 45 mm width. The base units have an illuminated display - for even faster diagnostics.

### Modular structure

- The configurable small controllers PNOZmulti consist of a base unit and various expansion modules. The expansion modules that can be connected depend on the type of base unit (see section entitled System expansion [📖 30]).
  The units from the three systems ***Configurable safety systems PNOZmulti***, ***Configurable small control systems PNOZmulti Mini*** and ***Configurable control systems PNOZmulti 2*** are not interchangeable.
- The base unit has various inputs and outputs and is also fully functional without expansion modules.
- The expansion modules supplement the base unit with additional inputs or outputs.

### Configuration in the PNOZmulti Configurator

- The system's function is defined via the PNOZmulti Configurator.
- The PNOZmulti Configurator is a graphic tool which is used to define the functions of the units. Various safety functions are available, such as emergency stop, two-hand monitoring, safety gate monitoring and drive monitoring. With the correct circuitry it is possible to achieve categories up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061.
- 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.

# System description
## Overview

- The system can be expanded or the functions modified at any time.
- Frequently used parts of the circuit diagram can be combined into macro elements, stored in the macro library and reused.

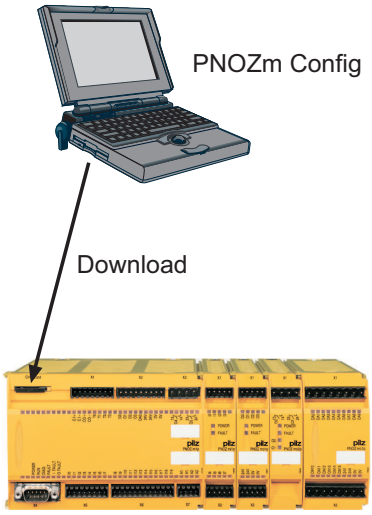
**Inputs**

- The small controllers PNOZmulti have semiconductor inputs for safety-related and standard applications.
- The inputs for standard applications can also be set via the integrated interface or via fieldbus modules (e.g. PROFIBUS-DP, CANopen, ...).
- Decentralised input modules provide safe inputs for use up to IP67.
- Analogue input modules can be connected to the base units of the configurable safety system PNOZmulti, thereby providing 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**

- The small controllers PNOZmulti have various outputs.
  - Relay safety outputs
  - Semiconductor safety outputs
  - Semiconductor outputs for standard applications
- 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.
- Safe semiconductor outputs with advanced fault detection can also be configured for the base units PNOZmulti Mini. These single-channel semiconductor outputs can be used to achieve a higher level of safety.
- 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 integrated interface or via fieldbus modules (e.g. PROFIBUS-DP, CANopen, ...).

## System description
Overview




Base unit + expansion modules

# System description
## Hardware

**Structure of the configurable control system**

The configurable control system consists of the base unit and expansion modules. Depending on the unit type, a base unit will have:

- Inputs
- Relay outputs
- Safe semiconductor outputs
- Outputs for standard applications
- Cascading input
- 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.

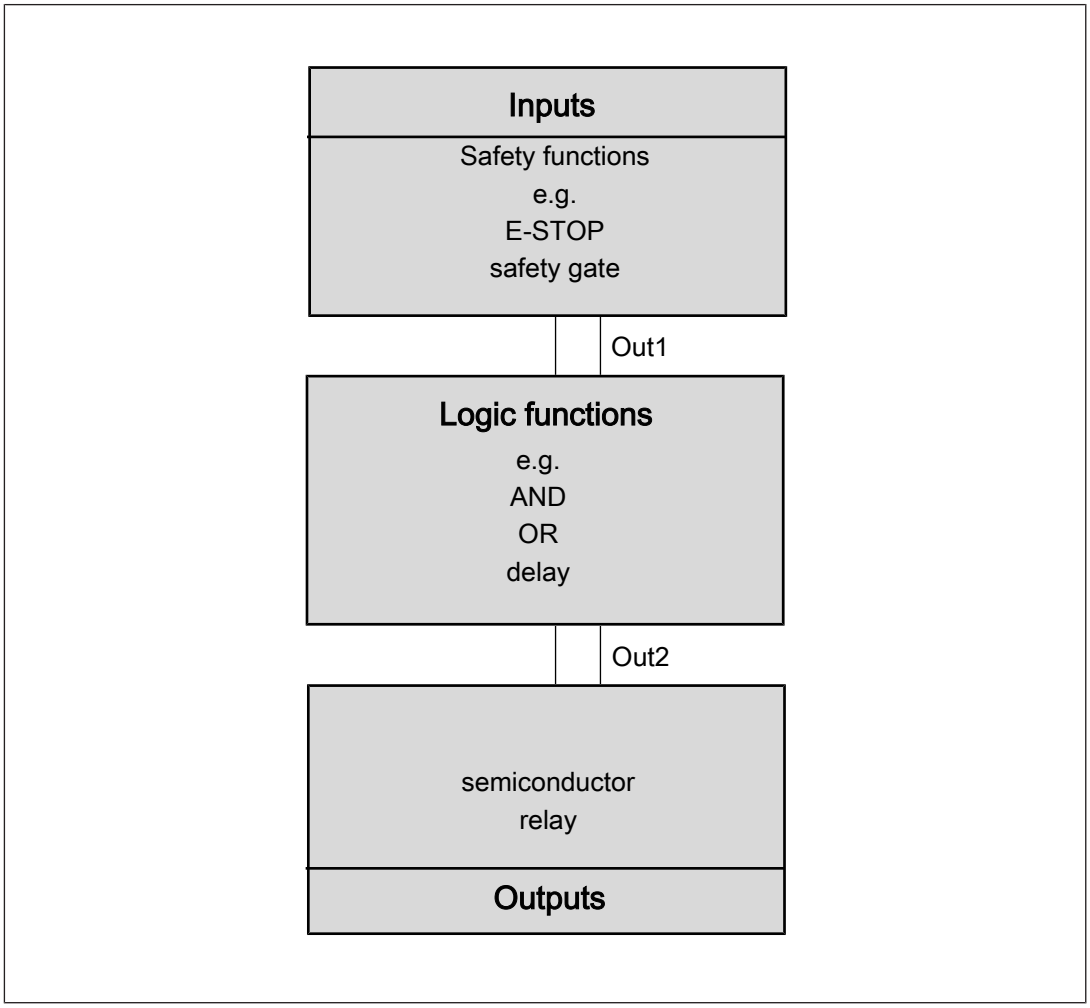
# System description
## Hardware

**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.



# System description
## Hardware

### Fieldbus modules

The fieldbus modules are used to

- Read the diagnostic data
- Set virtual inputs for standard functions
- Read virtual outputs for standard functions

### Interfaces

The base units have an interface to

- Download the project
- Read the diagnostic data
- Set virtual inputs for standard functions
- Read virtual outputs for standard functions
- Read the error stack.

### Safety Functions

The PNOZmulti systems have inputs and outputs, which can be used for various safety functions, depending on the system. Special base units and modules may be needed to implement safety functions (see selection guide).

Configurable safety systems PNOZmulti

Monitoring of

- E-STOP pushbuttons
- Operating mode selector switches
- Enabling switches
- Two-hand pushbuttons
- Safety gates
- Light curtains
- Light beam devices
- Speeds (modules PNOZ ms... see selection guide)
- Standstill
- Muting
- Analogue input signals (analogue input module PNOZ ma1p)
- Safety mats
- Mechanical presses (with base unit PNOZ m2p)
- Furnaces (with base unit PNOZ m3p)

# System description
## Hardware

Configurable small control systems PNOZmulti Mini

Monitoring of

- E-STOP pushbuttons
- Operating mode selector switches
- Enabling switches
- Two-hand pushbuttons
- Safety gates
- Light curtains
- Light beam devices
- Muting
- Safety mats

Configurable control systems PNOZmulti 2

Monitoring of

- E-STOP pushbuttons
- Operating mode selector switches
- Enabling switches
- Two-hand pushbuttons
- Safety gates
- Light curtains
- Light beam devices
- Muting
- Safety mats
- Drives (speed/speed range monitoring, direction of movement monitoring, operating stop monitoring)

Various switch types are available for the required safety-related applications. With some switch types it is possible to monitor for simultaneity (see online help for the PNOZmulti Configurator).

# System description
## Software

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

Procedure

- First, the required hardware is selected in the PNOZmulti Configurator via drag and drop. Each unit is given a resource label.
- When all the units are selected, the circuit diagram is created in the user program. 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.
- Frequently used parts of the circuit diagram can be combined into macro elements, stored in the macro library and reused.
- On Multi2 systems, complex modules are configured in a separate sub-program, the Module program (mIQ). The user program then consists of a main program and one or more module programs. Each module is configured in a separate module program.
- 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. It is either downloaded directly via the communications interface or via a chip card reader.
- After downloading, a test must be performed to check that the safety devices function correctly.
- A project or diagnostic configuration can be created in multiple languages.

# System description
## Diagnostics

The PNOZmulti has many options for diagnostics and fault detection:

- LEDs on the base unit and expansion modules
- Diagnostic data via the communication interface and via a fieldbus
- Error stack
- Diagnostic word in the PNOZmulti Configurator
- Expanded diagnostic options using a visualisation system, e.g. PMImicro diag

Only for base units PNOZmulti Mini and PNOZmulti 2

- Display messages can be configured in the PNOZmulti Configurator

Detailed information on the diagnostic options are available in the document "PNOZmulti communication interfaces".

### LEDs on the base unit and expansion modules

The LEDs signal

- Operating states (e.g. "RUN")
- External and internal errors

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

### RS232/Ethernet interface

The RS232/Ethernet interface on the configurable control system PNOZmulti is used to transfer diagnostic data to an user program.

### Diagnostic data

The diagnostic data can be called up via the RS232/Ethernet interface or via a connected fieldbus. All base units that have an Ethernet interface also support Modbus/TCP.

The diagnostic data may only be used for non-safety purposes, e.g. visualisation.

The diagnostic data on PNOZmulti systems is:

- Version:

  Product number, device 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 communication.
- 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
  – Status of LED
  – Diagnostic word
  – Element types

Expanded diagnostic options using a diagnostic terminal, e.g. PMImicro diag. An expanded diagnostic 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:

  Includes 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; messages are triggered when safeguards, inputs, outputs and connection points reach a defined state

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. 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.

# System description
## Diagnostics

### 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, for example

- Hardware errors
- Wiring error
- 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 Ethernet or serial interface on the base unit
- Via a connected fieldbus

The diagnostic word contains information about a certain element, e.g.

- Operating states (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.

# Installation
## General guidelines

For detailed information about the installation of the PNOZmulti systems, please read the installation manual for the PNOZmulti.

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

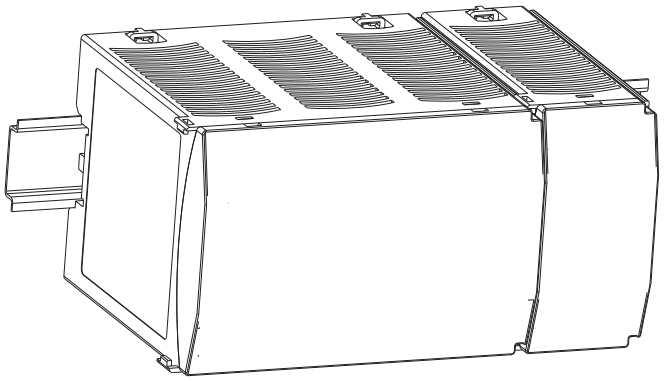
Please refer to the section entitled System expansion [📖 30] for details of the number of modules that can be connected to the base unit and the module types.

Install the expansion modules in the position in which it is configured in the PNOZmulti Configurator. For module selection please refer to the online help for the PNOZmulti Configurator.

# Installation
Install configurable safety systems PNOZmulti

## Control cabinet installation

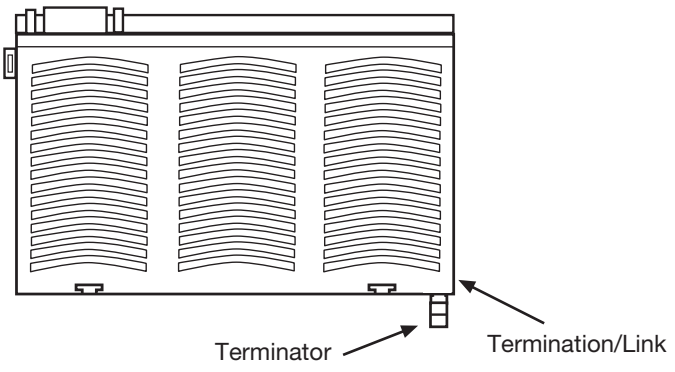
- The control system should be installed in a control cabinet with a protection type of at least IP54. Fit the control system to a horizontal mounting rail. The venting slots must face upward and downward. Other mounting positions could destroy the control system.
- Use the notches on the rear of the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



# Installation
Install configurable safety systems PNOZmulti

## Install base unit without expansion module

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



# Installation
Install configurable safety systems PNOZmulti

## Connecting the base unit and expansion modules

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

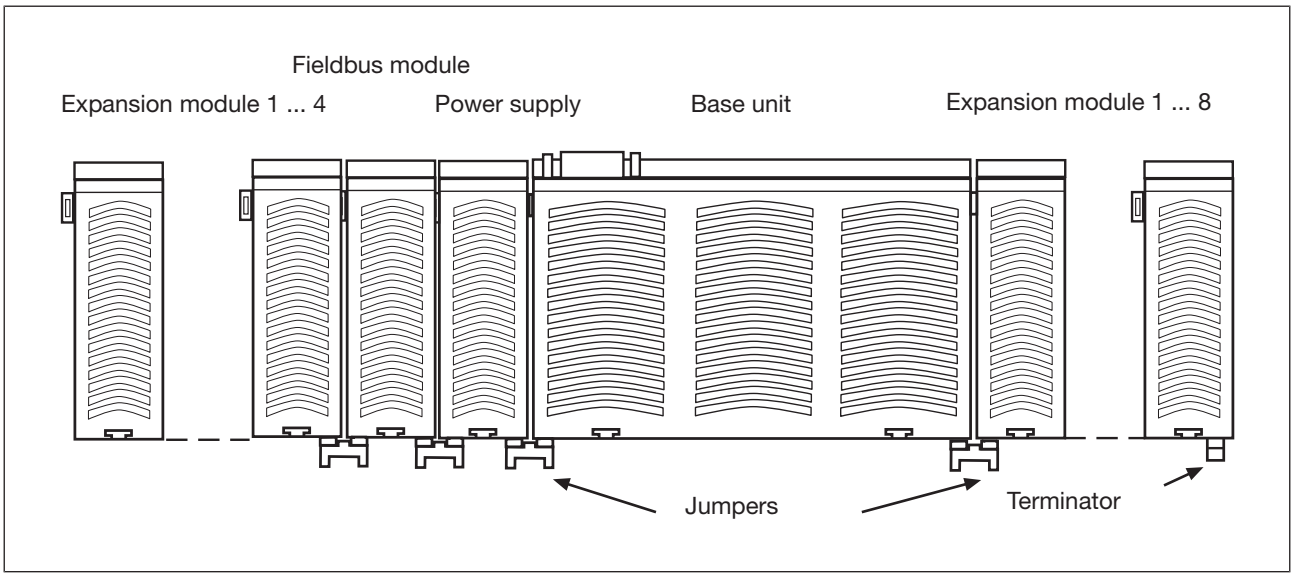
Please refer to the document "PNOZmulti System Expansion" for details of the number of modules that can be connected to the base unit and the module types.

The modules are linked via jumpers.

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

A max. of 12 expansion modules plus one fieldbus module may be connected to one base unit.

- Ensure that no terminator is connected.
- 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.
- A terminator must not be fitted to the last expansion module to the left of the base unit.



# Installation
Install configurable small control systems PNOZmulti Mini

## Control cabinet installation

- The unit should be installed in a control cabinet with a protection type of at least IP54.
- Fit the safety system to a horizontal mounting rail. The venting slots must face upwards and downwards. Other mounting positions could destroy the safety system.
- Use the notch on the rear of the unit to attach it to a mounting rail.
- In environments exposed to heavy vibration, the unit should be secured using a fixing element (e.g. retaining bracket or end angle).
- Push the unit upwards or downwards before lifting it from the mounting rail.
- To comply with EMC requirements, the mounting rail must have a low impedance connection to the control cabinet housing.

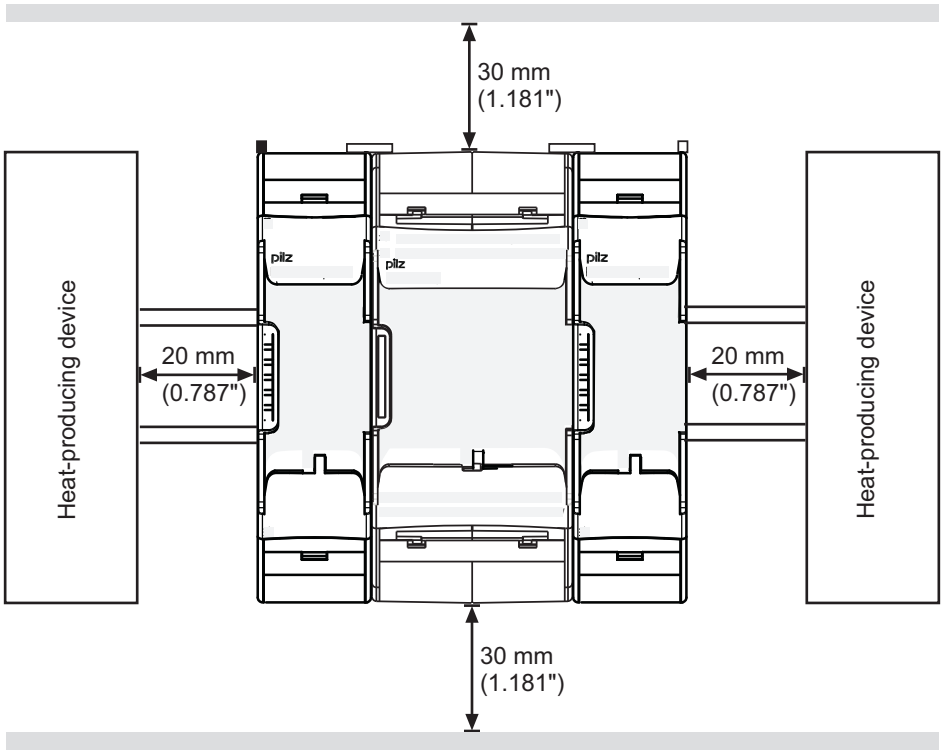
# Installation
## Install configurable small control systems PNOZmulti Mini

### Mounting distances

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

The ambient temperature in the control cabinet must not exceed the figure stated in the technical details. Air conditioning may otherwise be required.

Mounting distances:

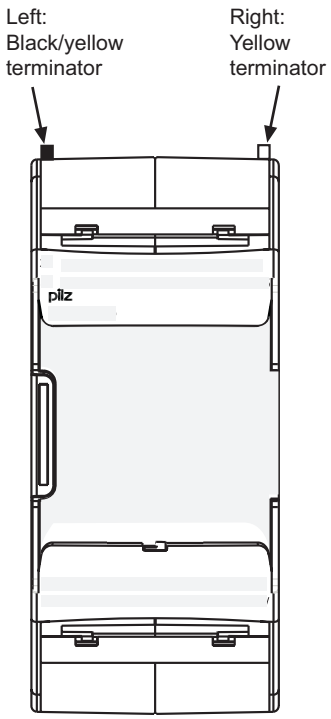


# Installation
Install configurable small control systems PNOZmulti Mini

## Install base unit without expansion module

Make sure that the terminators are inserted on the top left and right of the unit :

- Left: Black/yellow terminator
- Right: Yellow terminator



# Installation
Install configurable small control systems PNOZmulti Mini

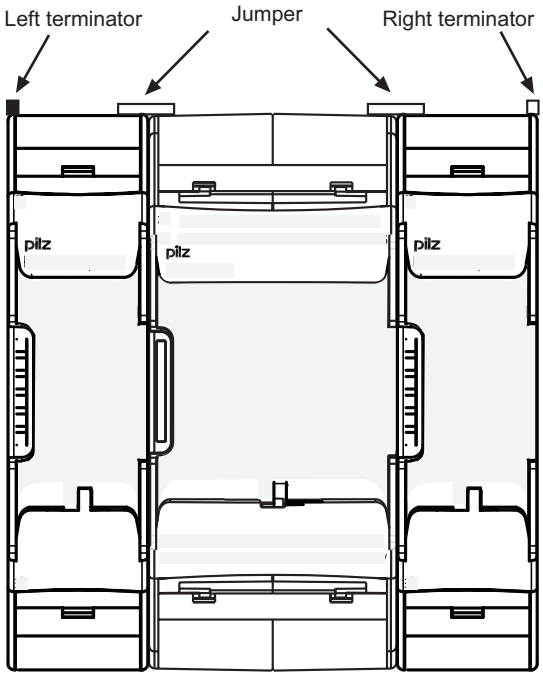
## Connecting the base unit and expansion modules

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

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

The modules are linked via jumpers.

- Remove the terminator on the side of the base unit and on the expansion module.
- Before installing the units on the mounting rail, connect the base unit to the expansion module using the jumper supplied .
- Fit the appropriate terminator to the unconnected interfaces on the base unit and expansion module.
  - Left-hand side on the base unit and expansion modules to the left of the base unit: Black/yellow terminator
  - Right-hand side on the base unit and expansion modules to the right of the base unit: Yellow terminator



# Installation
Install configurable control systems PNOZmulti 2

## Control cabinet installation

- The unit should be installed in a control cabinet with a protection type of at least IP54.
- Install the system vertically on to a horizontal mounting rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the locking elements on the rear of the unit to attach it to a mounting rail.
- In environments exposed to heavy vibration, the unit should be secured using a fixing element (e.g. retaining bracket or end angle).
- Open the locking slide before lifting the unit from the mounting rail.
- To comply with EMC requirements, the mounting rail must have a low impedance connection to the control cabinet housing.

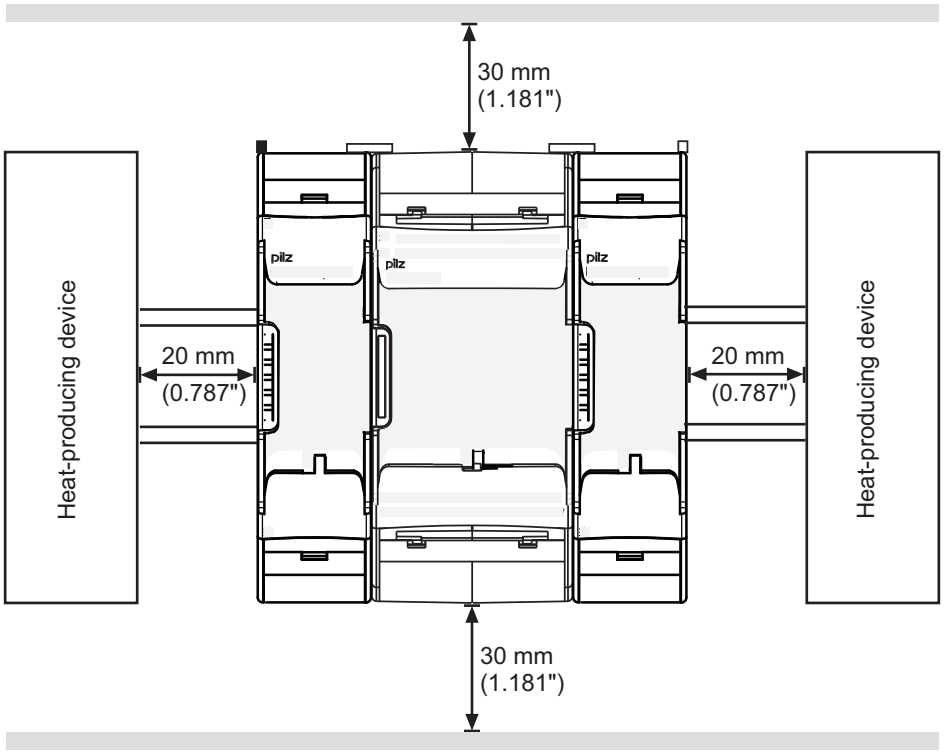
# Installation
## Install configurable control systems PNOZmulti 2

### Mounting distances

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

The ambient temperature in the control cabinet must not exceed the figure stated in the technical details. Air conditioning may otherwise be required.

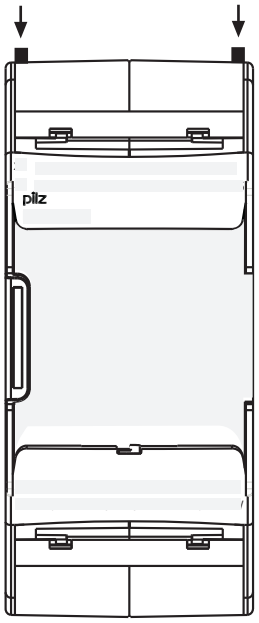
Mounting distances:



# Installation
Install configurable control systems PNOZmulti 2

## Install base unit without expansion module

Make sure that the terminators are inserted on the top left and right of the unit.



# Installation
Install configurable control systems PNOZmulti 2

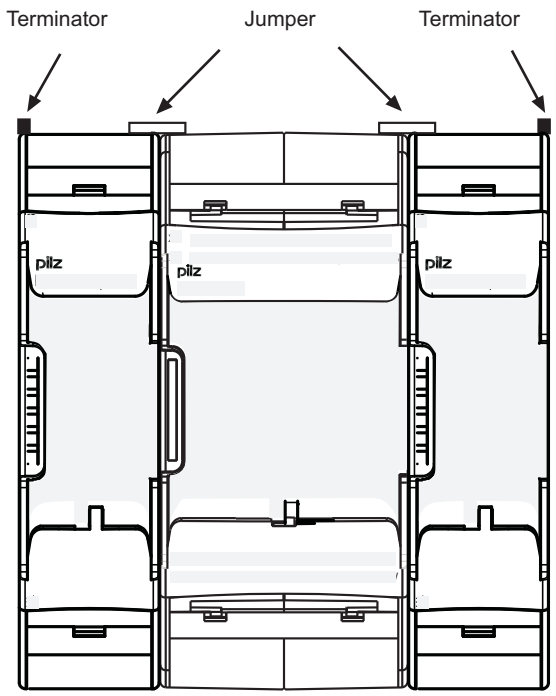
## Connecting the base unit and expansion modules

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

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

The modules are linked via jumpers.

- Remove the terminator on the side of the base unit and on the expansion module.
- Install the base unit and expansion modules on the mounting rail in the order configured in the PNOZmulti Configurator and connect the units using the jumper supplied.
- Fit the terminator to the unconnected interfaces on the base unit and expansion module.



# System expansion
## Configurable safety systems PNOZmulti

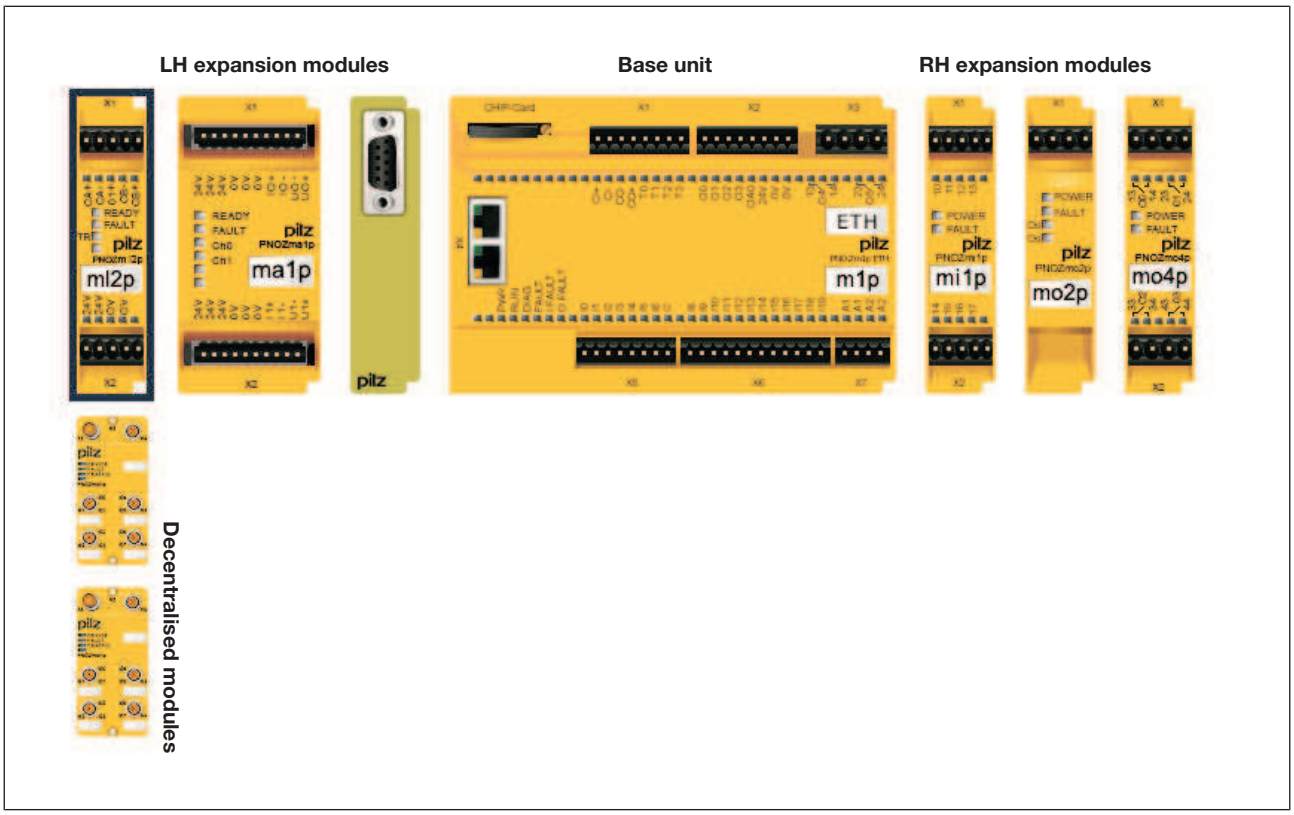
**Maximum system expansion:**

- Right of the base unit:
  - 8 expansion modules
- Left of the base unit
  - 4 expansion modules

  and
  - 1 fieldbus module
- Connectable to the link module PNOZ ml2p:

  4 decentralised modules per link module (max. 16 decentralised modules)

**Example of a control system PNOZmulti: Base unit PNOZ m1p ETH with expansion modules**



## System expansion
Configurable safety systems PNOZmulti

**System expansion depends on the base units:**

| Expansion modules | | Slot | PNOZ m0p (ETH) | PNOZ m1p (ETH) | PNOZ m2p (ETH) | PNOZ m3p (ETH) |
|---|---|---|---|---|---|---|
| | | | Number of connectable modules | | | |
| **Analogue input modules** | | **Left** | **-** | **4** | **4** | **4** |
| PNOZ ma1p | Analogue input module | | | | | |
| **Link modules** | | **Left** | **4** | **4** | **4** | **4** |
| PNOZ ml1p | To connect 2 base units | | | | | |
| PNOZ ml2p | To connect a base unit to up to 4 decentralised modules PDP67 (see below) | | | | | |
| **Decentralised modules (connectable to the link module PNOZ ml2p)** | | **Left** | **16** | **16** | **16** | **16** |
| PDP67 F 8DI ION | IP67, 8 safe inputs | | | | | |
| PDP67 F 8DI ION HP | IP67, 8 safe inputs | | | | | |
| **Input modules** | | **Right** | **-** | **8** | **8** | **8** |
| PNOZ mi1p | 8 safe inputs | | | | | |
| PNOZ mi2p | 8 inputs for standard applications | | | | | |
| **Output modules** | | **Right** | **-** | **6** | **6** | **6** |
| PNOZ mo1p | 4 safe semiconductor outputs | | | | | |
| PNOZ mo2p | 2 safe relay outputs | | | | | |
| PNOZ mo3p | 2 safe 2-pole semiconductor outputs | | | | | |
| PNOZ mo4p | 4 safe relay outputs | | | | | |
| PNOZ mo5p | 4 safe, diverse relay outputs | | | | | |
| **Output modules for standard applications** | | **Right** | **-** | **8** | **8** | **8** |
| PNOZ mc1p | 16 semiconductor outputs for standard applications | | | | | |

## System expansion
Configurable safety systems PNOZmulti

| Expansion modules | | Slot | PNOZ m0p (ETH) | PNOZ m1p (ETH) | PNOZ m2p (ETH) | PNOZ m3p (ETH) |
|---|---|---|---|---|---|---|
| **Speed monitor** | | **Right** | **-** | **4** | **4** | **4** |
| PNOZ ms1p | Monitoring of 2 axes<br>Connectable encoders: Proximity switch, incremental encoder Sin/Cos, TTL | | | | | |
| PNOZ ms2p HTL | Monitoring of 2 axes<br>Connectable encoders: Proximity switch, incremental encoder HTL | | | | | |
| PNOZ ms2p TTL | Monitoring of 2 axes<br>Connectable encoders: Proximity switch, incremental encoder Sin/Cos, TTL | | | | | |
| PNOZ ms3p HTL | Monitoring of 2 axes<br>Connectable encoders: Incremental encoder HTL | | | | | |
| PNOZ ms3p TTL | Monitoring of 2 axes<br>Connectable encoders: Incremental encoder Sin/Cos, TTL | | | | | |
| PNOZ ms4p | Monitoring of 1 axis<br>Connectable encoders: Incremental encoder Sin/Cos, TTL, HTL | | | | | |

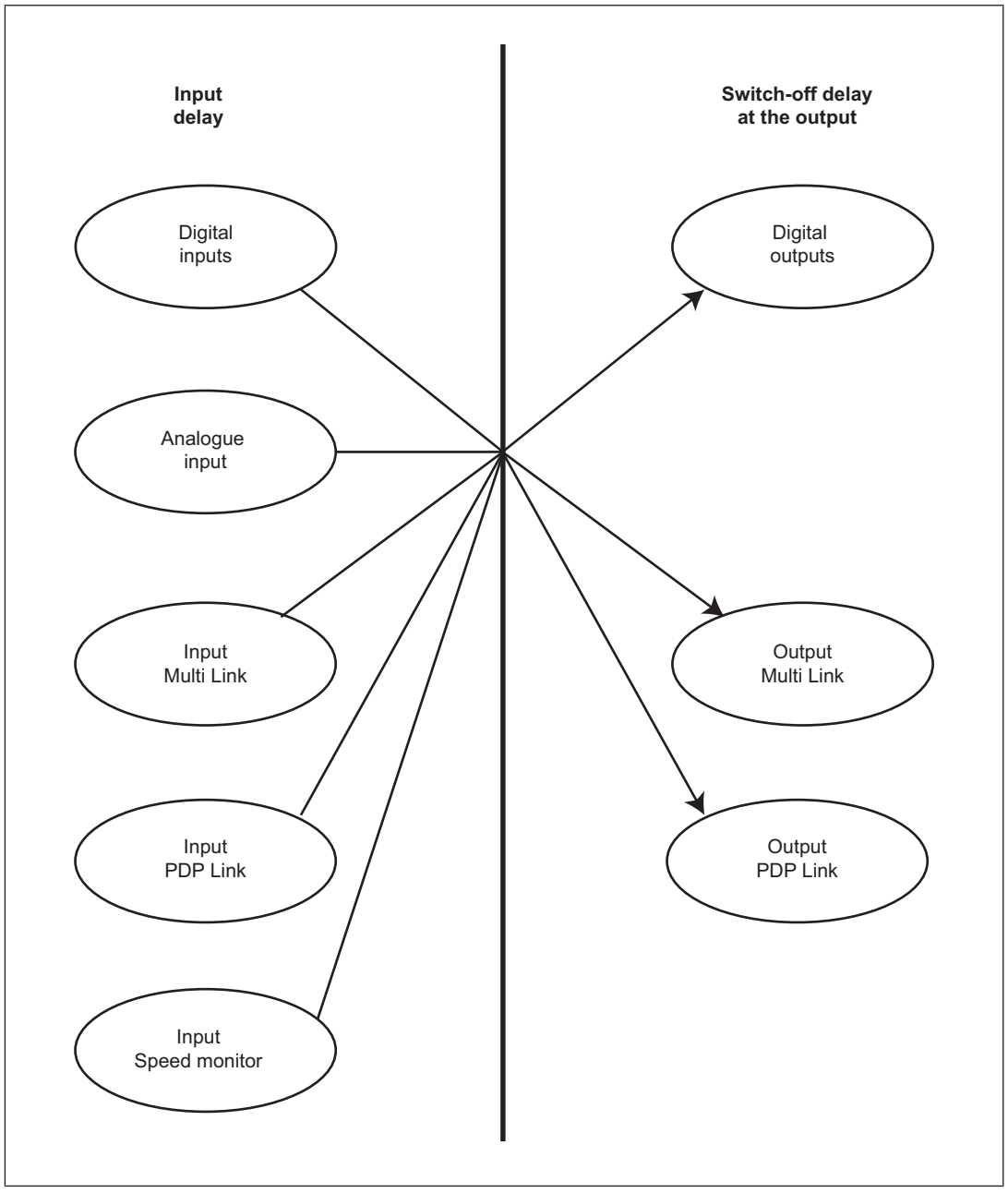
## System expansion
Configurable safety systems PNOZmulti

| Expansion modules | | Slot | PNOZ m0p (ETH) | PNOZ m1p (ETH) | PNOZ m2p (ETH) | PNOZ m3p (ETH) |
|---|---|---|---|---|---|---|
| **Fieldbus modules** | | **Left** | **1** | **1** | **1** | **1** |
| PNOZ mc0p | Power supply to supply voltage to fieldbus modules | | | | | |
| PNOZ mc2p | EtherCAT | | | | | |
| PNOZ mc2.1p | EtherCAT (DS301 V4.02 compliant) | | | | | |
| PNOZ mc3p | PROFIBUS-DP | | | | | |
| PNOZ mc4p | DeviceNet | | | | | |
| PNOZ mc5p | Interbus | | | | | |
| PNOZ mc5.1p | Interbus fibre-optic cable | | | | | |
| PNOZ mc6p | CANopen | | | | | |
| PNOZ mc6.1p | CANopen | | | | | |
| PNOZ mc7p | CC-Link | | | | | |
| PNOZ mc8p | Ethernet IP/Modbus TCP | | | | | |
| PNOZ mc9p | Profinet | | | | | |
| PNOZ mc10p | sercos III | | | | | |
| PNOZ mc12p | Ethernet POWERLINK | | | | | |

# System expansion
Configurable safety systems PNOZmulti

## System reaction times

The reaction time between an input switching off and a linked output in the system switching off depends on the delay time at the input and the delay time at the output. The times vary depending on which input/output is used by which device.



## System expansion
Configurable safety systems PNOZmulti

Calculation of the max. reaction time:

| |
|---|
| **t** ReactionMax = **t** Max. input delay + **t** Max. switch-off delay at the output |

Please note that the reaction time is also increased by

- Delay times configured in the user program
- Delay on the sensor that is used
- Delay on the actuator that is used
- Delay due to periphery devices or control systems

Reaction times of the base units and expansion modules

| Modules | Max. input delay | Max. switch-off delay Output (incl. processing time) |
|---|---|---|
| **PNOZ m0p … PNOZ m3p** | **4 ms** | **30 ms** (semiconductor output)<br>**50 ms** (relay output) |
| **PNOZ mi1p … PNOZ mi2p** | **4 ms** | **-** |
| **PNOZ mo1p, PNOZ mo3p** | **-** | **30 ms** |
| **PNOZ mo2p, PNOZ mo4p, PNOZ mo5p** | **-** | **50 ms** |
| **PNOZ ml1p** | **0 ms** (1) | **35 ms** (connection's transmission delay) |
| **PNOZ ml2p** | **15 ms**<br>+ Max. processing time of the input PDP67 (2) | **35 ms** |
| **PNOZ ma1p** | **100 ms** | **-** |
| **PNOZ ms1p … PNOZ ms4p** | **10 ms [+1/f]**<br>(+conf.switch-off delay) | **-** |

(1) An input delay is not considered because it is already considered in the output delay of the communication partner.

(2) See technical details in the operating manual

To simplify the calculation, the stated times include various times that need to be considered within the system. As a result, transmission times, for example, do not need to be included separately in the calculation. The processing time in the base unit is already considered in the max. switch off delay at the output.

## System expansion
Configurable safety systems PNOZmulti

### Example configuration: Input from PNOZ mi2p, output from PNOZ mo3p

| Input<br>PNOZ mi2p<br><br>tInput Delay.Max | Output<br>PNOZ mo3p<br><br>tSwitch-offDelay.Max |
|---|---|
| 4 ms | 30 ms |

$t_{ReactionMax}$ = 4 ms + 30 ms

$t_{ReactionMax}$ = 34 ms

| Input PNOZ m1p<br><br>Input Delay.Max | Output PNOZ mo4p<br><br>Switch-off Delay.Max |
|---|---|
| 4 ms | 50 ms |

$t_{ReactionMax}$ = 4 ms + 50 ms

$t_{ReactionMax}$ = 54 ms

## System expansion
Configurable small control systems PNOZmulti Mini

**Maximum system expansion:**

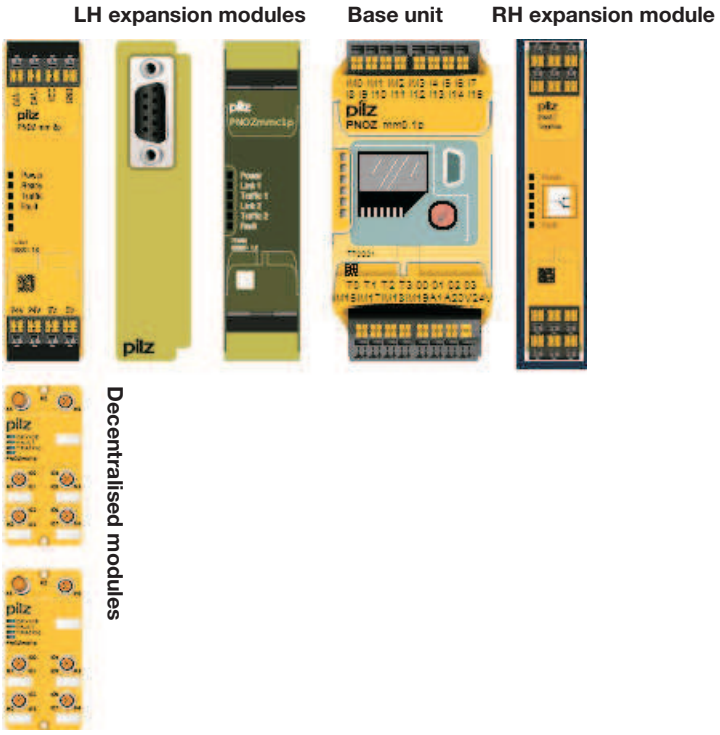
- Right of the base unit:
  - 1 PNOZsigma expansion module (+1 contact expansion)
- Left of the base unit
  - 1 fieldbus module

    and
  - 1 communication module

    and
  - 4 link modules
- Connectable to the link module PNOZ mml2p:

  4 decentralised modules per link module (max. 16 decentralised modules)

**Example of a control system PNOZmulti Mini: Base unit PNOZ mm0.1p with expansion modules**



## System expansion
Configurable small control systems PNOZmulti Mini

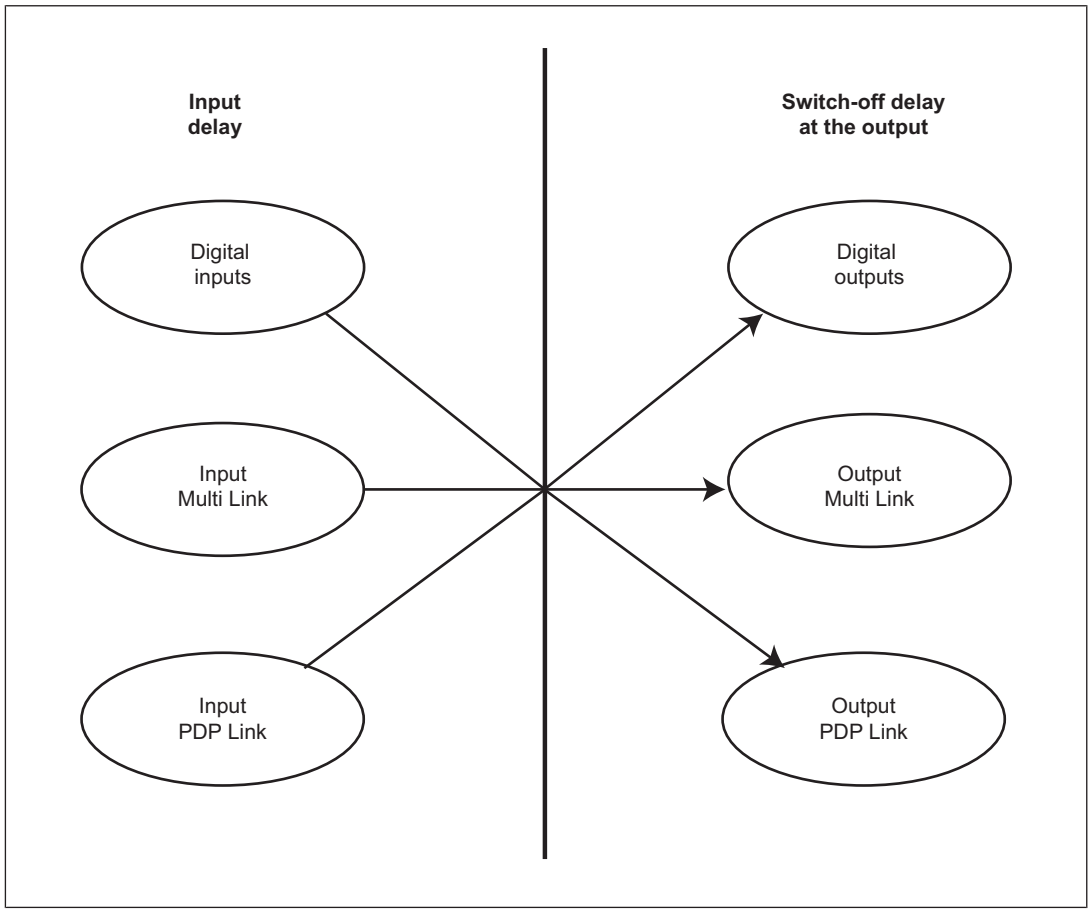
**System expansion depends on the base units:**

| Expansion modules | | Slot | PNOZ mm0p | PNOZ mm0.1p | PNOZ mm0.2p |
|---|---|---|---|---|---|
| | | | Number of connectable modules | | |
| **Link modules** | | **Left** | **-** | **4** | **4** |
| PNOZ mml1p | To connect 2 base units | | | | |
| PNOZ mml2p | To connect a base unit to up to 4 decentralised modules PDP67 (see below) | | | | |
| **Decentralised modules (connectable to the link module PNOZ mml2p)** | | **Left** | **-** | **16** | **16** |
| PDP67 F 8DI ION | IP67, 8 safe inputs | | | | |
| PDP67 F 8DI ION HP | IP67, 8 safe inputs | | | | |
| **Communication modules** | | **Left** | **-** | **1** | **1** |
| PNOZ mmc1p | Ethernet interface | | | | |
| PNOZ mmc2p | Serial interface RS232 | | | | |
| **Fieldbus modules** | | **Left** | **-** | **1** | **1** |
| PNOZ mmc3p | PROFIBUS DP | | | | |
| PNOZ mmc4p | DeviceNet | | | | |
| PNOZ mmc6p | CANopen | | | | |
| PNOZ mmc7p | CC-Link | | | | |
| PNOZ mmc11p | EtherCAT | | | | |
| PNOZ mmc12p | Ethernet POWERLINK | | | | |
| **PNOZsigma output modules** | | **Right** | **-** | **1** | **1** |
| PNOZ s7 | 1 safe relay output | | | | |
| PNOZ s7.1 | 1 safe relay output (+ 1 PNOZ s7, PNOZ s10 or PNOZ s11 can be connected as a contact expansion module) | | | | |
| PNOZ s7.2 | 1 safe relay output (+ 1 expansion module PNOZ s7, PNOZ s10 or PNOZ s11 can be connected) | | | | |
| PNOZ s10 | 1 safe relay output | | | | |
| PNOZ s11 | 1 safe relay output | | | | |
| PNOZ s22 | 2 safe relay outputs | | | | |

# System expansion
Configurable small control systems PNOZmulti Mini

## System reaction times

The reaction time between an input switching off and a linked output in the system switching off depends on the delay time at the input and the delay time at the output. The times vary depending on which input/output is used by which device.




Calculation of the max. reaction time:

| |
|---|
| **t** ReactionMax = **t** Max. input delay + **t** Max. switch-off delay at the output |

Please note that the reaction time is also increased by

- Delay times configured in the user program
- Delay on the sensor that is used
- Delay on the actuator that is used
- Delay due to periphery devices or control systems

## System expansion
Configurable small control systems PNOZmulti Mini

Reaction times of the base units and expansion modules

| Modules | Max. input delay | t Max. switch-off delay Output (incl. processing time) |
|---|---|---|
| **PNOZ mm0p … PNOZ mm0.2p** | **4 ms** | **30 ms** (semiconductor output) |
| **PNOZ mm0.2p** | **4 ms** | **35 ms** (virtual outputs for data transfer when 2 base units are connected) |
| **PNOZ s7, PNOZ s7.1, PNOZ s7.2, PNOZ s10, PNOZ s11, PNOZ s22** | **-** | **30 ms** + delay-on de-energisation of expansion module |
| **PNOZ mml1p** | **0 ms** (1) | **35 ms** (connection's transmission delay) |
| **PNOZ mml2p** | **15 ms** + input delay PDP67 (2) | **35 ms** |

(1) An input delay is not considered because it is already considered in the output delay of the communication partner.

(2) See technical details in the operating manual

To simplify the calculation, the stated times include various times that need to be considered within the system. As a result, transmission times, for example, do not need to be included separately in the calculation. The processing time in the base unit is already considered in the max. switch off delay at the output.

### Example configuration: Input from base unit PNOZ mm0.1p, output from PNOZ s7

| Input PNOZ mm0.1p<br>Input Delay.Max | Output PNOZ mo4p<br>Switch-off Delay.Max |
|---|---|
| **4 ms** | **30 ms + delay-on de-energisation 30 ms** |

$t_{ReactionMax}$ = 4 ms + 30 ms + 30 ms

$t_{ReactionMax}$ = 64 ms

## System expansion
Configurable control systems PNOZmulti 2

**Maximum system expansion:**

- Right of the base unit:

  PNOZ m B0:

  – 6 expansion modules

  PNOZ m B1:

  – 12 expansion modules (restriction: The number of modules PNOZ m EF 4DI4DOR and PNOZ m EF 2MM is in total limited to a maximum of 8 )

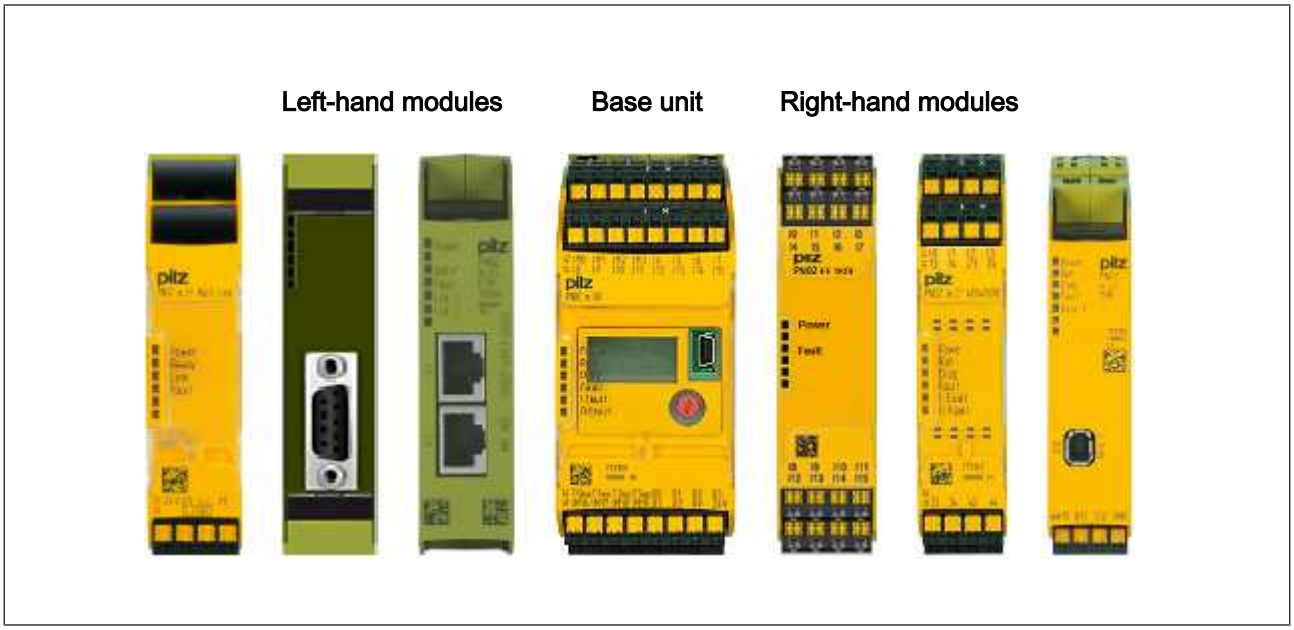
  – 1 standard module (position: last module to the right of the safety modules)
- Left of the base unit

  – 4 expansion modules

  – PNOZ m B0: 1 communication module

  – 1 fieldbus module

**Example of a control system PNOZmulti 2: Base unit PNOZ m B0 with expansion modules**




**System expansion depends on the base units:**

## System expansion
Configurable control systems PNOZmulti 2

| Expansion modules | | Slot | PNOZ m B0 | PNOZ m B1 |
|---|---|---|---|---|
| | | | **Number of connectable modules** | |
| **Link modules** | | **Left** | **4** | **4** |
| PNOZ m EF Multi Link | To connect 2 base units | | | |
| PNOZ m EF PDP Link | To connect a base unit to up to 4 decentralised modules PDP67 | | | |
| **Input module** | | **Right** | **6** | **12** |
| PNOZ EF 16DI | 16 safe inputs | | | |
| **Input and output modules** | | **Right** | | |
| PNOZ EF 8DI4DO | 8 safe inputs, 4 safe semi-conductor outputs | | | |
| PNOZ EF 4DI4DOR | 4 safe inputs, 4 safe relay outputs | | | **8** (in total with PNOZ m EF 2MM) |
| **Output module for standard applications** | | **Right** To the right of the safe expan-sion modules | - | **1** |
| PNOZ ES 14DO | 14 semiconductor outputs for standard applications | | | |
| **Motion monitoring modules** | | **Right** | **6** | |
| PNOZ m EF 1MM | Monitoring of 1 axis | | | **12** |
| PNOZ m EF 2MM | Monitoring of 2 axes | | | **8** (in sum with PNOZ m EF 4DI4DOR) |
| **Fieldbus modules** | | **Left** | **1** | |
| PNOZ m ES Profibus | Profibus | | | **1** |
| PNOZ m ES CANopen | CANopen | | | **-** |
| PNOZ m ES CC-Link | CC-Link | | | **1** |
| PNOZ m ES EtherCAT | EtherCAT | | | **1** |
| PNOZ m ES Powerlink | Powerlink | | | **-** |
| PNOZ m ES EtherNet/ IP | EtherNet/IP | | | **-** |
| PNOZ m ES Profinet | Profinet | | | **1** |

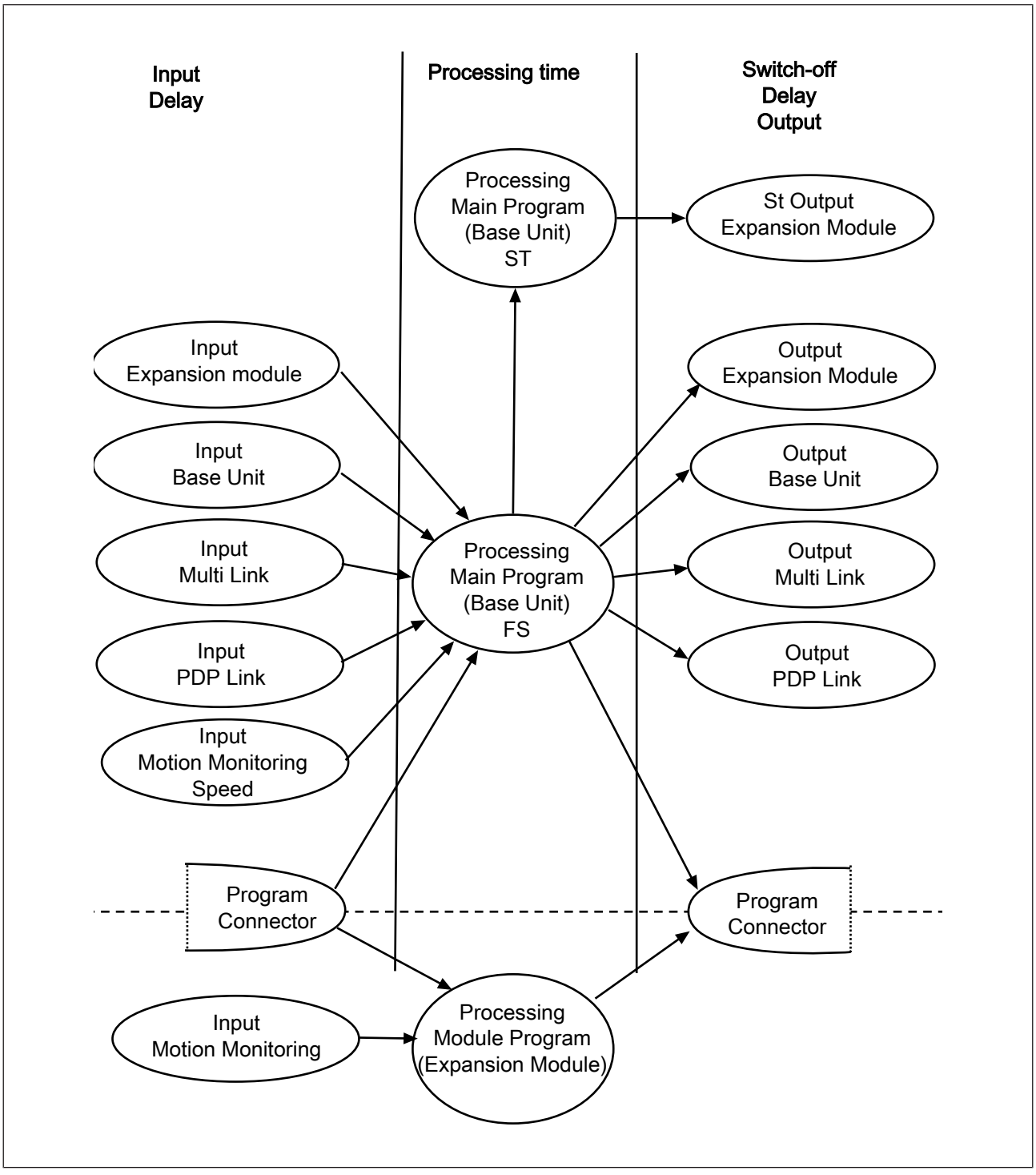
## System expansion
Configurable control systems PNOZmulti 2

| Expansion modules | | Slot | PNOZ m B0 | PNOZ m B1 |
|---|---|---|---|---|
| **Communication modules** | | **Left** | **1** | **-** |
| PNOZ m ES ETH | Ethernet interface | | | |
| PNOZ m ES RS232 | Serial interface RS232 | | | |

# System expansion
Configurable control systems PNOZmulti 2

## System reaction times

The reaction time between an input switching off and a linked output in the system switching off depends on the delay time at the input, the delay time at the output and the processing time. The times vary depending on which input/output is used by which device.



## System expansion
Configurable control systems PNOZmulti 2

Calculation of the max. reaction time:

| |
|---|
| **t** ReactionMax = **t** Max input delay + **t** Max processing time + **t** Max switch-off delay at the output |

Please note that the reaction time is also increased by

- Delay times configured in the user program
- Delay on the sensor that is used
- Delay on the actuator that is used

Maximum reaction times of the base units and expansion modules

| Modules | Max. input delay | Max. processing time | Max. switch-off delay Output |
|---|---|---|---|
| **PNOZ m B0** | **2 ms** | **30 ms** | **1 ms** |
| **PNOZ m B1 (FS)** | - | **30 ms** | - |
| **PNOZ m B1 (ST)** | - | **3 ms** | - |
| **PNOZ m EF 16DI** | **8 ms** | - | - |
| **PNOZ m EF 8DI4DO** | **8 ms** | - | **3 ms** |
| **PNOZ m EF 4DI4DOR** | **8 ms** | - | **22 ms** |
| **PNOZ m EF Multi Link** | **0 ms** (1) | - | **5 ms** (connection's transmission delay) |
| **PNOZ m EF PDP Link** | **15 ms** + Max. processing time of the input PDP67 (2) | - | **5 ms** |
| **PNOZ m EF 1MM, PNOZ m EF 2MM (configuration in the main program)** | **1/f_ist + 16 ms** (3) | - | - |
| **PNOZ m EF 1MM, PNOZ m EF 2MM (configuration in the module program)** | **1/f_ist + 8 ms** (3) | **8 ms** | - |
| **PNOZ m ES 14DO** | **-** | **-** | **1 ms** |
| **Program connector** | **0 ms** (4) | - | **0 ms** |

(1) An input delay does not need to be considered because it is already considered in the output delay of the communication partner.

(2) See technical details in the operating manual

(3) **1/f_ist** corresponds to the period length T of the measured frequency. The maximum input delay **1/f_ist + 16 ms** or **1/f_ist + 8 ms** is the reaction time at the input after a limit value is exceeded.

(4) No additional time needs to be added for data exchange between main program processing and module program processing via the program connectors. This delay is already included in the processing times.

To simplify the calculation, the stated times include various times that need to be considered within the system. As a result, transmission times, for example, do not need to be included separately in the calculation.

### Example configuration: Input from PNOZ m EF 8DI4DO, output from PNOZ m EF 8DI4DO

| Input<br>PNOZ m EF 8DI4DO<br>Max. input delay | Processing in the main program<br>Processing time | Output<br>PNOZ m EF 8DI4DO<br>Switch-off delay |
|---|---|---|
| 8 ms | 30 ms | 3 ms |

$t_{ReactionMax}$ = 8 ms + 30 ms + 3 ms

$t_{ReactionMax}$ = 41 ms

### Example configuration: Input from base unit, output from PNOZ m EF 4DI4DOR

| Input PNOZ m B0<br>Max. input delay | Processing in the main program<br>Processing time | Output PNOZ m EF 8DI4DOR<br>Switch-off delay |
|---|---|---|
| 2 ms | 30 ms | 22 ms |

$t_{ReactionMax}$ = 2 ms + 30 ms + 22 ms

$t_{ReactionMax}$ = 54 ms

### Example configuration: Input from base unit, output from base unit

| Base unit input<br>Max. input delay | Processing in the main program<br>Processing time | Base unit output<br>Switch-off delay |
|---|---|---|
| 2 ms | 30 ms | 1 ms |

$t_{ReactionMax}$ = 2 ms + 30 ms + 1 ms

$t_{ReactionMax}$ = 33 ms

## System expansion
Configurable control systems PNOZmulti 2

### Example configuration: Input from PNOZ m EF 16DI, output for standard applications from PNOZ m ES 14DO

| Input PNOZ m EF 16DI<br>Max. input delay | Processing in the main program<br>Processing time (FS + ST) | Output PNOZ m ES 14DO<br>Switch-off delay |
|---|---|---|
| **8 ms** | **30 ms + 3 ms** | **1 ms** |

$t_{ReactionMax}$ = 8 ms + 30 ms + 3 ms + 1 ms

$t_{ReactionMax}$ = 42 ms

### Example configuration: Input from PNOZ m EF 1MM (configured in the main program), output from base unit

f_ist = 100 ms

| Input PNOZ m EF 1MM<br>Max. input delay | Processing in the main program<br>Processing time | Base unit output<br>Switch-off delay |
|---|---|---|
| **26 ms** | **30 ms** | **1 ms** |

1/f_ist = 1/100 Hz = 10 ms

1/f_ist + 16 ms = 26 ms

$t_{ReactionMax}$ = 26 ms + 30 ms + 1 ms

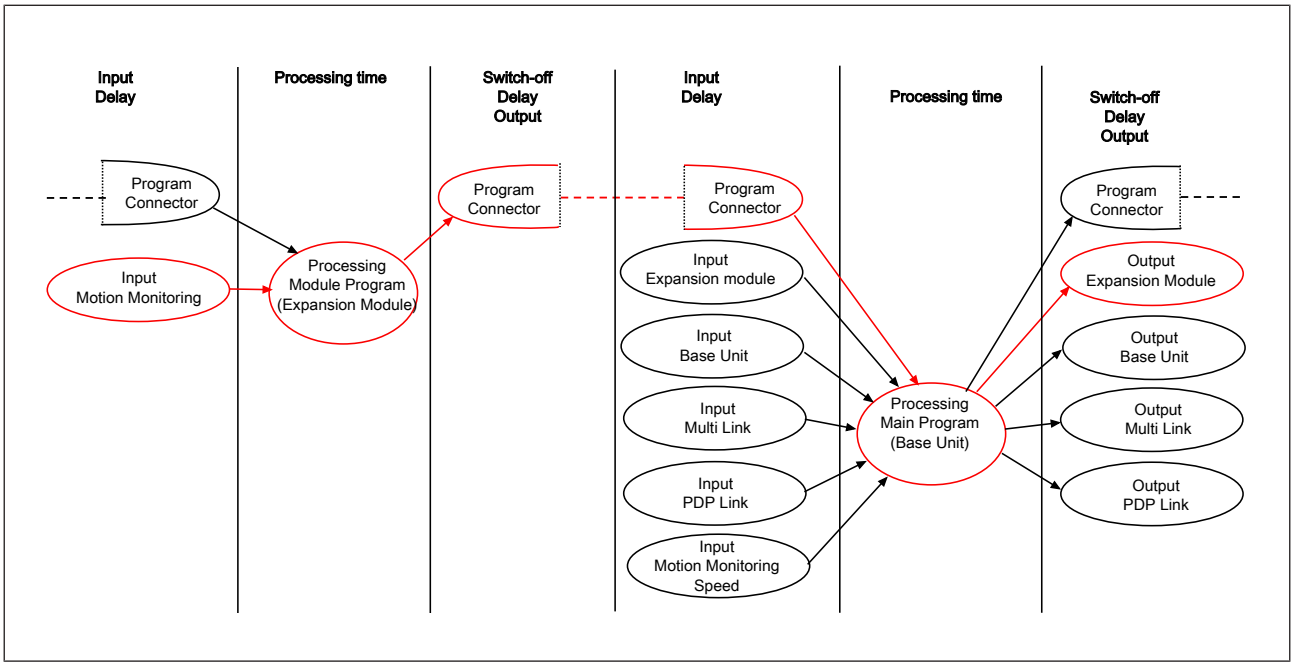
$t_{ReactionMax}$ = 57 ms

## System expansion
Configurable control systems PNOZmulti 2

### Example configuration: Input from PNOZ m EF 1MM (configured in the module program), output from PNOZ m EF 8DI4DO

f_ist = 100 ms

| Input<br>PNOZ m EF 1MM<br>Input-Delay.Max | Processing in module program<br>Processing Max | Program connectors (output signal from the module program to the main program) | Processing in the main program<br>Processing Max | Output<br>PNOZ m EF 8DI4DO<br>Output delay |
|---|---|---|---|---|
| 18 ms | 8 ms | 0 ms | 30 ms | 3 ms |




1/f_ist = 1/100 Hz = 10 ms

1/f_ist + 8 ms = 18 ms

$t_{ReactionMax}$ = 18 ms + 8 ms + 30 ms + 1 ms

$t_{ReactionMax}$ = 57 ms

### Test pulse suppression at the inputs

On function elements with switch type 3 (see online help for the PNOZmulti Configurator) a test pulse suppression on the inputs can be activated. This function can be used when self-monitored switches are used that create switch-off pulses > 300 µs.

When test pulse suppression is activated please note that the reaction time can increase by up to 15 ms!

# System expansion
## Connection of multiple PNOZmulti systems

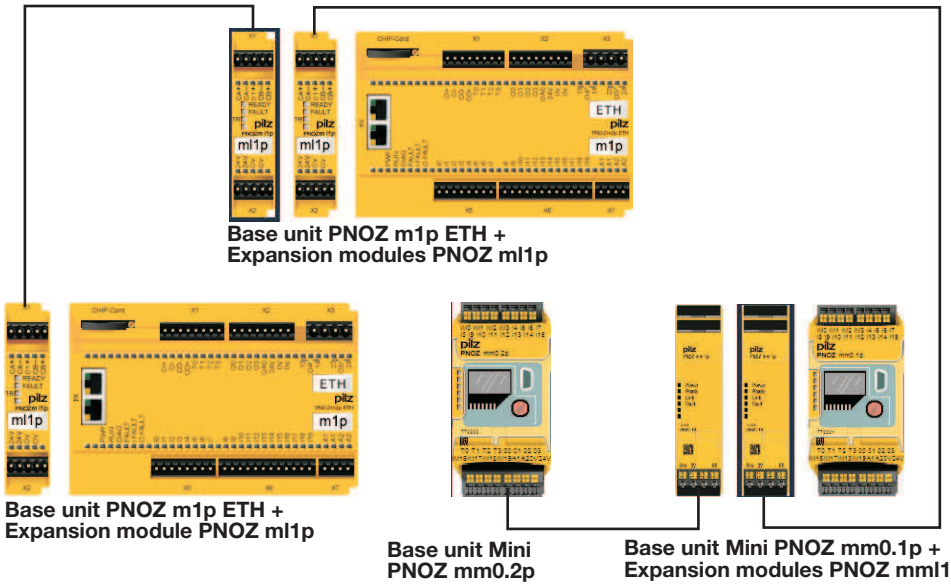
For safe data exchange two or more configurable control systems PNOZmulti can be connected to each other.

The connection is created via two connection modules and/or connection interfaces that are assigned to one base unit each.

Any number of base units can be connected via link modules.

However, only a max. of 4 link modules can be connected to a base unit.

**Example: Connecting 4 base units**




### Connection options

The following base units can be interconnected:

| | PNOZ m B0, PNOZ m B1 +PNOZ m EF Multi Link | PNOZ m0p/1p/2p/3p (ETH) +PNOZ ml1p | PNOZ mm0p | PNOZ mm0.1p +PNOZ mml1p | PNOZ mm0.2p |
|---|---|---|---|---|---|
| **PNOZ m B0, PNOZ m B1 +PNOZ m EF Multi Link** | x | x | | x | x |
| **PNOZ m0p/1p/2p/3p (ETH) +PNOZ ml1p** | x | x | | x | x |
| **PNOZ mm0p** | | | | | |

# System expansion
## Connection of multiple PNOZmulti systems

| | | | | | |
|---|---|---|---|---|---|
| **PNOZ mm0.1p + PNOZ mml1p** | **x** | **x** | | **x** | **x** |
| **PNOZ mm0.2p** | **x** | **x** | | **x** | **x** |

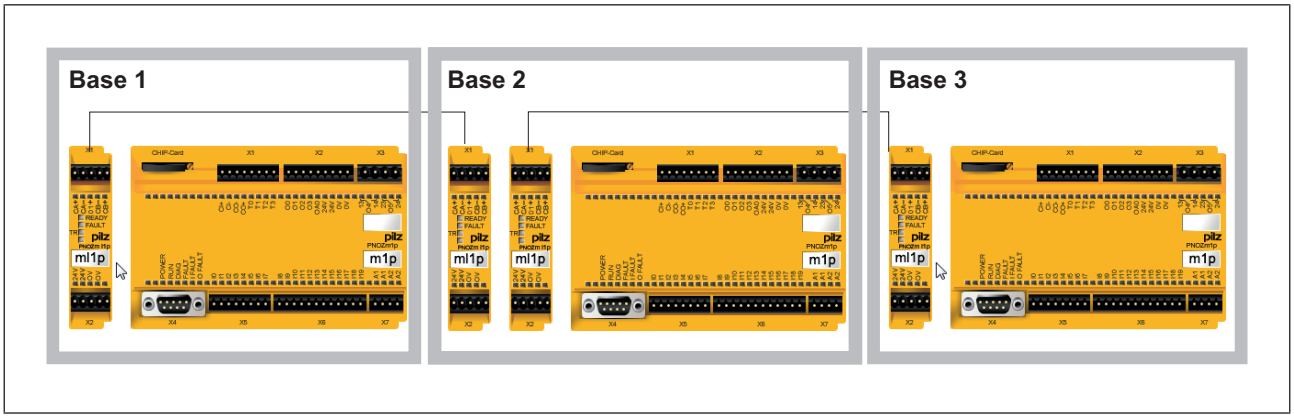
### Connection's reaction times

The reaction time when connecting two or more base units is calculated from the transmission delay of the connection at the link module of a communication partner and the input delay at the link module of the connected communication partner.

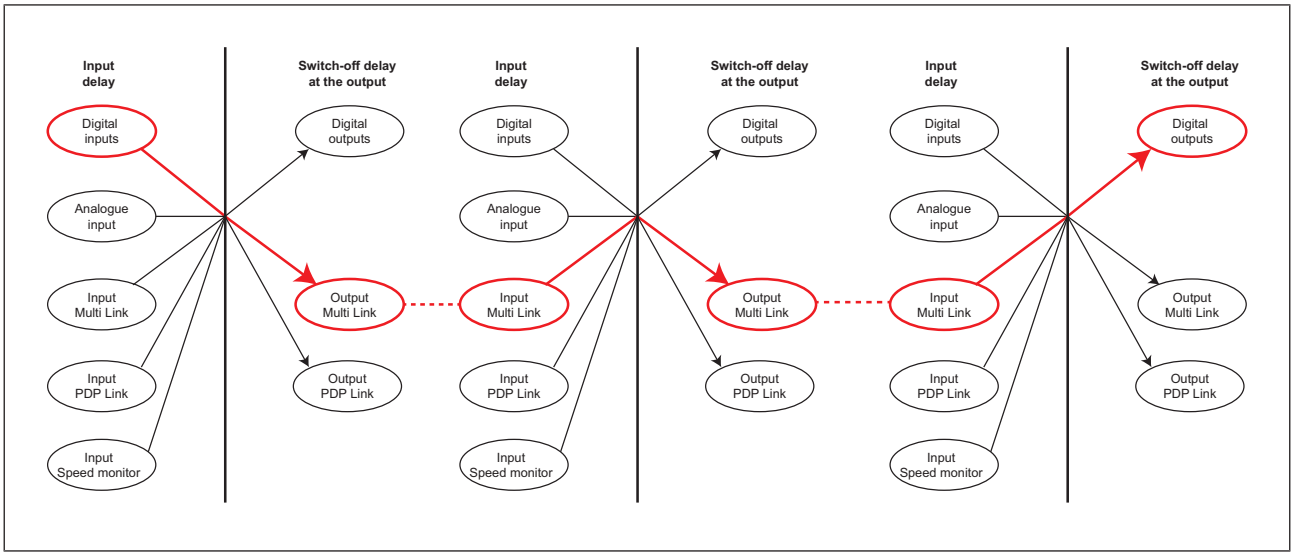
#### Example: Connecting 3 base units PNOZmulti

The maximum reaction time $t_{ReactionMax}$ includes the following times:

- Max. input delay PNOZ m1p (Base 1): 4 ms
- Data transfer time of the connection at the PNOZ ml1p (Base 1): 35 ms
- Max. input delay PNOZ ml1p (Base 2): 0 ms
- Data transfer time of the connection at the PNOZ ml1p (Base 2): 35 ms
- Max. input delay PNOZ ml1p (Base 3): 0 ms
- Max. switch-off delay at the output PNOZ m1p: 30 ms



## System expansion
Connection of multiple PNOZmulti systems




$t_{ReactionMax}$ **= 4 ms + 35 ms + 0 ms + 35 ms + 0 ms + 30 ms**

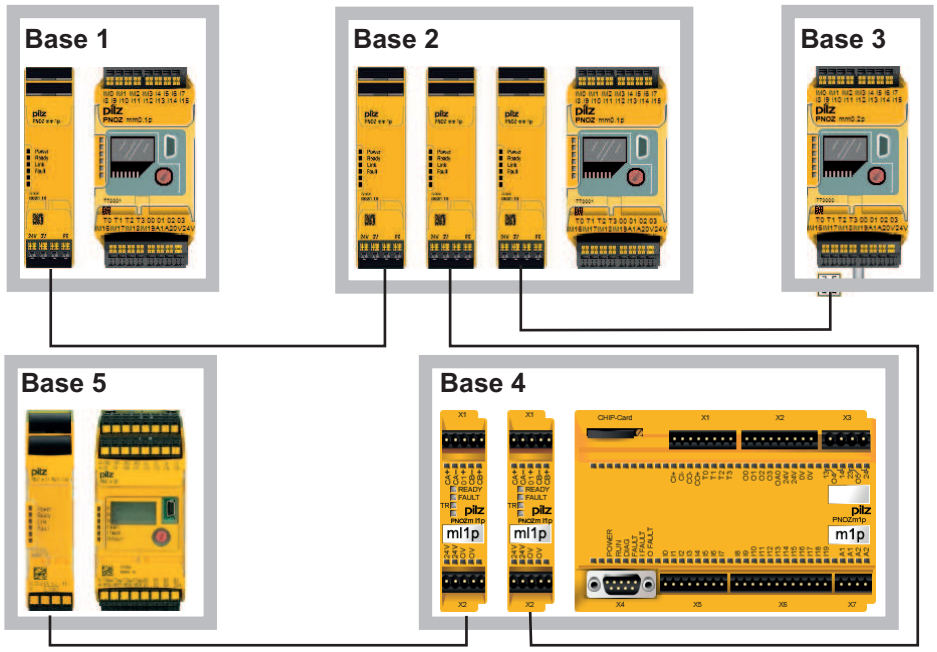
$t_{ReactionMax}$ **= 104 ms**

# System expansion
## Connection of multiple PNOZmulti systems

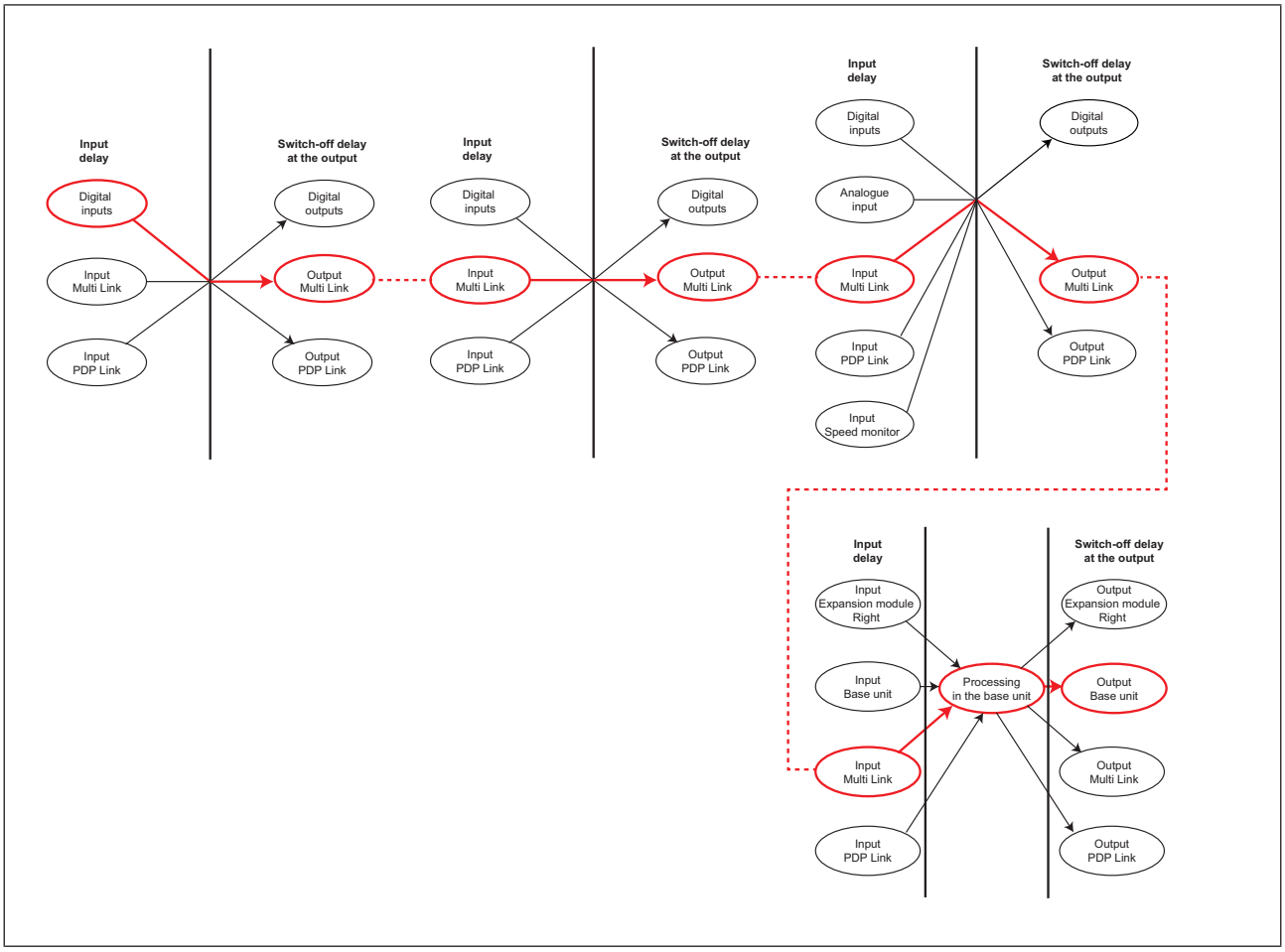
### Example: Connecting 5 base units PNOZmulti

The maximum reaction time $t_{ReactionMax}$ includes the following times:

- Max. input delay PNOZ mm0.1p (Base 1): 4 ms
- Data transfer time of the connection at the PNOZ mml1p (Base 1): 35 ms
- Max. input delay PNOZ mml1p (Base 2): 0 ms
- Data transfer time of the connection at the PNOZ mml1p (Base 2): 35 ms
- Max. input delay PNOZ mml1p (Base 2): 0 ms
- Data transfer time of the connection at the PNOZ ml1p (Base 4): 35 ms
- Max. input delay PNOZ m EF Multi Link (Base 5): 0 ms
- Max. processing time PNOZ m B0 (Base 5): 30 ms
- Max. switch-off delay at the output PNOZ mB0 (Base 5): 1 ms



## System expansion
Connection of multiple PNOZmulti systems




$t_{ReactionMax}$ **=4 ms + 35 ms + 0 ms + 35 ms + 0 ms + 35 ms + 0 ms 30 ms + 1 ms**

$t_{ReactionMax}$ **= 140 ms**

## System expansion
Connection via the cascading inputs and outputs

To connect base units from the safety systems PNOZmulti via the cascading inputs and outputs, please refer to the PNOZmulti Installation Manual.

# Selection guide

| Contents | Page |
|---|---|

## Configurable safety systems PNOZmulti
Base units

| Type | Order number | Features | Common features |
|---|---|---|---|
| PNOZ m0p<br>PNOZ m0p ETH | 773 110<br>773 113 | **Base unit**<br>From 3 … 6 safety functions<br>Only 1 link module and fieldbus module each can be connected,<br>no other expansion modules can be used,<br>From 3 … 6 safety functions | To connect emergency stop devices, two-hand pushbuttons, safety gate limit switches, light beam devices, scanners, enabling switches, safety gate switches PSEN, operating mode selector switches, muting, safety mats, sensors, for example<br>Can be configured in the PNOZmulti Configurator<br>Exchangeable program memory<br>Diagnostic interface<br>1 fieldbus module can be connected<br>PNOZ m1p, PNOZ m2p, PNOZ m3p: Max. 8 expansion modules can be connected<br>20 safe inputs<br>Semiconductor outputs:<br>– 4 safety outputs<br>Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061<br>– 1 output for standard applications<br>Positive-guided relay outputs:<br>– 2 safety outputs<br>Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061<br>4 test pulse outputs<br>1 cascading input and output;<br>can also be used as a standard output<br>LED for fault, diagnostics, supply voltage, input and output circuits<br>Plug-in connection terminals: either spring-loaded or screw terminals (available as accessory)<br>Dimensions (H x B x T): 94 x 135 x 121 mm |
| PNOZ m1p<br>PNOZ m1p ETH<br>PNOZ m1p coated version<br>PNOZ m1p ETH coated version | 772 001 | **Base unit**<br>Modular and expandable, max. 8 expansion modules and 1 fieldbus module can be connected<br>From 4 safety functions and automation functions | |
| PNOZ m2p<br>PNOZ m2p ETH | 772 002 | **Base unit - specifically for press applications**<br>Monitoring of operating modes such as set-up mode, single-stroke and automatic, safety light curtains in single-break and double-break mode, rotary cam arrangement with run monitoring,<br>press safety valves<br>Modular and expandable as PNOZ m1p | |
| PNOZ m3p<br>PNOZ m3p ETH | 773 125<br>773 126 | **Base unit - specifically for burner management:**<br>Control and monitoring of furnaces, e.g. monitoring of safety sequences, combustion air pressure, ignition, flame, external compound controller and tightness control; plus control of safety valves, ignition valves, exhaust valves, ignition, external compound controller and combustion air blower<br>Modular and expandable as PNOZ m1p | |

Please refer to the section entitled System expansion [30] for details of the number and type of connectable expansion modules for the expandable base units.

## Configurable safety systems PNOZmulti
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| **Analogue input modules** | | | |
| PNOZ ma1p<br>PNOZ ma1p coated version | 773 812<br>773 813 | Safe analogue input module | ▸ 2 safe analogue inputs for current or voltage measurement<br>▸ Each input can be configured separately<br>▸ Voltage range: -10.24 ... +10.2375 V<br>▸ Current range: 0 ... 25.59 mA<br>▸ Resolution<br>– Voltage measurement: 13 Bit (signed 12 Bit)<br>– Current measurement: 12 Bit<br>▸ Range monitoring to monitor for wiring errors or errors in the sensor (4 range limits can be configured)<br>▸ Threshold value monitoring to monitor process variables (8 threshold values can be configured)<br>▸ Exact analogue value can be passed to a fieldbus for diagnostic purposes<br>▸ Status indicators<br>▸ Coated version: for increased environmental requirements |
| **Link modules** | | | |
| PNOZ ml1p<br>PNOZ ml1p coated version | 773 540<br>773 545 | For safe connection of two PNOZmulti base units | ▸ Point-to-point connection via 4-core shielded and twisted-pair cable<br>▸ 32 virtual inputs and 32 virtual outputs<br>▸ Status indicators<br>▸ Coated version: for increased environmental requirements |
| PNOZ ml2p | 773 602 | For safe connection of one base unit with up to 4 decentralised modules PDP67 (see below) | ▸ Max. 4 decentralised modules PDP67 F 8DI ION can be connected to the link module PNOZ ml2p<br>▸ Status indicators |
| **Decentralised modules (not included in this catalogue)** | | | |
| PDP67 F 8DI ION | 773 600 | Decentralised safe input module IP67 | ▸ Protection type IP67<br>▸ 8 inputs for connecting 8 single-channel or 4 dual-channel sensors<br>▸ 8 outputs, which can be configured as<br>– Standard outputs<br>– Test pulse outputs<br>– 24 V outputs<br>▸ Status indicators |

## Configurable safety systems PNOZmulti
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| PDP67 F 8DI ION HP | 773 601 | Decentralised safe input module IP67 | ▸ Protection type IP67<br>▸ 8 inputs for connecting 8 single-channel or 4 dual-channel sensors<br>▸ 8 outputs, which can be configured as<br>– Standard outputs<br>– Test pulse outputs<br>– 24 V outputs<br>▸ Separate output supply for applications with higher current consumption<br>▸ Module is galvanically isolated from CAN bus<br>▸ Status indicators |
| **Input modules** | | | |
| PNOZ mi1p<br>PNOZ mi1p coated version | 773 400<br>773 405 | Safe input module | ▸ 8 safe inputs<br>▸ Status indicators<br>▸ Test pulse outputs used to monitor shorts across the inputs<br>▸ Coated version: for increased environmental requirements |
| PNOZ mi2p | 773 410 | Input module | ▸ 8 inputs for standard applications<br>▸ Status indicators |
| **Output modules** | | | |
| PNOZ mo1p<br>PNOZ mo1p coated version | 773 500<br>773 505 | Safe semiconductor output module | ▸ 4 safe semiconductor outputs up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061, depending on the application<br>▸ Status indicators<br>▸ Coated version: for increased environmental requirements |
| PNOZ mo2p<br>PNOZ mo2p coated version | 773 520<br>773 525 | Safe relay output module | ▸ 2 safe relay outputs, positive-guided<br>up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061, depending on the application<br>▸ Status indicators<br>▸ Coated version: for increased environmental requirements |
| PNOZ mo3p | 773 510 | Safe semiconductor output module, 2-pole | ▸ 4 safe semiconductor outputs, 2-pole, up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061, depending on the application<br>▸ Status indicators |
| PNOZ mo4p<br>PNOZ mo4p coated version | 773 536<br>773 537 | Safe relay output module, volt-free switching of actuators | ▸ 4 safe relay outputs, positive-guided<br>up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061, depending on the application<br>▸ Status indicators<br>▸ Coated version: for increased environmental requirements |
| PNOZ mo5p | 773 534 | Safe relay output module to control the safety valves on a burner in accordance with EN 50156 | ▸ 4 safe relay outputs, positive-guided, diverse<br>Up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061, depending on the application<br>▸ Status indicators |

## Configurable safety systems PNOZmulti
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| **Output modules for standard applications** | | | |
| PNOZ mc1p<br>PNOZ mc1p coated version | 773 700<br>773 705 | Semiconductor output module for standard applications | ▸ 16 semiconductor outputs for standard applications<br>▸ Status indicators<br>▸ Coated version: for increased environmental requirements<br>▸ Status indicators |
| **Speed monitors** | | | |
| PNOZ ms1p | 773 800 | To connect<br>▸ Proximity switches<br>▸ Incremental encoders Sin/Cos, TTL (5V) | ▸ Monitoring of 2 independent axes (8 cutoff frequencies can be set)<br>▸ Connection per axis: 1 incremental encoder or 2 proximity switches or one of each<br>▸ Measured variables:<br>– Standstill<br>– Speed (8 values can be set)<br>– Direction of rotation<br>▸ Encoder types can be selected in the PNOZmulti Configurator<br>▸ Proximity detectors are connected directly to the terminals<br>▸ Status indicators |
| PNOZ ms2p HTL | 773 815 | To connect<br>▸ Proximity switches<br>▸ Incremental encoders HTL (24 V) | |
| PNOZ ms2p TTL<br>PNOZ ms2p TTL coated version | 773 816<br>773 811 | To connect<br>▸ Proximity switches<br>▸ Incremental encoders Sin/Cos, TTL (5V) | |
| PNOZ ms3p | 773 820 | To connect<br>▸ Incremental encoders Sin/Cos, TTL (5V), HTL (24 V) | ▸ Monitoring of 2 independent axes (8 cutoff frequencies can be set)<br>▸ Connection per axis: 1 incremental encoder<br>▸ Measured variables:<br>– Standstill<br>– Speed (8 values can be set)<br>– Direction of rotation<br>▸ Encoder types can be selected in the PNOZmulti Configurator<br>▸ Function to deactivate speed monitoring<br>▸ Status indicators |
| PNOZ ms3p HTL | 773 825 | To connect<br>Incremental encoders HTL (24 V) | |
| PNOZ ms3p TTL | 773 826 | To connect<br>▸ Incremental encoders Sin/Cos, TTL (5V) | |
| PNOZ ms4p | 773 830 | To connect<br>▸ Incremental encoders Sin/Cos, TTL (5V), HTL (24 V) | ▸ Monitoring of 1 axis<br>▸ Connection per axis: 1 incremental encoder<br>▸ Measured variables:<br>– Standstill<br>– Speed (16 values can be set)<br>– Direction of rotation<br>▸ Function to deactivate speed monitoring<br>▸ Encoder types can be selected in the PNOZmulti Configurator<br>▸ Status indicators |

## Configurable safety systems PNOZmulti
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| **Fieldbus modules** | | | |
| PNOZ mc0p | 773 720 | Power supply to supply voltage to fieldbus modules | |
| PNOZ mc2.1p | 773 713 | EtherCAT (DS301 V4.02 compliant) | |
| PNOZ mc3p | 773 732 | PROFIBUS-DP | |
| PNOZ mc4p<br>PNOZ mc4p coated version | 773 711<br>773 729 | DeviceNet | |
| PNOZ mc5p | 773 723 | Interbus | |
| PNOZ mc5.1p | 773 728 | Interbus fibre-optic cable | |
| PNOZ mc6p<br>PNOZ mc6p coated version | 773 712<br>773 727 | CANopen | |
| PNOZ mc6.1p | 773 733 | CANopen | |
| PNOZ mc7p<br>PNOZ mc7p coated version | 773 726<br>773 725 | CC-Link | |
| PNOZ mc8p<br>PNOZ mc8p coated version | 773 730<br>773 734 | Ethernet IP/Modbus TCP | |
| PNOZ mc9p | 773 731 | Profinet | |
| PNOZ mc10p | 773 715 | sercos III | |
| PNOZ mc12p | 773 719 | Ethernet POWERLINK | |

Please refer to the section entitled System expansion [30] for details of the number of connectable expansion modules and the slot.

# Configurable compact controllers PNOZmulti Mini
## Expansion modules

| Type | Order number | Features | Common features |
|---|---|---|---|
| PNOZ mm0p<br>PNOZ mm0p-T | 772 000<br>772 010 | **Base unit**<br>From 3 … 6 safety functions<br>Not modular and expandable | ▸ To connect emergency stop devices, two-hand pushbuttons, safety gate limit switches, light beam devices, scanners, enabling switches, safety gate switches PSEN, operating mode selector switches, muting, safety mats, sensors, for example<br>▸ Can be configured in the PNOZmulti Configurator<br>▸ Exchangeable program memory<br>▸ 20 safe inputs, up to 8 of which can be configured as outputs for standard applications<br>▸ 4 safe semiconductor outputs up to PL e, SIL CL 3<br>▸ 4 semiconductor outputs, can be configured as outputs for standard applications or as test pulses<br>▸ Display for error messages, state of the supply voltage, state of the inputs and outputs, status and device information. Customised texts can be displayed<br>▸ Rotary knob for menu control<br>▸ Plug-in connection terminals: either spring-loaded or screw terminals (available as accessory)<br>▸ Dimensions (H x B x T): 100 x 45 x 120 mm |
| PNOZ mm0.1p | 772 001 | **Base unit**<br>From 4 safety functions and for standard control functions<br>▸ Expansion modules PNOZsigma can be connected<br>▸ 1 link module or communication module can be connected<br>▸ 1 fieldbus module can be connected<br>▸ Decentralisation: PDP67 modules can be connected to connect sensor technology<br>▸ Expanded diagnostics PVIS<br>From 4 safety functions and for standard control functions | |
| PNOZ mm0.2p | 772 002 | **Base unit**<br>As PNOZ mm0.1p,<br>with additional integrated Multi-Link interface | |

Please refer to the section entitled System expansion [📖 30] for details of the number and type of connectable expansion modules for the expandable base units.

| Type | Order number | Application area | Features |
|---|---|---|---|
| **Link modules** | | | |
| PNOZ mml1p | 772 020 | For safe connection of two PNOZmulti base units | ▸ Point-to-point connection via 4-core shielded and twisted-pair cable<br>▸ 32 virtual inputs and 32 virtual outputs<br>▸ Status indicators |
| PNOZ mml2p | 772 020 | For safe connection of one base unit with up to 4 decentralised modules PDP67 (see below) | ▸ Max. 4 decentralised modules PDP67 F 8DI ION can be connected to the link module PNOZ mml2p<br>▸ Status indicators |
| **Decentralised modules (not included in this catalogue)** | | | |
| PDP67 F 8DI ION | 773 600 | Decentralised safe input module IP67 | ▸ Protection type IP67<br>▸ 8 inputs for connecting 8 single-channel or 4 dual-channel sensors<br>▸ 8 outputs, which can be configured as<br>– Standard outputs<br>– Test pulse outputs<br>– 24 V outputs<br>▸ Status indicators |

## Configurable compact controllers PNOZmulti Mini
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| PDP67 F 8DI ION HP | 773 601 | Decentralised safe input module IP67 | ▸ Protection type IP67<br>▸ 8 inputs for connecting 8 single-channel or 4 dual-channel sensors<br>▸ 8 outputs, which can be configured as<br>– Standard outputs<br>– Test pulse outputs<br>– 24 V outputs<br>▸ Separate output supply for applications with higher current consumption<br>▸ Module is galvanically isolated from CAN bus<br>▸ Status indicators |
| **Communication modules** | | | |
| PNOZ mmc1p | 772 030 | Communication module with Ethernet interfaces (TCP/IP, Modbus/TCP) | ▸ 2 Ethernet interfaces<br>▸ Status indicators |
| PNOZ mmc2p | 772 031 | Communication module with serial interface RS232 | ▸ 1 serial interface RS232<br>▸ Status indicators |
| **Fieldbus modules** | | | |
| PNOZ mmc3p | 772 032 | Fieldbus module PROFIBUS DP | ▸ Connection for PROFIBUS DP<br>▸ Station addresses from 0 ... 99, selected via rotary switch<br>▸ Status indicators |
| PNOZ mmc4p | 772 033 | Fieldbus module DeviceNet | ▸ Connection for DeviceNet<br>▸ Station addresses from 0 ... 63 using DIP switch(es)<br>▸ Status indicators |
| PNOZ mmc6p | 772 034 | Fieldbus module CANopen | ▸ Connection for CANopen<br>▸ Station addresses from 0 ... 99, selected via rotary switch<br>▸ Transmission rate selected via rotary switch (1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s)<br>▸ Status indicators |
| PNOZ mmc7p | 772 035 | Fieldbus module CC-Link | ▸ Connection for CC-Link<br>▸ Station addresses from 1 ... 63, selected via rotary switch<br>▸ Station type: Remote Device<br>▸ Occupied stations: 2<br>▸ Status indicators |

## Configurable compact controllers PNOZmulti Mini
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| PNOZ mmc11p | 772 036 | Fieldbus module EtherCAT | ▸ Connection for EtherCAT<br>▸ Network protocols: EtherCAT<br>▸ Supports CANopen over EtherCAT (DS301 V4.02 compliant)<br>▸ Status indicators |
| PNOZ mmc12p | 772 019 | Fieldbus module Ethernet POWERLINK | ▸ Connection for Ethernet POWERLINK (Ethernet POWERLINK V 2 protocol)<br>▸ Station addresses from 1 ... 239, selected via rotary switch<br>▸ The minimum cycle time for an application of 20 Byte Output and 20 Byte Input is 250µs. The minimum cycle time is 450 µs at the maximum PDO size of 254 Byte Input and 20 Byte Output (the inputs and outputs in this case are viewed from the Managing Node).<br>▸ Status indicators |
| **PNOZsigma output modules (not included in this catalogue)** | | | |
| PNOZ s7 | 751 107<br>750 107 | 1 safe relay output | Relay output modules for PNOZsigma product range (see Technical Catalogue PNOZ) |
| PNOZ s7.1 | 751 167<br>750 167 | 1 safe relay output (+ 1 PNOZ s7, PNOZ s10 or PNOZ s11 can be connected as a contact expansion module) | |
| PNOZ s7.2 | 751 177<br>750 177 | 1 safe relay output (+ 1 expansion module PNOZ s7, PNOZ s10 or PNOZ s11 can be connected) | |
| PNOZ s10 | 751 110<br>750 110 | 1 safe relay output | |
| PNOZ s11 | 751 111<br>750 111 | 8 safe relay outputs | |
| PNOZ s20 | 751 160<br>750 160 | 2 semiconductor outputs for standard applications | |
| PNOZ s22 | 751 132<br>750 132 | 2 safe relay outputs | |

Please refer to the section entitled System expansion [30] for details of the number of connectable expansion modules and the slot.

## Configurable control systems PNOZmulti 2
Base units

| Type | Order number | Features | Common features |
|---|---|---|---|
| PNOZ m B0 | 772 100 | **Base unit**<br>▸ Efficient from 4 safety functions upwards<br>▸ 20 safe inputs, up to 8 of which can be configured as outputs for standard applications<br>▸ 4 safe semiconductor outputs up to PL e, SIL CL 3<br>▸ 4 semiconductor outputs, can be configured as outputs for standard applications or as test pulses<br>▸ Display for error messages, state of the supply voltage, state of the inputs and outputs, status and device information. Customised texts can be displayed<br>▸ Rotary knob for menu control<br>▸ Max. 6 expansion modules can be connected<br>▸ 1 link module or communication module can be connected<br>▸ Exchangeable program memory<br>▸ LED for fault, diagnostics, supply voltage, input and output circuits<br>▸ Dimensions (H x B x T): 101.4 x 45 x 120 mm | ▸ To connect emergency stop devices, two-hand pushbuttons, safety gate limit switches, light beam devices, scanners, enabling switches, safety gate switches PSEN, operating mode selector switches, muting, safety mats, sensors, for example<br>▸ 1 fieldbus module can be connected<br>▸ Can be configured in the PNOZmulti Configurator<br>▸ Exchangeable program memory (USB memory)<br>▸ Diagnostic interface<br>▸ Plug-in connection terminals: either spring-loaded or screw terminals (available as accessory) |
| PNOZ m B1 | 772 101 | **Base unit**<br>▸ Efficient from 4 safety functions upwards<br>▸ Support for module programs (mIQ)<br>▸ 4 test pulse outputs to detect shorts between the inputs<br>▸ Display for error messages, state of the supply voltage, state of the inputs and outputs, status and device information, Ethernet settings, system date and time, stop and start device<br>▸ Multifunction switch for menu control<br>▸ Maximum number of expansion modules:<br>– Right-hand up to 12 safe expansion modules, additionally 1 output module for standard applications<br>– Left-hand up to 4 safe expansion modules, 1 fieldbus module<br>▸ Exchangeable program memory USB memory (512 Byte, supplied with the device): Several projects can be saved, only one can be executed, managed via the Project Manager<br>▸ Larger programs in the PNOZmulti Configurator: Up to 1024 connection lines are possible<br>▸ Date and time of the system can be set in the PNOZmulti Configurator<br>▸ LED display for fault, diagnostics, supply voltage<br>▸ Dimensions (H x B x T): 120.2 x 45 x 98 mm | |

Please refer to the section entitled System expansion [30] for details of expansion modules that can be connected for the expandable base units.

## Configurable control systems PNOZmulti 2
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| **Link modules** | | | |
| PNOZ m EF Multi Link | 772 120 | For safe connection of two PNOZmulti base units | ▸ Point-to-point connection via 4-core shielded and twisted-pair cable<br>▸ 32 virtual inputs and 32 virtual outputs<br>▸ Status indicators |
| PNOZ m EF PDP Link | 772 121 | For safe connection of one base unit with up to 4 decentralised modules PDP67 (see below) | ▸ Max. 4 decentralised modules PDP67 F 8DI ION can be connected to the link module PNOZ mml2p<br>▸ Status indicators |
| **Decentralised modules (not included in this catalogue)** | | | |
| PDP67 F 8DI ION | 773 600 | Decentralised safe input module IP67 | ▸ Protection type IP67<br>▸ 8 inputs for connecting 8 single-channel or 4 dual-channel sensors<br>▸ 8 outputs, which can be configured as<br>– Standard outputs<br>– Test pulse outputs<br>– 24 V outputs<br>▸ Status indicators |
| PDP67 F 8DI ION HP | 773 601 | Decentralised safe input module IP67 | ▸ Protection type IP67<br>▸ 8 inputs for connecting 8 single-channel or 4 dual-channel sensors<br>▸ 8 outputs, which can be configured as<br>– Standard outputs<br>– Test pulse outputs<br>– 24 V outputs<br>▸ Separate output supply for applications with higher current consumption<br>▸ Module is galvanically isolated from CAN bus<br>▸ Status indicators |
| **Input module** | | | |
| PNOZ EF 16DI | 772 140 | Safe input module | ▸ 16 safe inputs<br>▸ Test pulse outputs used to monitor shorts across the inputs<br>▸ Status indicators |
| **Input and output modules** | | | |
| PNOZ EF 8DI4DO | 772 142 | Safe input and output module | ▸ 8 safe inputs<br>▸ 4 safe semiconductor outputs up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061, depending on the application<br>▸ Status indicators |

## Configurable control systems PNOZmulti 2
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| PNOZ EF 4DI4DOR | 772 143 | Safe input and output module | ▸ 8 safe inputs<br>▸ 2 safe relay outputs, positive-guided<br>up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061, depending on the application<br>▸ Status indicators |
| **Output modules** | | | |
| PNOZ m ES 14DO | 772 181 | Output module for standard applications | ▸ 14 outputs for standard applications |
| **Motion monitoring modules** | | | |
| PNOZ m EF 1MM | 772 170 | Monitoring of 1 axis | ▸ Monitoring of 1 axis<br>▸ Measured value recorded by proximity switch and encoder<br>▸ Monitoring functions<br>– Safe speed monitoring (SSM)<br>– Safe speed range monitoring (SSR-M)<br>– Safe direction of movement monitoring (SDI-M)<br>– Safe operating stop monitoring (SOS-M)<br>– Analogue voltage (track S)<br>▸ Status indicators |
| PNOZ m EF 2MM | 772 171 | Monitoring of 2 axes | ▸ Monitoring of 2 independent axes<br>▸ Measured value recorded by proximity switch and encoder<br>▸ Monitoring functions<br>– Safe speed monitoring (SSM)<br>– Safe speed range monitoring (SSR-M)<br>– Safe direction of movement monitoring (SDI-M)<br>– Safe operating stop monitoring (SOS-M)<br>– Analogue voltage (track S)<br>▸ Status indicators |
| **Communication modules** | | | |
| PNOZ m ES ETH | 772 130 | Communication module with Ethernet interfaces (TCP/IP, Modbus/TCP) | ▸ 2 Ethernet interfaces<br>▸ Status indicators |
| PNOZ m ES RS232 | 772 131 | Communication module with serial interface RS232 | ▸ 1 serial interface RS232<br>▸ Status indicators |
| **Fieldbus modules** | | | |

## Configurable control systems PNOZmulti 2
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| PNOZ m ES Profibus | 772 132 | Fieldbus module PROFIBUS DP | ▸ Connection for PROFIBUS DP<br>▸ Station addresses from 0 ... 99, selected via rotary switch<br>▸ Status indicators |
| PNOZ m ES CANopen | 772 134 | Fieldbus module CANopen | ▸ Connection for CANopen<br>▸ Station addresses from 0 ... 99, selected via rotary switch<br>▸ Transmission rate selected via rotary switch (1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s)<br>▸ Status indicators |
| PNOZ m ES EtherCAT | 772 136 | Fieldbus module EtherCAT | ▸ Connection for EtherCAT<br>▸ Network protocols: EtherCAT<br>▸ Supports CANopen over EtherCAT (DS301 V4.02 compliant)<br>▸ Status indicators |
| PNOZ m ES Powerlink | 772 119 | Fieldbus module Ethernet POWERLINK | ▸ Connection for Ethernet POWERLINK (Ethernet POWERLINK V 2 protocol)<br>▸ Station addresses from 1 ... 239, selected via rotary switch<br>▸ The minimum cycle time for an application of 20 Byte Output and 20 Byte Input is 250µs. The minimum cycle time is 450 µs at the maximum PDO size of 254 Byte Input and 20 Byte Output (the inputs and outputs in this case are viewed from the Managing Node).<br>▸ Status indicators |
| PNOZ m ES EtherNet/IP | 772 137 | Fieldbus module EtherNet/IP | ▸ Connection for EtherNet/IP<br>▸ Connection for EtherNet/IP as adapter<br>▸ Transmission rate 10 MBit/s (10BaseT) and 100 MBit/s (100BaseTX)<br>▸ Status indicators |
| PNOZ m ES Profinet | 772 138 | Fieldbus module PROFINET | ▸ Connection for PROFINET<br>▸ Transmission rate 100 MBit/s (100BaseTX), full and half duplex<br>▸ Two RJ45 ports<br>▸ Profinet IO device (V2.2) functions in accordance with Conformance Class C<br>▸ Supported functions:<br>– RT<br>– IRT<br>– MRP<br>– LLDP<br>▸ Status indicators |

## Configurable control systems PNOZmulti 2
Expansion modules

| Type | Order number | Application area | Features |
|---|---|---|---|
| PNOZ m ES CC-Link | 772 135 | Fieldbus module CC-Link | ▸ CC-Link connection<br>▸ Station addresses from 1 ... 63, selected via rotary switch<br>▸ Station type: Remote Device<br>▸ Occupied stations: 3<br>▸ Status indicators |

Please refer to the section entitled System expansion [30] for details of the number of connectable expansion modules and the slot.

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## Base units

# Base units

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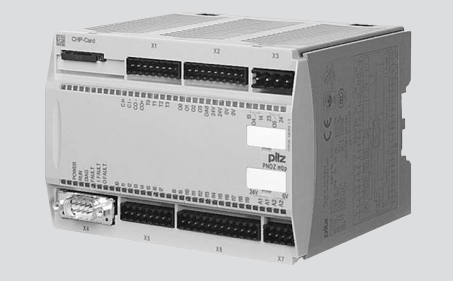
# Base units
PNOZ m0p



## Overview

### Unit features

Using the product PNOZ m0p:

Base unit from the configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  - 2 safety outputs
    Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- Semiconductor outputs:
  - 4 safety outputs
    Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
  - 1 output for standard applications
- 4 test pulse outputs
- 1 cascading input and output;
  can also be used as a standard output
- 20 inputs for connecting, for example:
  - E-STOP pushbuttons
  - Two-hand pushbuttons
  - Safety gate limit switches
  - Start buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN
  - Operating mode selector switches

  - Safety mats
- Muting function
- LED indicator for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Integrated interfaces:
  - PNOZ m0p: Serial interface RS232
  - PNOZ m0p **ETH**: 2 Ethernet interfaces
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

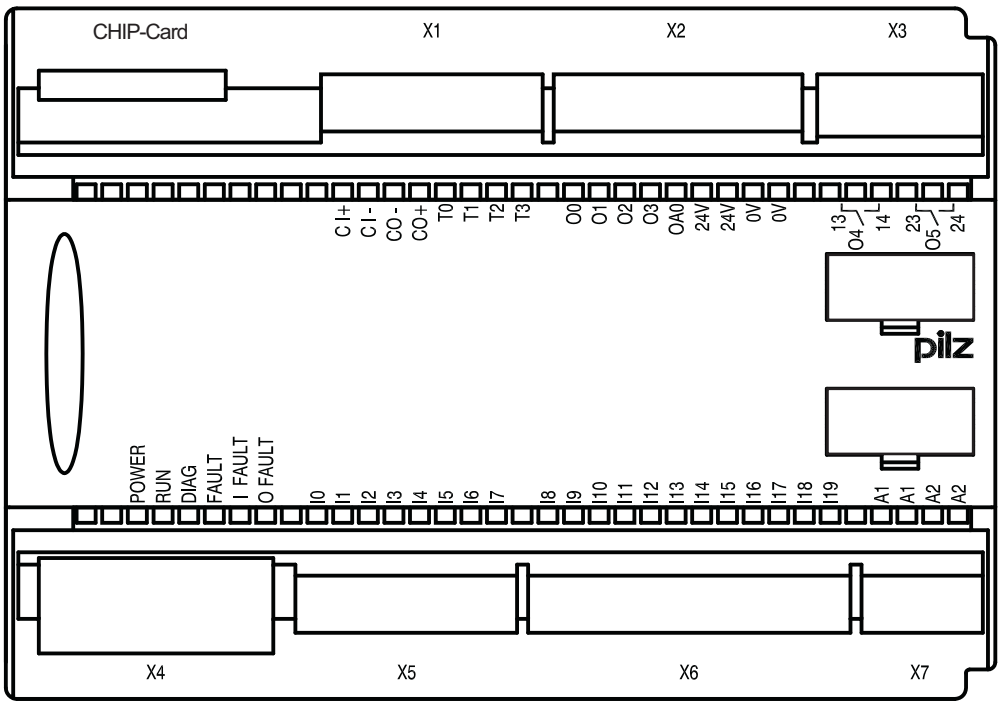
### Chip card

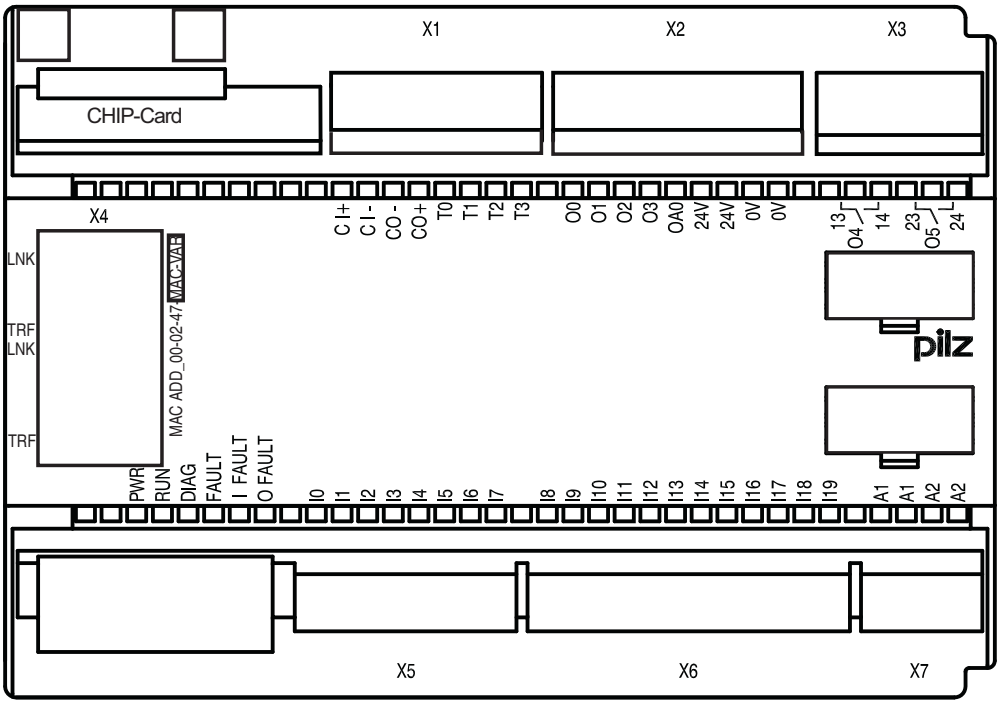
To be able to use the product you will need a chip card.

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see Technical Catalogue: Accessories chapter).

## Base units
PNOZ m0p

### Front view



# Base units
PNOZ m0p

**Legend:**

| | |
|---|---|
| CHIP card | Chipkarte interface |
| X1 | Cascading inputs and outputs CI and CO,<br>Test pulse outputs T0 ... T3 |
| X2 | Semiconductor outputs O0 ... O3,<br>Auxiliary output OA0,<br>Supply connections |
| X3 | Relay outputs O4 and O5 |
| X4 | RS232 interface / Ethernet interface |
| X5, X6 | Inputs I0 ... I19 |
| X7 | Power supply |
| LEDs: | PWR<br>RUN<br>DIAG<br>FAULT<br>I FAULT<br>O FAULT |

## Function description

### Functions

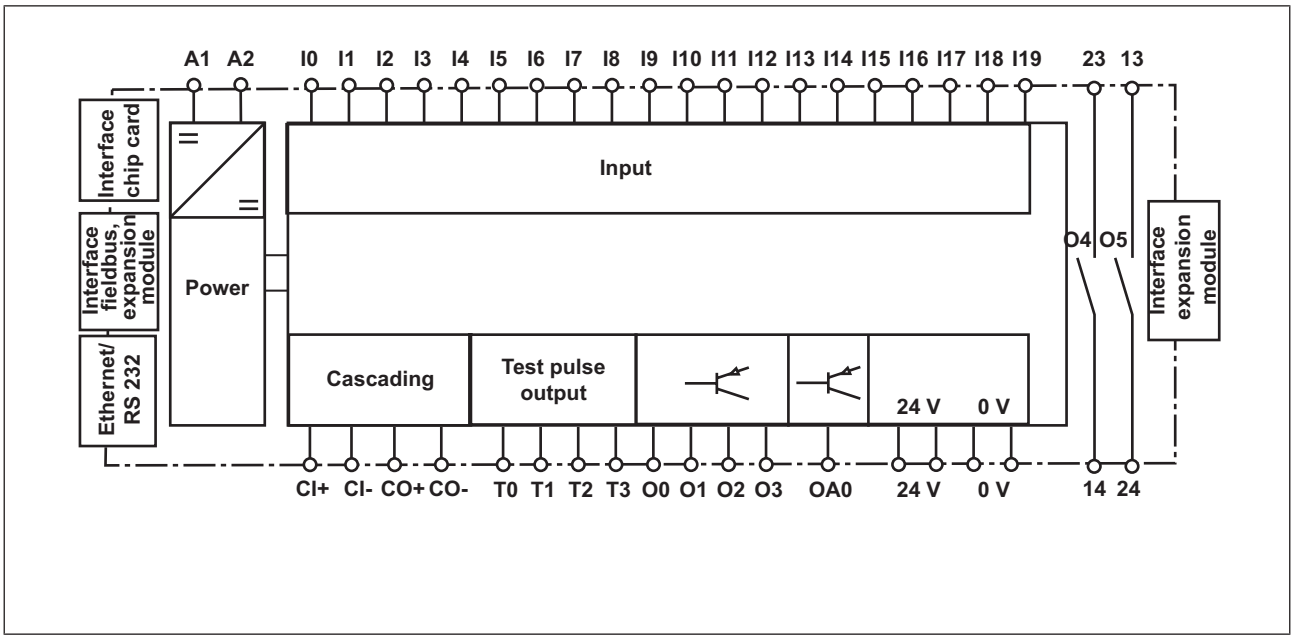
The function of the inputs and outputs on the control system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the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

The LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

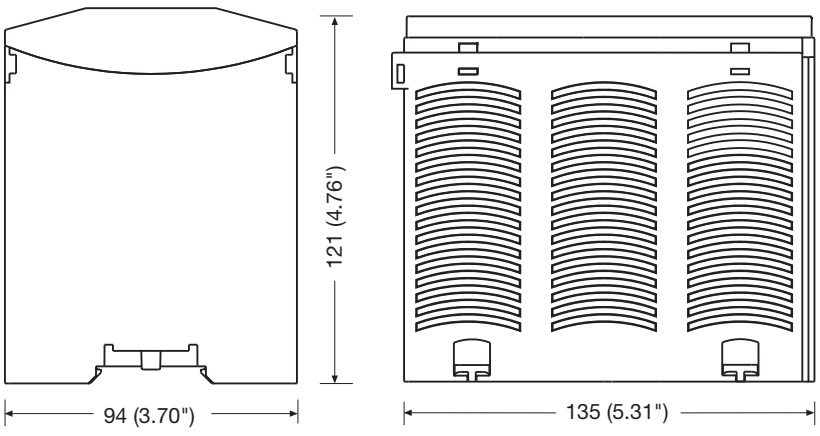
# Base units
PNOZ m0p

## Block diagram




## Installation

### Dimensions



## Commissioning

### General wiring guidelines

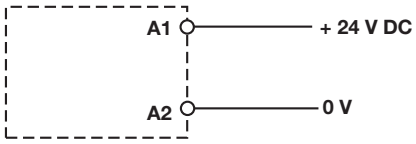
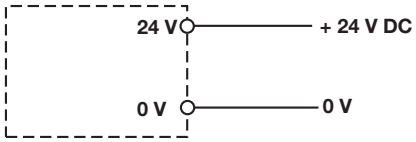
The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a safety function and the outputs that are to switch this safety function.

Please note:

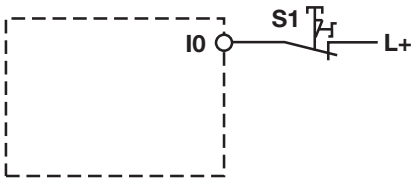
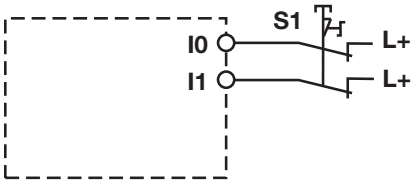
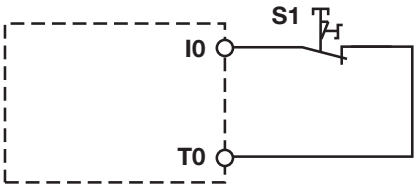
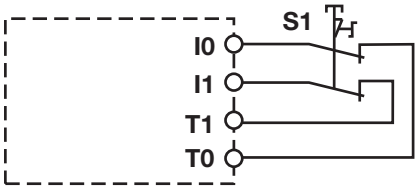
- Information given in the Technical details [84] must be followed.
- Outputs:
  - O0 to O5 are safety outputs
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an output to delete a project from the base unit (see online help for the PNOZmutli Configurator).
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wiring with a temperature stability of 75°C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The control system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective 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. When the supply voltage is looped, the current at each terminal may not exceed 3 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.
  Test pulses that are used for the safety mat may not be reused for other purposes.

# Base units
PNOZ m0p

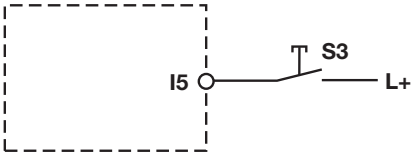
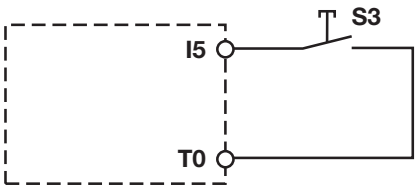
## Connection

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

Supply voltage

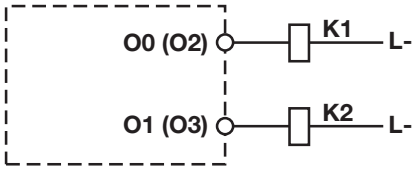
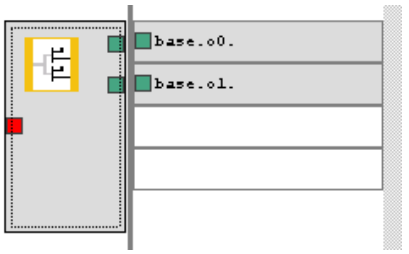
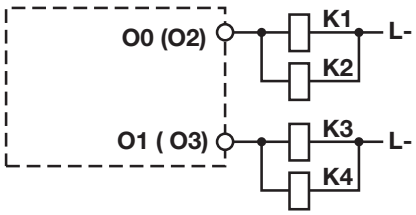
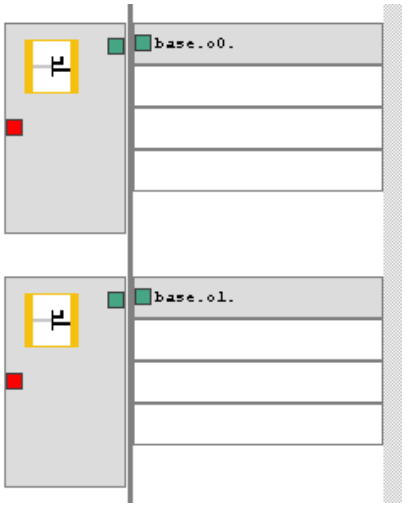
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

Connection examples for the input circuit

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

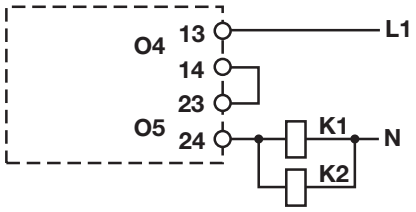
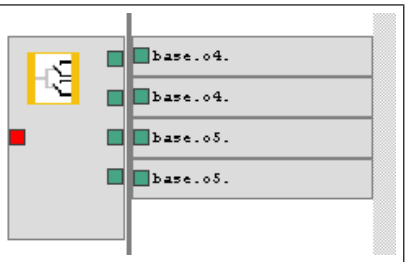
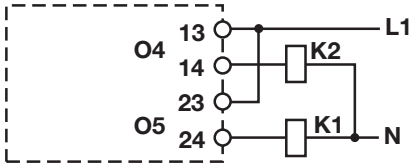
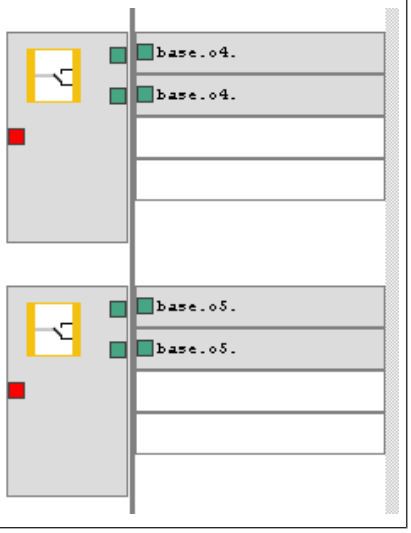
Connection examples for start circuit

## Base units
PNOZ m0p

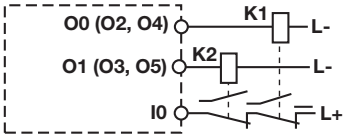
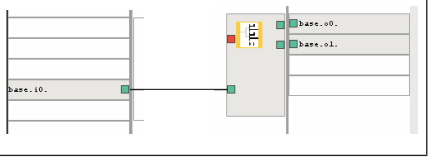
| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |

Connection examples for semiconductor outputs

## Base units
PNOZ m0p

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

Connection examples for relay outputs

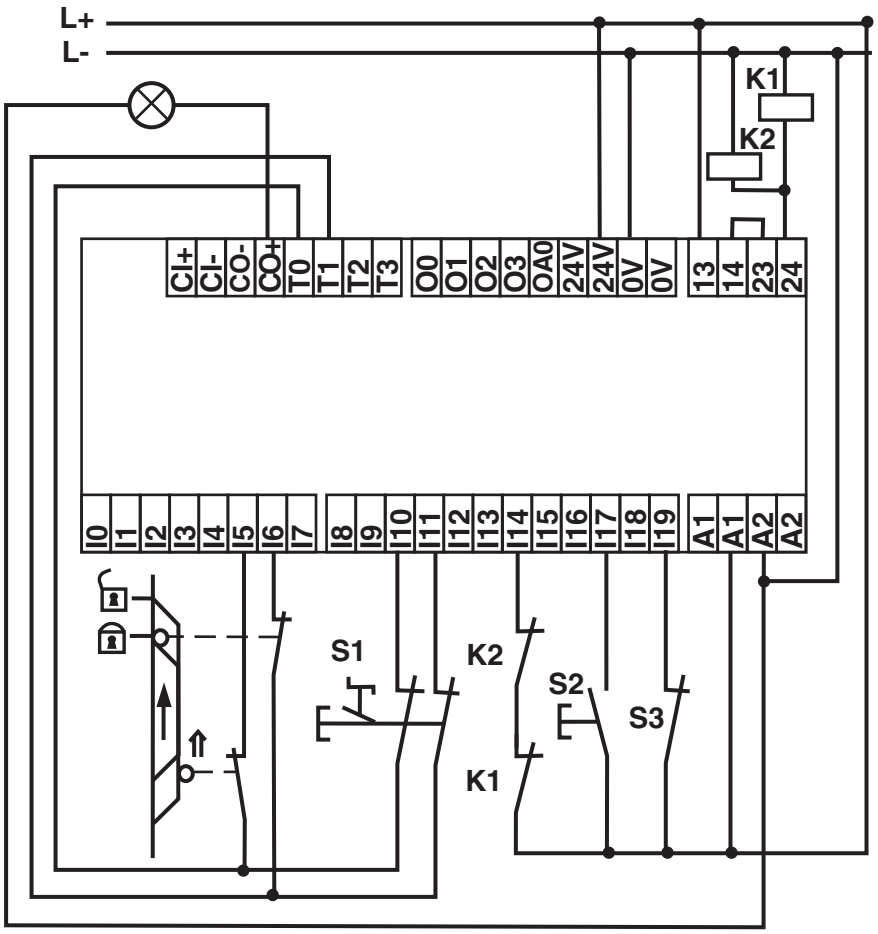
| Feedback loop | Redundant output |
|---|---|
| Contacts from external contactors |   |

Connection examples for feedback loop

# Base units
PNOZ m0p

### Connection example

Dual-channel E-STOP and safety gate wiring, monitored start (I17), feedback loop (I14), cascading output as auxiliary output (CO+/A2)



# Base units
PNOZ m0p

## Technical Details

| General | 773110 | 773113 |
|---|---|---|
| Approvals | BG, CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed | BG, CCC, CE, EAC (Eurasian), KCC, TÜV, cULus Listed |
| **Electrical data** | **773110** | **773113** |
| Supply voltage | | |
| for | Supply to the system | Supply to the system |
| Voltage | 24,0 V | 24,0 V |
| Kind | DC | DC |
| Voltage tolerance | -15 %/+20 % | -15 %/+20 % |
| Output of external power supply (DC) at no load | 8,0 W | 9,0 W |
| Residual ripple DC | 5 % | 5 % |
| Supply voltage | | |
| for | Supply to the SC outputs | Supply to the SC outputs |
| Voltage | 24 V | 24 V |
| Kind | DC | DC |
| Voltage tolerance | -15 %/+20 % | -15 %/+20 % |
| Output of external power supply (DC) | 192,0 W | 192,0 W |
| Residual ripple DC | 5 % | 5 % |
| Potential isolation | yes | yes |
| Status indicator | LED | LED |
| **Inputs** | **773110** | **773113** |
| Number | 20 | 20 |
| Max. number of live inputs within the max. permitted ambient temperature (see "Environmental data") | U_B <= 26,4 V : 20, U_B > 26,4 V : 15 | U_B <= 26,4 V : 20, U_B > 26,4 V : 15 |
| Signal level at "0" | -3 - +5 V DC | -3 - +5 V DC |
| Signal level at "1" | 15 - 30 V DC | 15 - 30 V DC |
| Input voltage in accordance with EN 61131-2 Type 1 | 24 V DC | 24 V DC |
| Input current at rated voltage | 8 mA | 8 mA |
| Min. pulse duration | 18 ms | 18 ms |
| Pulse suppression | 0,6 ms | 0,6 ms |
| Maximum input delay | 4 ms | 4 ms |
| Potential isolation | No | No |
| **Semiconductor outputs** | **773110** | **773113** |
| Number | 4 | 4 |

## Base units
PNOZ m0p

| Semiconductor outputs | 773110 | 773113 |
|---|---|---|
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **2,0 A** | **2,0 A** |
| Power | **48 W** | **48 W** |
| Signal level at "1" | **UB - 0.5 VDC at 2 A** | **UB - 0.5 VDC at 2 A** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| Max. capacitive load | **1 µF** | **1 µF** |
| Max. duration of off time during self test | **300 µs** | **300 µs** |
| Switch-off delay | **30 ms** | **30 ms** |
| Potential isolation | **yes** | **yes** |
| Short circuit-proof | **yes** | **yes** |
| **Semiconductor outputs (standard)** | **773110** | **773113** |
| Number | **1** | **1** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **0,50 A** | **0,50 A** |
| Power | **12,0 W** | **12,0 W** |
| Galvanic isolation | **yes** | **yes** |
| Short circuit-proof | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| Signal level at "1" | **UB - 0.5 VDC at 0.5 A** | **UB - 0.5 VDC at 0.5 A** |
| **Test pulse outputs** | **773110** | **773113** |
| Number of test pulse outputs | **4** | **4** |
| Voltage | **24 V** | **24 V** |
| Current | **0,5 A** | **0,5 A** |
| Max. duration of off time during self test | **5 ms** | **5 ms** |
| Short circuit-proof | **yes** | **yes** |
| Potential isolation | **No** | **No** |
| **Relay outputs** | **773110** | **773113** |
| Utilisation category | | |
| In accordance with the standard | **EN 60947-4-1** | **EN 60947-4-1** |

## Base units
PNOZ m0p

| Relay outputs | 773110 | 773113 |
|---|---|---|
| Utilisation category of safety contacts | | |
| AC1 at | **240 V** | **240 V** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **1440 VA** | **1440 VA** |
| DC1 at | **24 V** | **24 V** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **144 W** | **144 W** |
| Utilisation category | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Utilisation category of safety contacts | | |
| AC15 at | **230 V** | **230 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **690 W** | **690 W** |
| DC13 (6 cycles/min) at | **24 V** | **24 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **72 W** | **72 W** |
| Airgap creepage between | | |
| Relay contacts | **3 mm** | **3 mm** |
| Relay contacts and other circuits | **5,5 mm** | **5,5 mm** |
| External contact fuse protection, safety contacts | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Blow-out fuse, quick | **6 A** | **6 A** |
| Blow-out fuse, slow | **6,00 A** | **6,00 A** |
| Circuit breaker 24V AC/DC, characteristic B/C | **6 A** | **6 A** |
| Switch-off delay | **50 ms** | **50 ms** |
| Potential isolation | **yes** | **yes** |
| **Cascading output as standard output** | **773110** | **773113** |
| Number | **1** | **1** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **0,2 A** | **0,2 A** |
| Power | **4,8 W** | **4,8 W** |
| Galvanic isolation | **No** | **No** |
| Short circuit-proof | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| **Ethernet interface** | **773110** | **773113** |
| Number | – | **2** |

## Base units
PNOZ m0p

| Serial interface | 773110 | 773113 |
|---|---|---|
| Number of RS232 interfaces | **1** | – |
| **Times** | **773110** | **773113** |
| Switch-on delay | **5,00 s** | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |
| Simultaneity, channel 1 and 2 max. | **3 s** | **3 s** |
| Simultaneity in the two-hand circuit | **0,5 s** | **0,5 s** |
| Max. cycle time of the device | **15 ms** | **15 ms** |
| Max. processing time for data communication | – | **50 ms** |
| **Environmental data** | **773110** | **773113** |
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** | **55 °C** |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Not permitted** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **10,0 - 150,0 Hz** |
| Acceleration | **1g** | **1g** |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **250 V** | **250 V** |
| Rated impulse withstand voltage | **6,00 kV** | **6,00 kV** |

## Base units
PNOZ m0p

| Environmental data | 773110 | 773113 |
|---|---|---|
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Potential isolation** | **773110** | **773113** |
| Potential isolation between | **SC output and system voltage** | **SC output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** |
| Rated surge voltage | **2500 V** | **2500 V** |
| Potential isolation between | **Relay output and system voltage** | **Relay output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** |
| Rated surge voltage | **6000 V** | **6000 V** |
| **Mechanical data** | **773110** | **773113** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Max. cable length | | |
| Max. cable length per input | **1,0 km** | **1,0 km** |
| Sum of individual cable lengths at the test pulse output | **40 km** | **40 km** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Conductor cross section with screw terminals (relay outputs) | | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |

# Base units
PNOZ m0p

| Mechanical data | 773110 | 773113 |
|---|---|---|
| Torque setting with screw terminals (relay outputs) | **0,50 Nm** | **0,50 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |
| Stripping length with screw terminals (relay outputs) | **8 mm** | **8 mm** |
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Conductor cross section with spring-loaded terminals (relay outputs) | | |
| 1 core flexible without crimp connector | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 1 core flexible with crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** |
| Stripping length with spring-loaded terminals (relay outputs) | **10 mm** | **10 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **135,0 mm** | **135,0 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **499 g** | **518 g** |

Where standards are undated, the 2010-10 latest editions shall apply.

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,90E-09** | **20** |

## Base units
PNOZ m0p

| | | | | | | |
|---|---|---|---|---|---|---|
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **2,50E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,90E-10** | **20** |
| SC inputs | **Short circuit-forming safety mats** | **PL d** | **Cat. 3** | **SIL CL 2** | **1,81E-09** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,50E-10** | **20** |
| Cascad. inputs | – | **PL e** | **Cat. 4** | **SIL CL 3** | **3,10E-10** | **20** |
| **Output** | | | | | | |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **7,00E-09** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **8,60E-10** | **20** |
| Cascad. outputs | – | **PL e** | **Cat. 4** | **SIL CL 3** | **4,91E-10** | **20** |
| Relay outputs | **1-channel** | **PL c** | **Cat. 1** | **-** | **2,90E-08** | **20** |
| Relay outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **3,00E-10** | **20** |

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

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

# Base units
PNOZ m0p

## Supplementary data

### Service life graph for the relay contacts

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.

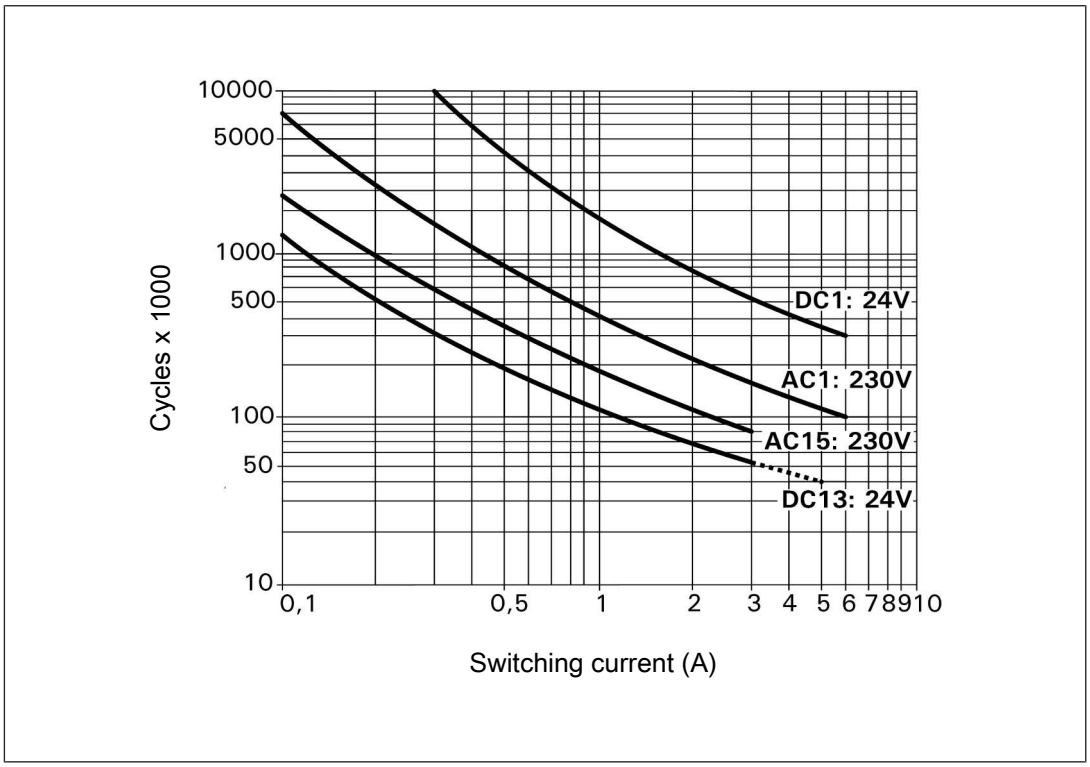



Fig.: Service life graphs at 24 VDC and 230 VAC

# Base units
PNOZ m0p

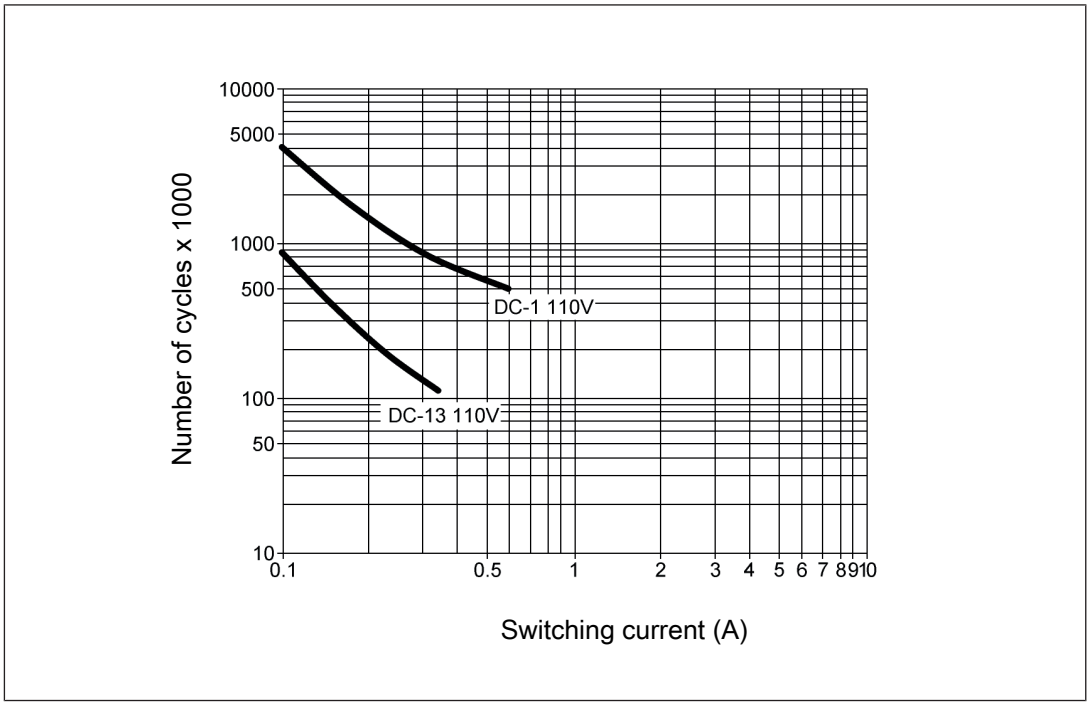



Fig.: Service life graphs at 110 VDC

**Example**

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see Technical details [📖 84]) can be used in the calculation.

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

We recommend you use semiconductor outputs to switch 24 VDC loads.

# Base units
PNOZ m0p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ m0p | Base unit | 773 110 |
| PNOZ m0p ETH | Base unit, Ethernet interface | 773 113 |

### Accessories

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 100 |
| Set screw terminals | 1 set of screw terminals | 793 100 |

#### Terminator, jumper

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

# Base units
PNOZ m1p

## Overview

### Unit features

Using the product PNOZ m1p:

Base unit from the configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  - 2 safety outputs
    Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- Semiconductor outputs:
  - 4 safety outputs
    Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
  - 1 output for standard applications
- 4 test pulse outputs
- 1 cascading input and output;
  can also be used as a standard output
- 20 inputs for connecting, for example:
  - E-STOP pushbuttons
  - Two-hand pushbuttons
  - Safety gate limit switches
  - Start buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN
  - Operating mode selector switches

  - Safety mats
- Muting function
- LED indicator for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Expansion modules can be connected
  (please refer to the document "PNOZmulti System Expansion" for details of the type and number that can be connected)
- Integrated interfaces:
  - PNOZ m1p: Serial interface RS232
  - PNOZ m1p **ETH**: 2 Ethernet interfaces
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Coated version:

  Increased environmental requirements (see Technical details [📖 104])

### Chip card

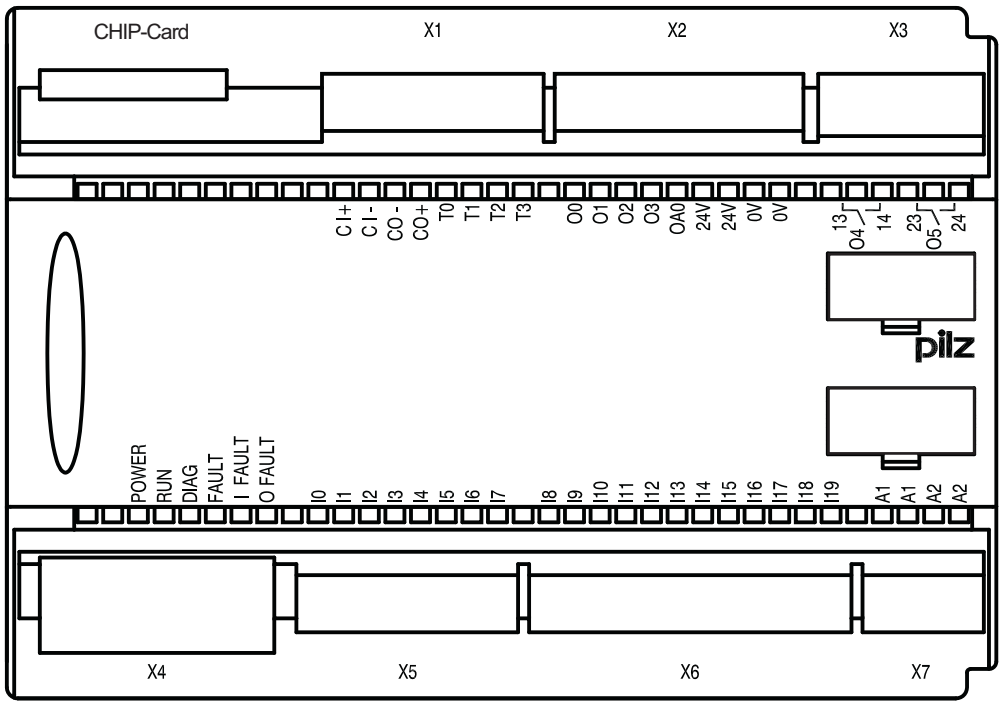
To be able to use the product you will need a chip card.

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see Technical Catalogue: Accessories chapter).

# Base units
PNOZ m1p

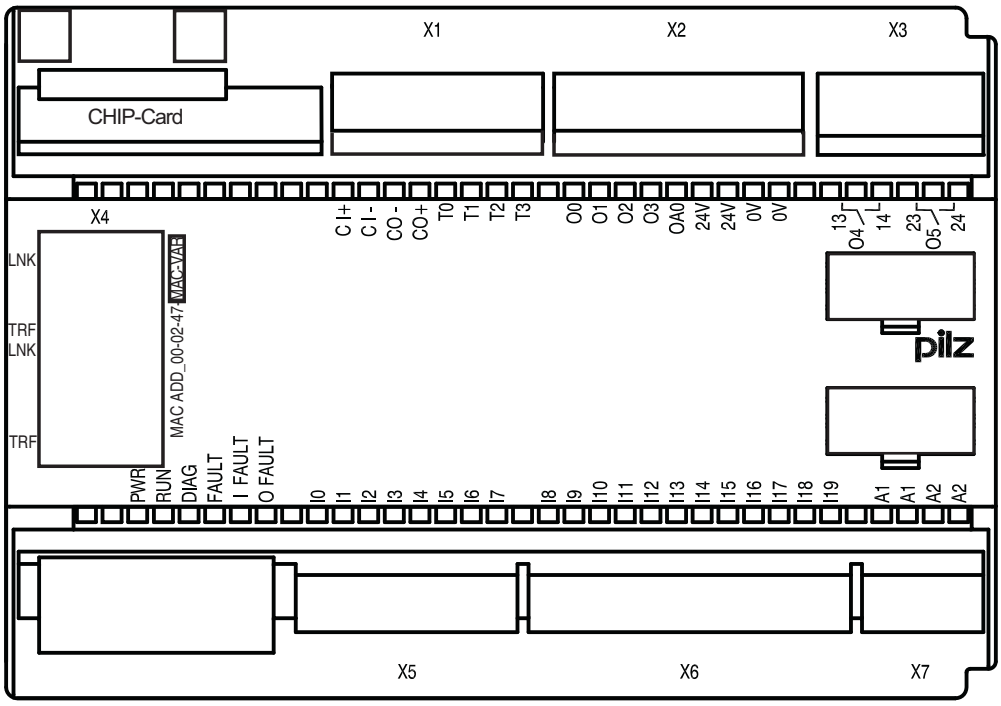
## Front view

### PNOZ m1p



# Base units
## PNOZ m1p

**PNOZ m1p ETH**




**Legend:**

| | |
|---|---|
| CHIP card | Chipkarte interface |
| X1 | Cascading inputs and outputs CI and CO,<br>Test pulse outputs T0 ... T3 |
| X2 | Semiconductor outputs O0 ... O3,<br>Auxiliary output OA0,<br>Supply connections |
| X3 | Relay outputs O4 and O5 |
| X4 | RS232 interface / Ethernet interface |
| X5, X6 | Inputs I0 ... I19 |
| X7 | Power supply |
| LEDs: | PWR<br>RUN<br>DIAG<br>FAULT<br>I FAULT<br>O FAULT |

# Base units
PNOZ m1p

## Function description

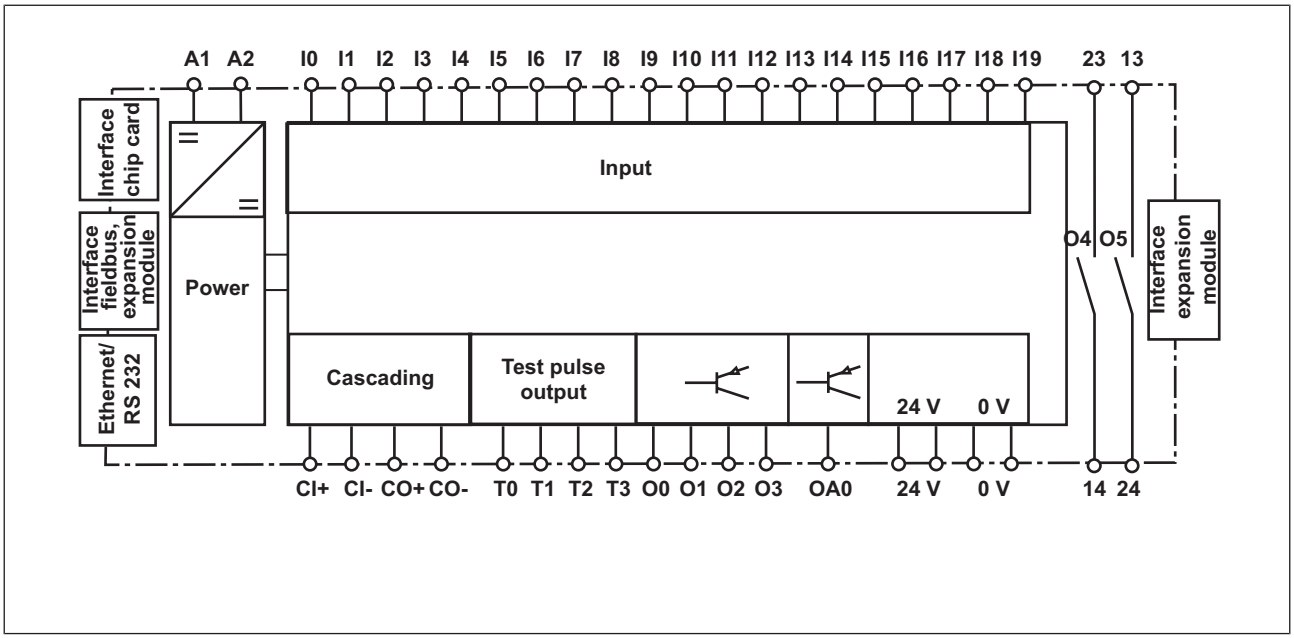
### Functions

The function of the inputs and outputs on the control 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 LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

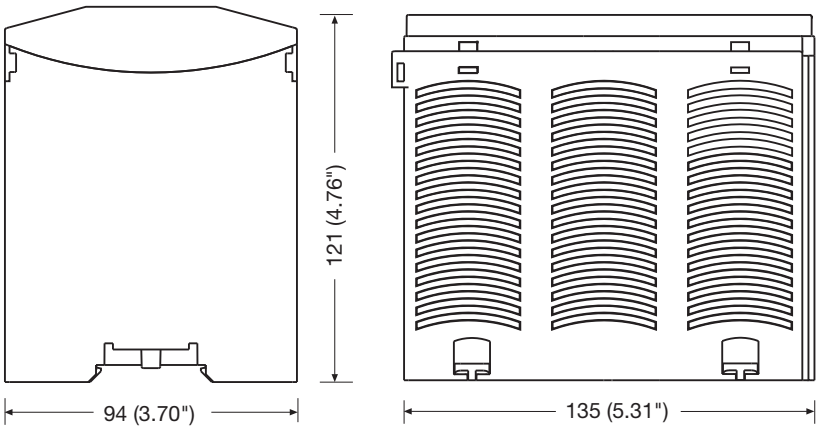
### Block diagram



# Base units
PNOZ m1p

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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

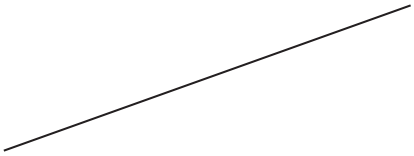
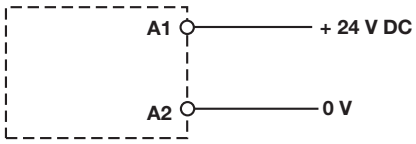
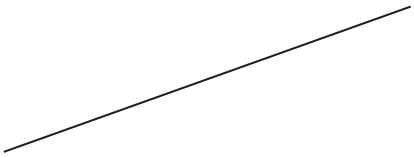
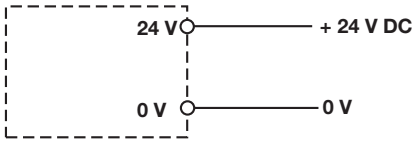
Please note:

- Information given in the Technical details [📖 104] 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 output to delete a project from the base unit (see online help for the PNOZmutli Configurator).
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wiring with a temperature stability of 75°C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The control system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation.

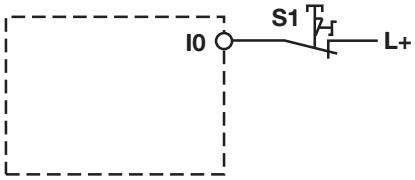
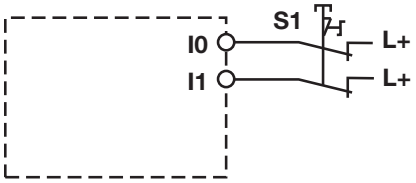
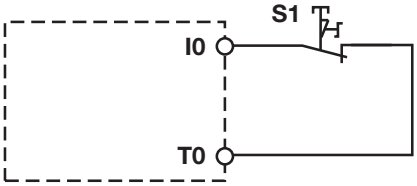
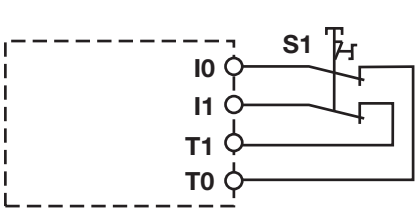
# Base units
PNOZ m1p

- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. When the supply voltage is looped, the current at each terminal may not exceed 3 A.
- 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.
  Test pulses that are used for the safety mat may not be reused for other purposes.

## Connection

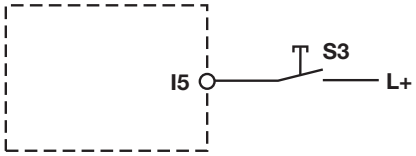
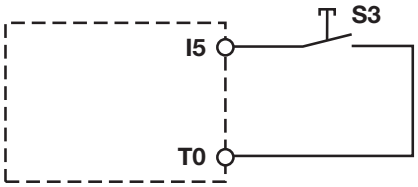
| Supply voltage | AC | DC |
|---|---|---|
| For the safety system (connector X7) |  |  |
| For the semiconductor outputs (connector X2)<br>Must always be present, even if the semiconductor outputs are not used |  |  |

Supply voltage

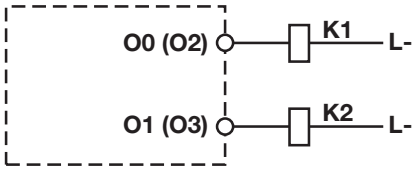
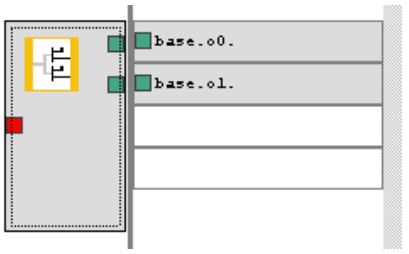
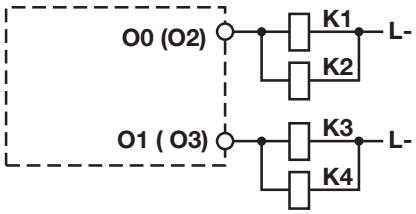
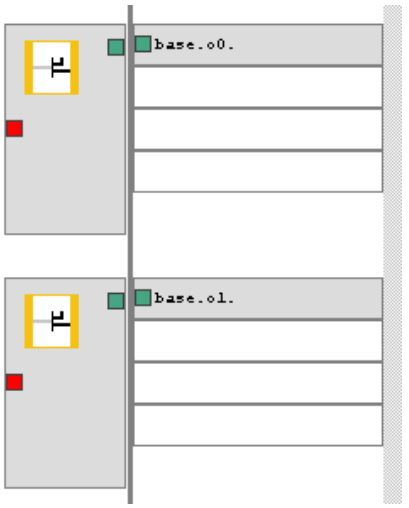
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

Connection examples for the input circuit

## Base units
PNOZ m1p

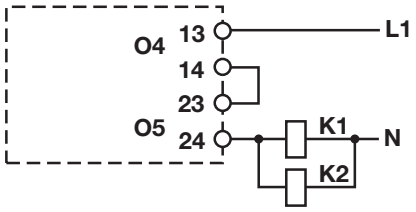
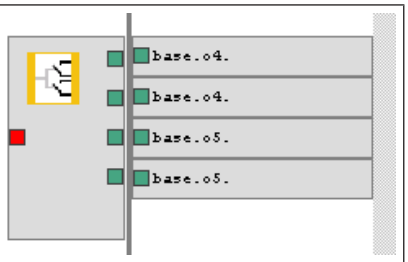
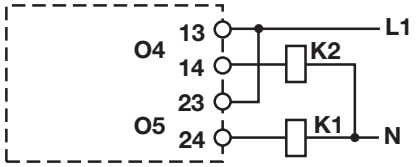
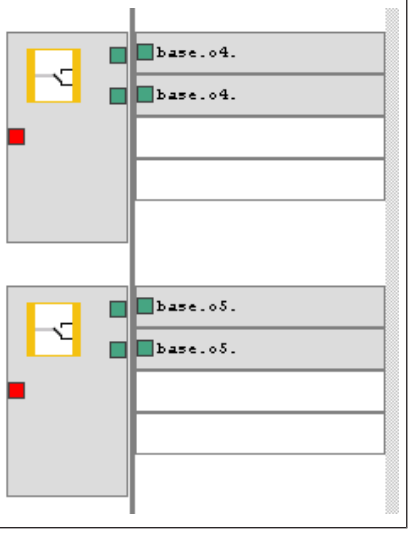
| Start circuit | Input circuit without detection of shorts across contacts | Input circuit with detection of shorts across contacts |
|---|---|---|
| |  |  |

Connection examples for start circuit

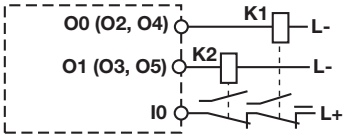
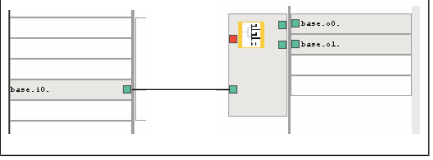
| Redundant output |  |  |
|---|---|---|
| Single output |  |  |

Connection examples for semiconductor outputs

## Base units
PNOZ m1p

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

Connection examples for relay outputs

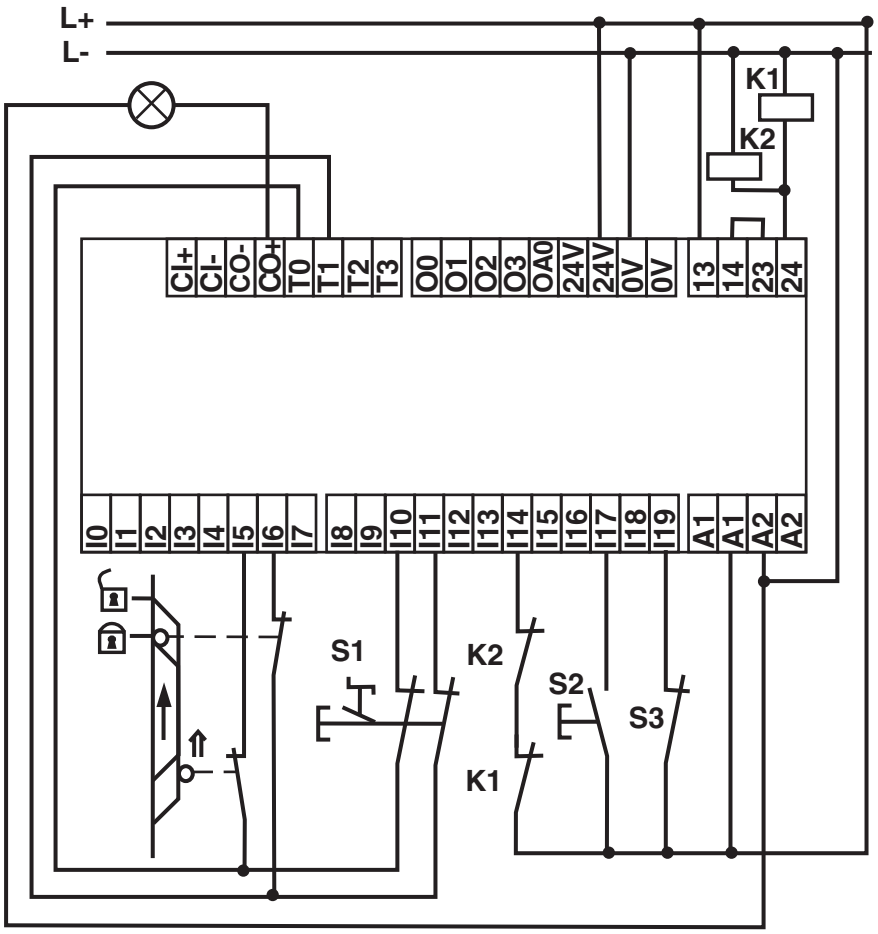
| Feedback loop | Redundant output | |
|---|---|---|
| Contacts from external contactors |  |  |

Connection examples for feedback loop

# Base units
PNOZ m1p

### Connection example

Dual-channel E-STOP and safety gate wiring, monitored start (I17), feedback loop (I14), cascading output as auxiliary output (CO+/A2)



# Base units
PNOZ m1p

## Technical Details

| General | 773100 | 773103 | 773104 | 773105 |
|---|---|---|---|---|
| Approvals | BG, CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed | BG, CCC, CE, EAC (Eurasian), KCC, TÜV, cULus Listed | BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed | BG, CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed |
| **Electrical data** | **773100** | **773103** | **773104** | **773105** |
| Supply voltage | | | | |
| for | Supply to the system | Supply to the system | Supply to the system | Supply to the system |
| Voltage | 24,0 V | 24,0 V | 24,0 V | 24,0 V |
| Kind | DC | DC | DC | DC |
| Voltage tolerance | -15 %/+20 % | -15 %/+20 % | -15 %/+20 % | -15 %/+20 % |
| Output of external power supply (DC) at no load | 8,0 W | 9,0 W | 9,0 W | 8,0 W |
| Residual ripple DC | 5 % | 5 % | 5 % | 5 % |
| Supply voltage | | | | |
| for | Supply to the SC outputs | Supply to the SC outputs | Supply to the SC outputs | Supply to the SC outputs |
| Voltage | 24 V | 24 V | 24 V | 24 V |
| Kind | DC | DC | DC | DC |
| Voltage tolerance | -15 %/+20 % | -15 %/+20 % | -15 %/+20 % | -15 %/+20 % |
| Output of external power supply (DC) | 192,0 W | 192,0 W | 192,0 W | 192,0 W |
| Residual ripple DC | 5 % | 5 % | 5 % | 5 % |
| Potential isolation | yes | yes | yes | yes |
| Supply voltage | | | | |
| Power consumption per expansion module | 2,50 W | 2,50 W | 2,50 W | 2,50 W |
| Status indicator | LED | LED | LED | LED |
| **Inputs** | **773100** | **773103** | **773104** | **773105** |
| Number | 20 | 20 | 20 | 20 |
| Max. number of live inputs within the max. permitted ambient temperature (see "Environmental data") | U_B <= 26,4 V : 20, U_B > 26,4 V : 15 | U_B <= 26,4 V : 20, U_B > 26,4 V : 15 | U_B <= 26,4 V : 20, U_B > 26,4 V : 15 | U_B <= 26,4 V : 20, U_B > 26,4 V : 15 |
| Signal level at "0" | -3 - +5 V DC | -3 - +5 V DC | -3 - +5 V DC | -3 - +5 V DC |

## Base units
PNOZ m1p

| Inputs | 773100 | 773103 | 773104 | 773105 |
|---|---|---|---|---|
| Signal level at "1" | **15 - 30 V DC** | **15 - 30 V DC** | **15 - 30 V DC** | **15 - 30 V DC** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** | **24 V DC** | **24 V DC** | **24 V DC** |
| Input current at rated voltage | **8 mA** | **8 mA** | **8 mA** | **8 mA** |
| Min. pulse duration | **18 ms** | **18 ms** | **18 ms** | **18 ms** |
| Pulse suppression | **0,6 ms** | **0,6 ms** | **0,6 ms** | **0,6 ms** |
| Maximum input delay | **4 ms** | **4 ms** | **4 ms** | **4 ms** |
| Potential isolation | **No** | **No** | **No** | **No** |
| **Semiconductor outputs** | **773100** | **773103** | **773104** | **773105** |
| Number | **4** | **4** | **4** | **4** |
| Switching capability | | | | |
| Voltage | **24 V** | **24 V** | **24 V** | **24 V** |
| Current | **2,0 A** | **2,0 A** | **2,0 A** | **2,0 A** |
| Power | **48 W** | **48 W** | **48 W** | **48 W** |
| Derating of coated version at an ambient temperature > 50 °C | | | | |
| Voltage | – | – | **24 V** | **24 V** |
| Current | – | – | **1 A** | **1 A** |
| Power | – | – | **24 W** | **24 W** |
| Signal level at "1" | **UB - 0.5 VDC at 2 A** | **UB - 0.5 VDC at 2 A** | **UB - 0.5 VDC at 2 A** | **UB - 0.5 VDC at 2 A** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** | **0,5 mA** | **0,5 mA** |
| Max. capacitive load | **1 µF** | **1 µF** | **1 µF** | **1 µF** |
| Max. duration of off time during self test | **300 µs** | **300 µs** | **300 µs** | **300 µs** |
| Switch-off delay | **30 ms** | **30 ms** | **30 ms** | **30 ms** |
| Potential isolation | **yes** | **yes** | **yes** | **yes** |
| Short circuit-proof | **yes** | **yes** | **yes** | **yes** |
| **Semiconductor outputs (standard)** | **773100** | **773103** | **773104** | **773105** |
| Number | **1** | **1** | **1** | **1** |
| Switching capability | | | | |
| Voltage | **24 V** | **24 V** | **24 V** | **24 V** |
| Current | **0,50 A** | **0,50 A** | **0,50 A** | **0,50 A** |
| Power | **12,0 W** | **12,0 W** | **12,0 W** | **12,0 W** |
| Galvanic isolation | **yes** | **yes** | **yes** | **yes** |

# Base units
## PNOZ m1p

| **Semiconductor outputs (standard)** | **773100** | **773103** | **773104** | **773105** |
|---|---|---|---|---|
| Short circuit-proof | **yes** | **yes** | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** | **0,5 mA** | **0,5 mA** |
| Signal level at "1" | **UB - 0.5 VDC at 0.5 A** | **UB - 0.5 VDC at 0.5 A** | **UB - 0.5 VDC at 0.5 A** | **UB - 0.5 VDC at 0.5 A** |
| **Test pulse outputs** | **773100** | **773103** | **773104** | **773105** |
| Number of test pulse outputs | **4** | **4** | **4** | **4** |
| Voltage | **24 V** | **24 V** | **24 V** | **24 V** |
| Current | **0,5 A** | **0,5 A** | **0,5 A** | **0,5 A** |
| Max. duration of off time during self test | **5 ms** | **5 ms** | **5 ms** | **5 ms** |
| Short circuit-proof | **yes** | **yes** | **yes** | **yes** |
| Potential isolation | **No** | **No** | **No** | **No** |
| **Relay outputs** | **773100** | **773103** | **773104** | **773105** |
| Utilisation category | | | | |
| In accordance with the standard | **EN 60947-4-1** | **EN 60947-4-1** | **EN 60947-4-1** | **EN 60947-4-1** |
| Utilisation category of safety contacts | | | | |
| AC1 at | **240 V** | **240 V** | **240 V** | **240 V** |
| Max. current | **6,0 A** | **6,0 A** | **6,0 A** | **6,0 A** |
| Max. power | **1440 VA** | **1440 VA** | **1440 VA** | **1440 VA** |
| DC1 at | **24 V** | **24 V** | **24 V** | **24 V** |
| Max. current | **6,0 A** | **6,0 A** | **6,0 A** | **6,0 A** |
| Max. power | **144 W** | **144 W** | **144 W** | **144 W** |
| Derating of coated version at an ambient temperature > 50 °C | | | | |
| Safety contacts, AC1 at | – | – | **240 V** | **240 V** |
| Max. current | – | – | **4 A** | **4 A** |
| Max. power | – | – | **960 W** | **960 W** |
| Safety contacts, DC 1 at | – | – | **24 V** | **24 V** |
| Max. current | – | – | **4 A** | **4 A** |
| Max. power | – | – | **96 W** | **96 W** |
| Utilisation category | | | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** | **EN 60947-5-1** | **EN 60947-5-1** |

# Base units
## PNOZ m1p

| Relay outputs | 773100 | 773103 | 773104 | 773105 |
|---|---|---|---|---|
| Utilisation category of safety contacts | | | | |
| AC15 at | **230 V** | **230 V** | **230 V** | **230 V** |
| Max. current | **3,0 A** | **3,0 A** | **3,0 A** | **3,0 A** |
| Max. power | **690 W** | **690 W** | **690 W** | **690 W** |
| DC13 (6 cycles/ min) at | **24 V** | **24 V** | **24 V** | **24 V** |
| Max. current | **3,0 A** | **3,0 A** | **3,0 A** | **3,0 A** |
| Max. power | **72 W** | **72 W** | **72 W** | **72 W** |
| Airgap creepage between | | | | |
| Relay contacts | **3 mm** | **3 mm** | **3 mm** | **3 mm** |
| Relay contacts and other circuits | **5,5 mm** | **5,5 mm** | **5,5 mm** | **5,5 mm** |
| External contact fuse protection, safety contacts | | | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** | **EN 60947-5-1** | **EN 60947-5-1** |
| Blow-out fuse, quick | **6 A** | **6 A** | **6 A** | **6 A** |
| Blow-out fuse, slow | **6,00 A** | **6,00 A** | **6,00 A** | **6,00 A** |
| Circuit breaker 24V AC/DC, characteristic B/C | **6 A** | **6 A** | **6 A** | **6 A** |
| Switch-off delay | **50 ms** | **50 ms** | **50 ms** | **50 ms** |
| Potential isolation | **yes** | **yes** | **yes** | **yes** |
| **Cascading output as standard output** | **773100** | **773103** | **773104** | **773105** |
| Number | **1** | **1** | **1** | **1** |
| Switching capability | | | | |
| Voltage | **24 V** | **24 V** | **24 V** | **24 V** |
| Current | **0,2 A** | **0,2 A** | **0,2 A** | **0,2 A** |
| Power | **4,8 W** | **4,8 W** | **4,8 W** | **4,8 W** |
| Galvanic isolation | **No** | **No** | **No** | **No** |
| Short circuit-proof | **yes** | **yes** | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** | **0,5 mA** | **0,5 mA** |
| **Ethernet interface** | **773100** | **773103** | **773104** | **773105** |
| Number | – | **2** | **2** | – |

# Base units
## PNOZ m1p

| Serial interface | 773100 | 773103 | 773104 | 773105 |
|---|---|---|---|---|
| Number of RS232 interfaces | 1 | – | – | 1 |
| **Times** | **773100** | **773103** | **773104** | **773105** |
| Switch-on delay | 5,00 s | 5,00 s | 5,00 s | 5,00 s |
| Supply interruption before de-energisation | 20 ms | 20 ms | 20 ms | 20 ms |
| Simultaneity, channel 1 and 2 max. | 3 s | 3 s | 3 s | 3 s |
| Simultaneity in the two-hand circuit | 0,5 s | 0,5 s | 0,5 s | 0,5 s |
| Max. cycle time of the device | 15 ms | 15 ms | 15 ms | 15 ms |
| Max. processing time for data communication | – | 50 ms | 50 ms | – |
| **Environmental data** | **773100** | **773103** | **773104** | **773105** |
| Ambient temperature | | | | |
| In accordance with the standard | EN 60068-2-14 | EN 60068-2-14 | EN 60068-2-14 | EN 60068-2-14 |
| Temperature range | 0 - 60 °C | 0 - 60 °C | -25 - 60 °C | -25 - 60 °C |
| Forced convection in control cabinet off | 55 °C | 55 °C | – | – |
| Storage temperature | | | | |
| In accordance with the standard | EN 60068-2-1/-2 | EN 60068-2-1/-2 | EN 60068-2-1/-2 | EN 60068-2-1/-2 |
| Temperature range | -25 - 70 °C | -25 - 70 °C | -25 - 70 °C | -25 - 70 °C |
| Climatic suitability | | | | |
| In accordance with the standard | EN 60068-2-30, EN 60068-2-78 | EN 60068-2-30, EN 60068-2-78 | EN 60068-2-30, EN 60068-2-78 | EN 60068-2-30, EN 60068-2-78 |
| Humidity | 93 % r. h. at 40 °C | 93 % r. h. at 40 °C | 93 % r. h. at 40 °C | 93 % r. h. at 40 °C |
| Condensation during operation | Not permitted | Not permitted | Short-term (only with separated extra low voltage) | Short-term (only with separated extra low voltage) |
| EMC | EN 61131-2 | EN 61131-2 | EN 61131-2 | EN 61131-2 |
| Vibration | | | | |
| In accordance with the standard | EN 60068-2-6 | EN 60068-2-6 | EN 60068-2-6 | EN 60068-2-6 |
| Frequency | 10,0 - 150,0 Hz | 10,0 - 150,0 Hz | 5,0 - 500,0 Hz | 5,0 - 500,0 Hz |
| Acceleration | 1g | 1g | 1g | 1g |

## Base units
PNOZ m1p

| Environmental data | 773100 | 773103 | 773104 | 773105 |
|---|---|---|---|---|
| Broadband noise | | | | |
| In accordance with the standard | – | – | **EN 60068-2-64** | **EN 60068-2-64** |
| Frequency | – | – | **5 - 500 Hz** | **5 - 500 Hz** |
| Acceleration | – | – | **19 m/s² rms** | **19 m/s² rms** |
| Corrosive gas check | | | | |
| SO2: Concentration 10 ppm, duration 10 days, passive | – | – | **DIN V 40046-36** | **DIN V 40046-36** |
| H2S: Concentration 1 ppm, duration 10 days, passive | – | – | **DIN V 40046-37** | **DIN V 40046-37** |
| Shock stress | | | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** | **2000 m** | **2000 m** |
| Airgap creepage | | | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** | **III** | **III** |
| Pollution degree | **2** | **2** | **2** | **2** |
| Rated insulation voltage | **250 V** | **250 V** | **250 V** | **250 V** |
| Rated impulse withstand voltage | **6,00 kV** | **6,00 kV** | **6,00 kV** | **6,00 kV** |
| Protection type | | | | |
| In accordance with the standard | **EN 60529** | **EN 60529** | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** | **IP20** | **IP20** |
| **Potential isolation** | **773100** | **773103** | **773104** | **773105** |
| Potential isolation between | **SC output and system voltage** | **SC output and system voltage** | **SC output and system voltage** | **SC output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** | **Protective separation** | **Protective separation** |

## Base units
PNOZ m1p

| Potential isolation | 773100 | 773103 | 773104 | 773105 |
|---|---|---|---|---|
| Rated surge voltage | **2500 V** | **2500 V** | **2500 V** | **2500 V** |
| Potential isolation between | **Relay output and system voltage** | **Relay output and system voltage** | **Relay output and system voltage** | **Relay output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** | **Protective separation** | **Protective separation** |
| Rated surge voltage | **6000 V** | **6000 V** | **6000 V** | **6000 V** |
| **Mechanical data** | **773100** | **773103** | **773104** | **773105** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** | **27 mm** | **27 mm** |
| Max. cable length | | | | |
| Max. cable length per input | **1,0 km** | **1,0 km** | **1,0 km** | **1,0 km** |
| Sum of individual cable lengths at the test pulse output | **40 km** | **40 km** | **40 km** | **40 km** |
| Material | | | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |

## Base units
PNOZ m1p

| Mechanical data | 773100 | 773103 | 773104 | 773105 |
|---|---|---|---|---|
| Conductor cross section with screw terminals (relay outputs) | | | | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** | **0,25 Nm** | **0,25 Nm** |
| Torque setting with screw terminals (relay outputs) | **0,50 Nm** | **0,50 Nm** | **0,50 Nm** | **0,50 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** | **7 mm** | **7 mm** |
| Stripping length with screw terminals (relay outputs) | **8 mm** | **8 mm** | **8 mm** | **8 mm** |
| Conductor cross section with spring-loaded terminals | | | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Conductor cross section with spring-loaded terminals (relay outputs) | | | | |
| 1 core flexible without crimp connector | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 1 core flexible with crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** | **1** | **1** |

## Base units
PNOZ m1p

| Mechanical data | 773100 | 773103 | 773104 | 773105 |
|---|---|---|---|---|
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** | **9 mm** | **9 mm** |
| Stripping length with spring-loaded terminals (relay outputs) | **10 mm** | **10 mm** | **10 mm** | **10 mm** |
| Dimensions | | | | |
| Height | **94,0 mm** | **94,0 mm** | **94,0 mm** | **94,0 mm** |
| Width | **135,0 mm** | **135,0 mm** | **135,0 mm** | **135,0 mm** |
| Depth | **121,0 mm** | **121,0 mm** | **121,0 mm** | **121,0 mm** |
| Weight | **499 g** | **518 g** | **538 g** | **519 g** |

Where standards are undated, the 2010-10 latest editions shall apply.

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,90E-09** | **20** |
| Expansion | – | **PL e** | **Cat. 4** | **SIL CL 3** | **9,20E-09** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **2,50E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,90E-10** | **20** |
| SC inputs | **Short circuit-forming safety mats** | **PL d** | **Cat. 3** | **SIL CL 2** | **1,81E-09** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,50E-10** | **20** |
| Cascad. inputs | – | **PL e** | **Cat. 4** | **SIL CL 3** | **3,10E-10** | **20** |
| **Output** | | | | | | |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **7,00E-09** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **8,60E-10** | **20** |
| Cascad. outputs | – | **PL e** | **Cat. 4** | **SIL CL 3** | **4,91E-10** | **20** |

## Base units
PNOZ m1p

| Output | | | | | | |
|---|---|---|---|---|---|---|
| Relay outputs | **1-channel** | **PL c** | **Cat. 1** | **-** | **2,90E-08** | **20** |
| Relay outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **3,00E-10** | **20** |

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

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

# Base units
PNOZ m1p

## Supplementary data

### Service life graph for the relay contacts

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.

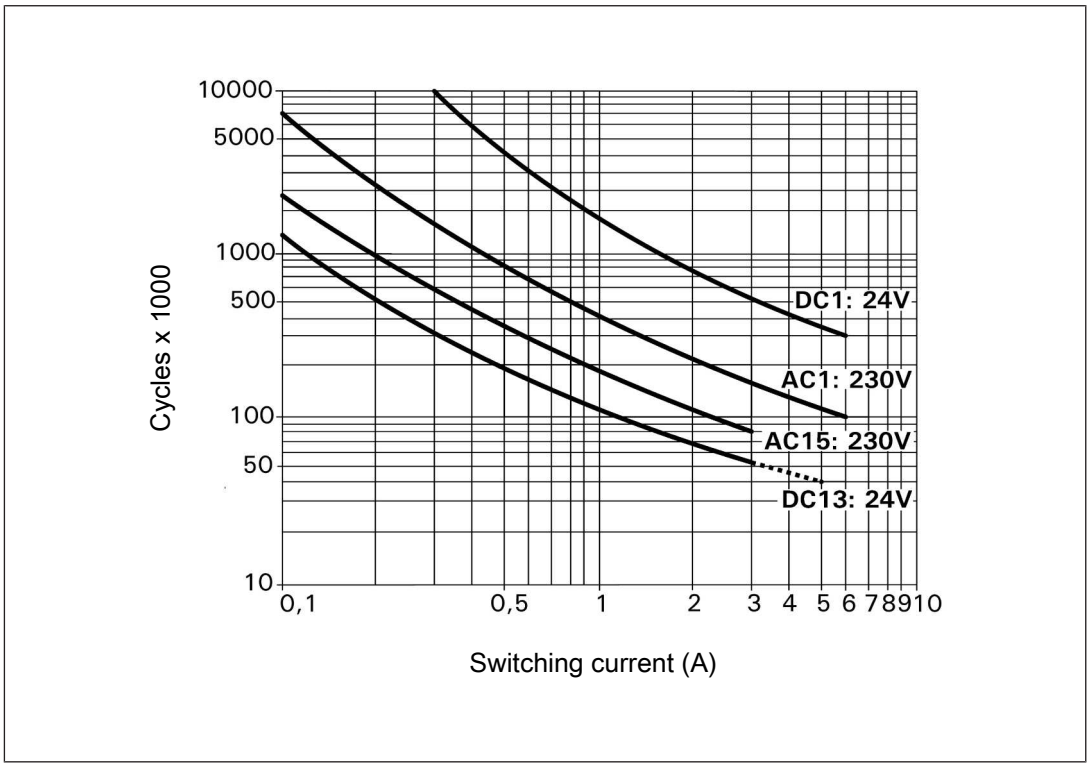



Fig.: Service life graphs at 24 VDC and 230 VAC

# Base units
PNOZ m1p

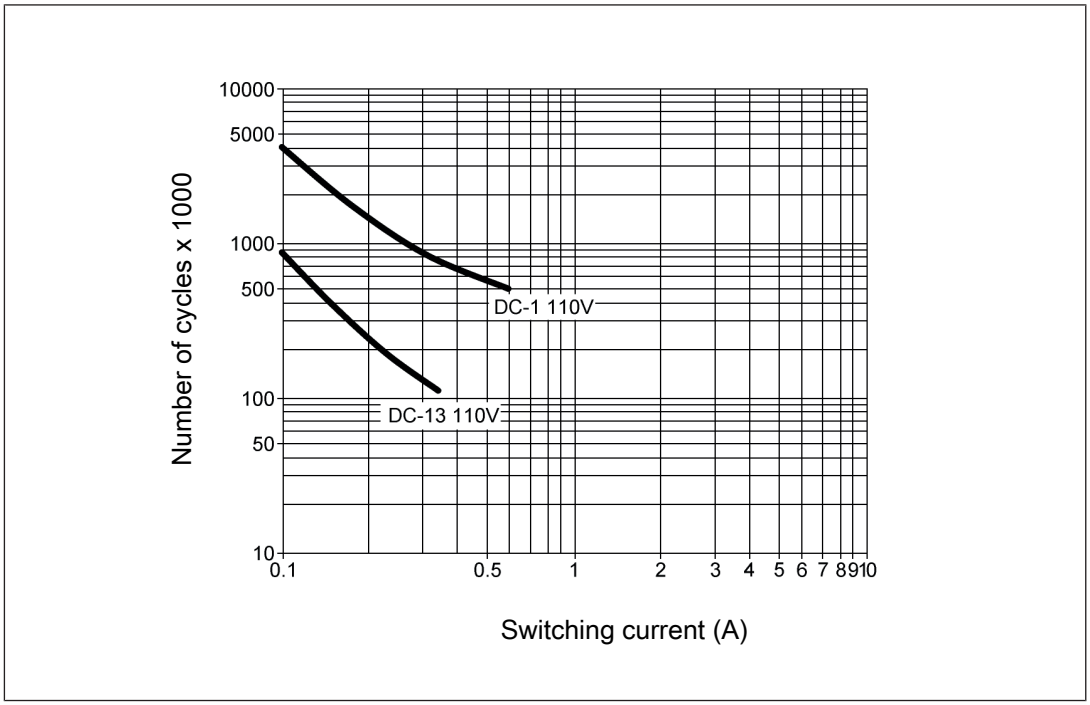



Fig.: Service life graphs at 110 VDC

**Example**

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see Technical details [📖 104]) can be used in the calculation.

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

We recommend you use semiconductor outputs to switch 24 VDC loads.

# Base units
PNOZ m1p

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m1p | Base unit | 773 100 |
| PNOZ m1p coated version | Base unit, coated version | 773 105 |
| PNOZ m1p ETH | Base unit, Ethernet interface | 773 103 |
| PNOZ m1p ETH coated version | Base unit, Ethernet interface, coated version | 773 104 |

### Accessories

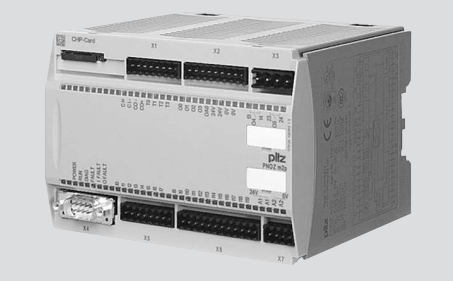
#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 100 |
| Set screw terminals | 1 set of screw terminals | 793 100 |

#### Terminator, jumper

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

# Base units
PNOZ m2p



## Overview

### Unit features

Using the product PNOZ m2p:

Base unit from the configurable control system PNOZmulti

The product has the following features:

- For applications on mechanical presses
- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  - 2 safety outputs
    Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- Semiconductor outputs:
  - 4 safety outputs
    Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
  - 1 output for standard applications
- 4 test pulse outputs
- 1 cascading input and output;
  can also be used as a standard output
- 20 inputs for connecting, for example:
  - E-STOP pushbuttons
  - Two-hand pushbuttons
  - Safety gate limit switches
  - Start buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN

  - Operating mode selector switches
  - Safety mats
- Muting function
- LED indicator for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Expansion modules can be connected
  (please refer to the document "PNOZmulti System Expansion" for details of the type and number that can be connected)
- Integrated interfaces:
  - PNOZ m2p: Serial interface RS232
  - PNOZ m2p **ETH**: 2 Ethernet interfaces
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

### Chip card

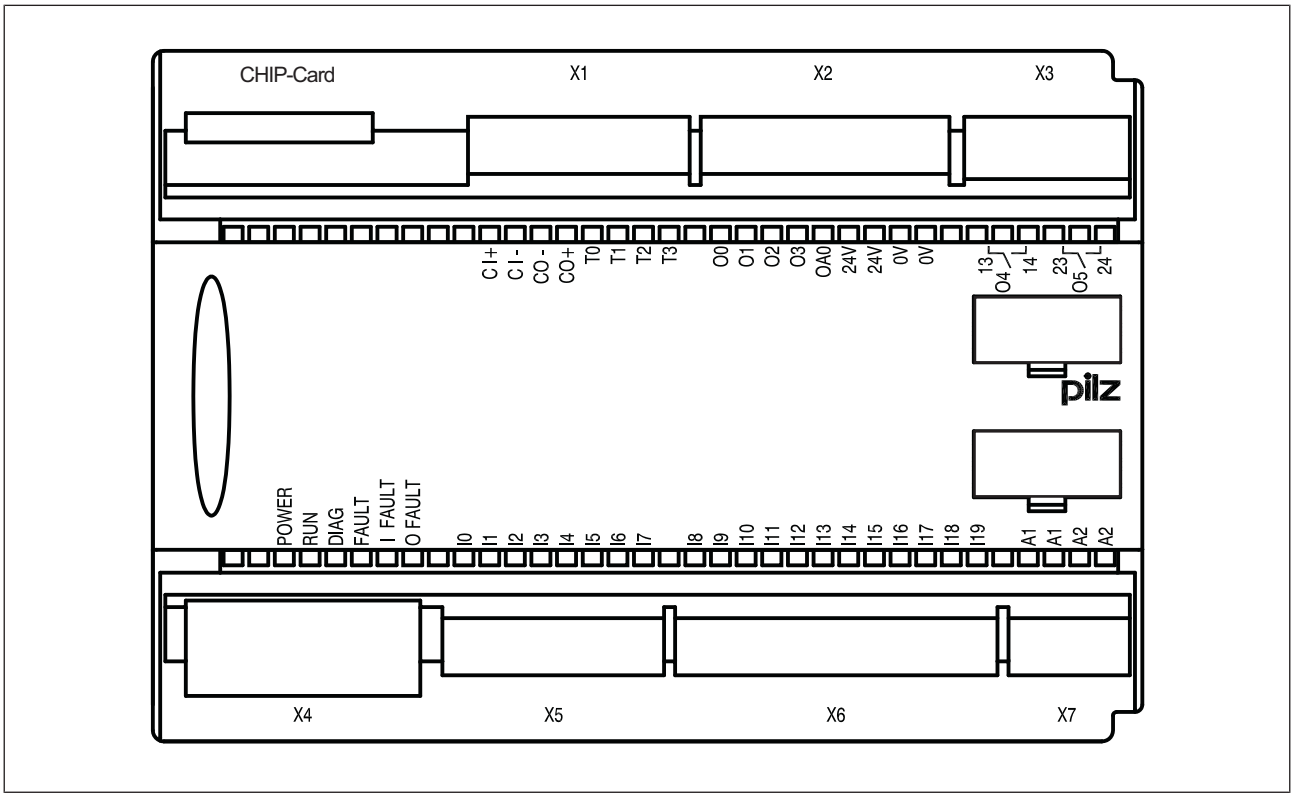
To be able to use the product you will need a chip card.

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see Technical Catalogue: Accessories chapter).

# Base units
PNOZ m2p

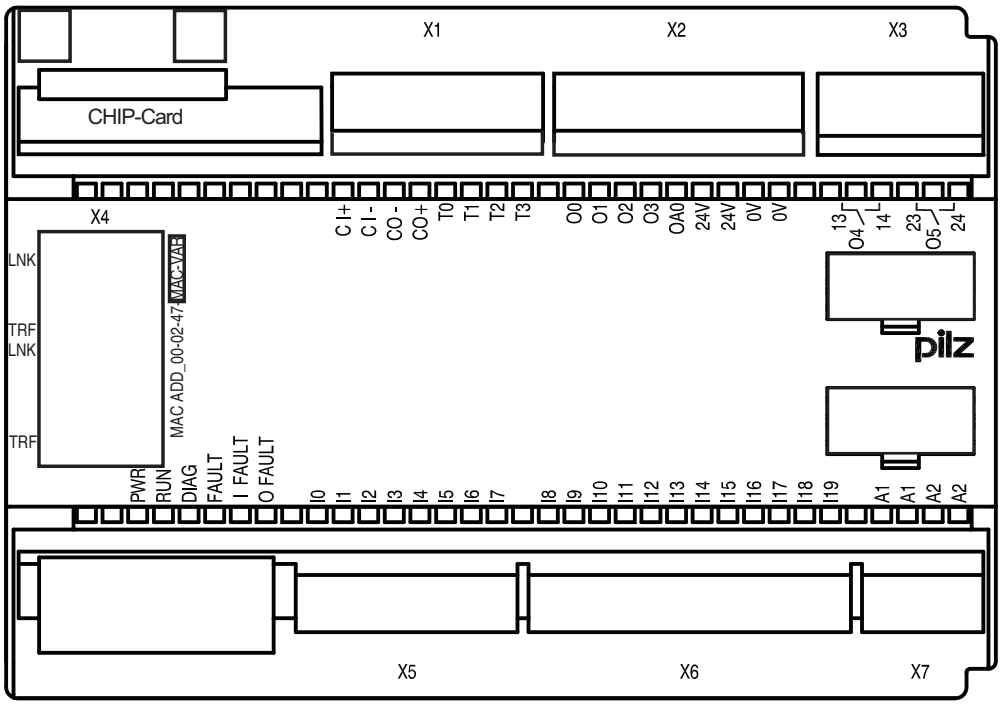
## Front view

### PNOZ m2p



# Base units
## PNOZ m2p

**PNOZ m2p ETH**




**Legend:**

| | |
|---|---|
| CHIP card | Chipkarte interface |
| X1 | Cascading inputs and outputs CI and CO,<br>Test pulse outputs T0 ... T3 |
| X2 | Semiconductor outputs O0 ... O3,<br>Auxiliary output OA0,<br>Supply connections |
| X3 | Relay outputs O4 and O5 |
| X4 | RS232 interface / Ethernet interface |
| X5, X6 | Inputs I0 ... I19 |
| X7 | Power supply |
| LEDs: | PWR<br>RUN<br>DIAG<br>FAULT<br>I FAULT<br>O FAULT |

# Base units
PNOZ m2p

## Function description

### Functions

The function of the inputs and outputs on the control 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 LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

### Application on mechanical presses

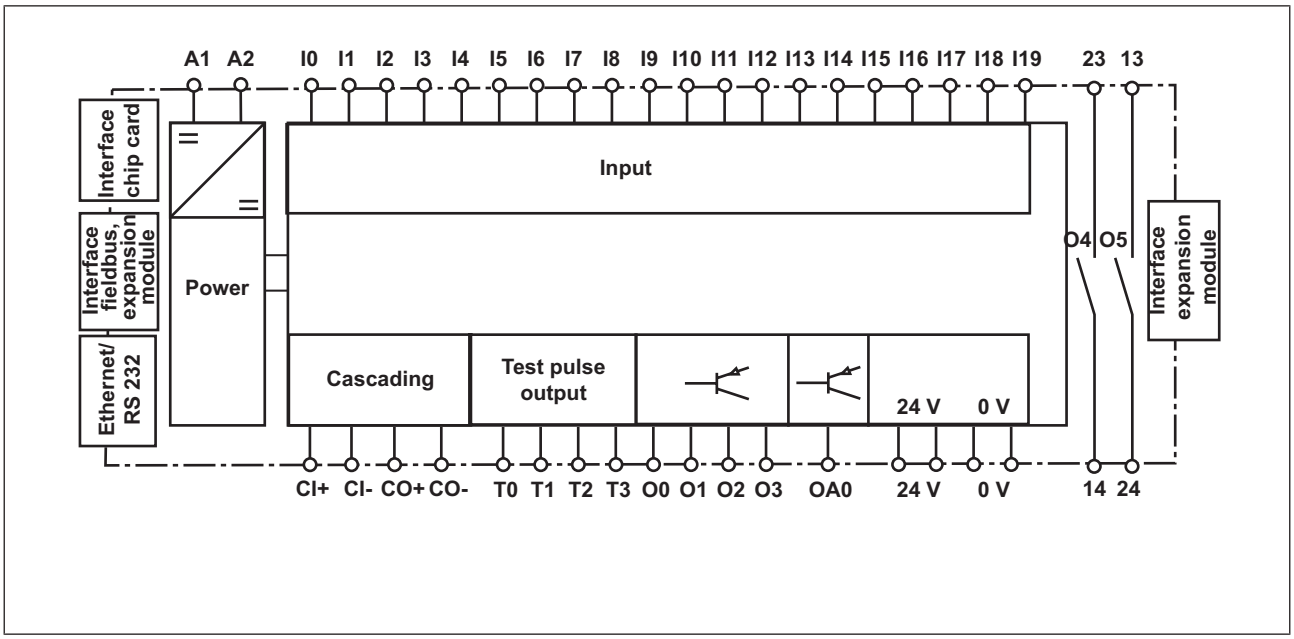
The base unit PNOZ m2p is designed for applications on mechanical presses (see online help for the PNOZmulti Configurator).

Functions:

- Operating modes
  - Set-up mode
  - Single stroke
  - Automatic
- Monitoring a mechanical rotary cam arrangement
- Run monitoring
- Monitoring of electrosensitive protective equipment (cycle mode)
- Driving and monitoring a press safety valve

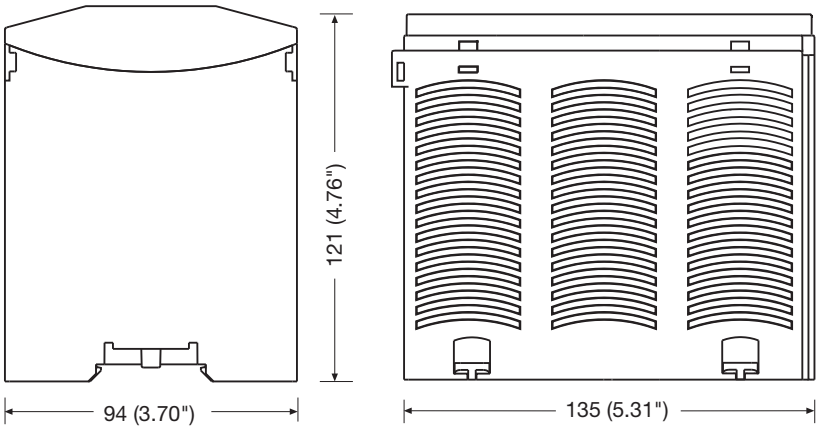
# Base units
PNOZ m2p

## Block diagram




## Installation

### Dimensions



# Base units
PNOZ m2p

## Commissioning

### General wiring guidelines

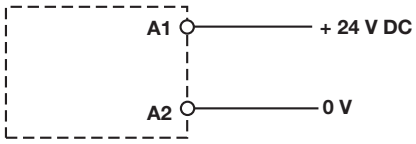
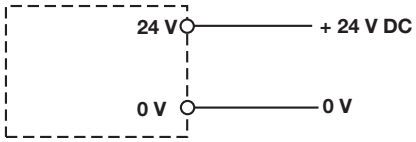
The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a safety function and the outputs that are to switch this safety function.

Please note:

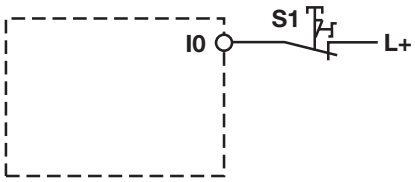
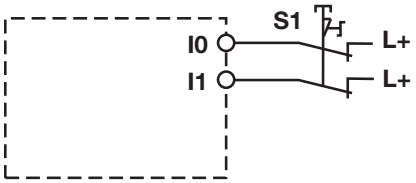
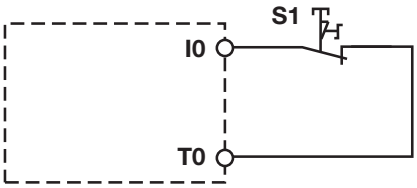
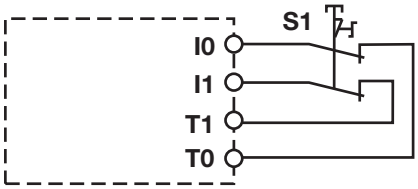
- Information given in the Technical details [📖 128] must be followed.
- Outputs:
  - O0 to O5 are safety outputs
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an output to delete a project from the base unit (see online help for the PNOZmutli Configurator).
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wiring with a temperature stability of 75°C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The control system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective 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. When the supply voltage is looped, the current at each terminal may not exceed 3 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.
  Test pulses that are used for the safety mat may not be reused for other purposes.

# Base units
PNOZ m2p

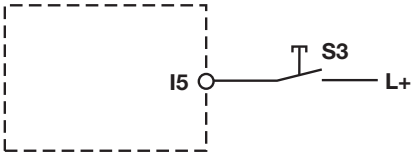
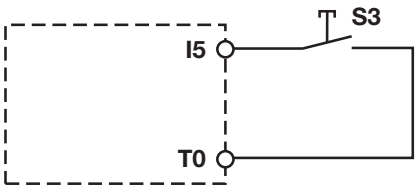
## Connection

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

Supply voltage

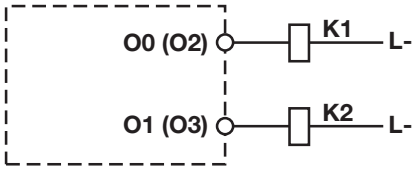
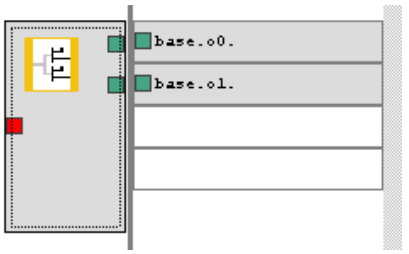
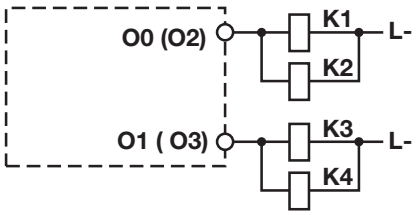
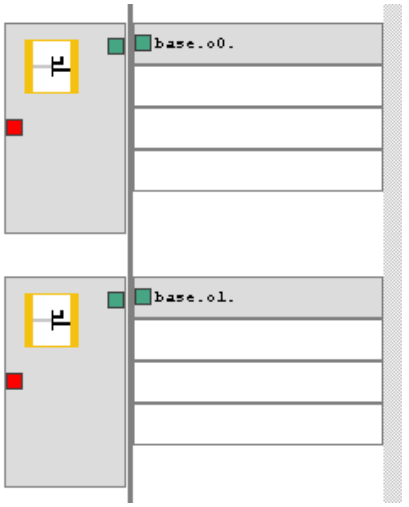
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

Connection examples for the input circuit

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

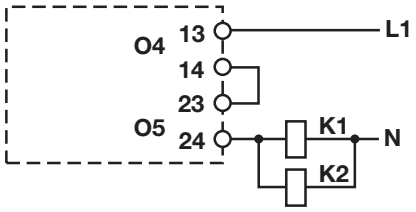
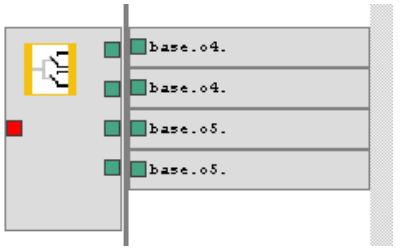
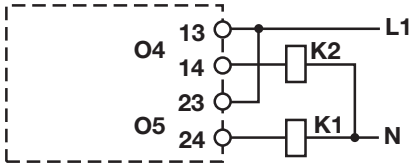
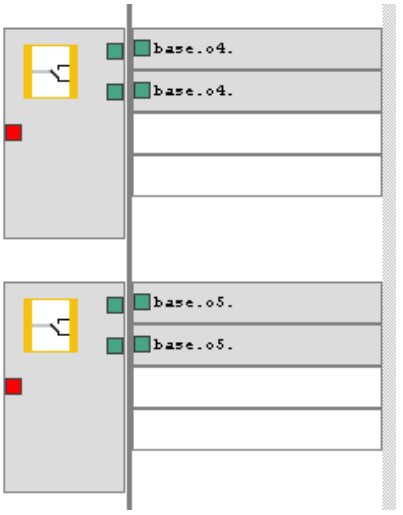
Connection examples for start circuit

## Base units
PNOZ m2p

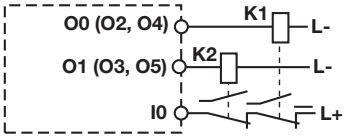
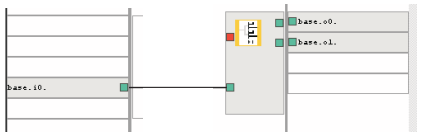
| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |

Connection examples for semiconductor outputs

## Base units
PNOZ m2p

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

Connection examples for relay outputs

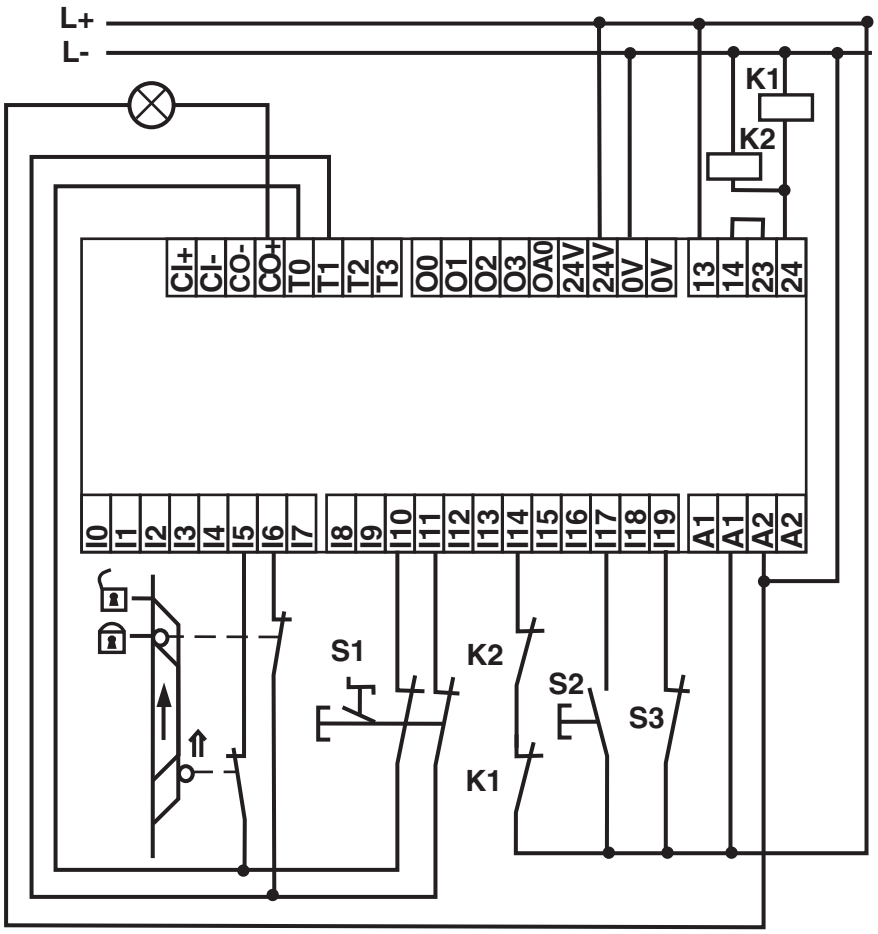
| Feedback loop | Redundant output |
|---|---|
| Contacts from external contactors |   |

Connection examples for feedback loop

# Base units
PNOZ m2p

### Connection example

Dual-channel E-STOP and safety gate wiring, monitored start (I17), feedback loop (I14), cascading output as auxiliary output (CO+/A2)



# Base units
PNOZ m2p

## Technical Details

| General | 773120 | 773123 |
|---|---|---|
| Approvals | BG, CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed | BG, CCC, CE, EAC (Eurasian), KCC, TÜV, cULus Listed |
| **Electrical data** | **773120** | **773123** |
| Supply voltage | | |
| for | Supply to the system | Supply to the system |
| Voltage | 24,0 V | 24,0 V |
| Kind | DC | DC |
| Voltage tolerance | -15 %/+20 % | -15 %/+20 % |
| Output of external power supply (DC) at no load | 8,0 W | 9,0 W |
| Residual ripple DC | 5 % | 5 % |
| Supply voltage | | |
| for | Supply to the SC outputs | Supply to the SC outputs |
| Voltage | 24 V | 24 V |
| Kind | DC | DC |
| Voltage tolerance | -15 %/+20 % | -15 %/+20 % |
| Output of external power supply (DC) | 192,0 W | 192,0 W |
| Residual ripple DC | 5 % | 5 % |
| Potential isolation | yes | yes |
| Supply voltage | | |
| Power consumption per expansion module | 2,50 W | 2,50 W |
| Status indicator | LED | LED |
| **Inputs** | **773120** | **773123** |
| Number | 20 | 20 |
| Max. number of live inputs within the max. permitted ambient temperature (see "Environmental data") | U_B <= 26,4 V : 20, U_B > 26,4 V : 15 | U_B <= 26,4 V : 20, U_B > 26,4 V : 15 |
| Signal level at "0" | -3 - +5 V DC | -3 - +5 V DC |
| Signal level at "1" | 15 - 30 V DC | 15 - 30 V DC |
| Input voltage in accordance with EN 61131-2 Type 1 | 24 V DC | 24 V DC |
| Input current at rated voltage | 8 mA | 8 mA |
| Min. pulse duration | 18 ms | 18 ms |
| Pulse suppression | 0,6 ms | 0,6 ms |
| Maximum input delay | 4 ms | 4 ms |
| Potential isolation | No | No |

## Base units
PNOZ m2p

| Semiconductor outputs | 773120 | 773123 |
|---|---|---|
| Number | **4** | **4** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **2,0 A** | **2,0 A** |
| Power | **48 W** | **48 W** |
| Signal level at "1" | **UB - 0.5 VDC at 2 A** | **UB - 0.5 VDC at 2 A** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| Max. capacitive load | **1 µF** | **1 µF** |
| Max. duration of off time during self test | **300 µs** | **300 µs** |
| Switch-off delay | **30 ms** | **30 ms** |
| Potential isolation | **yes** | **yes** |
| Short circuit-proof | **yes** | **yes** |
| **Semiconductor outputs (standard)** | **773120** | **773123** |
| Number | **1** | **1** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **0,50 A** | **0,50 A** |
| Power | **12,0 W** | **12,0 W** |
| Galvanic isolation | **yes** | **yes** |
| Short circuit-proof | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| Signal level at "1" | **UB - 0.5 VDC at 0.5 A** | **UB - 0.5 VDC at 0.5 A** |
| **Test pulse outputs** | **773120** | **773123** |
| Number of test pulse outputs | **4** | **4** |
| Voltage | **24 V** | **24 V** |
| Current | **0,5 A** | **0,5 A** |
| Max. duration of off time during self test | **5 ms** | **5 ms** |
| Short circuit-proof | **yes** | **yes** |
| Potential isolation | **No** | **No** |
| **Relay outputs** | **773120** | **773123** |
| Utilisation category | | |
| In accordance with the standard | **EN 60947-4-1** | **EN 60947-4-1** |

# Base units
## PNOZ m2p

| Relay outputs | 773120 | 773123 |
|---|---|---|
| Utilisation category of safety contacts | | |
| AC1 at | **240 V** | **240 V** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **1440 VA** | **1440 VA** |
| DC1 at | **24 V** | **24 V** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **144 W** | **144 W** |
| Utilisation category | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Utilisation category of safety contacts | | |
| AC15 at | **230 V** | **230 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **690 W** | **690 W** |
| DC13 (6 cycles/min) at | **24 V** | **24 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **72 W** | **72 W** |
| Airgap creepage between | | |
| Relay contacts | **3 mm** | **3 mm** |
| Relay contacts and other circuits | **5,5 mm** | **5,5 mm** |
| External contact fuse protection, safety contacts | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Blow-out fuse, quick | **6 A** | **6 A** |
| Blow-out fuse, slow | **6,00 A** | **6,00 A** |
| Circuit breaker 24V AC/DC, characteristic B/C | **6 A** | **6 A** |
| Switch-off delay | **50 ms** | **50 ms** |
| Potential isolation | **yes** | **yes** |
| **Cascading output as standard output** | **773120** | **773123** |
| Number | **1** | **1** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **0,2 A** | **0,2 A** |
| Power | **4,8 W** | **4,8 W** |
| Galvanic isolation | **No** | **No** |
| Short circuit-proof | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| **Ethernet interface** | **773120** | **773123** |
| Number | – | **2** |

## Base units
PNOZ m2p

| Serial interface | 773120 | 773123 |
|---|---|---|
| Number of RS232 interfaces | **1** | – |
| **Times** | **773120** | **773123** |
| Switch-on delay | **5,00 s** | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |
| Simultaneity, channel 1 and 2 max. | **3 s** | **3 s** |
| Simultaneity in the two-hand circuit | **0,5 s** | **0,5 s** |
| Max. cycle time of the device | **15 ms** | **15 ms** |
| Max. processing time for data communication | – | **50 ms** |
| **Environmental data** | **773120** | **773123** |
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** | **55 °C** |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Not permitted** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **10,0 - 150,0 Hz** |
| Acceleration | **1g** | **1g** |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **250 V** | **250 V** |
| Rated impulse withstand voltage | **6,00 kV** | **6,00 kV** |

# Base units
PNOZ m2p

| Environmental data | 773120 | 773123 |
|---|---|---|
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Potential isolation** | **773120** | **773123** |
| Potential isolation between | **SC output and system voltage** | **SC output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** |
| Rated surge voltage | **2500 V** | **2500 V** |
| Potential isolation between | **Relay output and system voltage** | **Relay output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** |
| Rated surge voltage | **6000 V** | **6000 V** |
| **Mechanical data** | **773120** | **773123** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Max. cable length | | |
| Max. cable length per input | **1,0 km** | **1,0 km** |
| Sum of individual cable lengths at the test pulse output | **40 km** | **40 km** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Conductor cross section with screw terminals (relay outputs) | | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |

## Base units
PNOZ m2p

| Mechanical data | 773120 | 773123 |
|---|---|---|
| Torque setting with screw terminals (relay outputs) | **0,50 Nm** | **0,50 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |
| Stripping length with screw terminals (relay outputs) | **8 mm** | **8 mm** |
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Conductor cross section with spring-loaded terminals (relay outputs) | | |
| 1 core flexible without crimp connector | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 1 core flexible with crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** |
| Stripping length with spring-loaded terminals (relay outputs) | **10 mm** | **10 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **135,0 mm** | **135,0 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **499 g** | **521 g** |

Where standards are undated, the 2010-10 latest editions shall apply.

# Base units
PNOZ m2p

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,90E-09** | **20** |
| Expansion | – | **PL e** | **Cat. 4** | **SIL CL 3** | **9,20E-09** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **2,50E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,90E-10** | **20** |
| SC inputs | **Short circuit-forming safety mats** | **PL d** | **Cat. 3** | **SIL CL 2** | **1,81E-09** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,50E-10** | **20** |
| Cascad. inputs | – | **PL e** | **Cat. 4** | **SIL CL 3** | **3,10E-10** | **20** |
| **Output** | | | | | | |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **7,00E-09** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **8,60E-10** | **20** |
| Cascad. outputs | – | **PL e** | **Cat. 4** | **SIL CL 3** | **4,91E-10** | **20** |
| Relay outputs | **1-channel** | **PL c** | **Cat. 1** | **-** | **2,90E-08** | **20** |
| Relay outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **3,00E-10** | **20** |

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

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

# Base units
PNOZ m2p

## Supplementary data

### Service life graph for the relay contacts

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.

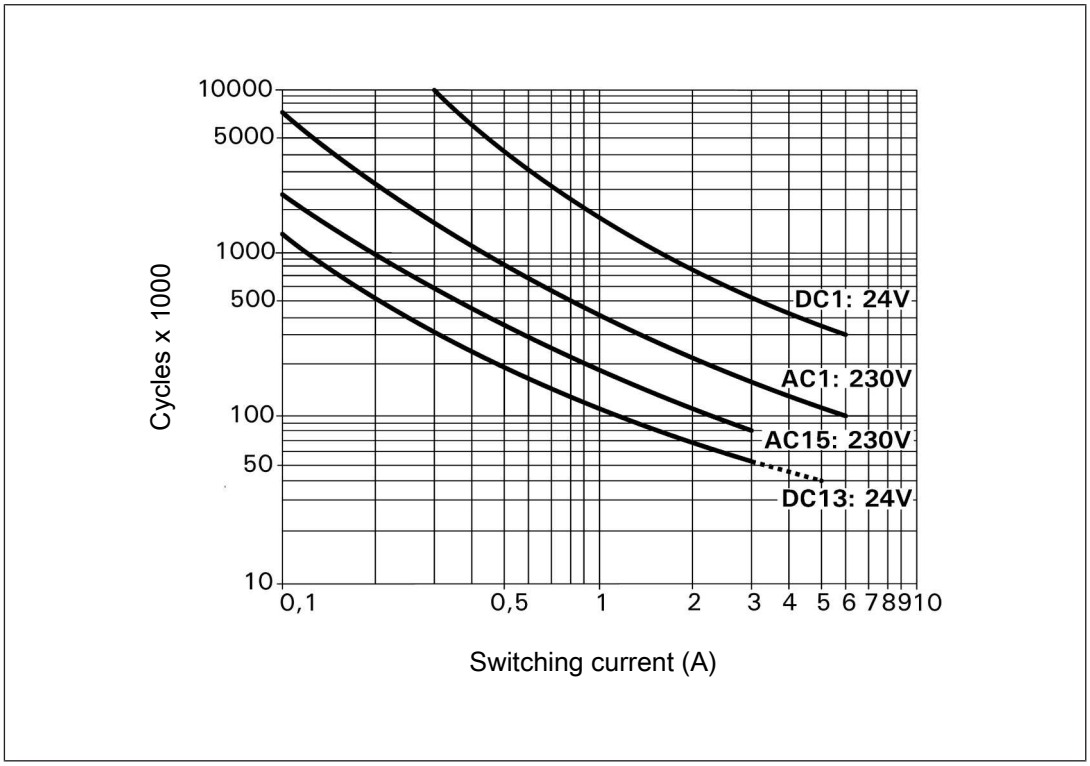



Fig.: Service life graphs at 24 VDC and 230 VAC

## Base units
PNOZ m2p

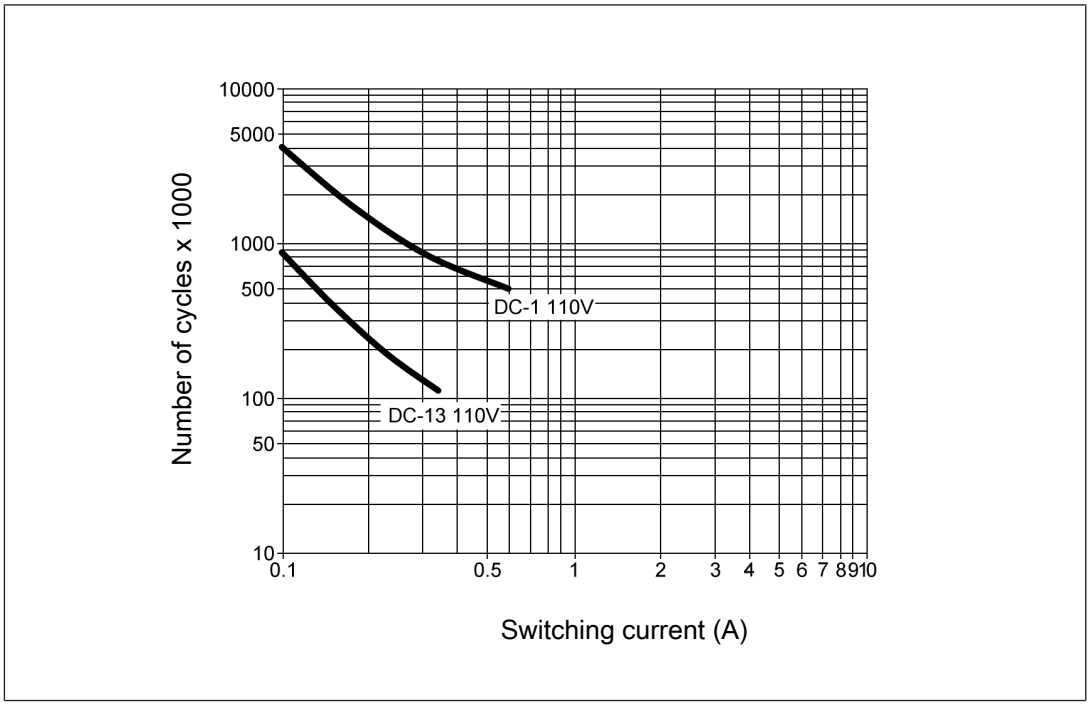



Fig.: Service life graphs at 110 VDC

**Example**

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see Technical details [📖 128]) can be used in the calculation.

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

We recommend you use semiconductor outputs to switch 24 VDC loads.

# Base units
PNOZ m2p

## Order reference

### Product

| Order reference | | |
|---|---|---|
| | | |

| Product type | Features | Order No. |
|---|---|---|
| PNOZ m2p | Base unit | 773 120 |
| PNOZ m2p ETH | Base unit, Ethernet interface | 773 123 |

### Accessories

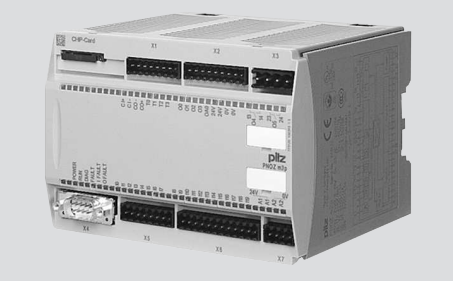
#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 100 |
| Set screw terminals | 1 set of screw terminals | 793 100 |

#### Terminator, jumper

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

# Base units
PNOZ m3p



## Overview

### Unit features

Using the product PNOZ m3p:

Base unit from the configurable control system PNOZmulti

The product has the following features:

- Designed to monitor and control furnaces
- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  - 2 safety outputs
    Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- Semiconductor outputs:
  - 4 safety outputs
    Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
  - 1 output for standard applications
- 4 test pulse outputs
- 1 cascading input and output;
  can also be used as a standard output
- 20 inputs for connecting, for example:
  - E-STOP pushbuttons
  - Two-hand pushbuttons
  - Safety gate limit switches
  - Start buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN

  - Operating mode selector switches
  - Safety mats
- Muting function
- LED indicator for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Integrated interfaces:
  - PNOZ m3p: Serial interface RS232
  - PNOZ m3p **ETH**: 2 Ethernet interfaces
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

### Chip card

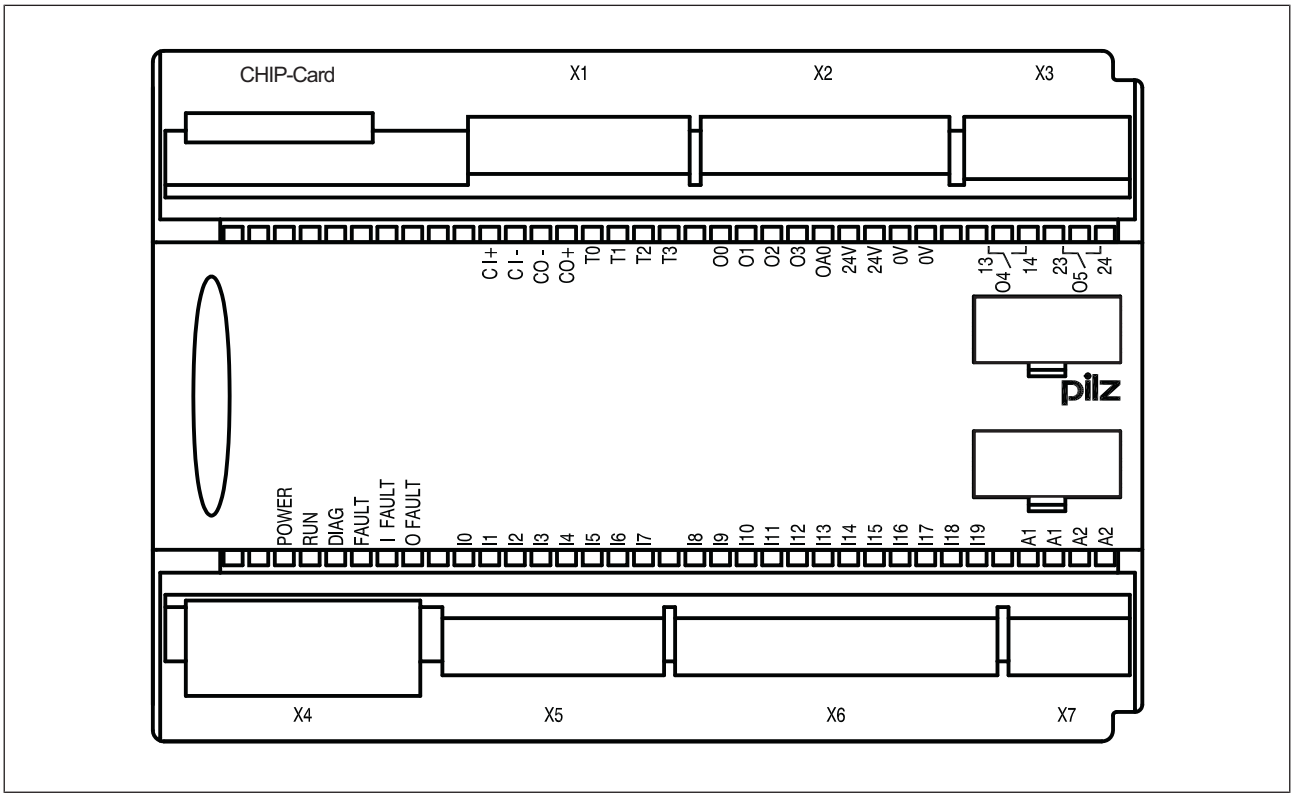
To be able to use the product you will need a chip card.

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see Technical Catalogue: Accessories chapter).

# Base units
PNOZ m3p

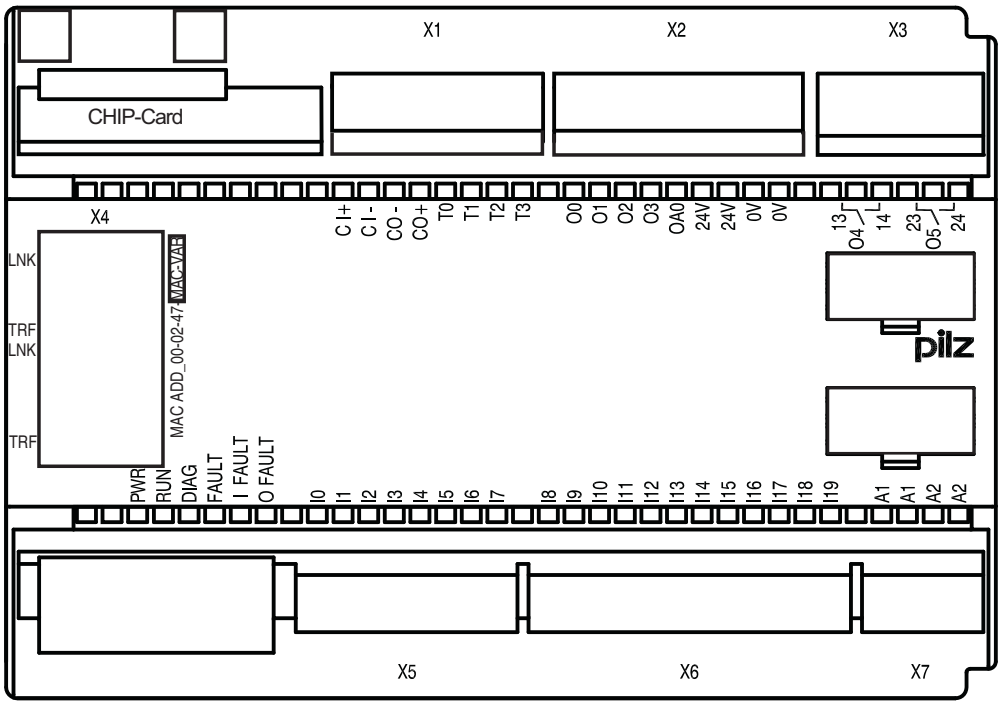
## Front view

### PNOZ m3p



# Base units
## PNOZ m3p

**PNOZ m3p ETH**




**Legend:**

- CHIP card:
  - Interface chip card
- X1:
  - Cascading inputs and outputs CI and CO,
  - Test pulse outputs T0 ... T3
- X2:
  - Semiconductor outputs O0 ... O3,
  - Auxiliary output OA0,
  - Supply connections
- X3:
  - Relay outputs O4 and O5
- X4:
  - RS232 interface / Ethernet interface
- X5, X6:
  - Inputs I0 ... I19

- X7:
  - Power supply
- LEDs:
  - PWR
  - RUN
  - DIAG
  - FAULT
  - I FAULT
  - O FAULT

## Function description

### Functions

The function of the inputs and outputs on the control 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 LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

### Application for furnaces

The base unit PNOZ m3p is designed for controlling and monitoring furnaces (see online help for the PNOZmulti Configurator).

These include:

Monitoring:

- Safety chains
- Combustion air pressure
- Ignition
- Flame monitoring
- External compound controller
- Tightness control

and controlling:

- Safety valves
- Ignition valves

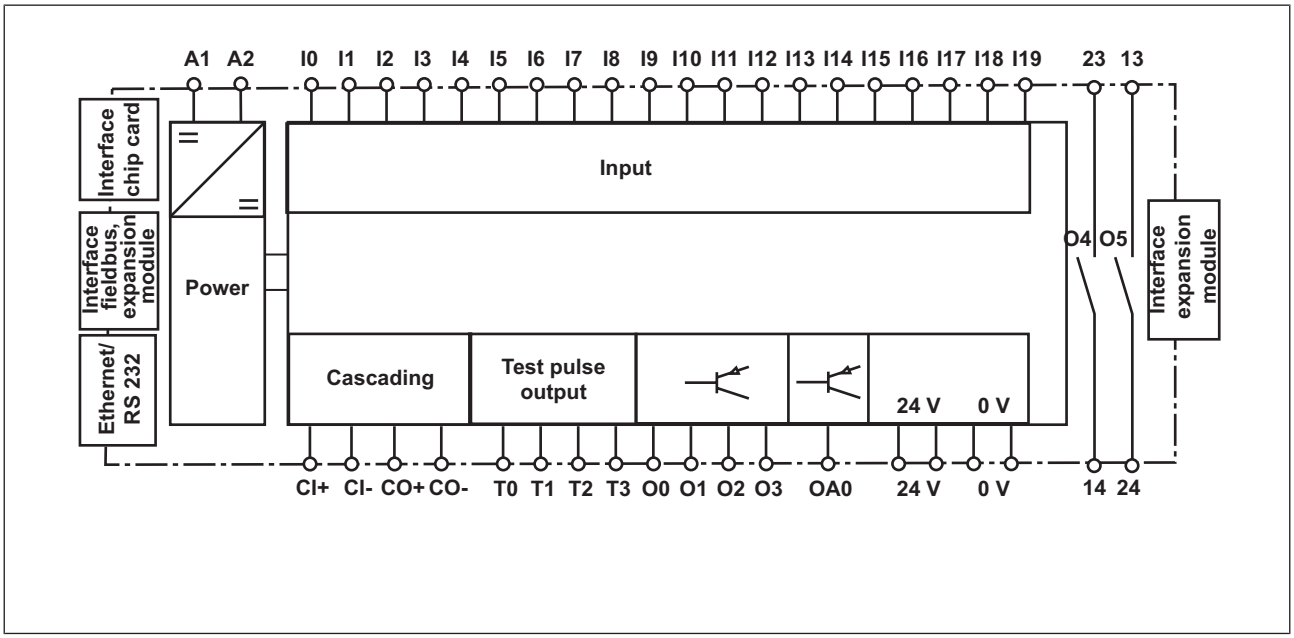
# Base units
PNOZ m3p

- Vent valve
- Ignition
- External compound controller
- Combustion Air Fan

The following oil and gas burner types can be monitored:

- Master burner with direct ignition
- Master burner with indirect ignition and joint flame monitoring
- Master burner with indirect ignition and separate flame monitoring

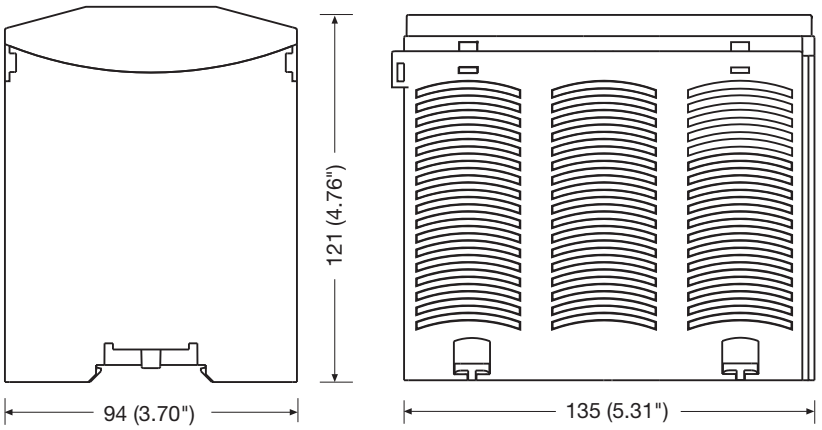
## Block diagram



# Base units
PNOZ m3p

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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

Please note:

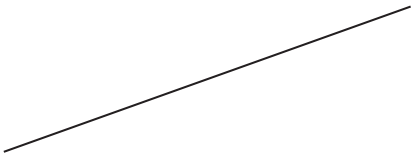
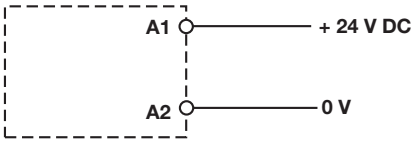
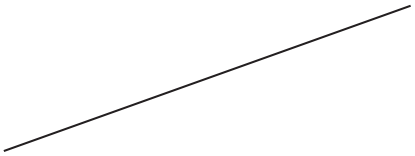
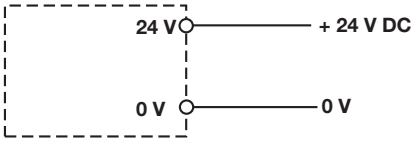
- Information given in the Technical details [📖 149] must be followed.
- Outputs:
  - O0 to O5 are safety outputs
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an output to delete a project from the base unit (see online help for the PNOZmutli Configurator).
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wiring with a temperature stability of 75°C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The control system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation.

# Base units
PNOZ m3p

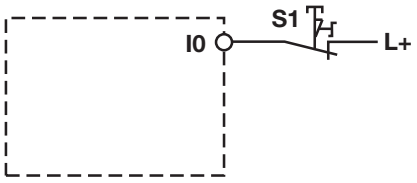
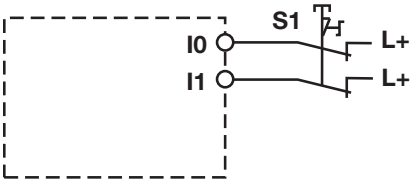
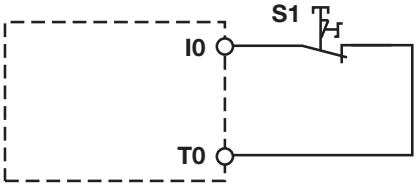
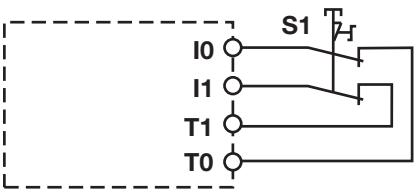
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. When the supply voltage is looped, the current at each terminal may not exceed 3 A.
- 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.
  Test pulses that are used for the safety mat may not be reused for other purposes.

The base unit PNOZ m3p is not suitable for connection to DC supplies.

## Connection

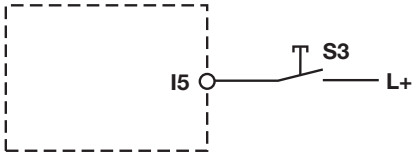
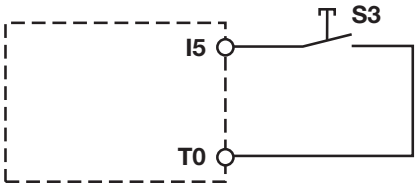
| Supply voltage | AC | DC |
|---|---|---|
| For the safety system (connector X7) |  |  |
| For the semiconductor outputs (connector X2)<br>Must always be present, even if the semiconductor outputs are not used |  |  |

Supply voltage

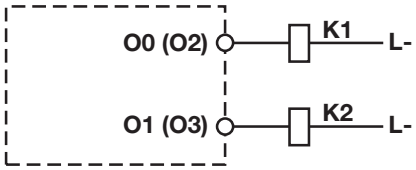
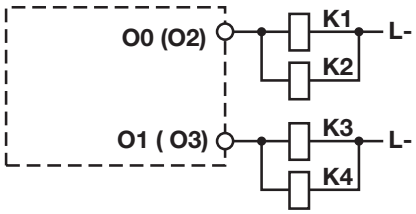
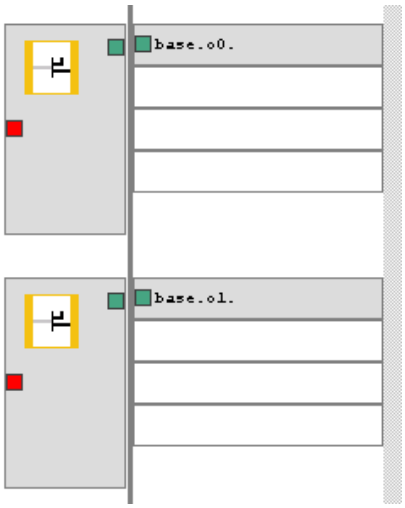
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

Connection examples for the input circuit

## Base units
PNOZ m3p

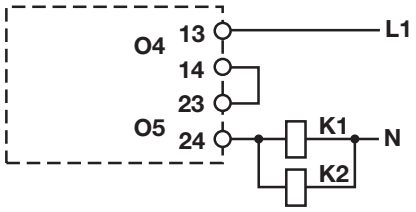
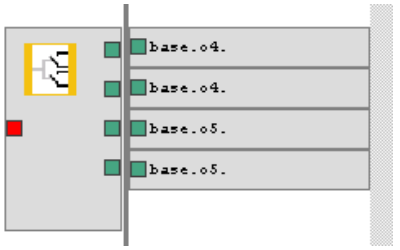
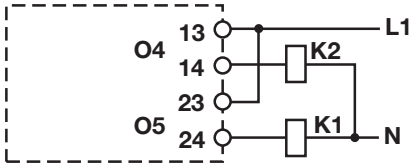
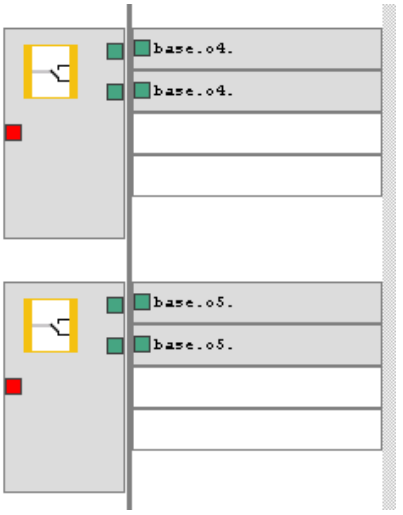
| Start circuit | Input circuit without detection of shorts across contacts | Input circuit with detection of shorts across contacts |
|---|---|---|
| |  |  |

Connection examples for start circuit

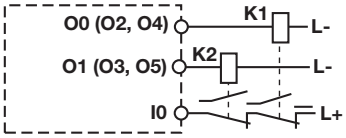
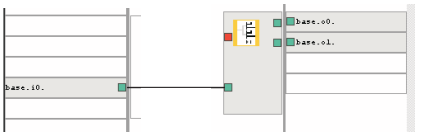
| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |

Connection examples for semiconductor outputs

## Base units
PNOZ m3p

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

Connection examples for relay outputs

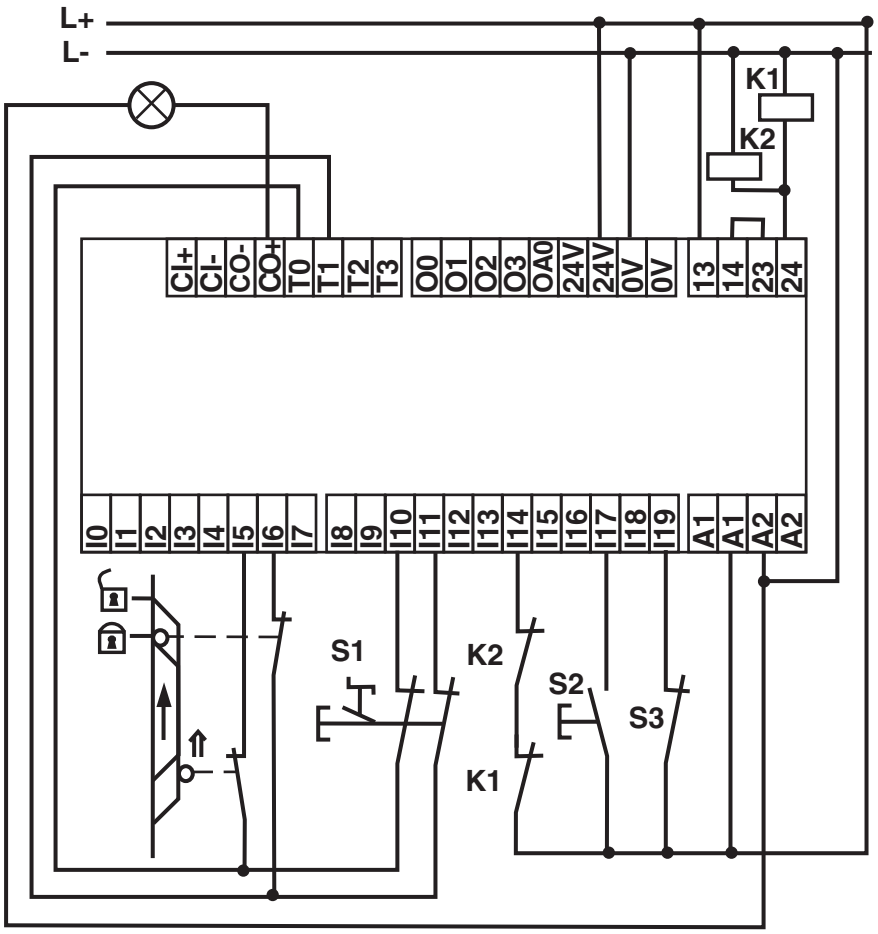
| Feedback loop | Redundant output |
|---|---|
| Contacts from external contactors |   |

Connection examples for feedback loop

# Base units
PNOZ m3p

### Connection example

Dual-channel E-STOP and safety gate wiring, monitored start (I17), feedback loop (I14), cascading output as auxiliary output (CO+/A2)



# Base units
PNOZ m3p

## Technical Details

| General | 773125 | 773126 |
|---|---|---|
| Approvals | **BG, CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed** | **BG, CCC, CE, EAC (Eurasian), KCC, TÜV, cULus Listed** |
| **Electrical data** | **773125** | **773126** |
| Supply voltage | | |
| for | **Supply to the system** | **Supply to the system** |
| Voltage | **24,0 V** | **24,0 V** |
| Kind | **DC** | **DC** |
| Voltage tolerance | **-15 %/+20 %** | **-15 %/+20 %** |
| Output of external power supply (DC) at no load | **8,0 W** | **9,0 W** |
| Residual ripple DC | **5 %** | **5 %** |
| Supply voltage | | |
| for | **Supply to the SC outputs** | **Supply to the SC outputs** |
| Voltage | **24 V** | **24 V** |
| Kind | **DC** | **DC** |
| Voltage tolerance | **-15 %/+20 %** | **-15 %/+20 %** |
| Output of external power supply (DC) | **192,0 W** | **192,0 W** |
| Residual ripple DC | **5 %** | **5 %** |
| Potential isolation | **yes** | **yes** |
| Supply voltage | | |
| Power consumption per expansion module | **2,50 W** | **2,50 W** |
| Status indicator | **LED** | **LED** |
| **Inputs** | **773125** | **773126** |
| Number | **20** | **20** |
| Max. number of live inputs within the max. permitted ambient temperature (see "Environmental data") | **U_B <= 26,4 V : 20, U_B > 26,4 V : 15** | **U_B <= 26,4 V : 20, U_B > 26,4 V : 15** |
| Signal level at "0" | **-3 - +5 V DC** | **-3 - +5 V DC** |
| Signal level at "1" | **15 - 30 V DC** | **15 - 30 V DC** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** | **24 V DC** |
| Input current at rated voltage | **8 mA** | **8 mA** |
| Min. pulse duration | **18 ms** | **18 ms** |
| Pulse suppression | **0,6 ms** | **0,6 ms** |
| Maximum input delay | **4 ms** | **4 ms** |
| Potential isolation | **No** | **No** |

## Base units
PNOZ m3p

| Semiconductor outputs | 773125 | 773126 |
|---|---|---|
| Number | **4** | **4** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **2,0 A** | **2,0 A** |
| Power | **48 W** | **48 W** |
| Signal level at "1" | **UB - 0.5 VDC at 2 A** | **UB - 0.5 VDC at 2 A** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| Max. capacitive load | **1 µF** | **1 µF** |
| Max. duration of off time during self test | **300 µs** | **300 µs** |
| Switch-off delay | **30 ms** | **30 ms** |
| Potential isolation | **yes** | **yes** |
| Short circuit-proof | **yes** | **yes** |
| **Semiconductor outputs (standard)** | **773125** | **773126** |
| Number | **1** | **1** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **0,50 A** | **0,50 A** |
| Power | **12,0 W** | **12,0 W** |
| Galvanic isolation | **yes** | **yes** |
| Short circuit-proof | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| Signal level at "1" | **UB - 0.5 VDC at 0.5 A** | **UB - 0.5 VDC at 0.5 A** |
| **Test pulse outputs** | **773125** | **773126** |
| Number of test pulse outputs | **4** | **4** |
| Voltage | **24 V** | **24 V** |
| Current | **0,5 A** | **0,5 A** |
| Max. duration of off time during self test | **5 ms** | **5 ms** |
| Short circuit-proof | **yes** | **yes** |
| Potential isolation | **No** | **No** |
| **Relay outputs** | **773125** | **773126** |
| Utilisation category | | |
| In accordance with the standard | **EN 60947-4-1** | **EN 60947-4-1** |

## Base units
PNOZ m3p

| Relay outputs | 773125 | 773126 |
|---|---|---|
| Utilisation category of safety contacts | | |
| AC1 at | **240 V** | **240 V** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **1440 VA** | **1440 VA** |
| DC1 at | **24 V** | **24 V** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **144 W** | **144 W** |
| Utilisation category | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Utilisation category of safety contacts | | |
| AC15 at | **230 V** | **230 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **690 W** | **690 W** |
| DC13 (6 cycles/min) at | **24 V** | **24 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **72 W** | **72 W** |
| Airgap creepage between | | |
| Relay contacts | **3 mm** | **3 mm** |
| Relay contacts and other circuits | **5,5 mm** | **5,5 mm** |
| External contact fuse protection, safety contacts | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Blow-out fuse, quick | **6 A** | **6 A** |
| Blow-out fuse, slow | **6,00 A** | **6,00 A** |
| Circuit breaker 24V AC/DC, characteristic B/C | **6 A** | **6 A** |
| Switch-off delay | **50 ms** | **50 ms** |
| Potential isolation | **yes** | **yes** |
| **Cascading output as standard output** | **773125** | **773126** |
| Number | **1** | **1** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **0,2 A** | **0,2 A** |
| Power | **4,8 W** | **4,8 W** |
| Galvanic isolation | **No** | **No** |
| Short circuit-proof | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| **Ethernet interface** | **773125** | **773126** |
| Number | – | **2** |

## Base units
PNOZ m3p

| Serial interface | 773125 | 773126 |
|---|---|---|
| Number of RS232 interfaces | 1 | – |
| **Times** | **773125** | **773126** |
| Switch-on delay | 5,00 s | 5,00 s |
| Supply interruption before de-energisation | 20 ms | 20 ms |
| Simultaneity, channel 1 and 2 max. | 3 s | 3 s |
| Simultaneity in the two-hand circuit | 0,5 s | 0,5 s |
| Max. cycle time of the device | 15 ms | 15 ms |
| Max. processing time for data communication | – | 50 ms |
| **Environmental data** | **773125** | **773126** |
| Ambient temperature | | |
| In accordance with the standard | EN 60068-2-14 | EN 60068-2-14 |
| Temperature range | 0 - 60 °C | 0 - 60 °C |
| Forced convection in control cabinet off | 55 °C | 55 °C |
| Storage temperature | | |
| In accordance with the standard | EN 60068-2-1/-2 | EN 60068-2-1/-2 |
| Temperature range | -25 - 70 °C | -25 - 70 °C |
| Climatic suitability | | |
| In accordance with the standard | EN 60068-2-30, EN 60068-2-78 | EN 60068-2-30, EN 60068-2-78 |
| Humidity | 93 % r. h. at 40 °C | 93 % r. h. at 40 °C |
| Condensation during operation | Not permitted | Not permitted |
| EMC | EN 61131-2 | EN 61131-2 |
| Vibration | | |
| In accordance with the standard | EN 60068-2-6 | EN 60068-2-6 |
| Frequency | 10,0 - 150,0 Hz | 10,0 - 150,0 Hz |
| Acceleration | 1g | 1g |
| Shock stress | | |
| In accordance with the standard | EN 60068-2-27 | EN 60068-2-27 |
| Acceleration | 15g | 15g |
| Duration | 11 ms | 11 ms |
| Max. operating height above sea level | 2000 m | 2000 m |
| Airgap creepage | | |
| In accordance with the standard | EN 61131-2 | EN 61131-2 |
| Overvoltage category | III | III |
| Pollution degree | 2 | 2 |
| Rated insulation voltage | 250 V | 250 V |
| Rated impulse withstand voltage | 6,00 kV | 6,00 kV |

# Base units
PNOZ m3p

| Environmental data | 773125 | 773126 |
|---|---|---|
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Potential isolation** | **773125** | **773126** |
| Potential isolation between | **SC output and system voltage** | **SC output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** |
| Rated surge voltage | **2500 V** | **2500 V** |
| Potential isolation between | **Relay output and system voltage** | **Relay output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** |
| Rated surge voltage | **6000 V** | **6000 V** |
| **Mechanical data** | **773125** | **773126** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Max. cable length | | |
| Max. cable length per input | **1,0 km** | **1,0 km** |
| Sum of individual cable lengths at the test pulse output | **40 km** | **40 km** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Conductor cross section with screw terminals (relay outputs) | | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |

## Base units
PNOZ m3p

| Mechanical data | 773125 | 773126 |
|---|---|---|
| Torque setting with screw terminals (relay outputs) | **0,50 Nm** | **0,50 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |
| Stripping length with screw terminals (relay outputs) | **8 mm** | **8 mm** |
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Conductor cross section with spring-loaded terminals (relay outputs) | | |
| 1 core flexible without crimp connector | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 1 core flexible with crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** |
| Stripping length with spring-loaded terminals (relay outputs) | **10 mm** | **10 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **135,0 mm** | **135,0 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **499 g** | **520 g** |

Where standards are undated, the 2010-10 latest editions shall apply.

# Base units
PNOZ m3p

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,90E-09** | **20** |
| Expansion | – | **PL e** | **Cat. 4** | **SIL CL 3** | **9,20E-09** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **2,50E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,90E-10** | **20** |
| SC inputs | **Short circuit-forming safety mats** | **PL d** | **Cat. 3** | **SIL CL 2** | **1,81E-09** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,50E-10** | **20** |
| Cascad. inputs | – | **PL e** | **Cat. 4** | **SIL CL 3** | **3,10E-10** | **20** |
| **Output** | | | | | | |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **7,00E-09** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **8,60E-10** | **20** |
| Cascad. outputs | – | **PL e** | **Cat. 4** | **SIL CL 3** | **4,91E-10** | **20** |
| Relay outputs | **1-channel** | **PL c** | **Cat. 1** | **-** | **2,90E-08** | **20** |
| Relay outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **3,00E-10** | **20** |

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

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

## Supplementary data

### Service life graph for the relay contacts

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.

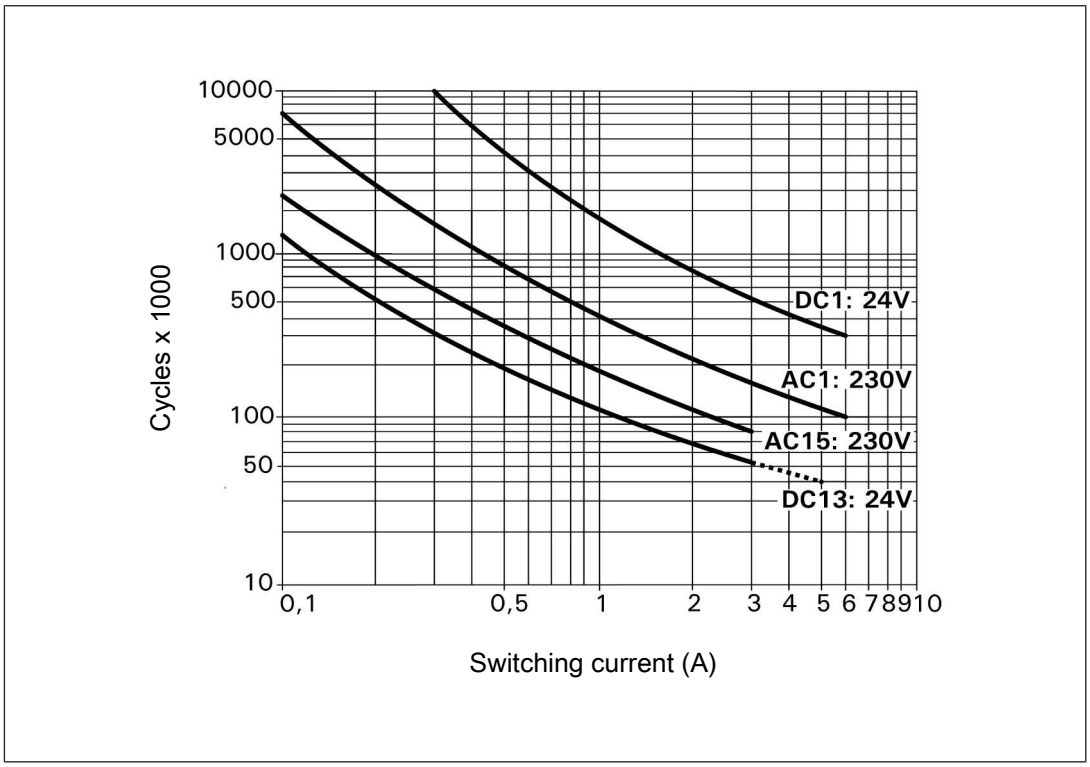



Fig.: Service life graphs at 24 VDC and 230 VAC

# Base units
PNOZ m3p

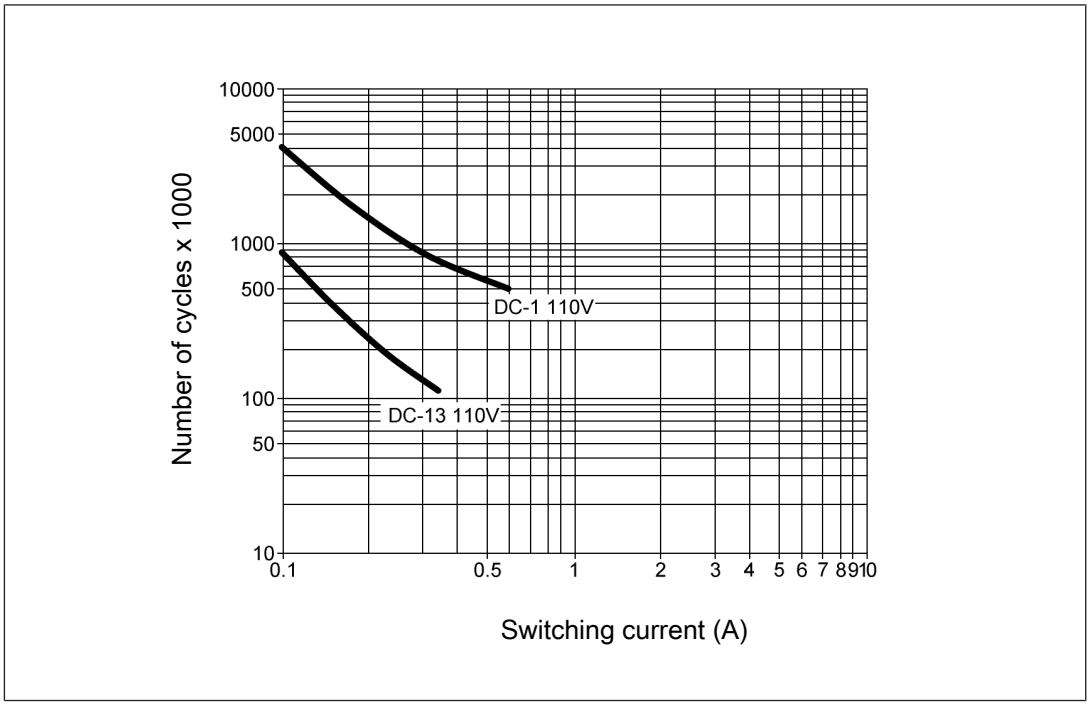



Fig.: Service life graphs at 110 VDC

**Example**

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see Technical details [📖 149]) can be used in the calculation.

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

We recommend you use semiconductor outputs to switch 24 VDC loads.

# Base units
PNOZ m3p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ m3p | Base unit | 773 125 |
| PNOZ m3p ETH | Base unit, Ethernet interface | 773 126 |

### Accessories

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 100 |
| Set screw terminals | 1 set of screw terminals | 793 100 |

#### Terminator, jumper

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

# Input modules
PNOZ mi1p

## Overview

### Unit features

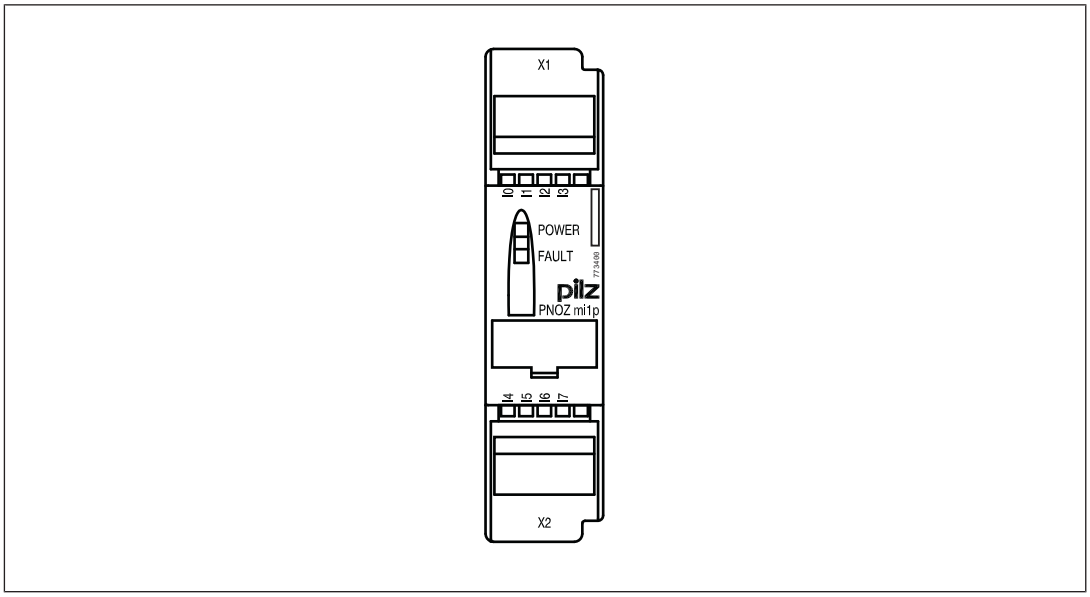
The product has the following features:

- 8 inputs for connecting:
  - E-STOP pushbuttons
  - Two-hand button
  - Safety gate limit switches
  - Start buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN
  - Operating mode selector switches
- Can be configured in the PNOZmulti Configurator
- LED indicator for:
  - Status of PNOZmulti
- Max. 8 PNOZ mi1p units can be connected to the base unit
- Test pulse outputs used to monitor shorts across the inputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Coated version:

  Increased environmental requirements (see Technical details [📖 163])

# Input modules
PNOZ mi1p

### Front view




Legend:

- Inputs I0 – I7

## Function description

### Functions

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.

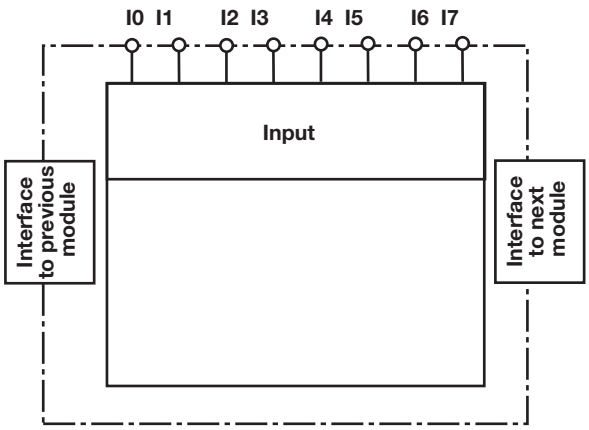
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

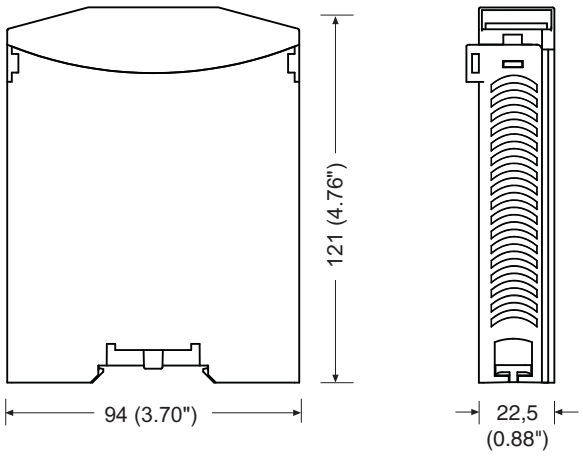
# Input modules
PNOZ mi1p

### Block diagram




## Installation

### Dimensions in mm



# Input modules
PNOZ mi1p

## Commissioning

### General wiring guidelines

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

Please note:

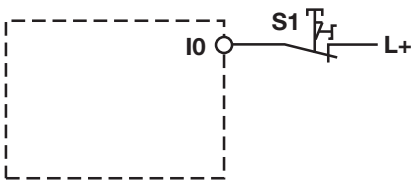
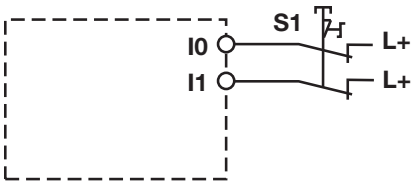
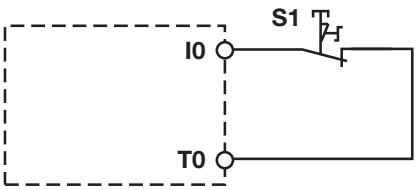
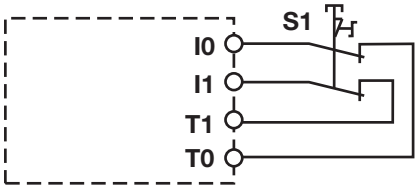
- Information given in the Technical details [📖 163] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation.

### Preparing for operation

The N/C contact on the trigger element (e.g. E-STOP) must be connected to the input circuit. A short circuit in the input circuit may or may not be detected, depending on the configuration and wiring. The test pulse outputs on the base unit must be used to detect shorts across contacts. The input assignment is defined in the PNOZmulti Configurator.

The input circuit should be connected as described in the table. The wiring at I0 and I1 is illustrated as an example; inputs I2 ... 17 are wired in a similar way.

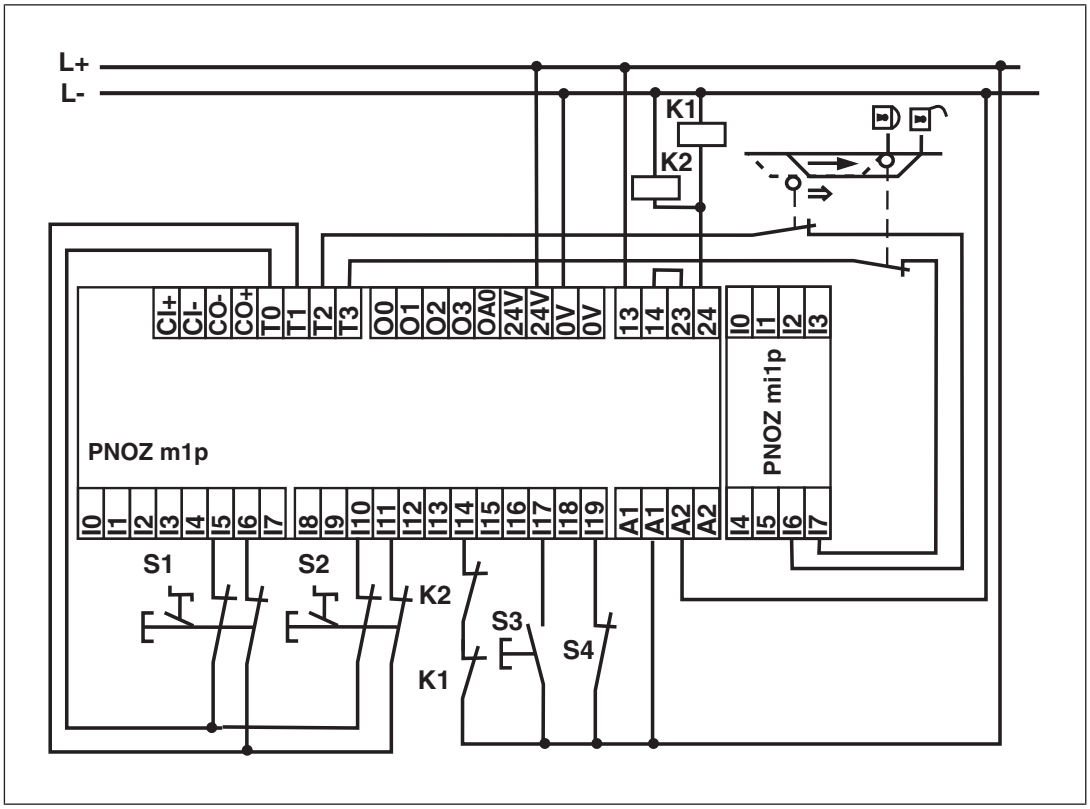
### Connection

| 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 |  |  |

Input circuit

# Input modules
PNOZ mi1p

### Connection example




## Technical details

| General | 773400 | 773405 |
|---|---|---|
| Approvals | BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed | BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed |
| **Electrical data** | **773400** | **773405** |
| Supply voltage | | |
| for | Module supply | Module supply |
| internal | Via base unit | Via base unit |
| Voltage | 5,0 V | 5,0 V |
| Kind | DC | DC |
| Voltage tolerance | -2 %/+2 % | -2 %/+2 % |
| Power consumption | 2,5 W | 2,5 W |
| Status indicator | LED | LED |
| **Inputs** | **773400** | **773405** |
| Number | 8 | 8 |
| Signal level at "0" | -3 - +5 V DC | -3 - +5 V DC |
| Signal level at "1" | 15 - 30 V DC | 15 - 30 V DC |

# Input modules
## PNOZ mi1p

| Inputs | 773400 | 773405 |
|---|---|---|
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** | **24 V DC** |
| Min. pulse duration | **18 ms** | **18 ms** |
| Pulse suppression | **0,6 ms** | **0,6 ms** |
| Maximum input delay | **4 ms** | **4 ms** |
| Potential isolation | **No** | **No** |
| **Times** | **773400** | **773405** |
| Switch-on delay | **5,00 s** | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |
| Simultaneity, channel 1 and 2 max. | **3 s** | **3 s** |
| Simultaneity in the two-hand circuit | **0,5 s** | **0,5 s** |
| **Environmental data** | **773400** | **773405** |
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **-25 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** | – |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Short-term** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **5,0 - 500,0 Hz** |
| Acceleration | **1g** | **1g** |
| Broadband noise | | |
| In accordance with the standard | – | **EN 60068-2-64** |
| Frequency | – | **5 - 500 Hz** |
| Acceleration | – | **1,9grms** |
| Corrosive gas check | | |
| SO2: Concentration 10 ppm, duration 10 days, passive | – | **DIN V 40046-36** |
| H2S: Concentration 1 ppm, duration 10 days, passive | – | **DIN V 40046-37** |

# Input modules
PNOZ mi1p

| Environmental data | 773400 | 773405 |
|---|---|---|
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** |
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Mechanical data** | **773400** | **773405** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Max. cable length | | |
| Max. cable length per input | **1,0 km** | **1,0 km** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |

# Input modules
PNOZ mi1p

| Mechanical data | 773400 | 773405 |
|---|---|---|
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **22,5 mm** | **22,5 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **120 g** | **123 g** |

Where standards are undated, the 2008-03 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 1-channel | **PL d** | **Cat. 2** | **SIL CL 2** | **2,50E-09** | **SIL 2** | **2,20E-04** | **20** |
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **2,90E-10** | **SIL 3** | **4,50E-06** | **20** |
| Short circuit-forming safety mats | **PL d** | **Cat. 3** | **SIL CL 2** | **1,81E-09** | **SIL 2** | **9,34E-05** | **20** |
| 1-ch., pulsed light barrier | **PL e** | **Cat. 4** | **SIL CL 3** | **2,50E-10** | **SIL 3** | **2,21E-05** | **20** |

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

# Input modules
PNOZ mi1p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mi1p | Expansion module, 8 inputs | 773 400 |
| PNOZ mi1p coated version | Expansion module, 8 inputs, coated version | 773 405 |

### Accessories

#### Connection terminals

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

#### Terminator, jumper

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

# Input modules
PNOZ mi2p

## Overview

### Unit features

Using the product PNOZ mi2p:

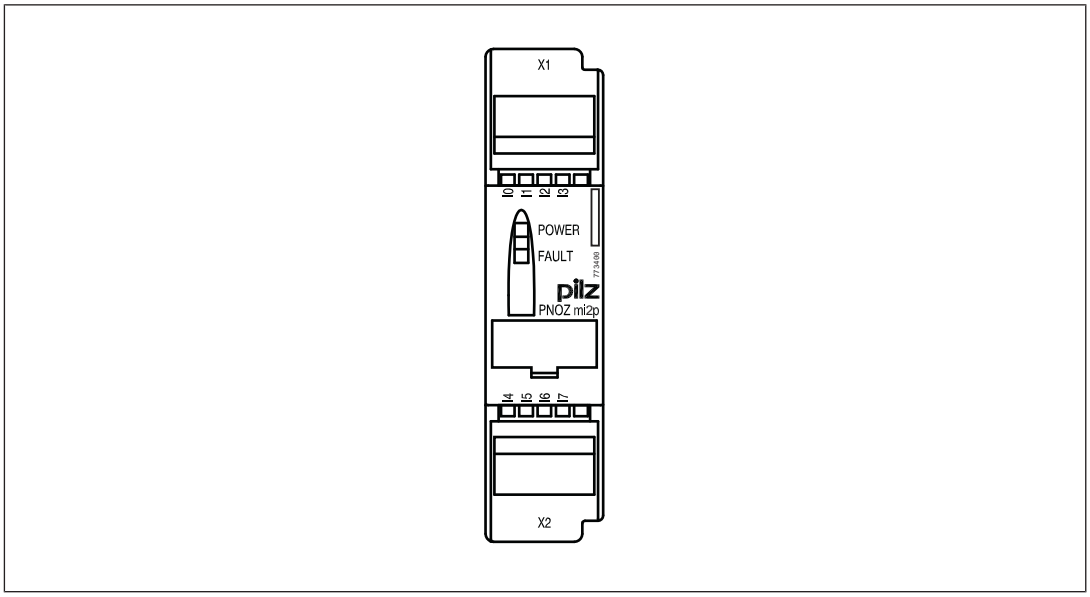
Expansion module for connection to a base unit from the configurable control system PNOZmulti .

The product has the following features:

- 8 inputs for standard functions
- Can be configured in the PNOZmulti Configurator
- LED indicator for:
  - Status of PNOZmulti
- Max. 8 PNOZ mi2p can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Input modules
PNOZ mi2p

### Front view




Legend:

- Inputs I0 – I7

## Function description

### Functions

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.

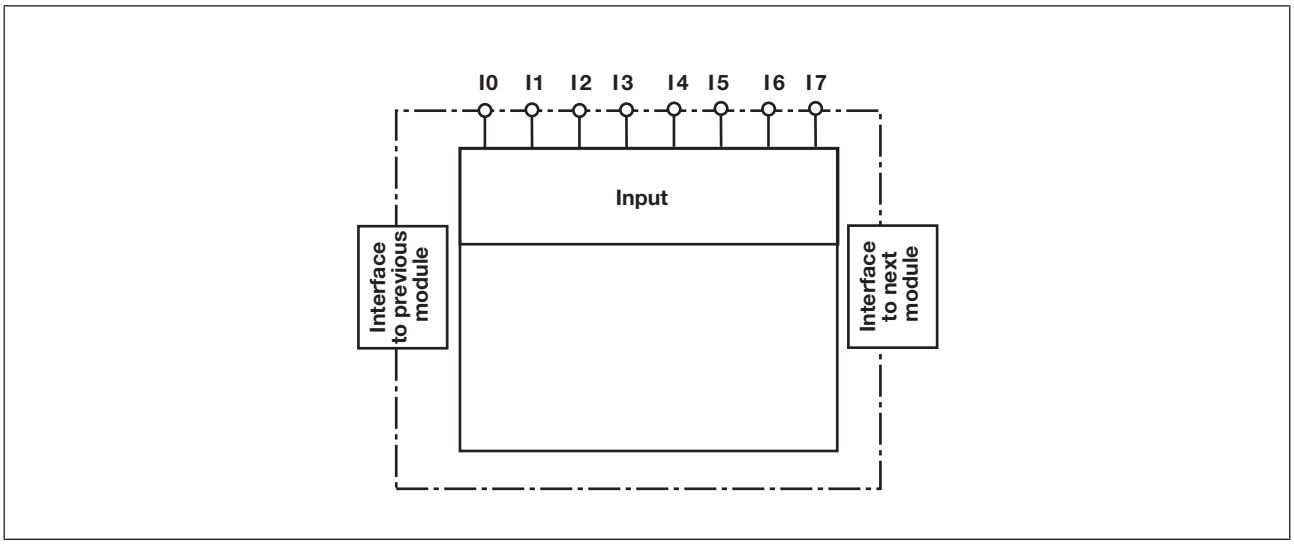
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

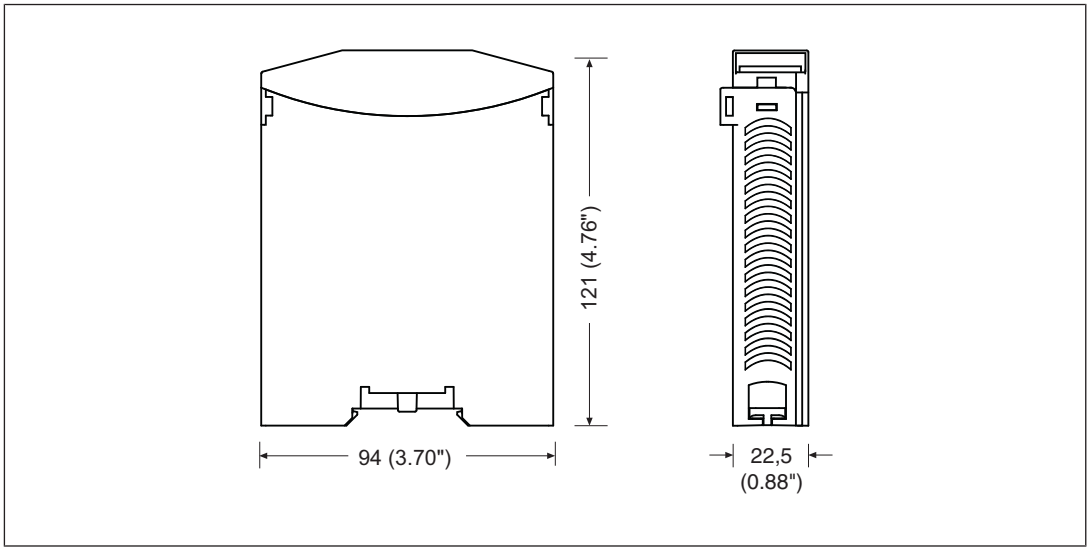
# Input modules
PNOZ mi2p

### Block diagram




## Installation

### Dimensions in mm



# Input modules
PNOZ mi2p

## Commissioning

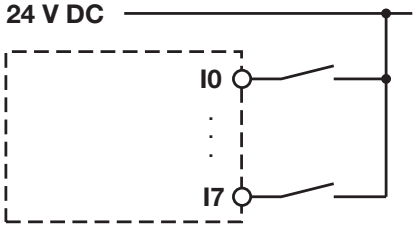
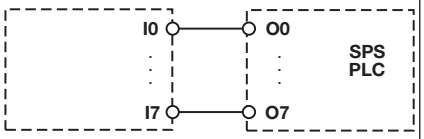
### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 172] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation.

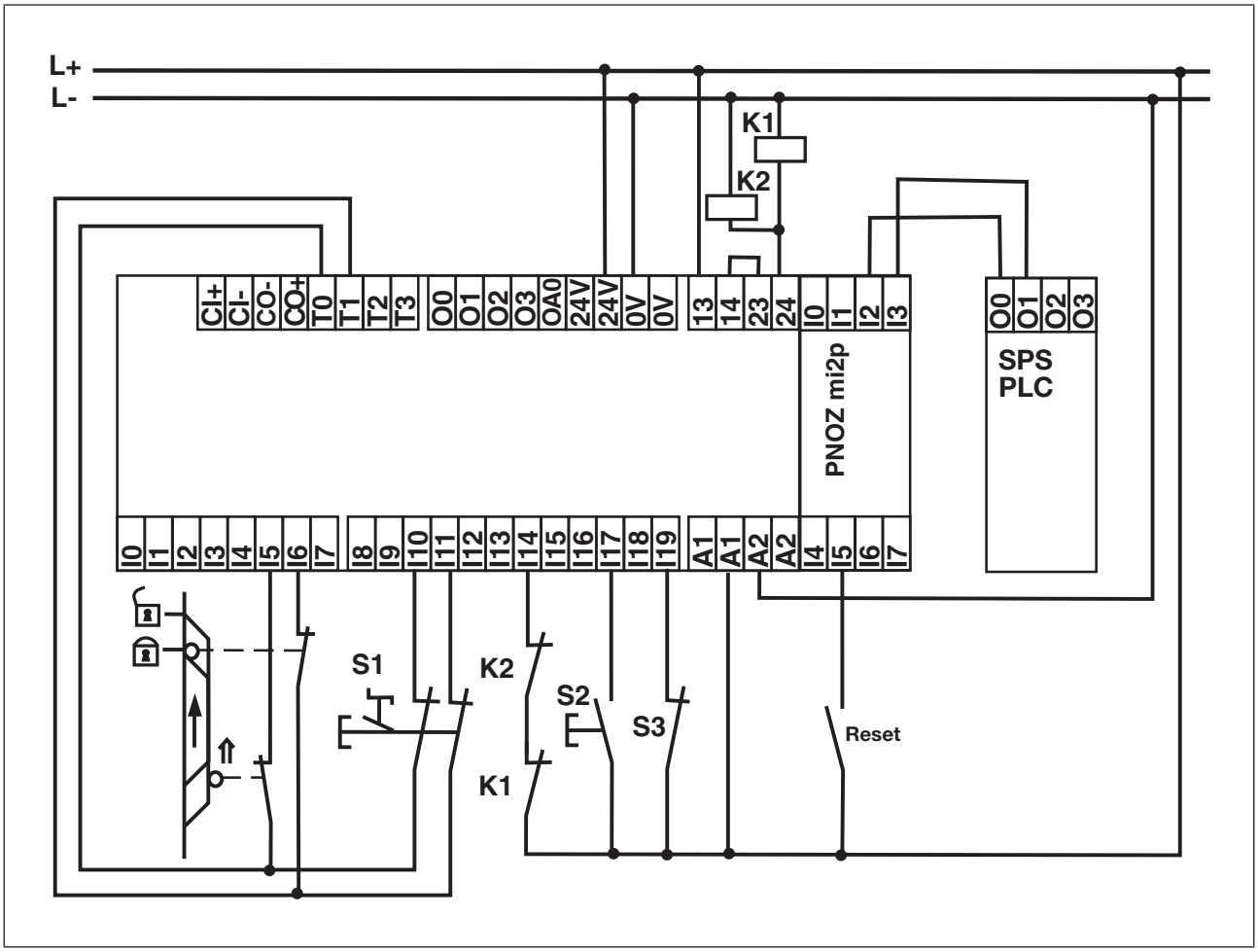
### Connection

| Input circuit | Contact | Semiconductor |
|---|---|---|
| **Not** safety-related |  |  |

# Input modules
PNOZ mi2p

### Connection example

Poll of PLC outputs (standard function)




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cU-Lus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **2,5 W** |
| Status indicator | **LED** |

# Input modules
## PNOZ mi2p

| | |
|---|---|
| **Inputs** | |
| Number | **8** |
| Signal level at "0" | **-3 - +5 V DC** |
| Signal level at "1" | **15 - 30 V DC** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** |
| Min. pulse duration | **18 ms** |
| Pulse suppression | **0,6 ms** |
| Potential isolation | **No** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| Simultaneity, channel 1 and 2 max. | **3 s** |
| Simultaneity in the two-hand circuit | **0,5 s** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Max. temperature in accordance with UL | **0 - 55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |

# Input modules
PNOZ mi2p

| | |
|---|---|
| **Environmental data** | |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **1,0 km** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **121,0 mm** |
| Weight | **119 g** |

Where standards are undated, the 2008-03 latest editions shall apply.

# Input modules
PNOZ mi2p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mi2p | 8 standard inputs | 773 410 |

### Accessories

#### Connection terminals

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

#### Terminator, jumper

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

# Output modules
PNOZ mo1p

## Overview

### Unit features

Using the product PNOZ mo1p:

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

The product has the following features:

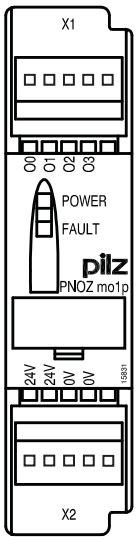
- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:

  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Coated version:

  Increased environmental requirements (see Technical details [182])

# Output modules
PNOZ mo1p

### Front view




**Legend:**

- 0 V, 24 V
  Supply connections
- O0 – O4
  Semiconductor outputs

## Function description

### Functions

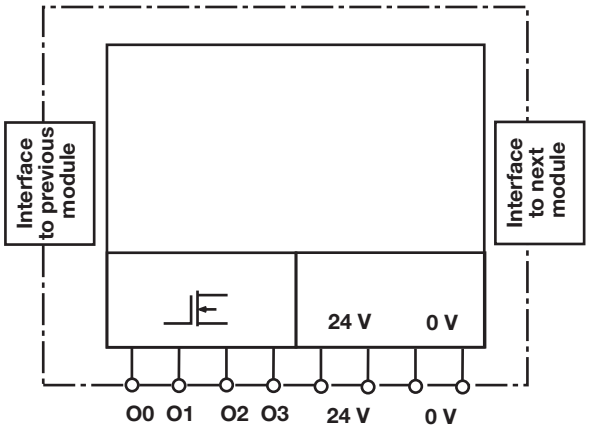
The expansion module provides additional semiconductor outputs.

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

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

# Output modules
PNOZ mo1p

### Block diagram

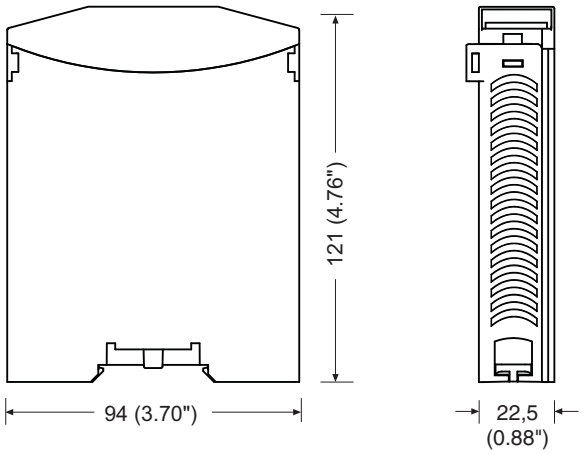



### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [📖 30]".

## Installation

### Dimensions in mm



# Output modules
PNOZ mo1p

## Commissioning

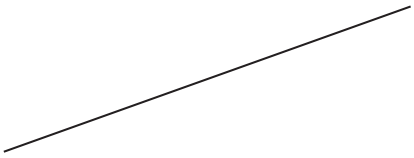
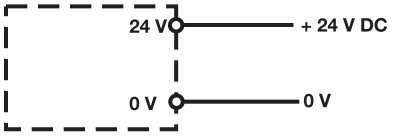
### General wiring guidelines

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

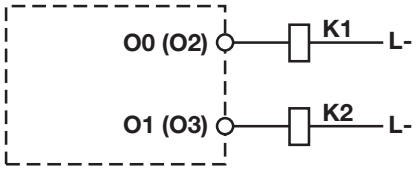
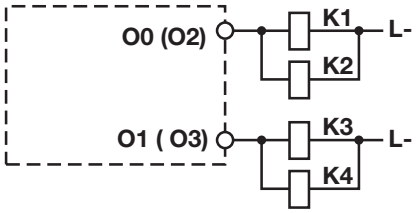
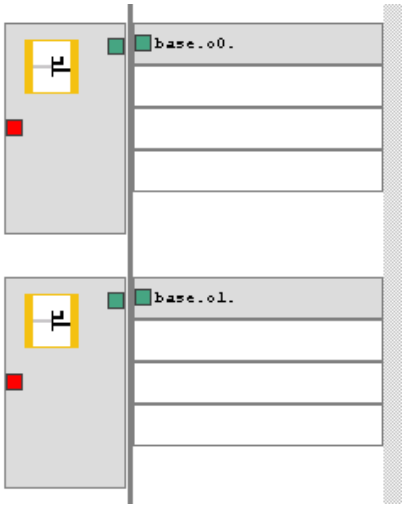
Please note:

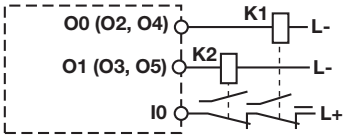
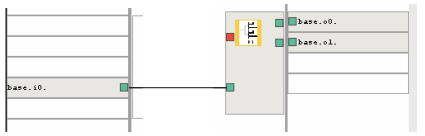
- Information given in the Technical details [182] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. When the supply voltage is looped, the current at each terminal may not exceed 3 A.

### Connection

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

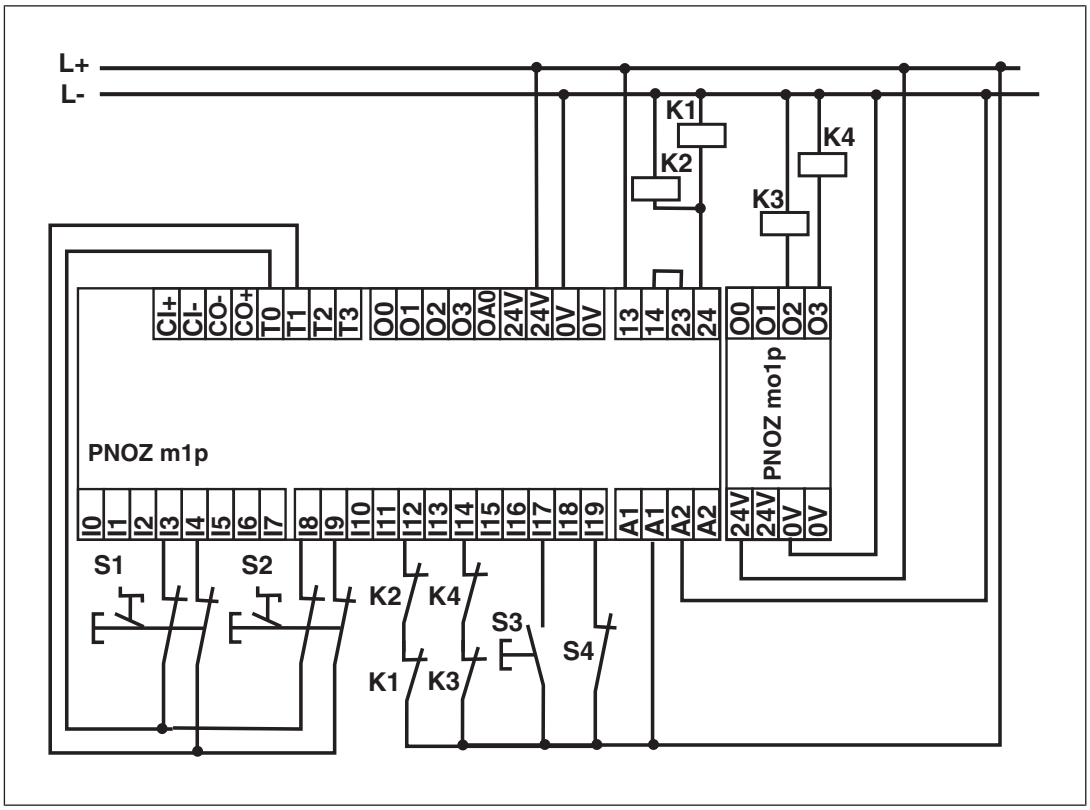
## Output modules
PNOZ mo1p

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

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

# Output modules
PNOZ mo1p

### Connection example




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

# Output modules
PNOZ mo1p

## Technical details

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

## Output modules
PNOZ mo1p

| Times | 773500 | 773505 |
|---|---|---|
| Switch-on delay | **5,00 s** | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |
| **Environmental data** | **773500** | **773505** |
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **-25 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** | – |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Short-term** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **5,0 - 500,0 Hz** |
| Acceleration | **1g** | **1g** |
| Broadband noise | | |
| In accordance with the standard | – | **EN 60068-2-64** |
| Frequency | – | **5 - 500 Hz** |
| Acceleration | – | **1,9grms** |
| Corrosive gas check | | |
| SO2: Concentration 10 ppm, duration 10 days, passive | – | **DIN V 40046-36** |
| H2S: Concentration 1 ppm, duration 10 days, passive | – | **DIN V 40046-37** |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** |

## Output modules
PNOZ mo1p

| Environmental data | 773500 | 773505 |
|---|---|---|
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Potential isolation** | **773500** | **773505** |
| Potential isolation between | **SC output and system voltage** | **SC output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** |
| Rated surge voltage | **2500 V** | **2500 V** |
| **Mechanical data** | **773500** | **773505** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** |

# Output modules
PNOZ mo1p

| Mechanical data | 773500 | 773505 |
|---|---|---|
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **22,5 mm** | **22,5 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **154 g** | **156 g** |

Where standards are undated, the 2008-03 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 1-channel | **PL d** | **Cat. 2** | **SIL CL 2** | **7,00E-09** | **SIL 2** | **6,14E-04** | **20** |
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **8,60E-10** | **SIL 3** | **1,30E-05** | **20** |

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

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mo1p | Expansion module, 2 or 4 semiconductor outputs, safe | 773 500 |
| PNOZ mo1p coated version | Expansion module, 2 or 4 semiconductor outputs, safe, coated version | 773 505 |

### Accessories

#### Terminator, jumper

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

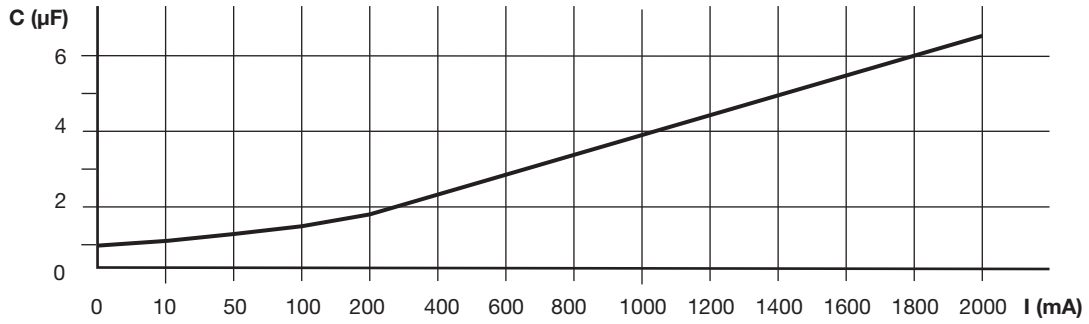
# Output modules
PNOZ mo1p

**Connection terminals**

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

## Supplementary data

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



# Output modules
PNOZ mo2p

## Overview

### Unit features

Using the product PNOZ mo2p:

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

The product has the following features:

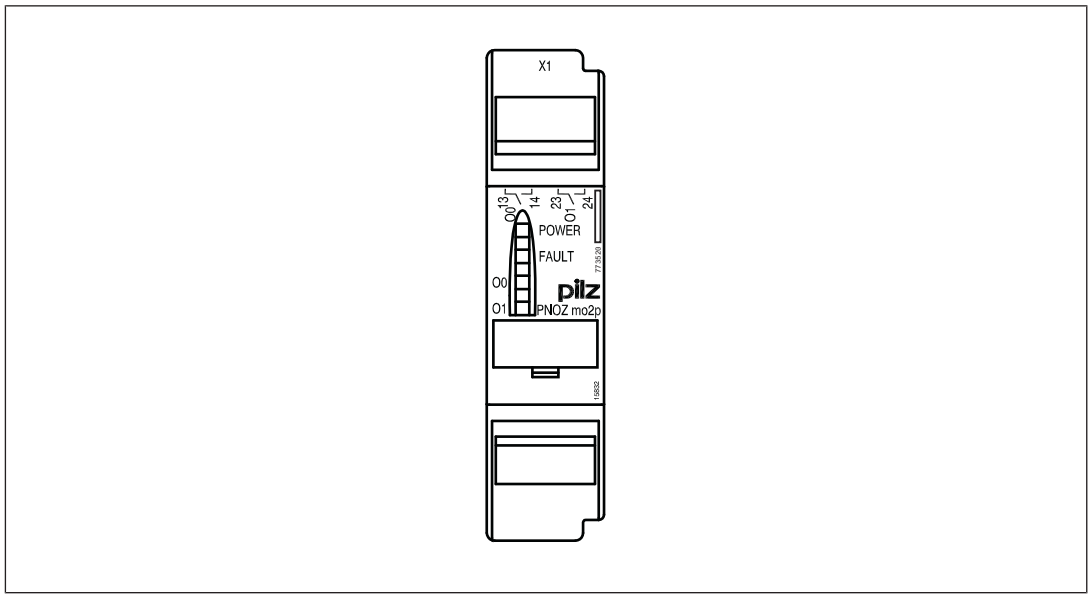
- Positive-guided relay outputs:

  2 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- Can be configured in the PNOZmulti Configurator
- Status indicators
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Coated version:

  Increased environmental requirements (see Technical details [📖 191])

# Output modules
PNOZ mo2p

### Front view




Key:

- O0 – O1
  Relay outputs

## Function description

### Functions

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.

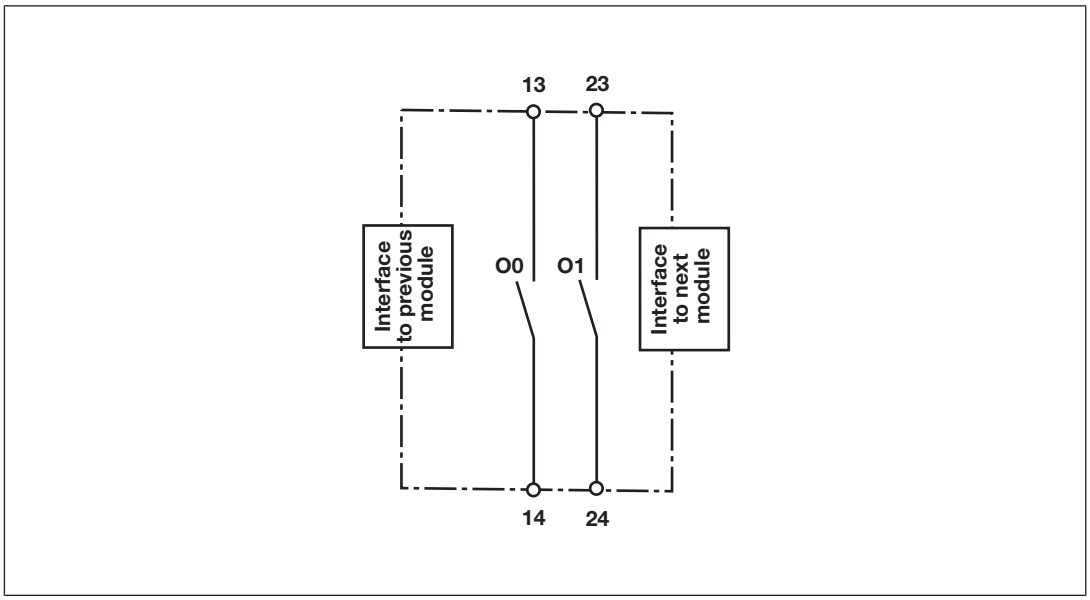
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

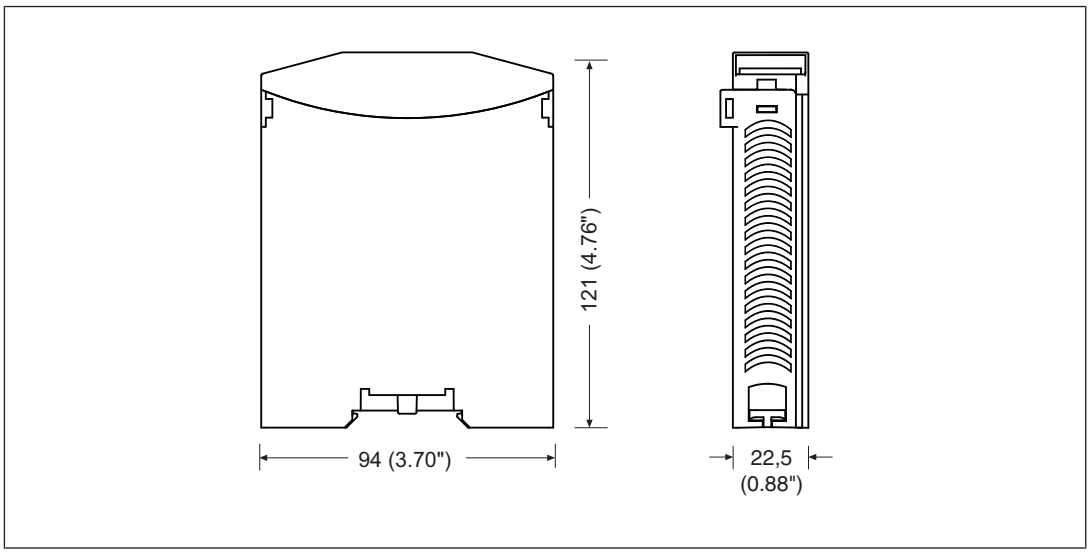
# Output modules
PNOZ mo2p

### Block diagram




## Installation

### Dimensions in mm



# Output modules
PNOZ mo2p

## Commissioning

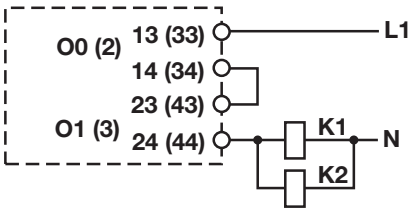
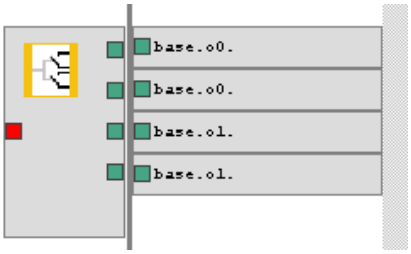
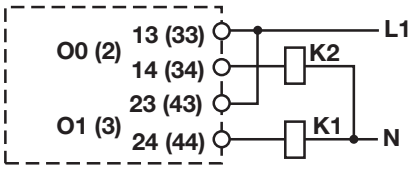
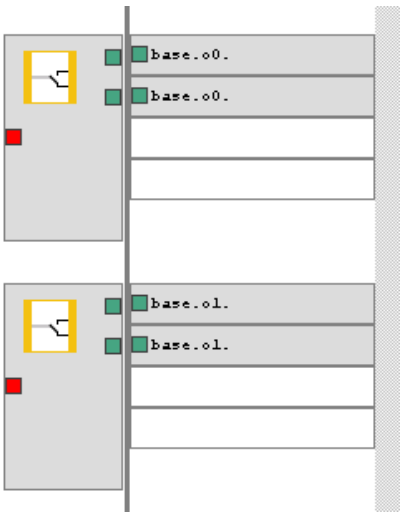
### General wiring guidelines

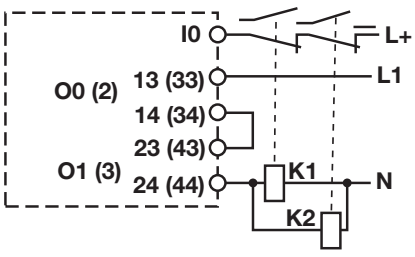
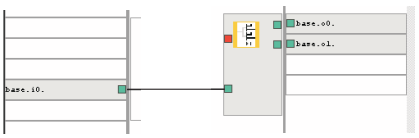
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Please note:

- Information given in the Technical details [191] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.

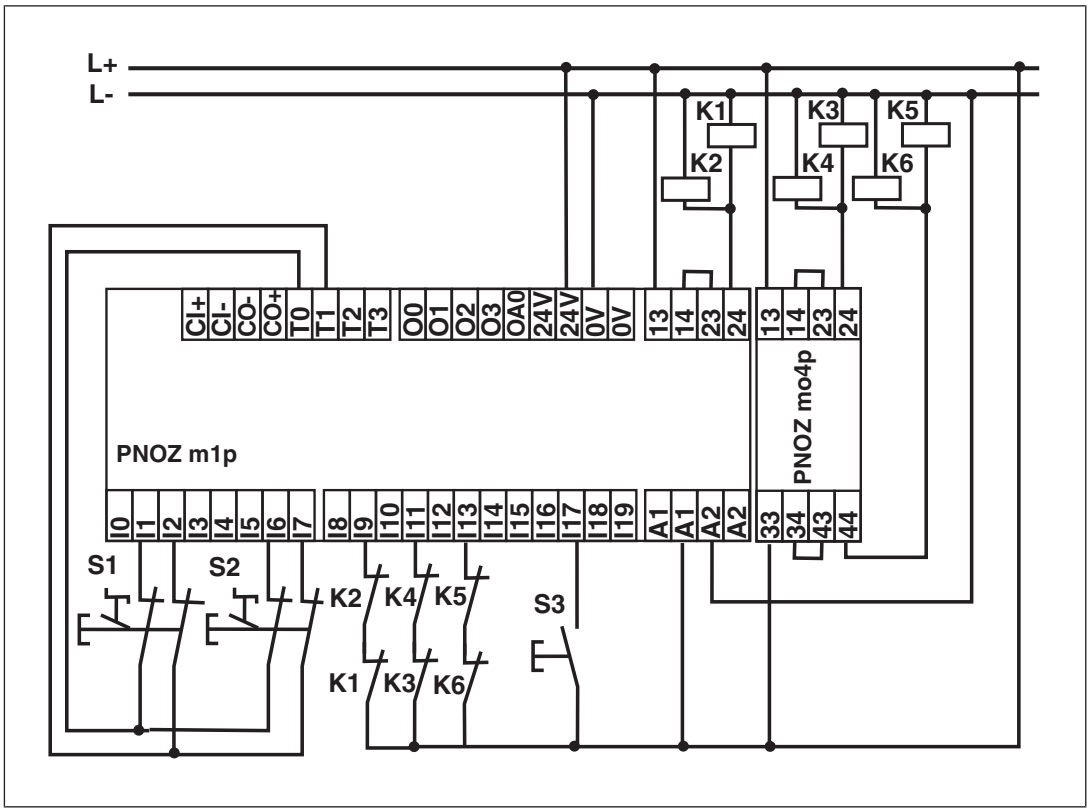
### Connection

| | | |
|---|---|---|
| Redundant |  |  |
| single |  |  |

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

# Output modules
PNOZ mo2p

### Connection example




## Technical details

| General | 773520 | 773525 |
|---|---|---|
| Approvals | BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed | BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed |
| **Electrical data** | **773520** | **773525** |
| Supply voltage | | |
| for | Module supply | Module supply |
| internal | Via base unit | Via base unit |
| Voltage | 5,0 V | 5,0 V |
| Kind | DC | DC |
| Voltage tolerance | -2 %/+2 % | -2 %/+2 % |
| Power consumption | 2,5 W | 2,5 W |
| Status indicator | LED | LED |
| **Relay outputs** | **773520** | **773525** |
| Utilisation category | | |
| In accordance with the standard | EN 60947-4-1 | EN 60947-4-1 |

# Output modules
PNOZ mo2p

| Relay outputs | 773520 | 773525 |
|---|---|---|
| Utilisation category of safety contacts | | |
| AC1 at | **240 V** | **240 V** |
| Min. current | **10,00 mA** | **10,00 mA** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **1440 VA** | **1440 VA** |
| DC1 at | **24 V** | **24 V** |
| Min. current | **10,00 mA** | **10,00 mA** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **144 W** | **144 W** |
| Safety contacts, AC1 at | – | **240 V** |
| Max. current | – | **4 A** |
| Max. power | – | **960 W** |
| Safety contacts, DC 1 at | – | **24 V** |
| Max. current | – | **4 A** |
| Max. power | – | **96 W** |
| Utilisation category | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Utilisation category of safety contacts | | |
| AC15 at | **230 V** | **230 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **690 W** | **690 W** |
| DC13 (6 cycles/min) at | **24 V** | **24 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **72 W** | **72 W** |
| Airgap creepage between | | |
| Relay contacts | **3 mm** | **3 mm** |
| Relay contacts and other circuits | **5,5 mm** | **5,5 mm** |
| External contact fuse protection, safety contacts | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Blow-out fuse, quick | **6 A** | **6 A** |
| Blow-out fuse, slow | **6,00 A** | **6,00 A** |
| Circuit breaker 24V AC/DC, characteristic B/C | **6 A** | **6 A** |
| Switch-off delay | **50 ms** | **50 ms** |
| Potential isolation | **yes** | **yes** |
| **Times** | **773520** | **773525** |
| Switch-on delay | **5,00 s** | **5,00 s** |

## Output modules
PNOZ mo2p

| Times | 773520 | 773525 |
|---|---|---|
| Supply interruption before de-energisation | **20 ms** | **20 ms** |
| **Environmental data** | **773520** | **773525** |
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **-25 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** | – |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Short-term (only with separated extra low voltage)** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **10,0 - 150,0 Hz** |
| Acceleration | **1g** | **1g** |
| Broadband noise | | |
| In accordance with the standard | – | **EN 60068-2-64** |
| Frequency | – | **5 - 500 Hz** |
| Acceleration | – | **1,9grms** |
| Corrosive gas check | | |
| SO2: Concentration 10 ppm, duration 10 days, passive | – | **DIN V 40046-36** |
| H2S: Concentration 1 ppm, duration 10 days, passive | – | **DIN V 40046-37** |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **250 V** | **250 V** |
| Rated impulse withstand voltage | **6,00 kV** | **6,00 kV** |

## Output modules
PNOZ mo2p

| Environmental data | 773520 | 773525 |
|---|---|---|
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Potential isolation** | **773520** | **773525** |
| Potential isolation between | **Relay output and system voltage** | **Relay output and system voltage** |
| Type of potential isolation | **Protective separation** | **Protective separation** |
| Rated surge voltage | **6000 V** | **6000 V** |
| **Mechanical data** | **773520** | **773525** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals (relay outputs) | | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals (relay outputs) | **0,50 Nm** | **0,50 Nm** |
| Stripping length with screw terminals (relay outputs) | **8 mm** | **8 mm** |
| Conductor cross section with spring-loaded terminals (relay outputs) | | |
| 1 core flexible without crimp connector | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 1 core flexible with crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals (relay outputs) | **10 mm** | **10 mm** |

## Output modules
PNOZ mo2p

| Mechanical data | 773520 | 773525 |
|---|---|---|
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **22,5 mm** | **22,5 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **170 g** | **151 g** |

Where standards are undated, the 2009-01 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 1-channel | **PL c** | **Cat. 1** | **-** | **2,90E-08** | **-** | **2,60E-03** | **20** |
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **3,00E-10** | **SIL 3** | **5,20E-07** | **20** |

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

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

# Output modules
PNOZ mo2p

## Supplementary data

### Service life graph for the relay contacts

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.

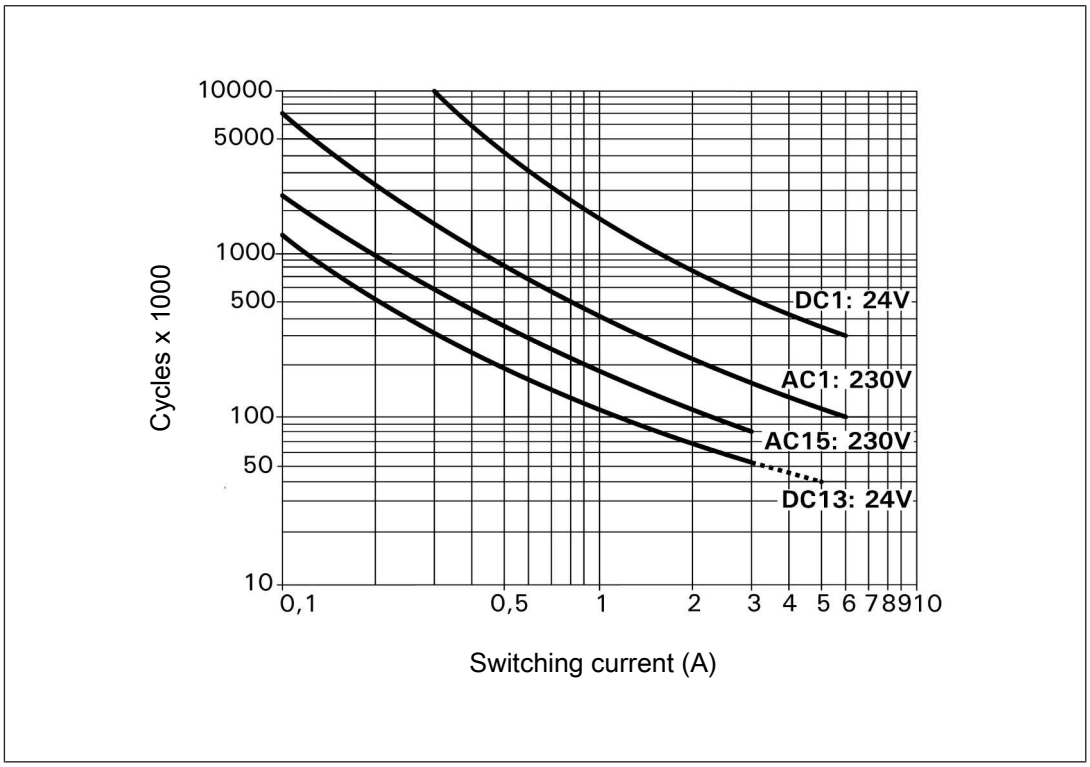



Fig.: Service life graphs at 24 VDC and 230 VAC

## Output modules
PNOZ mo2p

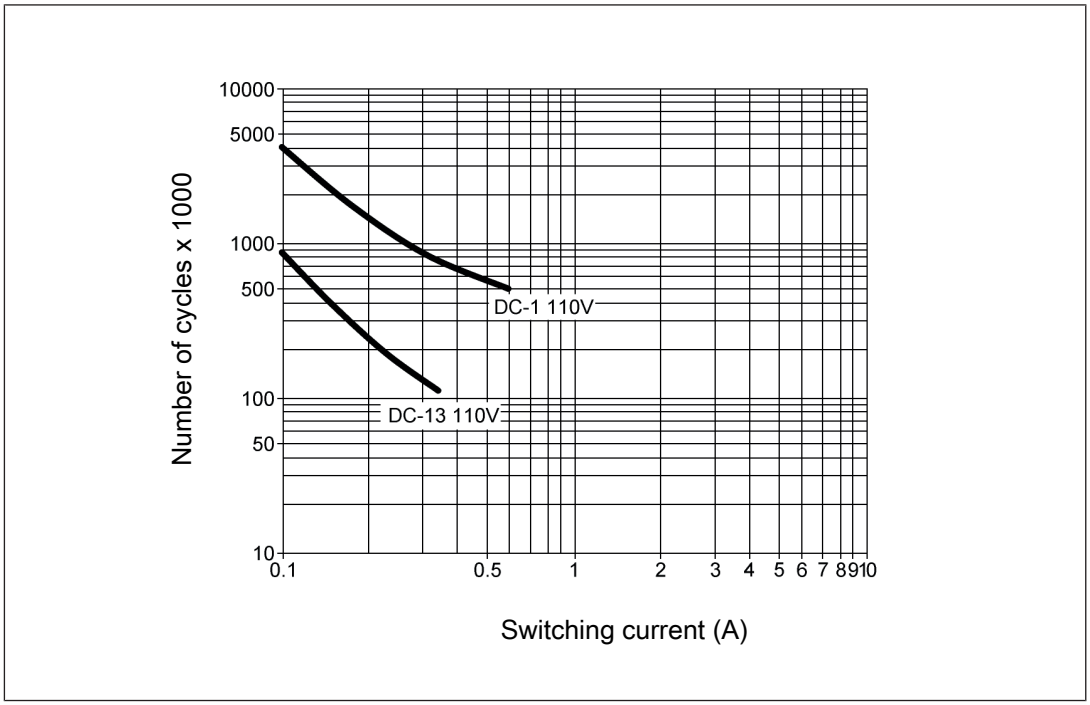



Fig.: Service life graphs at 110 VDC

**Example**

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see Technical details [📖 191]) can be used in the calculation.

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

We recommend you use semiconductor outputs to switch 24 VDC loads.

# Output modules
PNOZ mo2p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mo2p | Expansion module, 1 or 2 relay outputs, positive-guided | 773 520 |
| PNOZ mo2p coated version | Expansion module, 1 or 2 relay outputs, positive-guided, coated version | 773 525 |

### Accessories

#### Terminator, jumper

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

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 520 |
| Set screw terminals | 1 set of screw terminals | 793 520 |

# Output modules
PNOZ mo3p

## Overview

### Unit features

Using the product PNOZ mo3p:

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

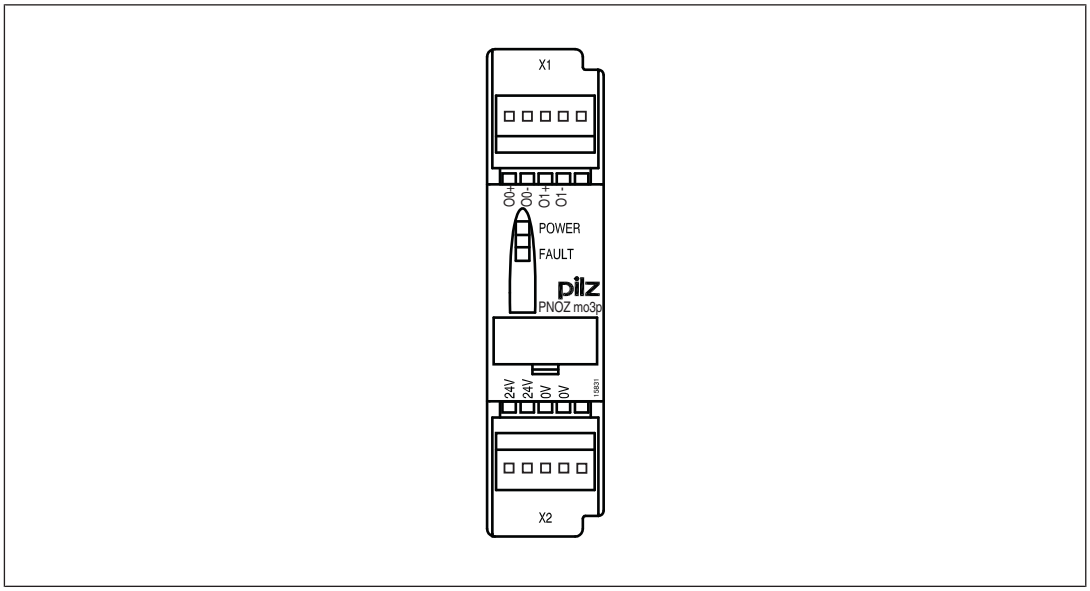
The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:

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

# Output modules
PNOZ mo3p

### Front view




Legend:

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

## Function description

### Functions

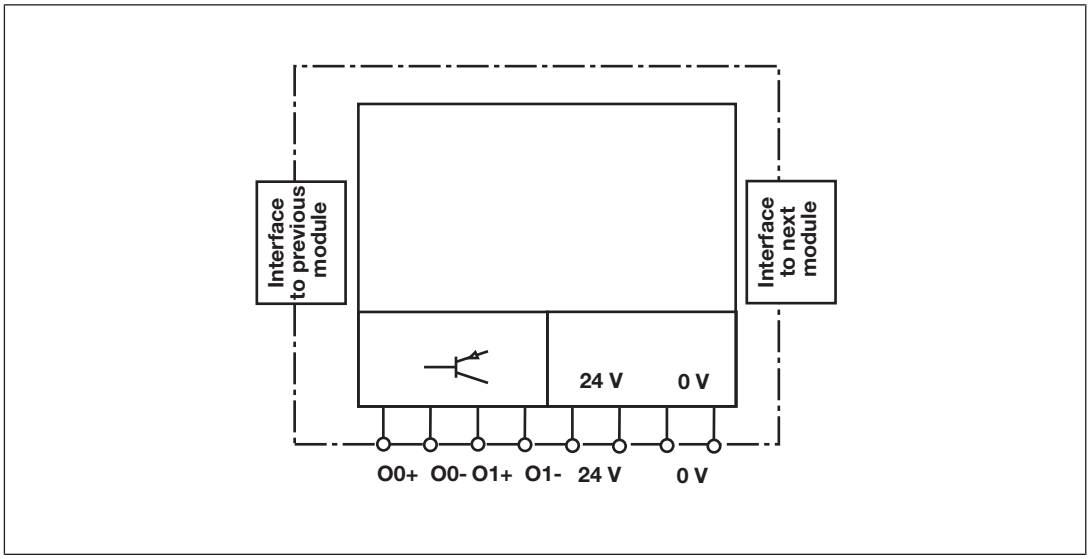
The expansion module provides additional semiconductor outputs.

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

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

# Output modules
PNOZ mo3p

### Block diagram

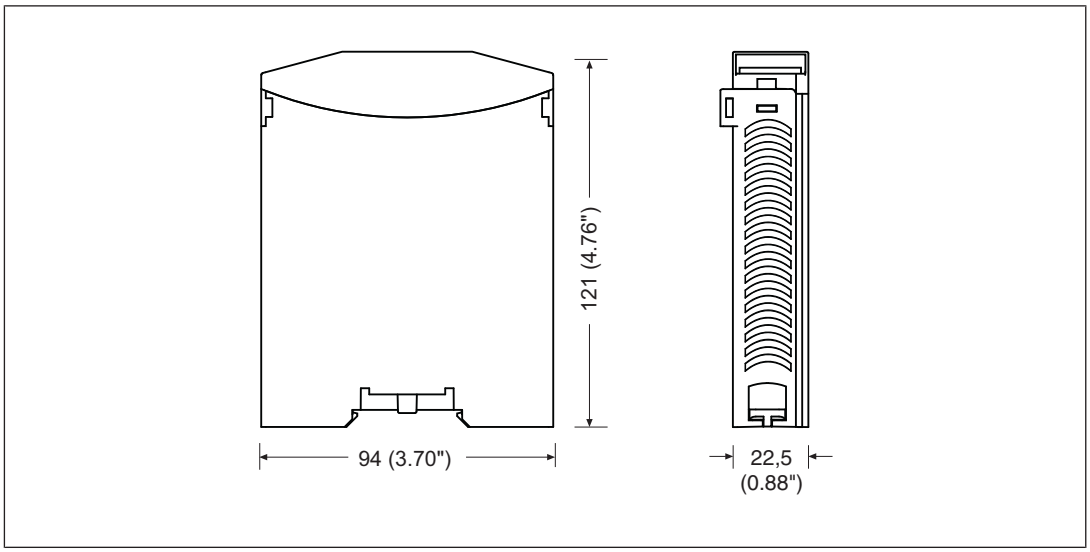



### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

## Installation

### Dimensions in mm



# Output modules
PNOZ mo3p

## Commissioning

### General wiring guidelines

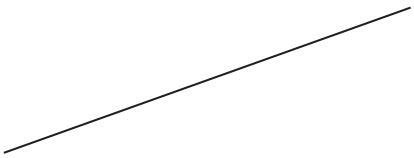
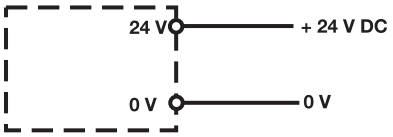
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Please note:

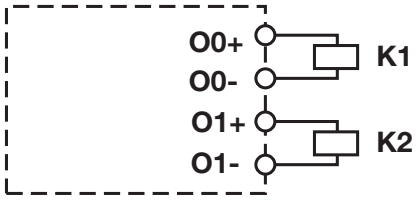
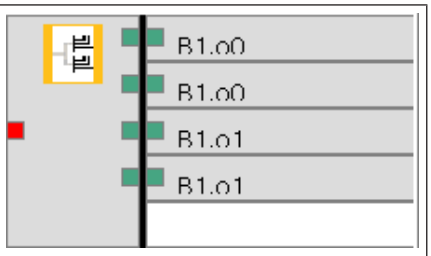
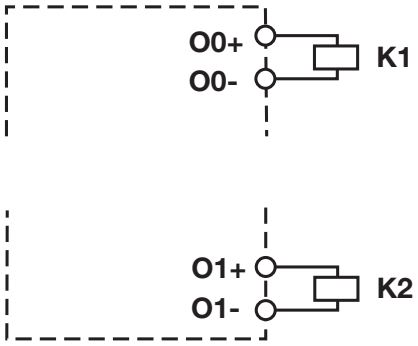
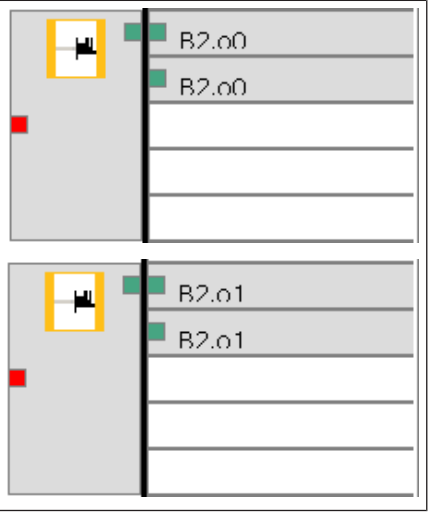
- Information given in the Technical details [📖 204] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. When the supply voltage is looped, the current at each terminal may not exceed 3 A.
- Please note: The supply voltage always must be present at X2, even if you do not use the semiconductor outputs.

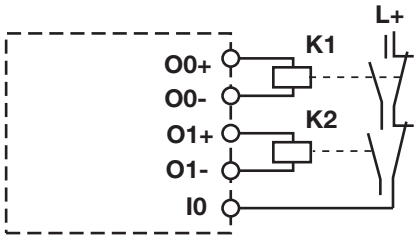
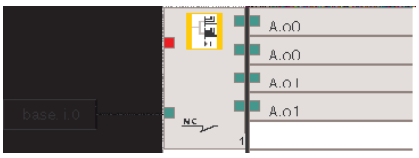
The unit has 2 dual-pole semiconductor outputs. These may be configured as single-pole or redundant outputs. The output assignment is defined in the PNOZmulti Configurator. Wire the output circuit as described in the table.

### Connection

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

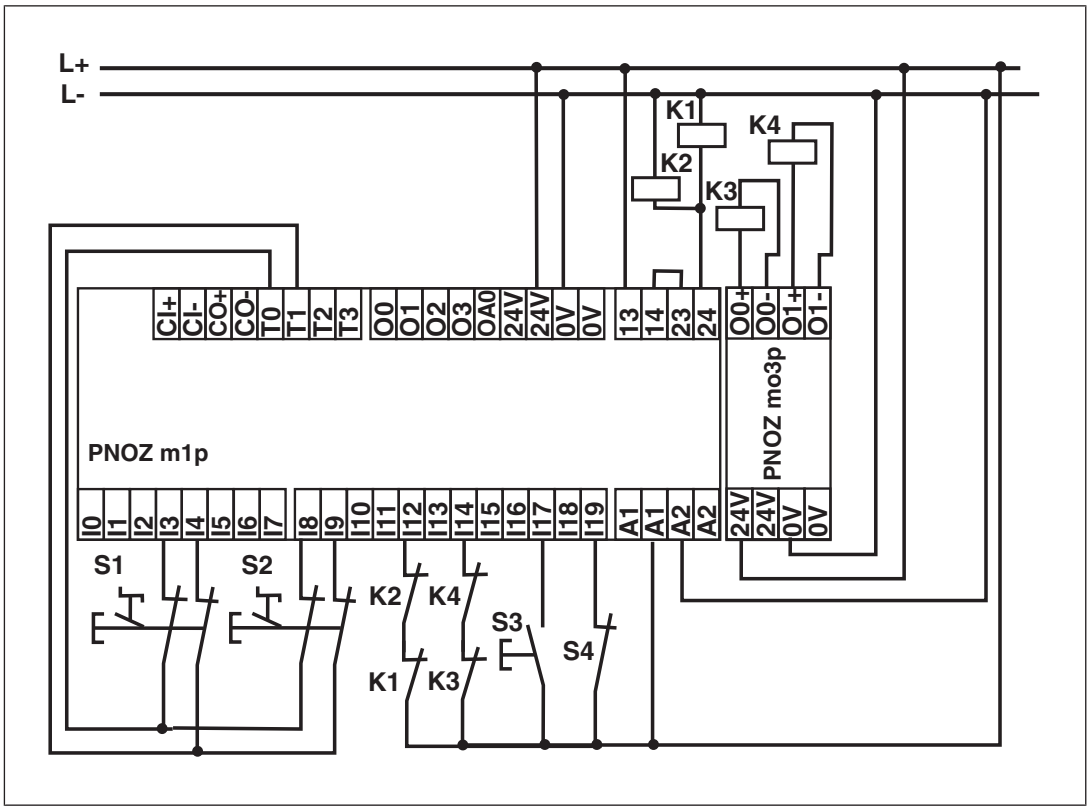
## Output modules
PNOZ mo3p

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

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

# Output modules
PNOZ mo3p

### Connection example




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cU-Lus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Supply to the SC outputs** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **96,0 W** |
| Residual ripple DC | **5 %** |
| Potential isolation | **yes** |

# Output modules
## PNOZ mo3p

| | |
|---|---|
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **2,5 W** |
| Status indicator | **LED** |
| **Semiconductor outputs, 2-pole** | |
| Number | **2** |
| Switching capability | |
| Voltage | **24 V DC** |
| Current | **2 A** |
| Power | **48 W** |
| Residual current at "0" | **0,5 mA** |
| Signal level at "1" | **2 A: UB - 0,5 V DC** |
| Switch-off delay | **30 ms** |
| Open circuit detection off | **3,00 kOhm** |
| Galvanic isolation | **yes** |
| Short circuit-proof | **yes** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |

# Output modules
PNOZ mo3p

| | |
|---|---|
| **Environmental data** | |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **SC output and system voltage** |
| Type of potential isolation | **Protective separation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals | **9 mm** |

# Output modules
PNOZ mo3p

| Mechanical data | |
|---|---|
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **121,0 mm** |
| Weight | **127 g** |

Where standards are undated, the 2008-03 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **1,74E-09** | **SIL 3** | **2,48E-05** | **20** |

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

## Order reference

### Product

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

### Accessories

#### Connection terminals

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

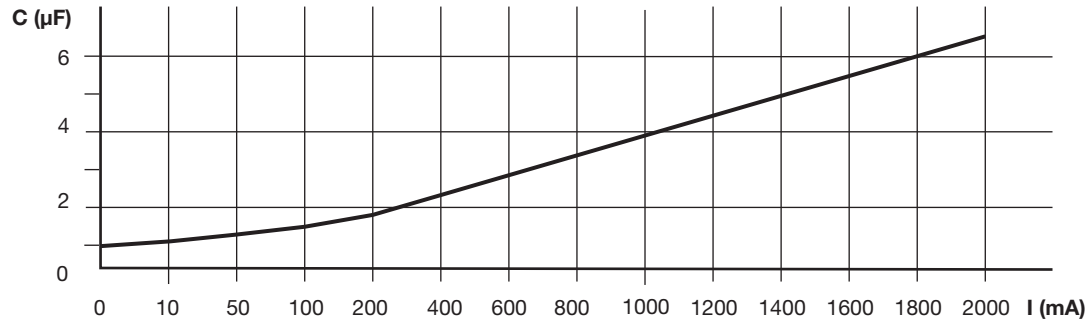
#### Terminator, jumper

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

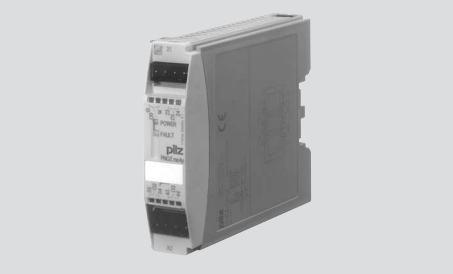
# Output modules
PNOZ mo3p

## Supplementary data

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



# Output modules
PNOZ mo4p



## Overview

### Unit features

Using the product PNOZ mo4p:

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

The product has the following features:

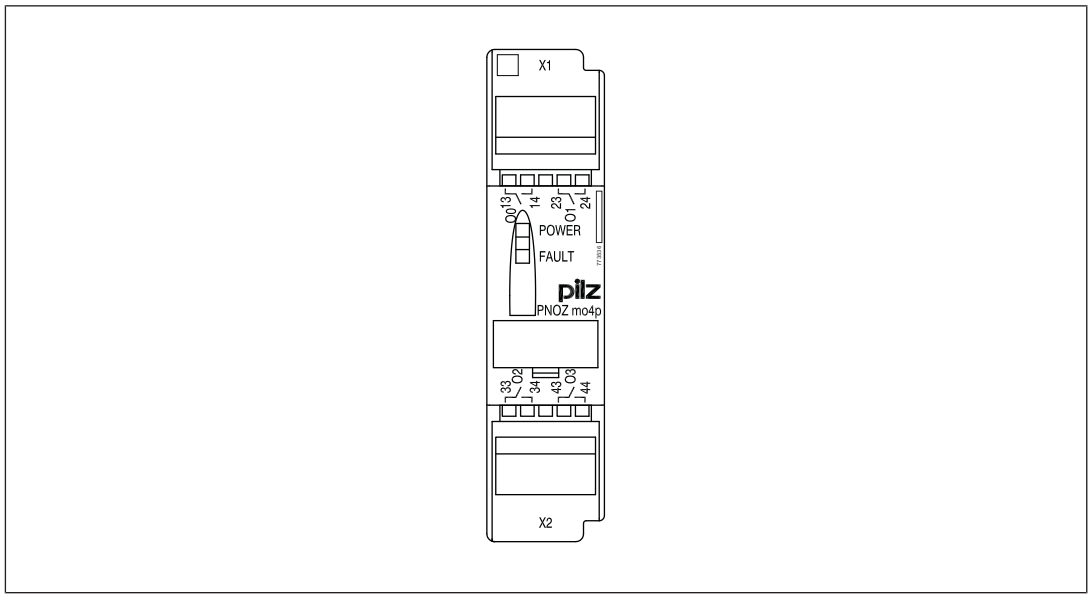
- Positive-guided relay outputs:

  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- Can be configured in the PNOZmulti Configurator
- Status indicators
- Max. 6 PNOZ mo4p units can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Coated version:

  Increased environmental requirements (see Technical details [213])

# Output modules
PNOZ mo4p

### Front view




Legend:

- O0 – O3
  Relay outputs

## Function description

### Functions

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.

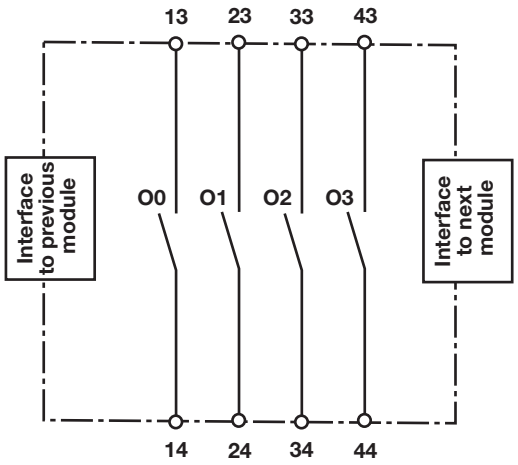
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

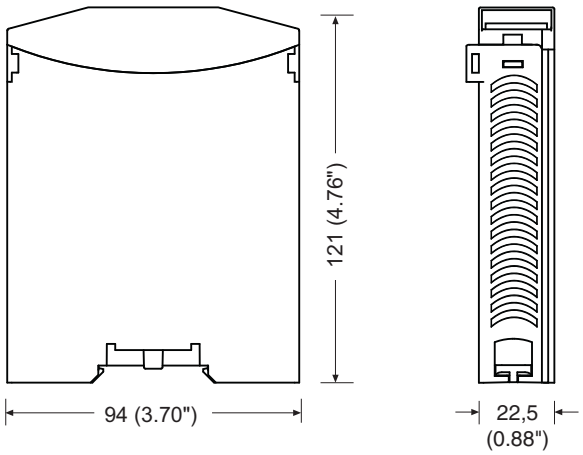
# Output modules
PNOZ mo4p

### Block diagram




## Installation

### Dimensions in mm



# Output modules
PNOZ mo4p

## Commissioning

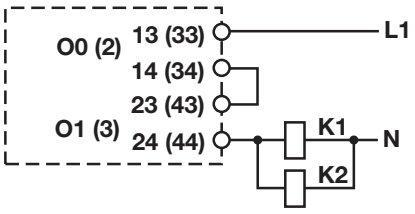
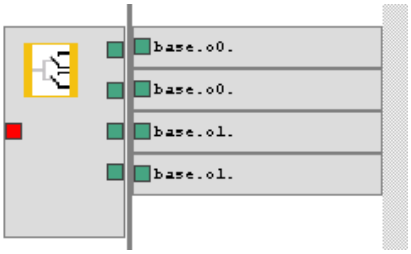
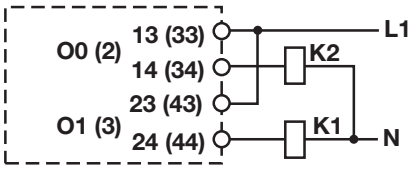
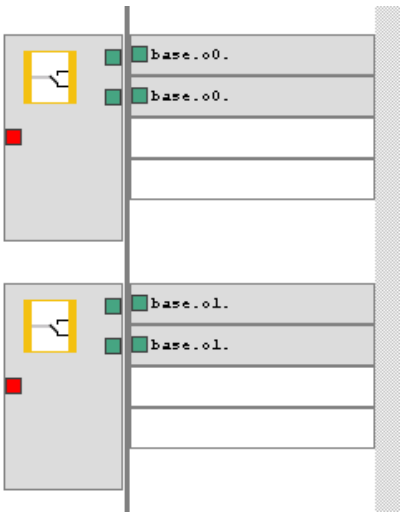
### General wiring guidelines

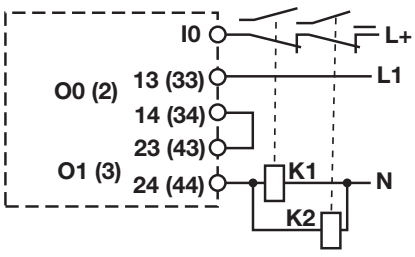
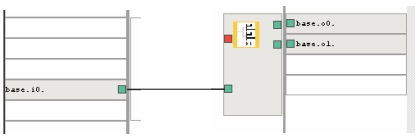
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Please note:

- Information given in the Technical details [213] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.

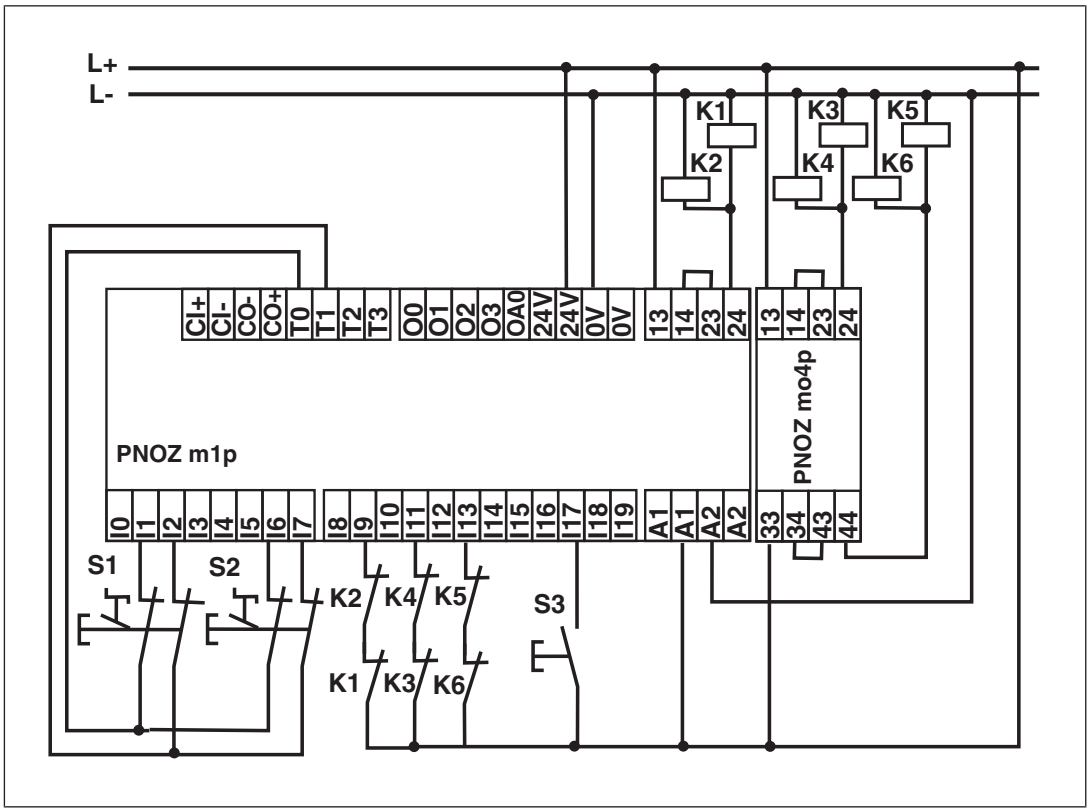
### Connection

| | | |
|---|---|---|
| Redundant |  |  |
| single |  |  |

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

# Output modules
PNOZ mo4p

### Connection example




## Technical details

| General | 773536 | 773537 |
|---|---|---|
| Approvals | BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed | BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed |
| **Electrical data** | **773536** | **773537** |
| Supply voltage | | |
| for | Module supply | Module supply |
| internal | Via base unit | Via base unit |
| Voltage | 5,0 V | 5,0 V |
| Kind | DC | DC |
| Voltage tolerance | -2 %/+2 % | -2 %/+2 % |
| Power consumption | 2,5 W | 2,5 W |
| Status indicator | LED | LED |
| **Relay outputs** | **773536** | **773537** |
| Utilisation category | | |
| In accordance with the standard | EN 60947-4-1 | EN 60947-4-1 |

# Output modules
PNOZ mo4p

| Relay outputs | 773536 | 773537 |
|---|---|---|
| Utilisation category of safety contacts | | |
| AC1 at | **240 V** | **240 V** |
| Min. current | **10,00 mA** | **10,00 mA** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **1440 VA** | **1440 VA** |
| DC1 at | **24 V** | **24 V** |
| Min. current | **10,00 mA** | **10,00 mA** |
| Max. current | **6,0 A** | **6,0 A** |
| Max. power | **144 W** | **144 W** |
| Safety contacts, AC1 at | – | **240 V** |
| Max. current | – | **2 A** |
| Max. power | – | **480 W** |
| Safety contacts, DC 1 at | – | **24 V** |
| Max. current | – | **2 A** |
| Max. power | – | **48 W** |
| Utilisation category | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Utilisation category of safety contacts | | |
| AC15 at | **230 V** | **230 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **690 W** | **690 W** |
| DC13 (6 cycles/min) at | **24 V** | **24 V** |
| Max. current | **3,0 A** | **3,0 A** |
| Max. power | **72 W** | **72 W** |
| AC15 at | – | **230 V** |
| Max. current | – | **2 A** |
| Max. power | – | **460 W** |
| DC13 (6 cycles/min) at | – | **24 V** |
| Max. current | – | **2 A** |
| Max. power | – | **48 W** |
| Max. permitted total current of relay outputs at an ambient temperature of > 50 °C | **12 A** | – |
| Airgap creepage between | | |
| Relay contacts | **3 mm** | **3 mm** |
| Relay contacts and other circuits | **5,5 mm** | **5,5 mm** |

# Output modules
PNOZ mo4p

| Relay outputs | 773536 | 773537 |
|---|---|---|
| External contact fuse protection, safety contacts | | |
| In accordance with the standard | **EN 60947-5-1** | **EN 60947-5-1** |
| Blow-out fuse, quick | **6 A** | **6 A** |
| Blow-out fuse, slow | **6,00 A** | **6,00 A** |
| Circuit breaker 24V AC/DC, characteristic B/C | **6 A** | **6 A** |
| Switch-off delay | **50 ms** | **50 ms** |
| Conventional thermal current | **12,0 A** | **12,0 A** |
| **Times** | **773536** | **773537** |
| Switch-on delay | **5,00 s** | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |
| **Environmental data** | **773536** | **773537** |
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **-25 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** | – |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Short-term (only with separated extra low voltage)** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **5,0 - 500,0 Hz** |
| Acceleration | **1g** | **1g** |
| Broadband noise | | |
| In accordance with the standard | – | **EN 60068-2-64** |
| Frequency | – | **5 - 500 Hz** |
| Acceleration | – | **1,9grms** |
| Corrosive gas check | | |
| SO2: Concentration 10 ppm, duration 10 days, passive | – | **DIN V 40046-36** |
| H2S: Concentration 1 ppm, duration 10 days, passive | – | **DIN V 40046-37** |

# Output modules
PNOZ mo4p

| Environmental data | 773536 | 773537 |
|---|---|---|
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **250 V** | **250 V** |
| Rated impulse withstand voltage | **6,00 kV** | **6,00 kV** |
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Mechanical data** | **773536** | **773537** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals (relay outputs) | | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals (relay outputs) | **0,50 Nm** | **0,50 Nm** |
| Stripping length with screw terminals (relay outputs) | **8 mm** | **8 mm** |

# Output modules
PNOZ mo4p

| Mechanical data | 773536 | 773537 |
|---|---|---|
| Conductor cross section with spring-loaded terminals (relay outputs) | | |
| 1 core flexible without crimp connector | **0,25 - 2,50 mm², 24 - 12 AWG** | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 1 core flexible with crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals (relay outputs) | **10 mm** | **10 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **22,5 mm** | **22,5 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **204 g** | **204 g** |

Where standards are undated, the 2009-01 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 1-channel | **PL c** | **Cat. 1** | **-** | **2,90E-08** | **-** | **2,60E-03** | **20** |
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **3,00E-10** | **SIL 3** | **5,20E-07** | **20** |

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

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

# Output modules
PNOZ mo4p

## Supplementary data

### Service life graph for the relay contacts

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.

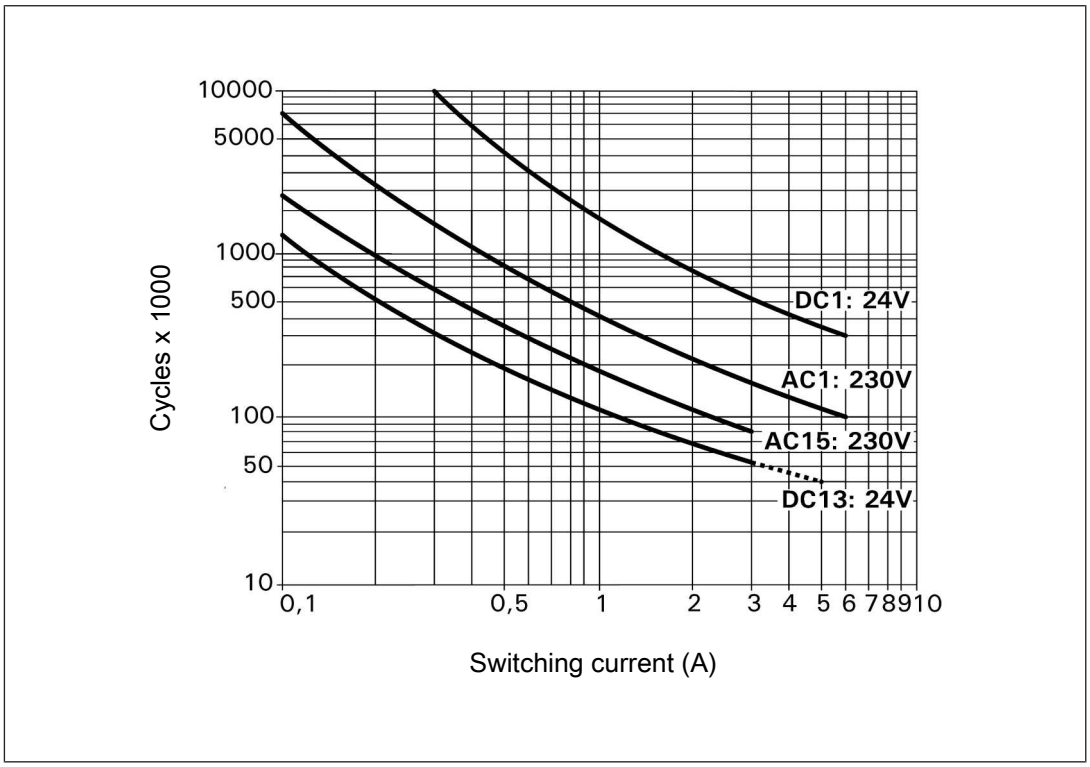



Fig.: Service life graphs at 24 VDC and 230 VAC

## Output modules
PNOZ mo4p

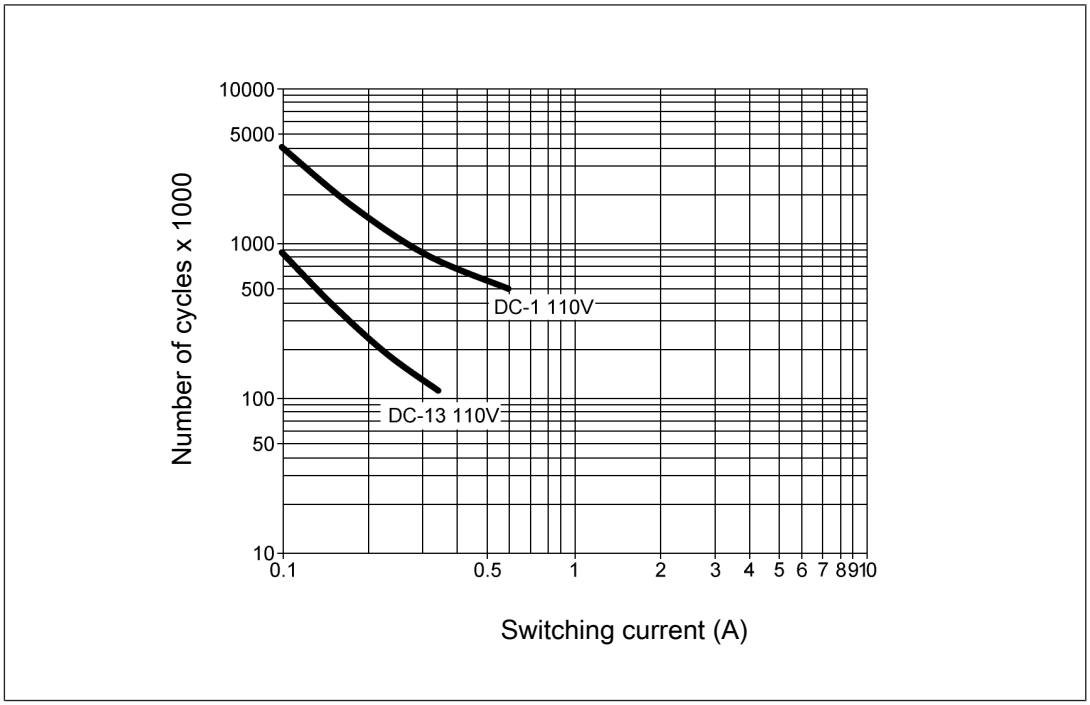



Fig.: Service life graphs at 110 VDC

**Example**

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see Technical details [📖 213]) can be used in the calculation.

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

We recommend you use semiconductor outputs to switch 24 VDC loads.

# Output modules
PNOZ mo4p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mo4p | Expansion module, 2 or 4 relay outputs, positive-guided | 773 536 |
| PNOZ mo4p coated version | Expansion module, 2 or 4 relay outputs, positive-guided, coated version | 773 537 |

### Accessories

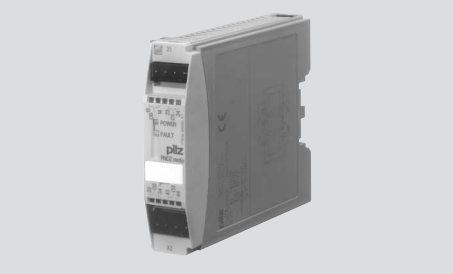
#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 536 |
| Set screw terminals | 1 set of screw terminals | 793 536 |

#### Terminator, jumper

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

# Output modules
PNOZ mo5p



## Overview

### Unit features

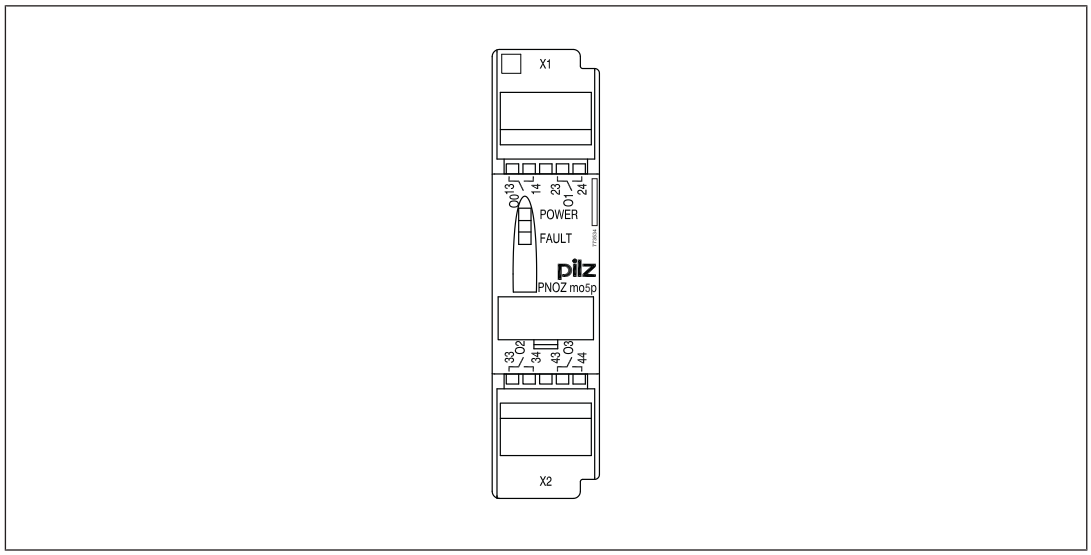
The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs, diverse:

  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- Suitable for controlling the safety valves on a burner in accordance with EN 50156
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 8 expansion modules and one fieldbus module can be connected to a base unit. A max. 6 of these may be the expansion modules PNOZ mo5p, PNOZ mo4p, PNOZ mo2p and PNOZ mo1p.

# Output modules
PNOZ mo5p

### Front view




Key:

- O0 – O3
  Relay outputs

## Function description

### Integrated protection mechanisms

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 protective separation through increased insulation compared with all other circuits in the safety system.
- A defective relay contact will be detected during switching.
- The relays are diverse in design.

### Operation

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.

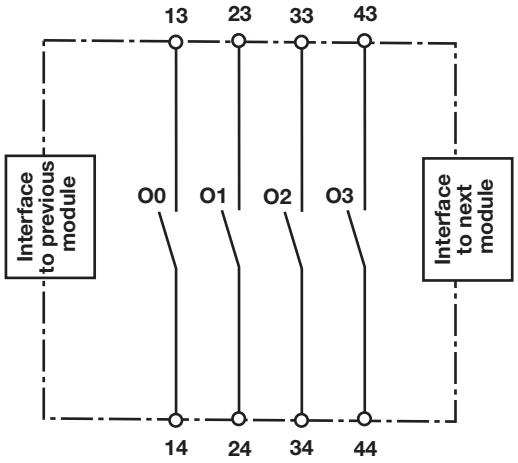
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

# Output modules
PNOZ mo5p

### System reaction time

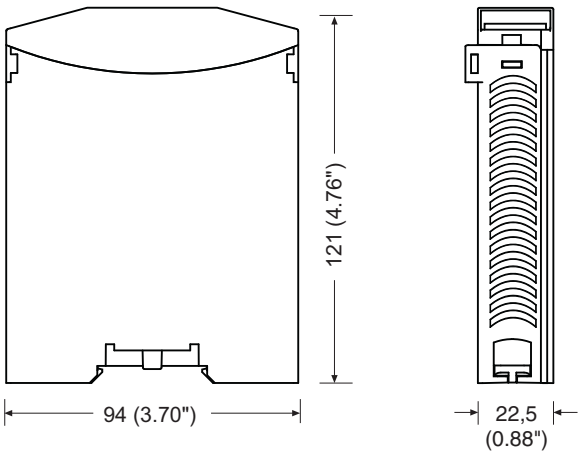
Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

### Block diagram




## Installation

### Dimensions in mm



# Output modules
PNOZ mo5p

## Commissioning

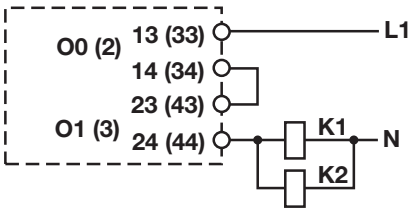
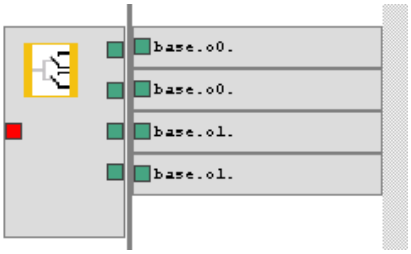
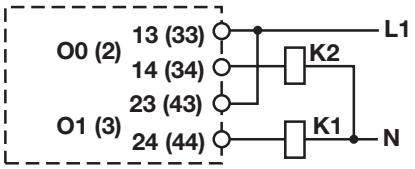
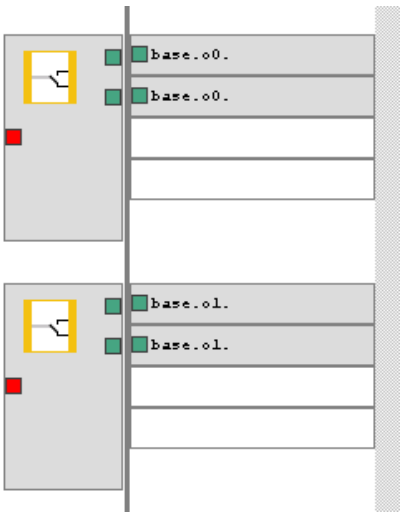
### General wiring guidelines

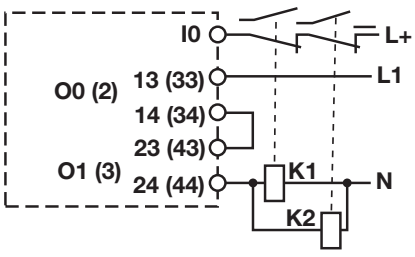
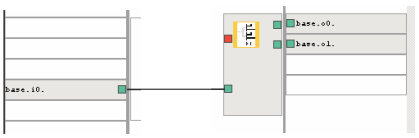
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Please note:

- Information given in the Technical details [226] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.

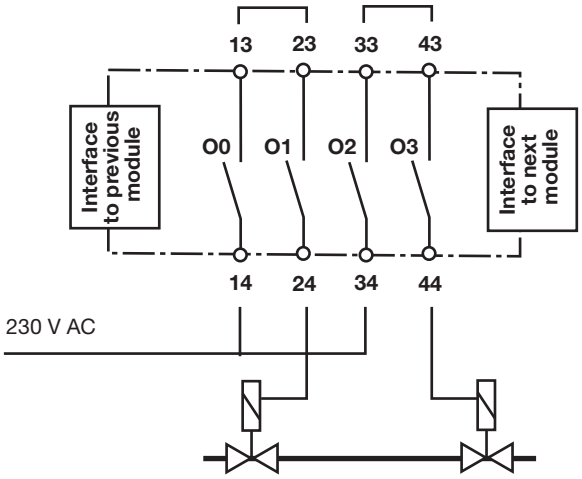
### Connection

| | | |
|---|---|---|
| Redundant |  |  |
| single |  |  |

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

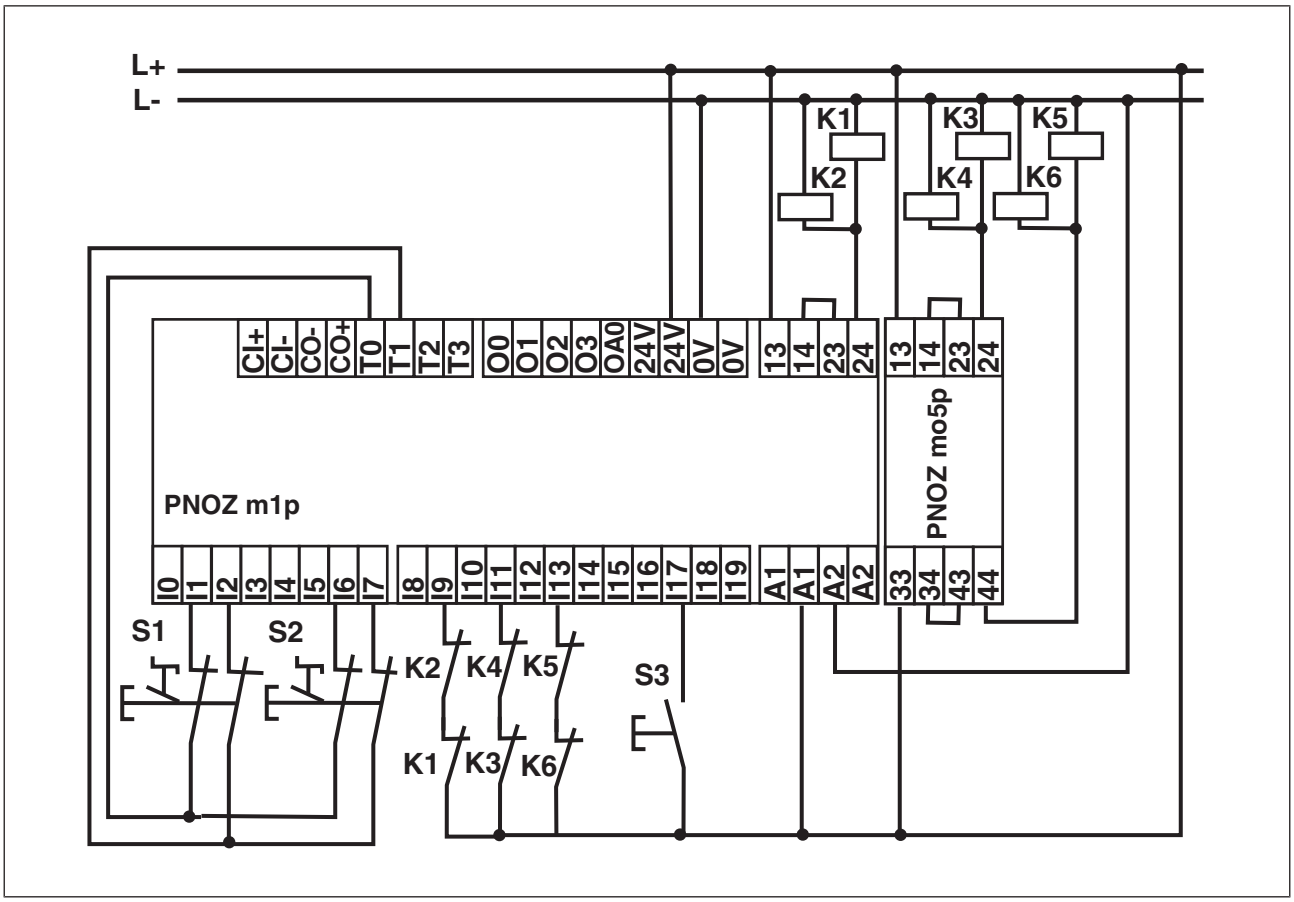
## Output modules
PNOZ mo5p

Connecting the safety valves on a burner in accordance with EN 50156



## Output modules
PNOZ mo5p

### Connection example




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **3,5 W** |
| Status indicator | **LED** |
| **Relay outputs** | |
| Utilisation category | |
| In accordance with the standard | **EN 60947-4-1** |

# Output modules
PNOZ mo5p

| | |
|---|---|
| **Relay outputs** | |
| Utilisation category of safety contacts | |
| AC1 at | **240 V** |
| Min. current | **10,00 mA** |
| Max. current | **1,5 A** |
| Max. power | **360 VA** |
| DC1 at | **24 V** |
| Min. current | **10,00 mA** |
| Max. current | **6,0 A** |
| Max. power | **144 W** |
| Utilisation category | |
| In accordance with the standard | **EN 60947-5-1** |
| Utilisation category of safety contacts | |
| AC15 at | **230 V** |
| Max. current | **0,6 A** |
| Max. power | **138 W** |
| DC13 (6 cycles/min) at | **24 V** |
| Max. current | **0,4 A** |
| Max. power | **9 W** |
| Airgap creepage between | |
| Relay contacts | **3 mm** |
| Relay contacts and other circuits | **5,5 mm** |
| External contact fuse protection, safety contacts | |
| In accordance with the standard | **EN 60947-5-1** |
| Blow-out fuse, quick | **6 A** |
| Blow-out fuse, slow | **6,00 A** |
| Circuit breaker 24V AC/DC, characteristic B/C | **6 A** |
| Switch-off delay | **50 ms** |
| Conventional thermal current | **12,0 A** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |

# Output modules
PNOZ mo5p

| | |
|---|---|
| **Environmental data** | |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **250 V** |
| Rated impulse withstand voltage | **6,00 kV** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals (relay outputs) | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals (relay outputs) | **0,50 Nm** |
| Stripping length with screw terminals (relay outputs) | **8 mm** |

## Output modules
PNOZ mo5p

| Mechanical data | |
|---|---|
| Conductor cross section with spring-loaded terminals (relay outputs) | |
| 1 core flexible without crimp connector | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 1 core flexible with crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals (relay outputs) | **10 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **121,0 mm** |
| Weight | **198 g** |

Where standards are undated, the 2009-01 latest editions shall apply.

# Output modules
PNOZ mo5p

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 1-channel | **PL c** | **Cat. 1** | **-** | **2,90E-08** | **-** | **2,60E-03** | **20** |
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **3,00E-10** | **SIL 3** | **5,20E-07** | **20** |

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

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

# Output modules
PNOZ mo5p

## Supplementary data

### Service life graph for the relay contacts

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.

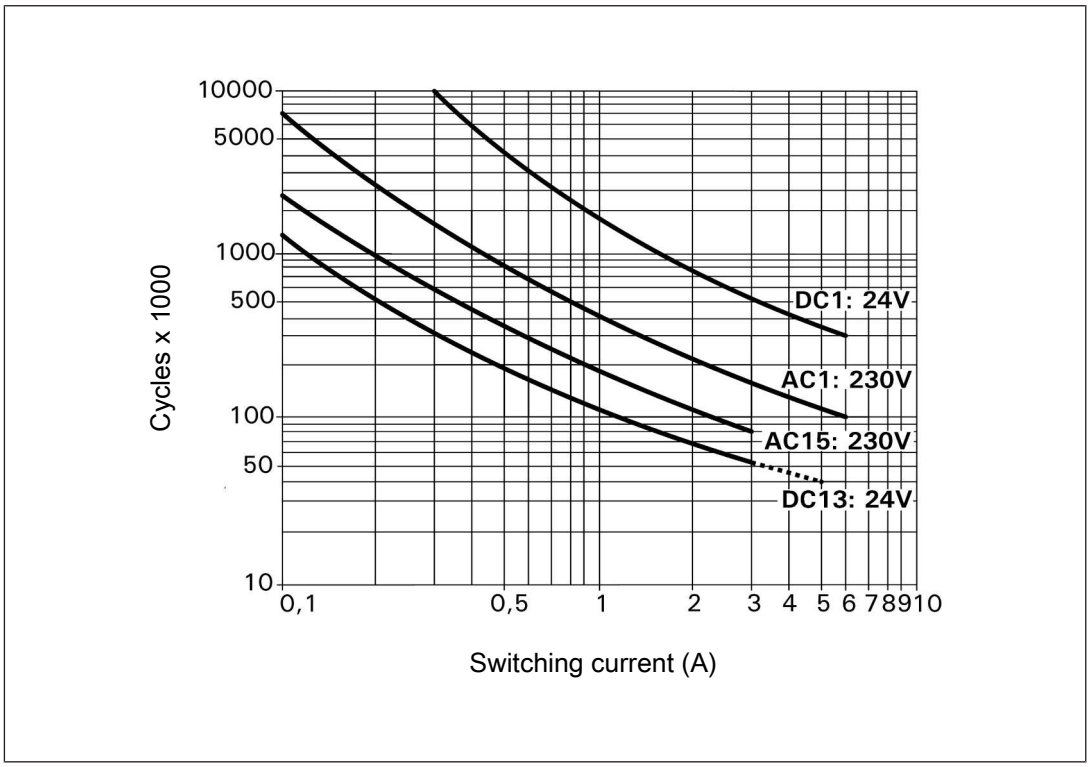



Fig.: Service life graphs at 24 VDC and 230 VAC

## Output modules
PNOZ mo5p

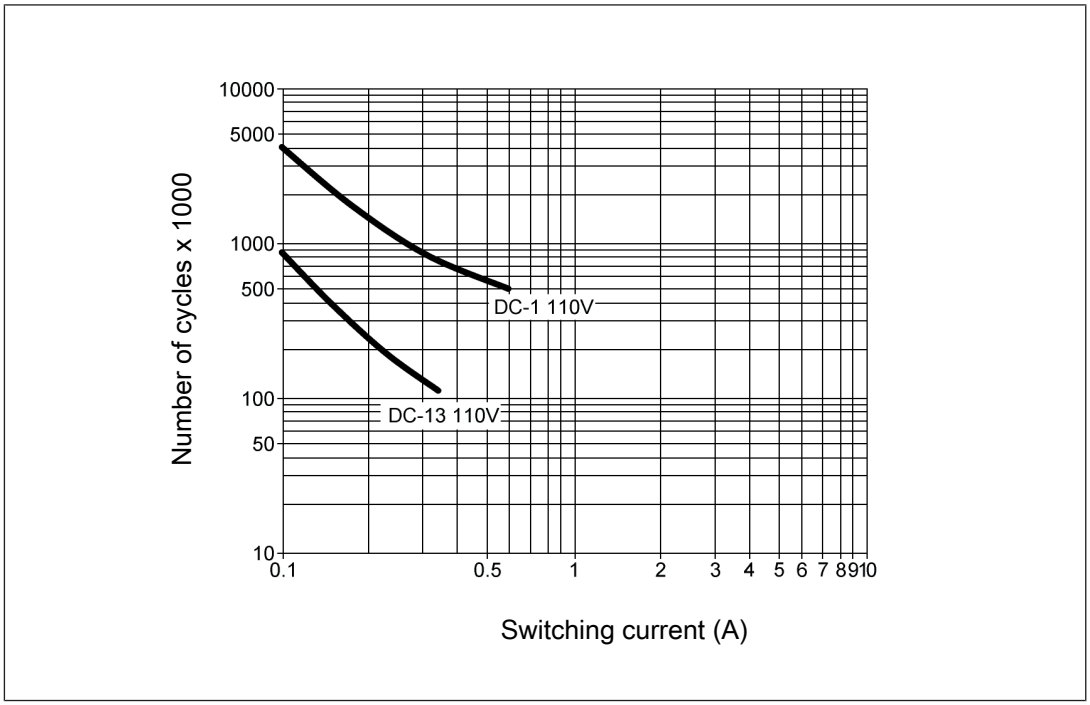



Fig.: Service life graphs at 110 VDC

**Example**

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 1 000 000 cycles

Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see Technical details [📖 226]) can be used in the calculation.

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

We recommend you use semiconductor outputs to switch 24 VDC loads.

# Output modules
PNOZ mo5p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mo5p | Expansion module, 2 or 4 relay outputs, positive-guided, diverse | 773 534 |

### Accessories

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 536 |
| Set screw terminals | 1 set of screw terminals | 793 536 |

#### Terminator, jumper

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

# Output modules
PNOZ mc1p

## Overview

### Unit features

Using the product PNOZ mc1p:

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

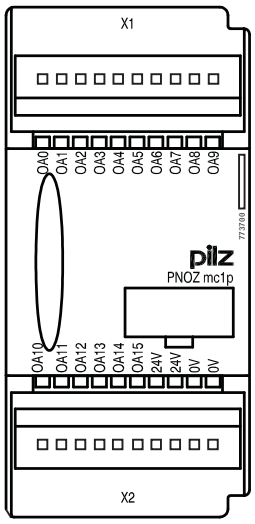
The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  - 16 auxiliary outputs
- Status indicators
- Coated version:

  Increased environmental requirements (see Technical details [📖 238])
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- For details of the base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Output modules
PNOZ mc1p

### Front view




## Function description

### Functions

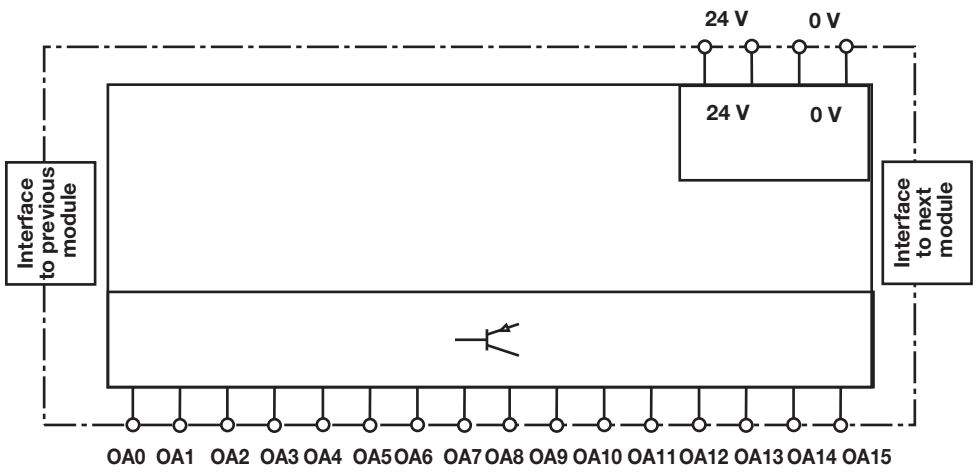
The expansion module operates as a signal module with non-safety-related outputs.

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.

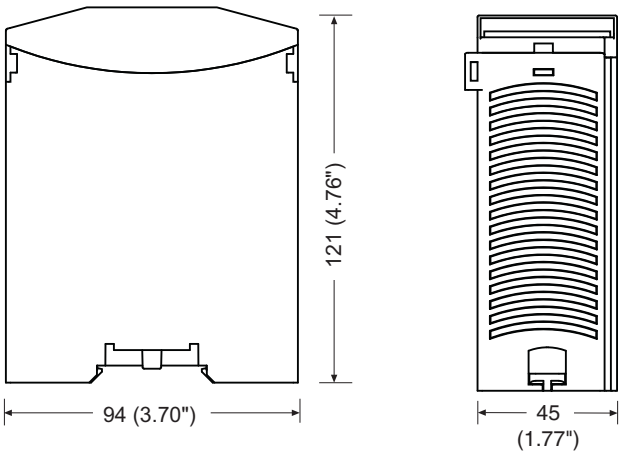
# Output modules
PNOZ mc1p

### Block diagram




## Installation

### Dimensions



# Output modules
PNOZ mc1p

## Commissioning

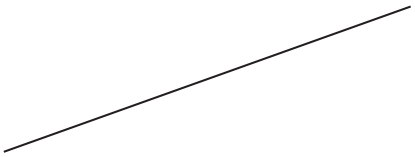
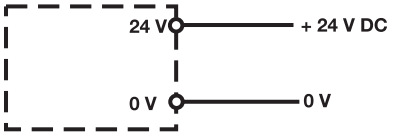
### General wiring guidelines

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

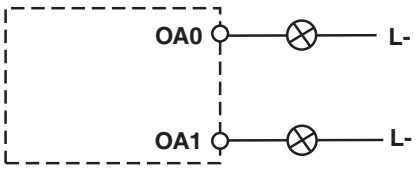
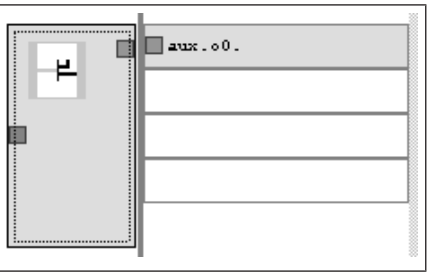
Please note:

- 2 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. The current at each terminal may not exceed 3 A.
- Outputs OA0 to OA15 are auxiliary outputs using semiconductor technology.
- Use copper wiring with a temperature stability of 75 °C.
- Information given in the Technical details [238] must be followed.

### Connection

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

Supply voltage

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

Semiconductor outputs

# Output modules
PNOZ mc1p

## Technical details

| General | 773700 | 773705 |
|---|---|---|
| Approvals | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed** | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed** |
| **Electrical data** | **773700** | **773705** |
| Supply voltage | | |
| for | **Supply to the SC outputs** | **Supply to the SC outputs** |
| Voltage | **24 V** | **24 V** |
| Kind | **DC** | **DC** |
| Voltage tolerance | **-15 %/+20 %** | **-15 %/+20 %** |
| Output of external power supply (DC) | **192,0 W** | **192,0 W** |
| Potential isolation | **yes** | **yes** |
| Supply voltage | | |
| for | **Module supply** | **Module supply** |
| internal | **Via base unit** | **Via base unit** |
| Voltage | **5,0 V** | **5,0 V** |
| Kind | **DC** | **DC** |
| Voltage tolerance | **-2 %/+2 %** | **-2 %/+2 %** |
| Power consumption | **0,6 W** | **0,6 W** |
| Status indicator | **LED** | **LED** |
| **Semiconductor outputs (standard)** | **773700** | **773705** |
| Number | **16** | **16** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **0,50 A** | **0,50 A** |
| Power | **12,0 W** | **12,0 W** |
| Max. permitted overall performance of semiconductor outputs at an ambient temperature of > 50 °C | – | **144 W** |
| Galvanic isolation | **yes** | **yes** |
| Short circuit-proof | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| Signal level at "1" | **UB - 0.5 VDC at 0.5 A** | **UB - 0.5 VDC at 0.5 A** |
| **Times** | **773700** | **773705** |
| Switch-on delay | **5,00 s** | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |

## Output modules
PNOZ mc1p

| Environmental data | 773700 | 773705 |
|---|---|---|
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **-25 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** | – |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Short-term** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **10,0 - 150,0 Hz** |
| Acceleration | **1g** | **1g** |
| Corrosive gas check | | |
| SO2: Concentration 10 ppm, duration 10 days, passive | – | **DIN V 40046-36** |
| H2S: Concentration 1 ppm, duration 10 days, passive | – | **DIN V 40046-37** |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** |
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Mechanical data** | **773700** | **773705** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |

## Output modules
PNOZ mc1p

| Mechanical data | 773700 | 773705 |
|---|---|---|
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **45,0 mm** | **45,0 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **164 g** | **166 g** |

Where standards are undated, the 2008-03 latest editions shall apply.

# Output modules
PNOZ mc1p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc1p | Expansion module, 16 semiconductor outputs, standard | 773 700 |
| PNOZ mc1p coated version | Expansion module, 16 semiconductor outputs, standard, coated version | 773 705 |

### Accessories

#### Terminator, jumper

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

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 700 |
| Set screw terminals | 1 set of screw terminals | 793 700 |

# Analogue input module
PNOZ ma1p

## Overview

### Unit features

Using the product PNOZ ma1p:

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

The product has the following features:

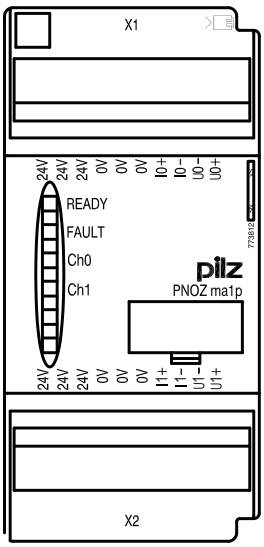
- 2 safe analogue inputs for current or voltage measurement
- Each input can be configured separately
- Voltage range: -10,24 ... +10.2375 V
- Current range: 0 ... 25.59 mA
- Resolution
  - Voltage measurement: 13 Bit (signed 12 Bit)
  - Current measurement: 12 Bit
- Range monitoring to monitor for wiring errors or errors in the sensor (4 range limits can be configured)
- Threshold value monitoring to monitor process variables (8 threshold values can be configured)
- Max. 4 PNOZ ma1p units can be connected to the base unit
- Exact analogue value can be passed to a fieldbus for diagnostic purposes
- LEDs for
  - Operating state
  - State of the input signals (Ch0, Ch1)
  - Error
- Coated version:

  Increased environmental requirements (see Technical details [📖 247])
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

# Analogue input module
PNOZ ma1p

- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

### Front view




Key:

- 0 V, 24 V:
  Supply connections
- I0+, I0-:
  Inputs for current measurement
- U0+, U0-
  Inputs for voltage measurement

## Function Description

### Functions

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.

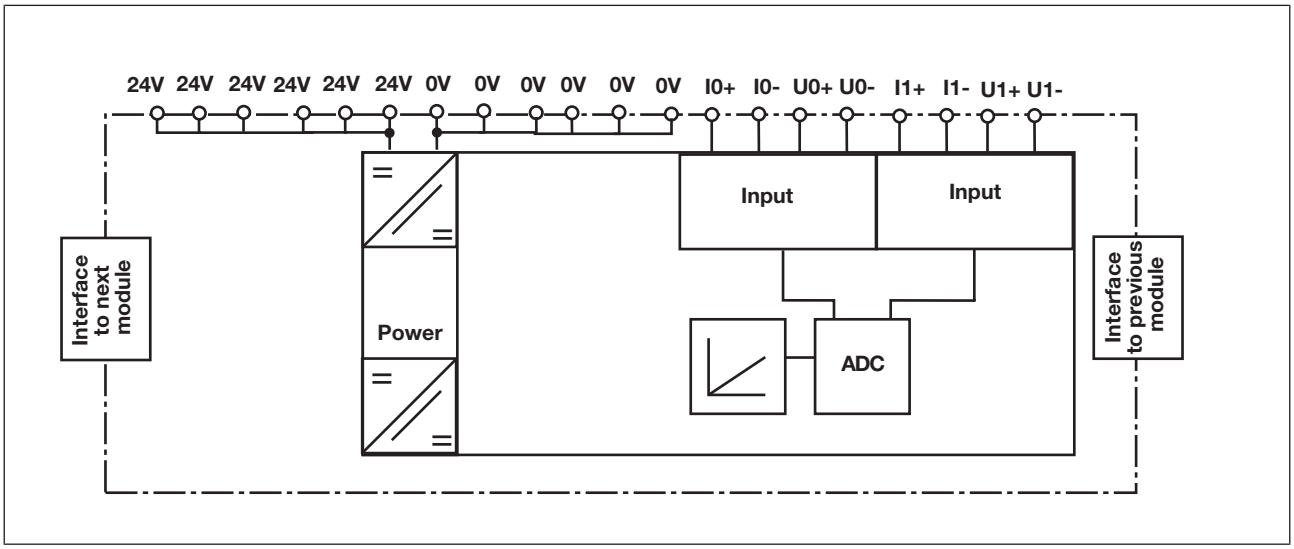
# Analogue input module
PNOZ ma1p

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 open circuit; I > 21 mA monitored for encoder 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 start" 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.

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.

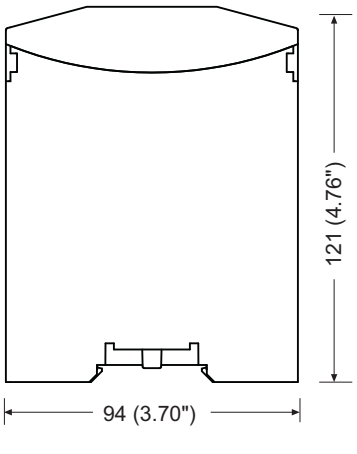
## Block diagram



# Analogue input module
PNOZ ma1p

## Installation

### Dimensions




## Commissioning

### Wiring

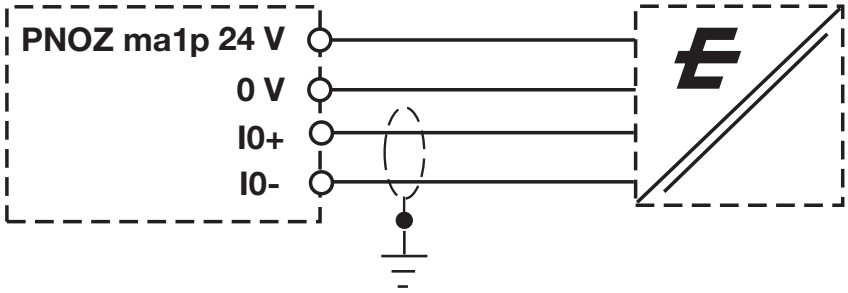
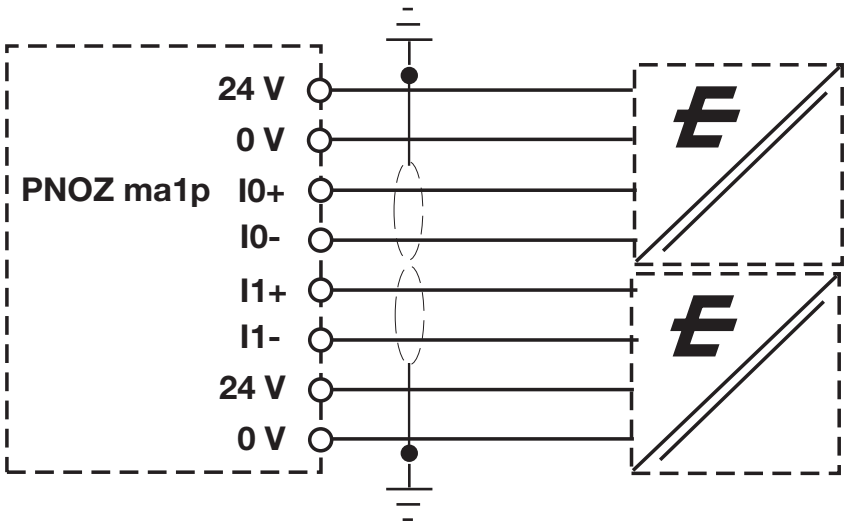
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Please note:

- Information given in the Technical details [247] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- The power supply that feeds the expansion module and the input devices must meet the regulations for extra low voltages with protective 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 encoder 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).

# Analogue input module
PNOZ ma1p

## Connection

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

Connection to transducer (SIL2 or SIL3)

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.

# Analogue input module
PNOZ ma1p

## Technical details

| General | 773812 | 773813 |
|---|---|---|
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| **Electrical data** | **773812** | **773813** |
| Supply voltage | | |
| for | **Module supply** | **Module supply** |
| Voltage | **24,0 V** | **24,0 V** |
| Kind | **DC** | **DC** |
| Voltage tolerance | **-15 %/+20 %** | **-15 %/+20 %** |
| Output of external power supply (DC) | **2,0 W** | **2,0 W** |
| Residual ripple DC | **5 %** | **5 %** |
| Status indicator | **LED** | **LED** |
| **Analogue inputs** | **773812** | **773813** |
| Number of analogue inputs | **2** | **2** |
| Type of analogue inputs | **Voltage, current** | **Voltage, current** |
| Input filter | **1st order, RC filter** | **1st order, RC filter** |
| Cutoff frequency | **80 Hz** | **80 Hz** |
| Current measurement | | |
| Signal range | **0,00 - 25,59 mA** | **0,00 - 25,59 mA** |
| Value range | **0 - 4095 d** | **0 - 4095 d** |
| Resolution | **12 Bit** | **12 Bit** |
| Value of least significant bit (LSB) | **6,25 µA** | **6,25 µA** |
| Input resistance | **100,000 Ohm** | **100,000 Ohm** |
| Max. continuous current | **50 mA** | **50 mA** |
| Voltage measurement | | |
| Signal range | **-10,2400 - 10,2375 V** | **-10,2400 - 10,2375 V** |
| Value range | **-4096 - 4095 d** | **-4096 - 4095 d** |
| Resolution | **13 Bit (signed 12 Bit)** | **13 Bit (signed 12 Bit)** |
| Value of least significant bit (LSB) | **5 mV** | **5 mV** |
| Input resistance | **290 kOhm** | **290 kOhm** |
| Max. continuous voltage | **-30 - 30 V** | **-30 - 30 V** |

# Analogue input module
PNOZ ma1p

| Analogue inputs | 773812 | 773813 |
|---|---|---|
| Deviations from the measuring range limit value | | |
| Output variable error at 25 °C | **0,5 %** | **0,5 %** |
| Temperature coefficient | **0,0025 %/K** | **0,0025 %/K** |
| Greatest transient deviation during el. interference test | **1,0 %** | **1,0 %** |
| Max. measurement error at full temperature range | **0,5 %** | **0,5 %** |
| Max. measurement error in the case of a potential module error | **1,5 %** | **1,5 %** |
| Max. voltage between inputs I0 and I1 with current or voltage measurement | **30 V** | **30 V** |
| Filter time constant | **2,0 ms** | **2,0 ms** |
| Potential isolation | **No** | **No** |
| **Times** | **773812** | **773813** |
| Switch-on delay | **5,00 s** | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |
| Max. reaction time when the input signal changes | **100 ms** | **100 ms** |
| **Environmental data** | **773812** | **773813** |
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **-25 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** | **55 °C** |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Short-term** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | – |
| Acceleration | **1g** | **1g** |
| Broadband noise | | |
| In accordance with the standard | – | **EN 60068-2-64** |
| Frequency | – | **5 - 500 Hz** |
| Acceleration | – | **1,9grms** |

# Analogue input module
PNOZ ma1p

| Environmental data | 773812 | 773813 |
|---|---|---|
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** |
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Mechanical data** | **773812** | **773813** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |

# Analogue input module
PNOZ ma1p

| Mechanical data | 773812 | 773813 |
|---|---|---|
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9,0 mm** | **9,0 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **45,0 mm** | **45,0 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **184 g** | **196 g** |

Where standards are undated, the 2009-10 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 1-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **8,71E-09** | **SIL 3** | **4,21E-05** | **20** |
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **8,71E-09** | **SIL 3** | **4,21E-05** | **20** |

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

# Analogue input module
PNOZ ma1p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ ma1p | Expansion module, 2 analogue inputs | 773 812 |
| PNOZ ma1p coated version | Expansion module, 2 analogue inputs, coated version | 773 813 |

### Accessories

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 700 |
| Set screw terminals | 1 set of screw terminals | 793 700 |

#### Terminator, jumper

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

# Link modules
PNOZ ml1p

## Overview

### Unit features

Using the product PNOZ ml1p:

Link module to safely connect two configurable control systems PNOZmulti.

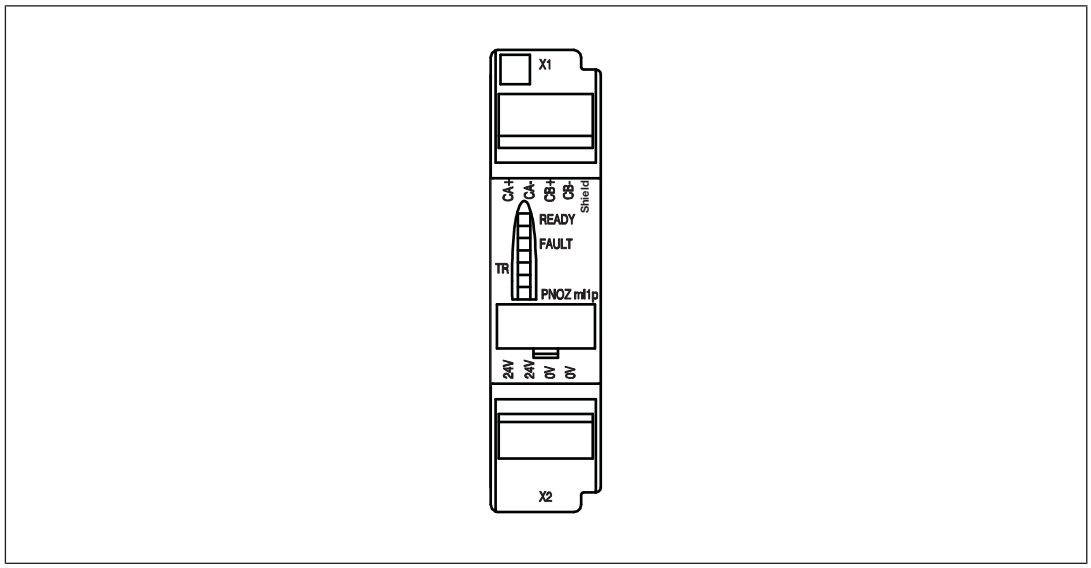
The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Point-to-point connection via 4-core shielded and 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
- LEDs for
  - Operating state
  - Error
  - Connection status
- Coated version:

  Increased environmental requirements (see Technical details [259])

# Link modules
PNOZ ml1p

### Front view




Key:

- 0 V, 24 V:
  Supply connections
- CA+, CA-, CB+, CB-:
  Connections for 2 expansion modules PNOZ ml1p
- Shield:
  Connection for the cable shield

## Function Description

### Functions

The PNOZ ml1p link module is used to safely transfer the input information from 32 virtual inputs and 32 virtual outputs between two PNOZmulti systems. One link module is assigned to each base unit. Data is exchanged cyclically.

The function of the inputs and outputs on the control 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 LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the control 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 link module. This output data is immediately sent to the link module on the other base unit.
- At the same time, the base unit reads the input data from the link module.

**Connection of multiple base units:**

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

**Data transmission time:**

The data transmission time $t_{BUS}$ 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 [📖 259]).

**The maximum reaction time for series connection of n base units**

This 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

- On semiconductor outputs:

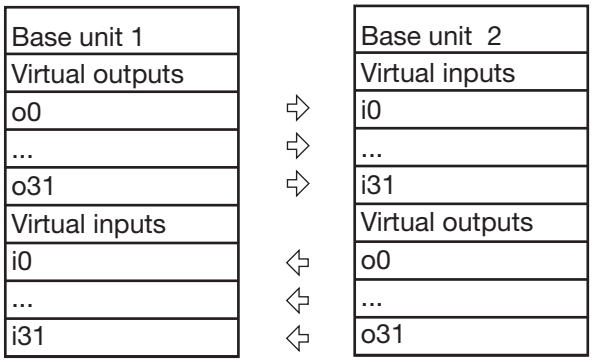
  $tS_{UM} = t_{ON} + (n * t_{BUS}) + t_{COND}$
- On relay outputs:

  $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{REL}$
- Input delay and switch-off delay are only included once in the reaction time. The data transmission time between the link modules is multiplied by the number of connections.
- Please refer to the Connection examples [📖 258].

# Link modules
PNOZ ml1p

**Virtual inputs and outputs:**

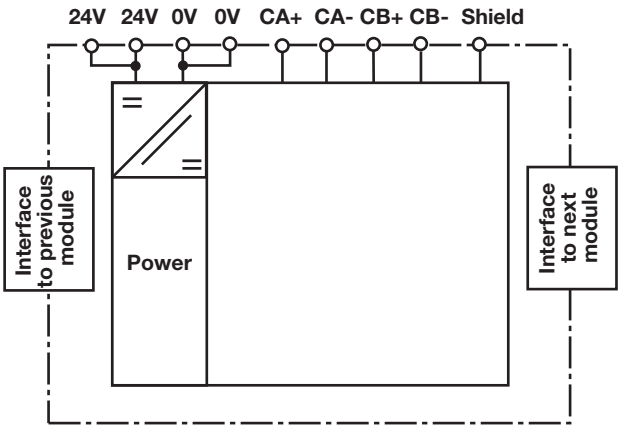
Inputs and outputs for both PNOZmulti systems are assigned in the PNOZmulti Configurator. Inputs and outputs with the same number are assigned to each other, e.g. output o5 on one PNOZmulti system to input i5 on the other PNOZmulti system.




## System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

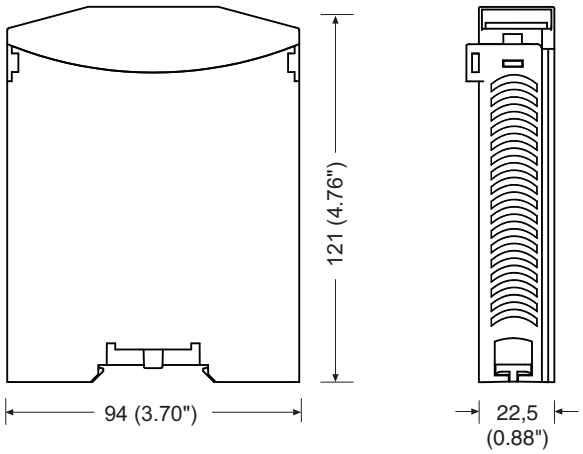
## Block diagram



# Link modules
PNOZ ml1p

## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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

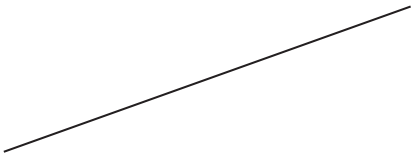
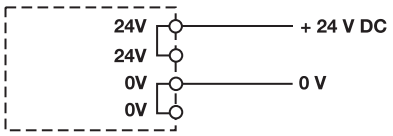
Please note:

- Information given in the Technical details [📖 259] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. When the supply voltage is looped, the current at each terminal may not exceed 3 A.
- The max. cable length between two link modules may be max. 1000 m.
  Please note:
  When connecting to a PNOZ ml1p with a version < 2.0, the cable length may be max. 100 m. The reduced cable length must be configured in the PNOZmulti Configurator.
- Connect the inputs and outputs from two PNOZ ml1p with a 4-core shielded cable. The cables must be twisted in pairs.
- Note the crossover cabling, e.g. CA+ with CB+.
- The cables must be classified into a minimum of Category 5 in accordance with ISO/IEC 11801.

# Link modules
PNOZ ml1p

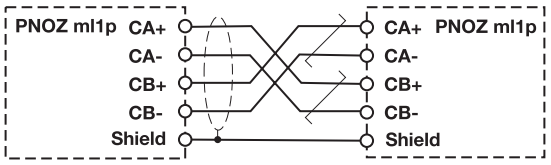
- You can use ready-made cable from Pilz to connect two PNOZ ml1p. The plug-in connection terminals are either designed as cage clamp terminals or screw terminals (see order reference).
- Cable shield:
  - Please note: Always connect the shield to both link modules (**Shield** terminal).
  - The shield 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

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



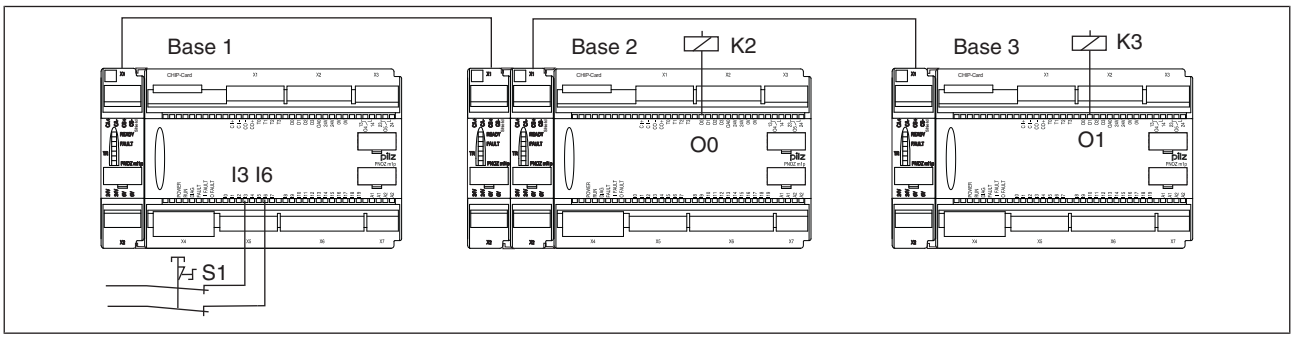
**Connection of two PNOZmulti base units via the module PNOZ ml1p**



# Link modules
PNOZ ml1p

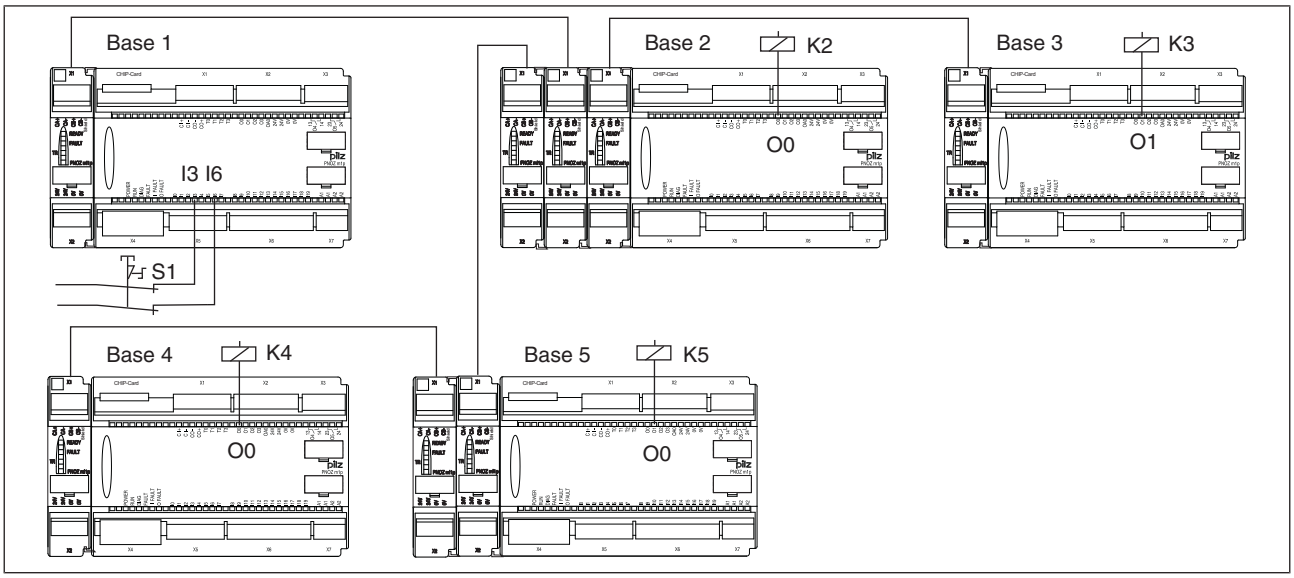
## Connection examples

Reaction time $t_{SUM}$ between base unit Base 1 and Base 2:
Input delay $t_{ON}$ at I3 and I6 + data transmission time1 * $t_{BUS}$ through link module + switch-off delay $t_{COND}$ of the 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 und I6 + data transmission time 2 * $t_{BUS}$ through link modules + switch-off delay $t_{COND}$ of the semiconductor output at O1
$t_{SUM} = t_{ON} + (n * t_{BUS} ) + t_{COND}$
$t_{SUM}$ = 4 ms + (2 * 35 ms ) + 30 ms = 104 ms



## Link modules
PNOZ ml1p

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




# Technical details

| General | 773540 | 773545 |
|---|---|---|
| Approvals | BG, CCC, CE, EAC (Eurasian), KCC, TÜV, cULus Listed | BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed |
| **Electrical data** | **773540** | **773545** |
| Supply voltage | | |
| for | Module supply | Module supply |
| Voltage | 24,0 V | 24,0 V |
| Kind | DC | DC |
| Voltage tolerance | -15 %/+20 % | -15 %/+20 % |
| Output of external power supply (DC) | 5,0 W | 5,0 W |
| Residual ripple DC | 5 % | 5 % |
| Status indicator | LED | LED |
| **Virtual inputs** | **773540** | **773545** |
| Number of virtual inputs | 32 | 32 |
| **Virtual outputs** | **773540** | **773545** |
| Number of virtual outputs | 32 | 32 |

# Link modules
PNOZ ml1p

| Times | 773540 | 773545 |
|---|---|---|
| Switch-on delay | **5,00 s** | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |
| Max. data transmission time | **35 ms** | **35 ms** |
| **Environmental data** | **773540** | **773545** |
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **-25 - 60 °C** |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Short-term** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **5,0 - 500,0 Hz** |
| Acceleration | **1g** | **1g** |
| Broadband noise | | |
| In accordance with the standard | – | **EN 60068-2-64** |
| Frequency | – | **5 - 500 Hz** |
| Acceleration | – | **1,9grms** |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** |
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |

## Link modules
PNOZ ml1p

| Mechanical data | 773540 | 773545 |
|---|---|---|
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Max. cable length between two link modules | **1 km** | **1 km** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **22,5 mm** | **22,5 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **129 g** | **135 g** |

Where standards are undated, the 2010-07 latest editions shall apply.

# Link modules
PNOZ ml1p

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **8,82E-09** | **SIL 3** | **3,86E-05** | **20** |

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

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ ml1p | Link Module | 773 540 |
| PNOZ ml1p coated version | Link module, coated version | 773 545 |

### Accessories

#### Terminator, jumper

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

#### Cable

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mli1p 5m screw | Cable, 5-pin, shielded, screw terminal, 5 m | 773 890 |
| PNOZ mli1p 10m screw | Cable, 5-pin, shielded, screw terminal, 10 m | 773 891 |
| PNOZ mli1p 50m screw | Cable, 5-pin, shielded, screw terminal, 50 m | 773 892 |
| PNOZ mli1p 5m spring | Cable, 5-pin, shielded, spring-loaded terminal, 5 m | 773 893 |
| PNOZ mli1p 10m spring | Cable, 5-pin, shielded, spring-loaded terminal, 10 m | 773 894 |
| PNOZ mli1p 50m spring | Cable, 5-pin, shielded, spring-loaded terminal, 50 m | 773 895 |

# Link modules
## PNOZ ml1p

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mli1p 1.5m spring | Cable, 5-pin, shielded, spring-loaded terminal, 1.5 m | 773 896 |
| PNOZ mli1p 1.5m spring | Cable, 5-pin, shielded, spring-loaded terminal, 1.5 m | 773 897 |
| SafetyNET p Cable | SafetyNET p cable, 1 - 500 m | 380 000 |

**Connection terminals**

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

# Link modules
PNOZ ml2p

## Overview

### Unit features

Using the product PNOZ ml2p:

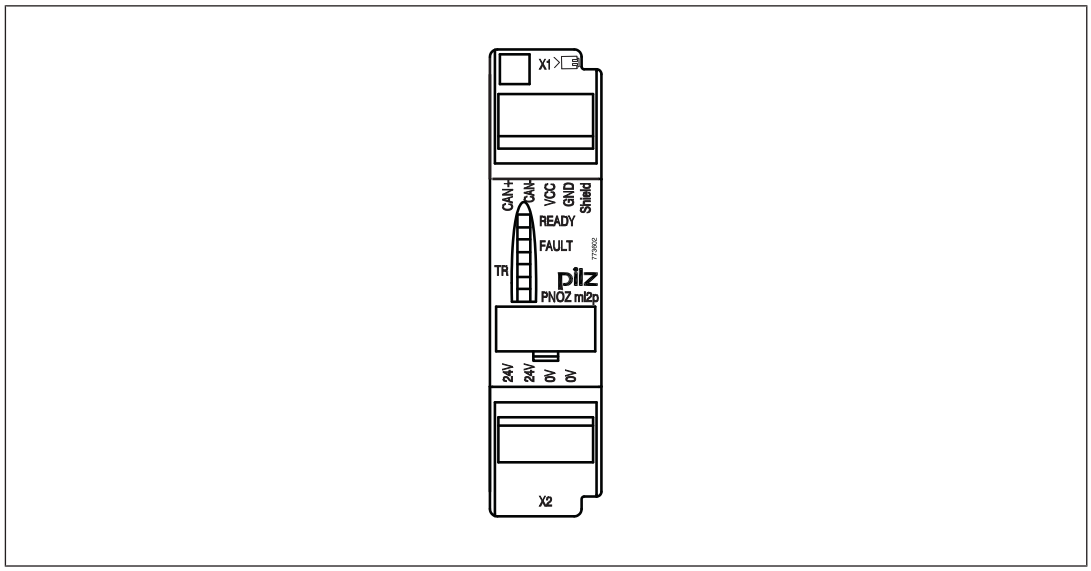
Link module to safely connect decentralised input/output modules to a configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Max. 4 PNOZ ml2p can be connected to the base unit
- Max. 4 decentralised modules PDP67 F 8DI ION can be connected to the link module PNOZ ml2p
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- LEDs for
  - Operating status
  - Fault
  - Connection status
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Link modules
PNOZ ml2p

### Front view




Key:

- 0 V, 24 V:
  Supply connections
- CAN+, CAN-, VCC, GND:
  Connection for decentralised modules
- Shield:
  Connection for the cable shield

## Function description

### Operation

The link module PNOZ ml2p is used to safely transfer the input information from decentralised modules to the safety system PNOZmulti.

The function of the inputs and outputs on the control 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 LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

# Link modules
PNOZ ml2p

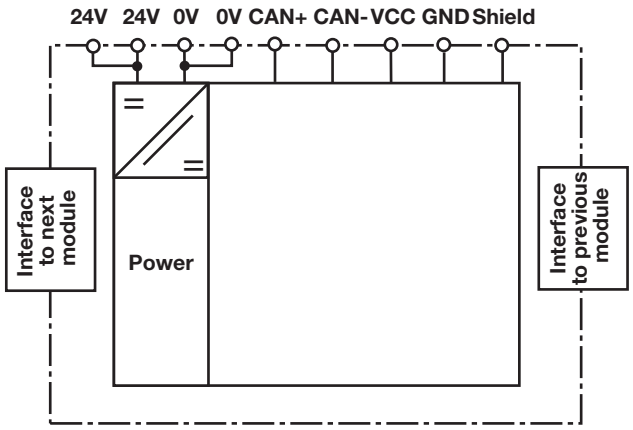
**Data exchange:**

- Communication with the decentralised modules is via a safe data link.
- The link module PNOZ ml2p reads the input information from the decentralised modules as part of each cycle and then forwards it to the base unit.
- At the end of a PNOZmulti cycle, the base unit sends its output data to its link module. This output data is immediately sent to the decentralised modules.

**Linking several decentralised modules:**

- A maximum of 4 link modules can be connected to a PNOZmulti base unit.
- A maximum of 4 decentralised modules can be connected to a link module PNOZ ml2p.
- If a decentralised module receives data intended for a different decentralised module that is connected, the data is forwarded without being processed.

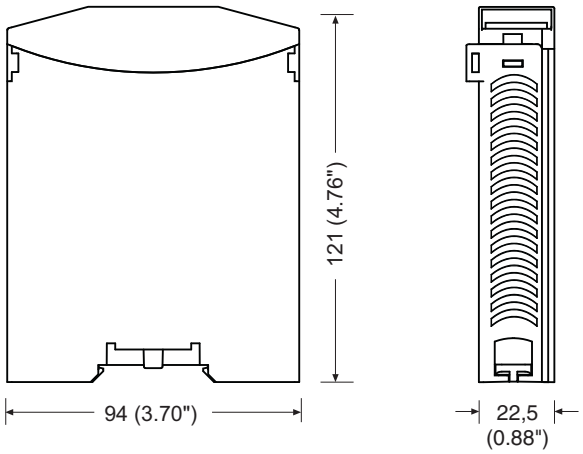
## Block diagram



# Link modules
PNOZ ml2p

## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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

Please note:

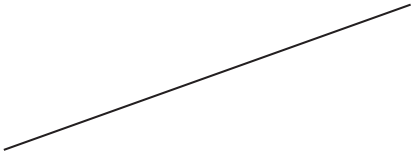
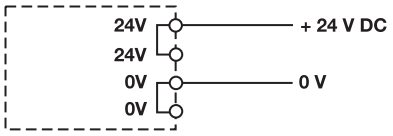
- Information given in the Technical details [📖 271] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. When the supply voltage is looped, the current at each terminal may not exceed 3 A.
- Please refer to the technical details for information on the maximum cable length. Please also read the section entitled Voltage drop [📖 269].
- Shielded cable must be used from a cable length of 30 m.
- Pilz pre-assembled cable can be used to connect the decentralised modules (see Order references [📖 273]).
- The plug-in connection terminals are either designed as cage clamp terminals or screw terminals (see Order references [📖 273]).

# Link modules
PNOZ ml2p

The product PNOZ ml2p is connected to functional earth via protection elements on the supply voltage. Insulation voltage tests are only possible with voltages up to ca. 42 V.

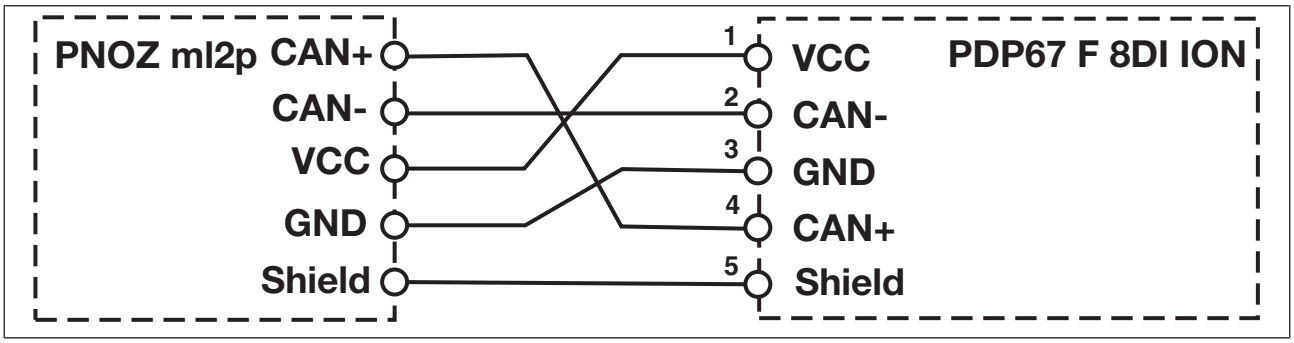
## Preparing for operation

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

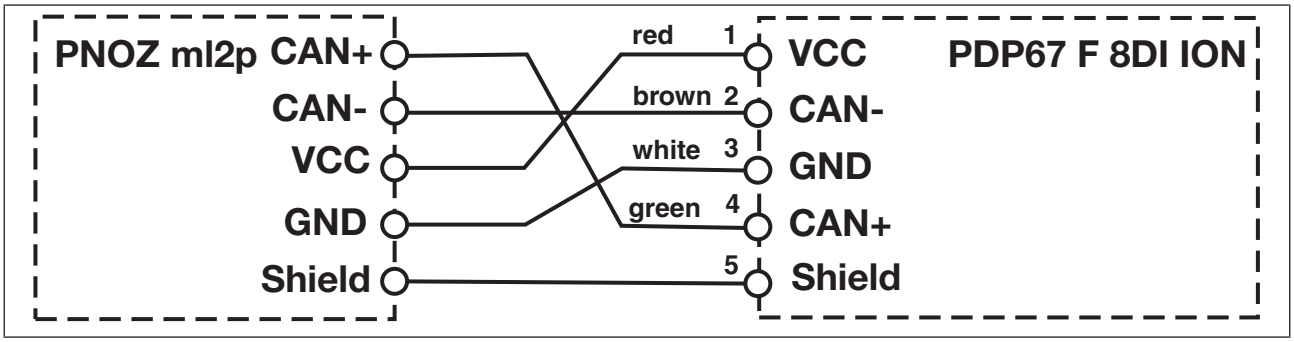
| Supply voltage | AC | DC |
|---|---|---|
| |  |  |

Supply voltage

**Connection to a decentralised input module PDP67**



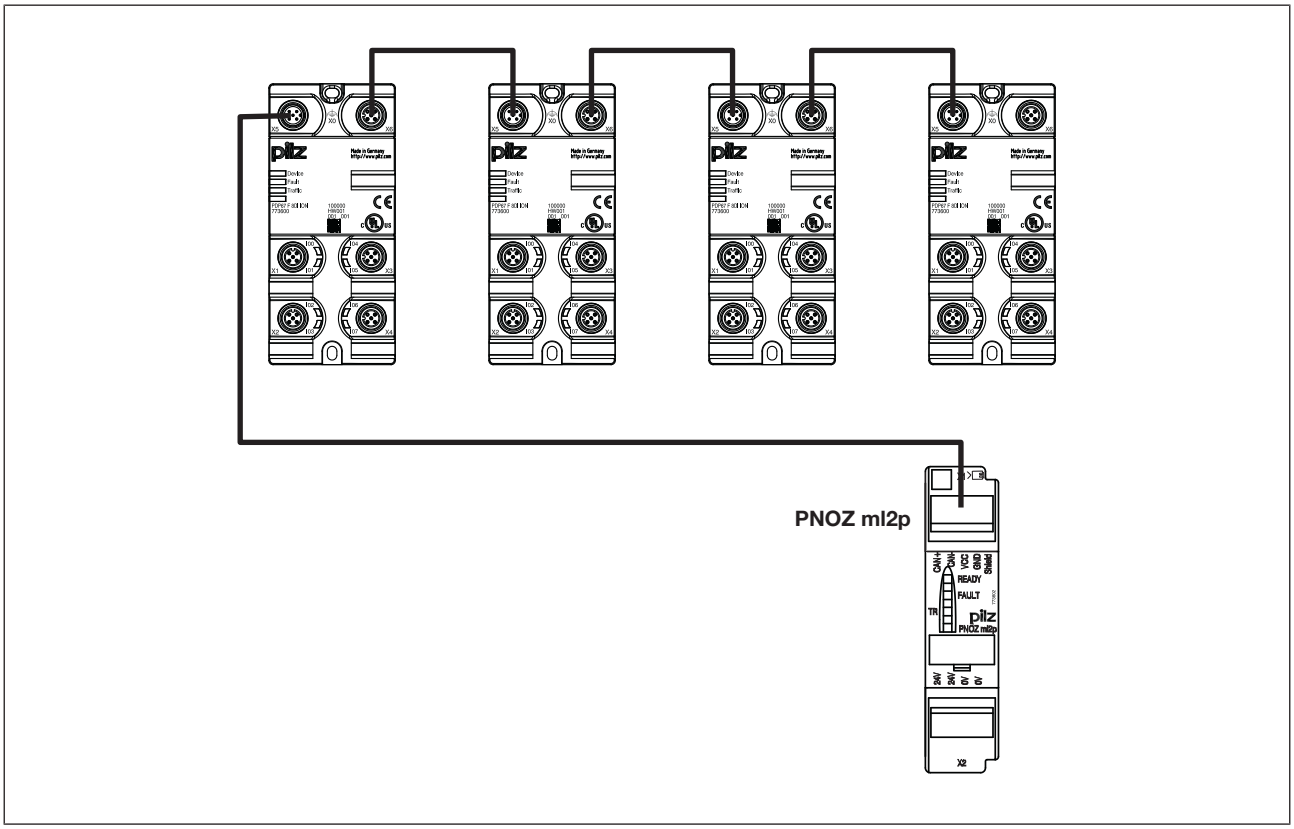

**Connection when using the PSS SB BUSCABLE LC in conjunction with a Pilz self-assembly "PSS67 M12 connector" (see order reference in the Technical Catalogue)**



# Link modules
PNOZ ml2p

### Series connection of 4 decentralised modules

You can connect up to 4 decentralised modules in series to a PNOZmulti link module.




### Voltage drop

The max. cable length depends on the voltage drop in the supply voltage cables. The level of voltage drop is determined by the:

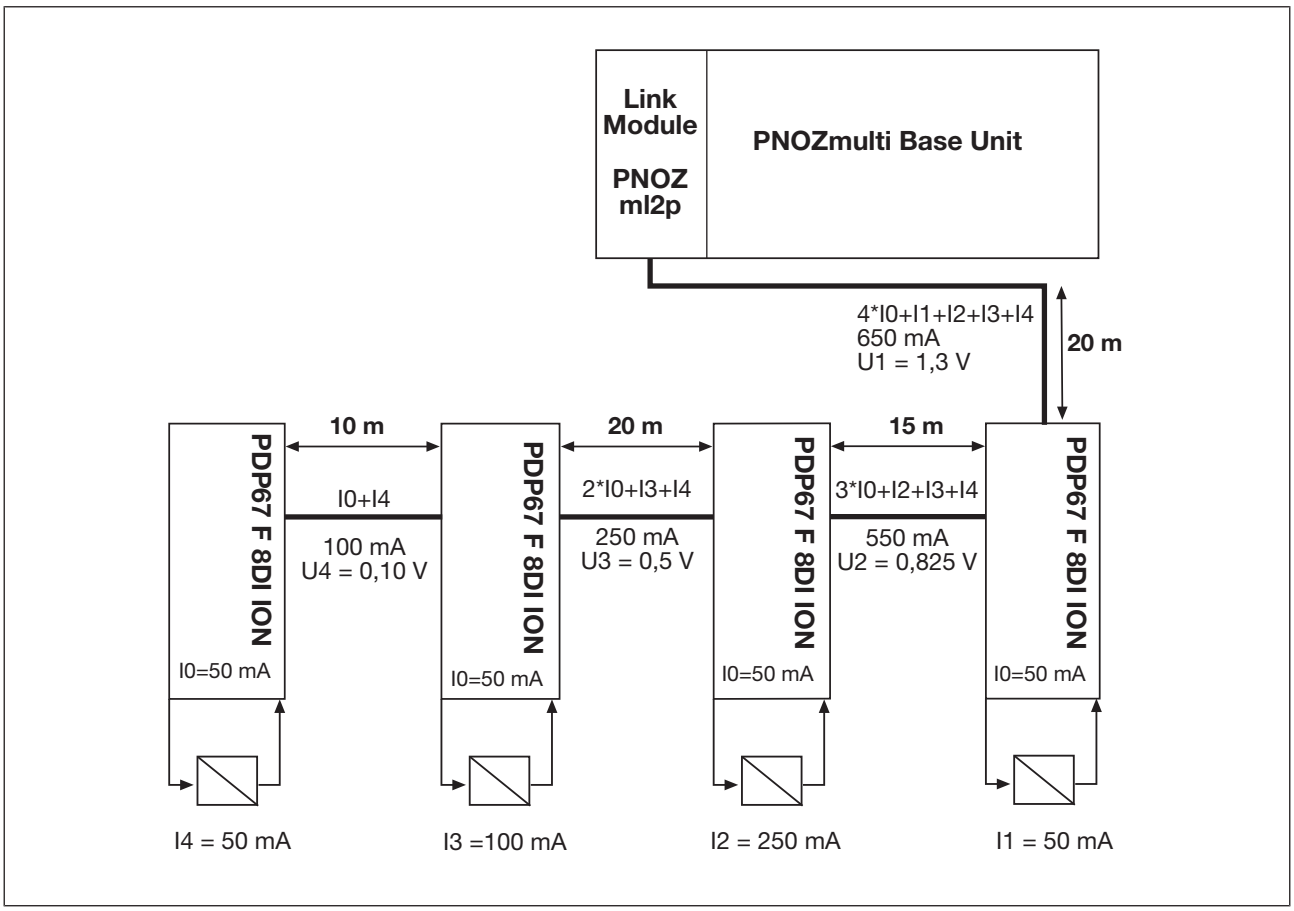
- Cable resistance on the supply voltage cables
- Operating current of the modules
- Load on the modules

To increase the max. cable length, the input voltage can be permanently increased by the voltage tolerance (see Technical Details).

| Cable type | Voltage drop per 10 m and per 100 mA |
|---|---|
| PSS SB BUSCABLE LC | 0.1 V |
| Sensor cable 0.25 $mm^2$ | 0.15 V |
| Sensor cable 0.34 $mm^2$ | 0.11 V |
| Sensor cable 0.5 $mm^2$ | 0.07 V |

## Link modules
PNOZ ml2p

- The PSS SB BUSCABLE LC is used in accordance with the pin assignment in section 6.2.2.
  Voltage drop per 10 m and per 100 mA: 0.1 V




Key:

- I0: Module's consumption.
- I1 ... I5: Load current taken from the module
- U1 … U4: Voltage drop on the respective connection path

Total voltage drop from the link module PNOZ ml2p to the final PDP67 F 8DI ION:
$U_{total} = U_1 + U_2 + U_3 + U_4$
$U_{total}$ = 1.3 V + 0.825 V + 0.5 V + 0.10 V = 2.725 V

# Link modules
PNOZ ml2p

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), KCC, TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **5,0 W** |
| Residual ripple DC | **5 %** |
| Status indicator | **LED** |
| **Inputs** | |
| Maximum input delay | **15 ms** |
| **Semiconductor outputs** | |
| Switch-off delay | **35 ms** |
| **Test pulse outputs** | |
| Maximum output current, decentralised module supply | **4 A** |
| Short circuit protection of decentralised module supply | **yes** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |

# Link modules
PNOZ ml2p

| | |
|---|---|
| **Environmental data** | |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length unshielded | **30 m** |
| Max. cable length shielded | **100 m** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |

# Link modules
PNOZ ml2p

| Mechanical data | |
|---|---|
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **121,0 mm** |
| Weight | **133 g** |

Where standards are undated, the 2009-12 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| – | **PL e** | **Cat. 4** | **SIL CL 3** | **5,35E-09** | **SIL 3** | **3,30E-05** | **20** |

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

## Order reference

### Products

| Product type | Features | Order No. |
|---|---|---|
| PNOZ ml2p | Link Module | 773 602 |

### Accessories

**Terminator, jumper**

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

# Link modules
PNOZ ml2p

### Adapter

| Product type | Features | Order No. |
|---|---|---|
| PSEN ma adapter | Adapter for connection to safety switch PSENmag | 380 300 |
| PSEN cs adapter | Adapter for connection to safety switch PSENcode | 380 301 |
| PSEN sl adapter | Adapter for connection to safety switch PSENslock | 380 325 |

### Cable

| Product type | Features | Order No. |
|---|---|---|
| PSS SB BUSCABLE LC | Cable, shielded, 1 - 100 m | 311074 |
| PSS67 I/O Cable | Cable, 1 - 30 m | 380 320 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 3 m | 380 200 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 5 m | 380 201 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 10 m | 380 202 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 30 m | 380 203 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 3m | 380 204 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 5 m | 380 205 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 10 m | 380 206 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 30 m | 380 207 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 3m | 380 208 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 5 m | 380 209 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 10 m | 380 210 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 20 m | 380 220 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 30 m | 380 211 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 3m | 380 212 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 5 m | 380 213 |

# Link modules
PNOZ ml2p

| Product type | Features | Order No. |
|---|---|---|
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 10 m | 380 214 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 30 m | 380 215 |
| PSEN op cable axial M12 5-pole 3m | Cable, straight, M12, 5-pin, open-ended socket, 3 m | 630310 |
| PSEN op cable axial M12 5-pole 5m | Cable, straight, M12, 5-pin, open-ended socket, 5 m | 630311 |
| PSEN op cable axial M12 5-pole 10m | Cable, straight, M12, 5-pin, open-ended socket, 10 m | 630312 |
| PSEN op cable axial M12 5-pole 20m | Cable, straight, M12, 5-pin, open-ended socket, 20 m | 630298 |
| PSEN op cable axial M12 5-pole 30m | Cable, straight, M12, 5-pin, open-ended socket, 30 m | 630297 |

**Connection terminals**

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

**Connector**

| Product type | Features | Order No. |
|---|---|---|
| PSS67 M12 connector | Connector, M12, straight, 5-pin, A-coded | 380 308 |
| PSS67 M12 connector | Socket, M12, straight, 5-pin, A-coded | 380 309 |
| PSS67 M12 connector | Connector, M12, angled, 5-pin, A-coded | 380 310 |
| PSS67 M12 connector | Socket, M12, angled, 5-pin, A-coded | 380 311 |
| PSS67 M8 connector | Connector, M8, straight, 4-pin | 380 316 |
| PSS67 M8 connector | Socket, M8, straight, 4-pin | 380 317 |
| PSS67 M8 connector | Connector, M8, angled, 4-pin | 380 318 |
| PSS67 M8 connector | Socket, M8, angled, 4-pin | 380 319 |

# Speed monitors
PNOZ ms1p

## Overview

### Unit features

Using the product PNOZ ms1p:

Speed monitor for connection to a base unit from the configurable control system PNOZmulti

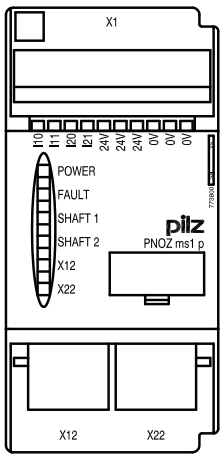
The product has the following features:

- 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 encoder
  - Proximity switch
  - 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)

# Speed monitors
PNOZ ms1p

- Connection technology incremental encoder:
  Female RJ45 connector
- Galvanic isolation between the connections X1, X12 and X22
- Max. 4 speed monitors can be connected to the base unit

## Front view




Key:

- X1:
  - I10, I11:
    connection terminals for proximity switch at axis 1
  - I20, I21:
    connection terminals for proximity switch at axis 2
  - 0 V, 24 V:
    supply connections
- X12:
  - female connector for the connection of an incremental encoder at axis 1
- X22:
  - female connector for the connection of an incremental encoder at axis 2
- LEDs:
  - POWER
  - FAULT
  - SHAFT 1
  - SHAFT 2
  - X12

# Speed monitors
PNOZ ms1p

– X22

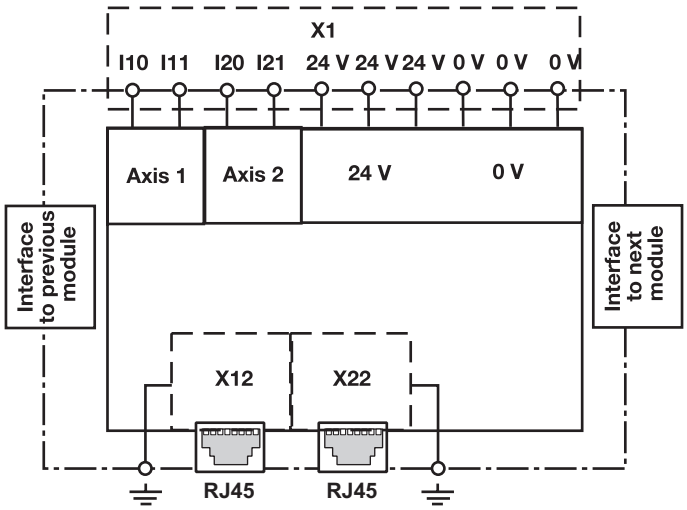
## Function description

### Operation

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.

The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

### Block diagram




### Input device types

- Only "pnp" type proximity switches may be used (N/O contact, switching to positive).
- The proximity switches require a 24 VDC supply.
- The proximity switches must be fitted so that at least one is always activated (carries a high signal).
- The proximity switches must be fitted so that the recorded signals overlap.
- When monitoring with proximity switches we recommend you use proximity switches with hysteresis in order to prevent bounce and therefore incorrect measurements.

# Speed monitors
PNOZ ms1p

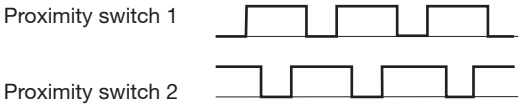



Fig.: Example proximity switch signal behaviour

- Please note the values stated in the technical details
- Only incremental encoders with a differential output of the following type are permitted
  - Sin/Cos
  - TTL (RS422)
- Please note the values stated in the technical details

The adapter records the data between the encoder and drive and makes it available to the PNOZ ms1p via the RJ45 socket.

Pilz supplies complete adapters as well as ready-made cable with RJ45 connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

In order to increase the availability, a proximity switch and an incremental encoder can be configured on one axis for the speed monitor. The speed monitor then monitors 3 signals on an axis: Track A and track B of the incremental encoder and the proximity switch

**Standstill monitoring**

Standstill is detected when at least two of these signals fall below the standstill frequency.

**Monitoring for broken shearpins**

If the Broken shearpin monitoring option is activated, a shearpin break is recognised if

- both signals of the incremental encoder fall below the set standstill frequency (standstill)

  and

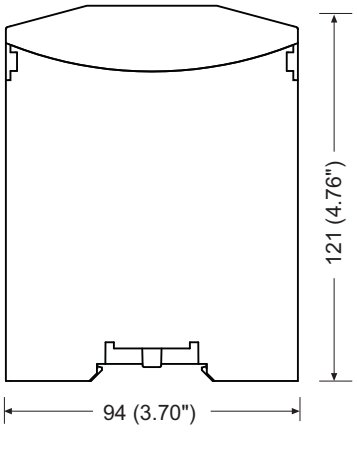
- the proximity switch exceeds the set standstill frequency (rotating shaft).

The recognised broken shearpin leads to safe condition (see status B2 in "Signal statuses" table in Chapter 8 of the operating manual). If individual or multiple signals change, the system may leave a safe state (see "Signal statuses" table).

Hazards that can arise through an automatic restart must be excluded from the user program.

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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 [289] must be followed.
- Use copper wiring with a temperature stability of 75 °C.

# Speed monitors
PNOZ ms1p

On each of the 2 axes you can connect as required:

- 1 incremental encoder

  or

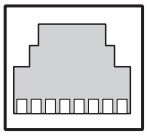
- 2 proximity switches

  or

- 1 incremental encoder and 1 proximity switch

| | Incremental encoder | Proximity switch |
|---|---|---|
| Connection axis 1 | X12 | - |
| | - | I10, I11, 0 V |
| | X12 | I10, 0 V |
| Connection axis 2 | X22 | - |
| | - | I20, I21, 0 V |
| | X22 | I20, 0 V |

## Pin assignment of RJ45 socket

| RJ45 socket<br>8-pin | PIN | Track |
|---|---|---|
|  | 1 | 5 V |
| | 2 | 0 V |
| | 3 | n.c. |
| | 4 | A |
| | 5 | /A |
| | 6 | n.c. |
| | 7 | B |
| | 8 | /B |

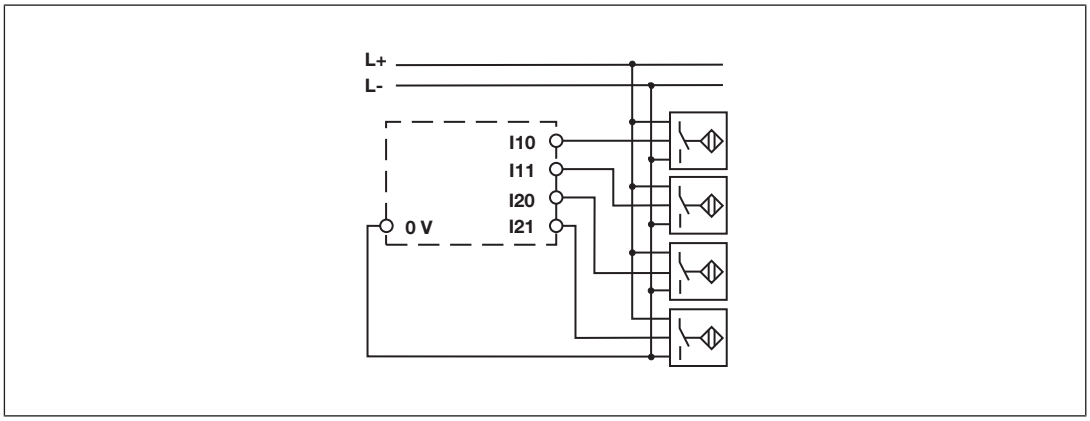
## Connection of proximity switches

Proceed as follows when connecting proximity switches:

- Terminals I10 and I11: connect the proximity switch for axis 1
- Terminals I20 and I21: connect the proximity switch for axis 2.
- If only one axis is to be monitored, either terminals I10 and I11 or terminals I20 and I21 will remain free.
- When connecting incremental encoders and proximity switches on one axis:
  - Terminals I10: connect proximity switch for axis 1 (I11 is not used)
  - Terminals I20: connect proximity switch for axis 2 (I21 is not used)

## Speed monitors
PNOZ ms1p

- The proximity switch must always be connected to a 0 V terminal of the speed monitor. The 0 V terminals are connected internally.
- Connect proximity switch to 24 VDC of the power supply or the speed monitor (the 24 V terminals of the speed monitor are connected internally)




### Connection of the incremental encoder

Proceed as follows when connecting the incremental encoder:

- The incremental encoder may be connected via an adapter or directly to the speed monitor.
- The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- Use only shielded cables for all connections
- 0 V from the incremental encoder and speed monitor should always be connected.
- Position the terminating resistors of the signal lines as close as possible to the speed monitor input.

# Speed monitors
PNOZ ms1p

Input device types: 1 Vss, 5 V-TTL

- Supply incremental encoder and speed monitor with 5 VDC
- Terminate incremental encoder with $Z_O$ = 120 Ohm

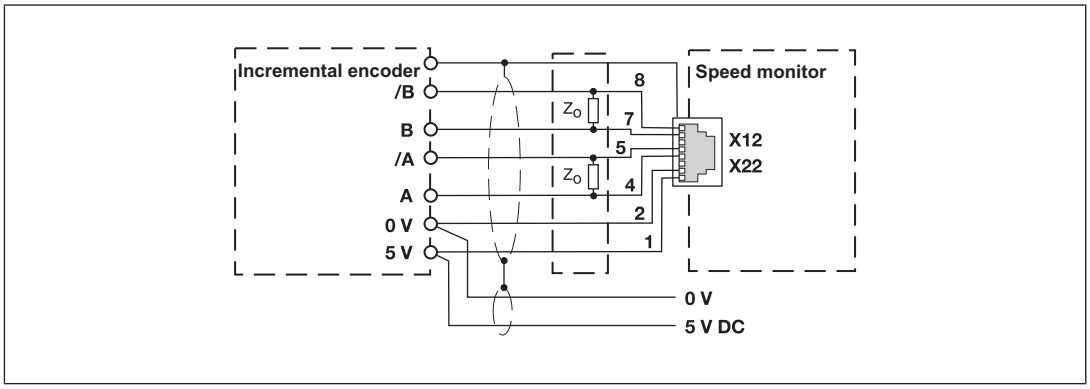



Fig.: Connection to incremental encoder type 1 Vss, 5 V-TTL

- The adapter is connected between the incremental encoder and the drive. The output on the adapter is connected to the female RJ45 connector on the speed monitor.
- The adapter can also be used without connecting to a drive. The signal lines can then be terminated directly at the adapter with $Z_O$ = 120 Ohm.
- If the signal lines in the drive are already terminated with $Z_O$ = 120 Ohm, the incremental encoder may no longer be terminated.
- The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated under Connect signals of the incremental encoder to the speed monitor [📖 283] and in the adapter operating manual must be observed when connecting the supply voltage.

## Speed monitors
PNOZ ms1p

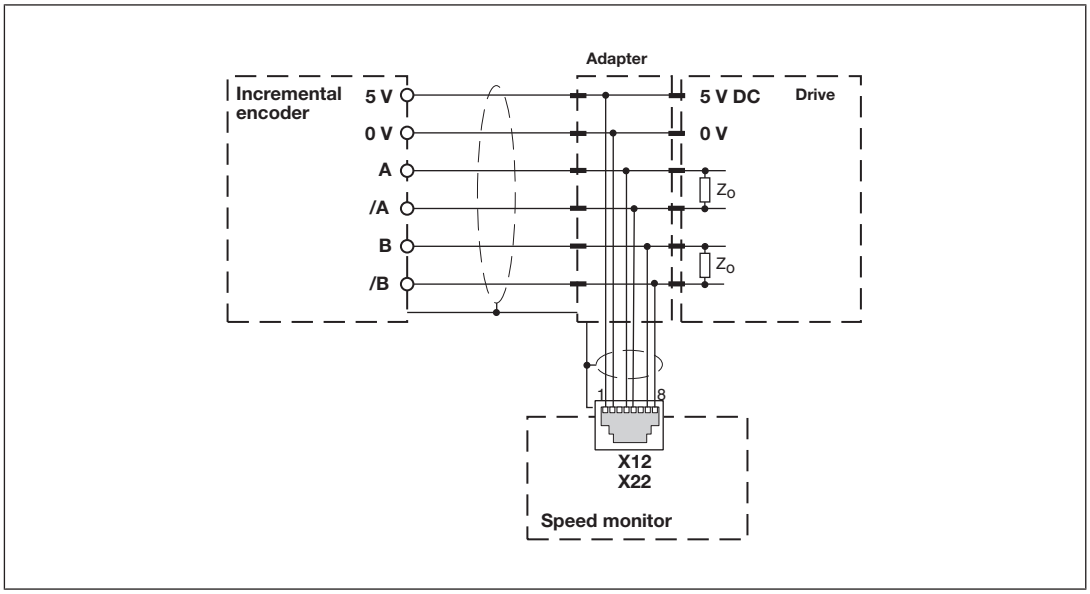



Fig.: Connection via adapter and drive

### Connection of proximity switches and incremental encoder

Axis 1:
Proximity switch at I10, I11
or
incremental encoder at X12

Axis 2:
Proximity switch at I20, I21
or
incremental encoder at X22

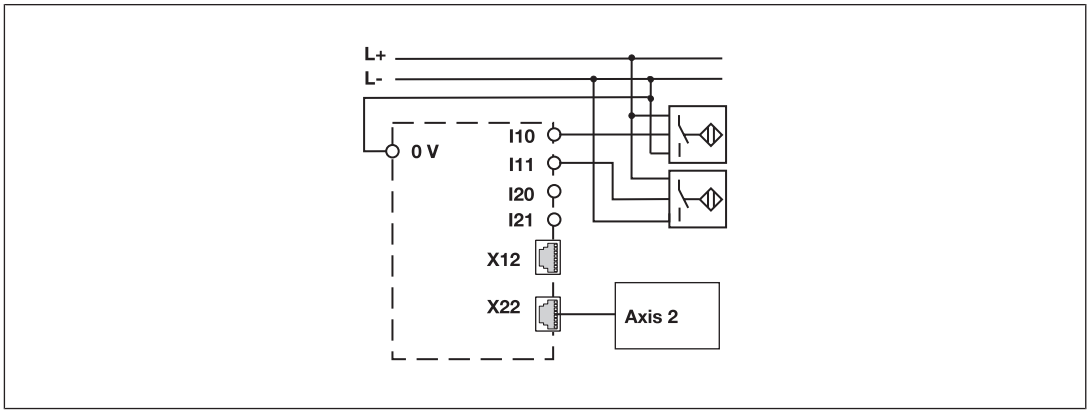



Fig.: Proximity switch and incremental encoder on various axes

## Speed monitors
PNOZ ms1p

Axis 1:
Proximity switch at I10 (I11 is unused)
and
Incremental encoder at X12
Axis 2:
Proximity switch at I20 (I21 is unused)
and
Incremental encoder at X22

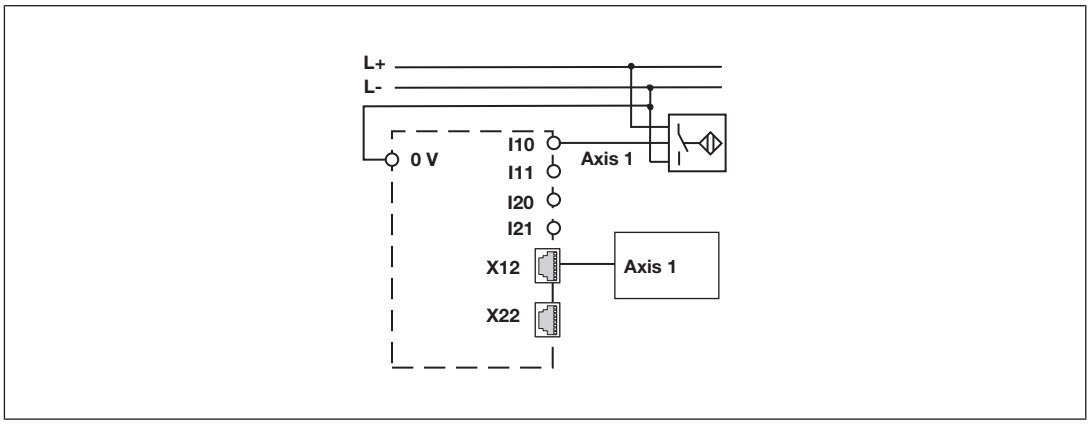



Fig.: Proximity switch and incremental encoder on one axis

# Speed monitors
PNOZ ms1p

## Connection examples

### Description

- 2 proximity switches, pnp-switching
- 1 incremental encoder

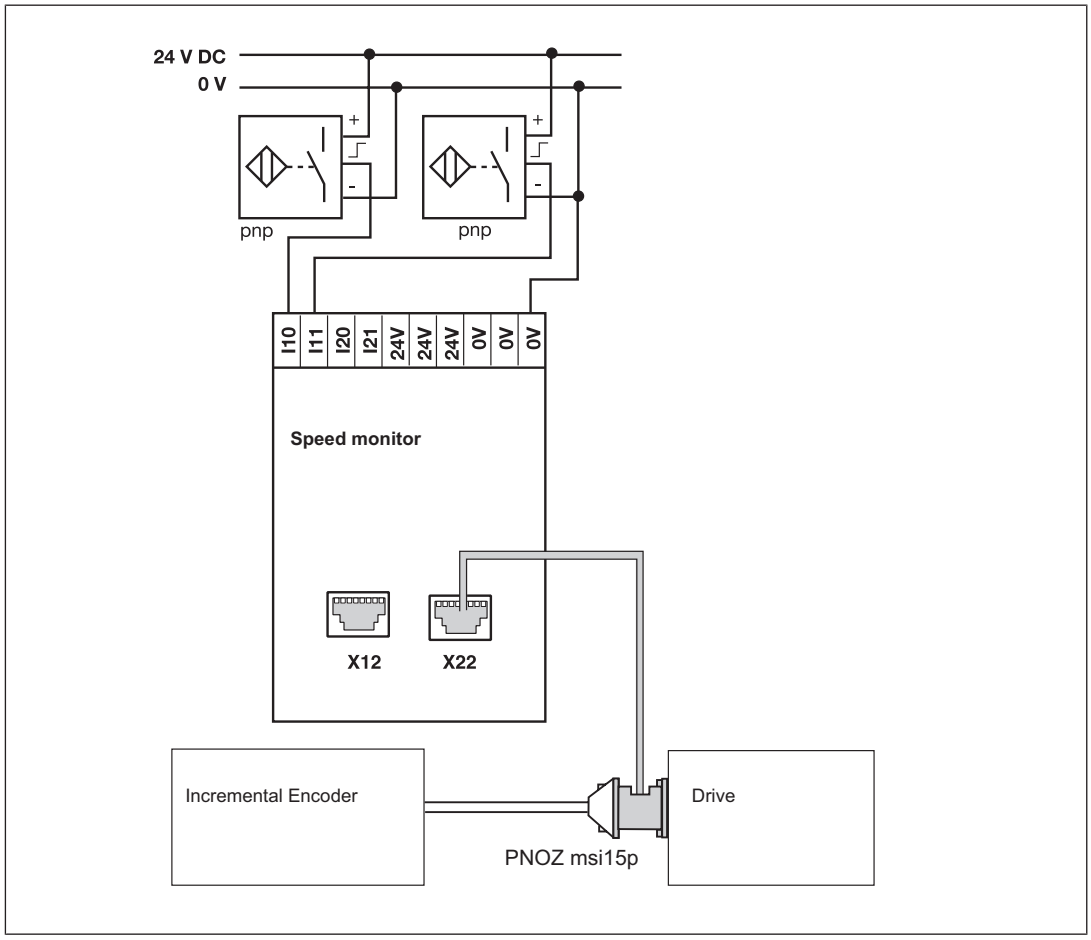



Fig.: Connection of 2 proximity switches, pnp-switching, one incremental encoder

# Speed monitors
PNOZ ms1p

**Description**

- 4 proximity switches, pnp-switching
- Connection through 24 V terminals and 0 V

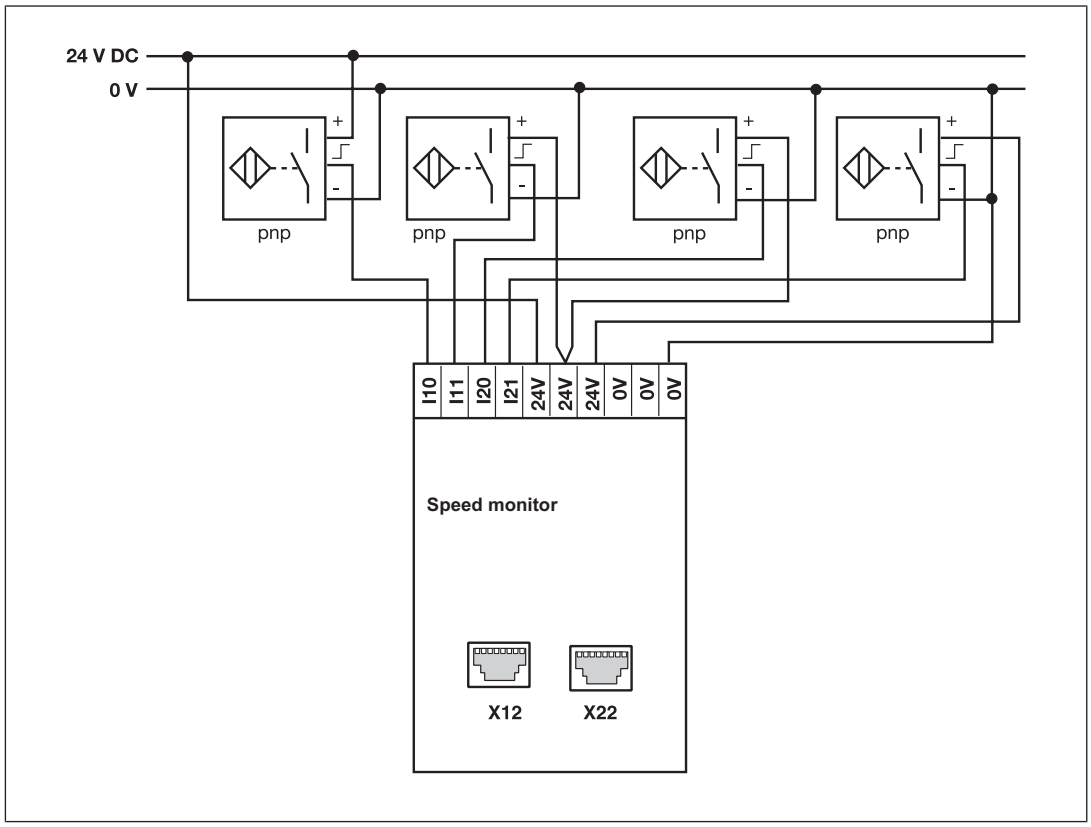



Fig.: Connection of 4 proximity switches, pnp-switching, connection through 24 V terminals and 0 V

# Speed monitors
PNOZ ms1p

**Description**

- 1 proximity switch, pnp-switching
- 1 incremental encoder
- Incremental encoder and proximity switch on one axis

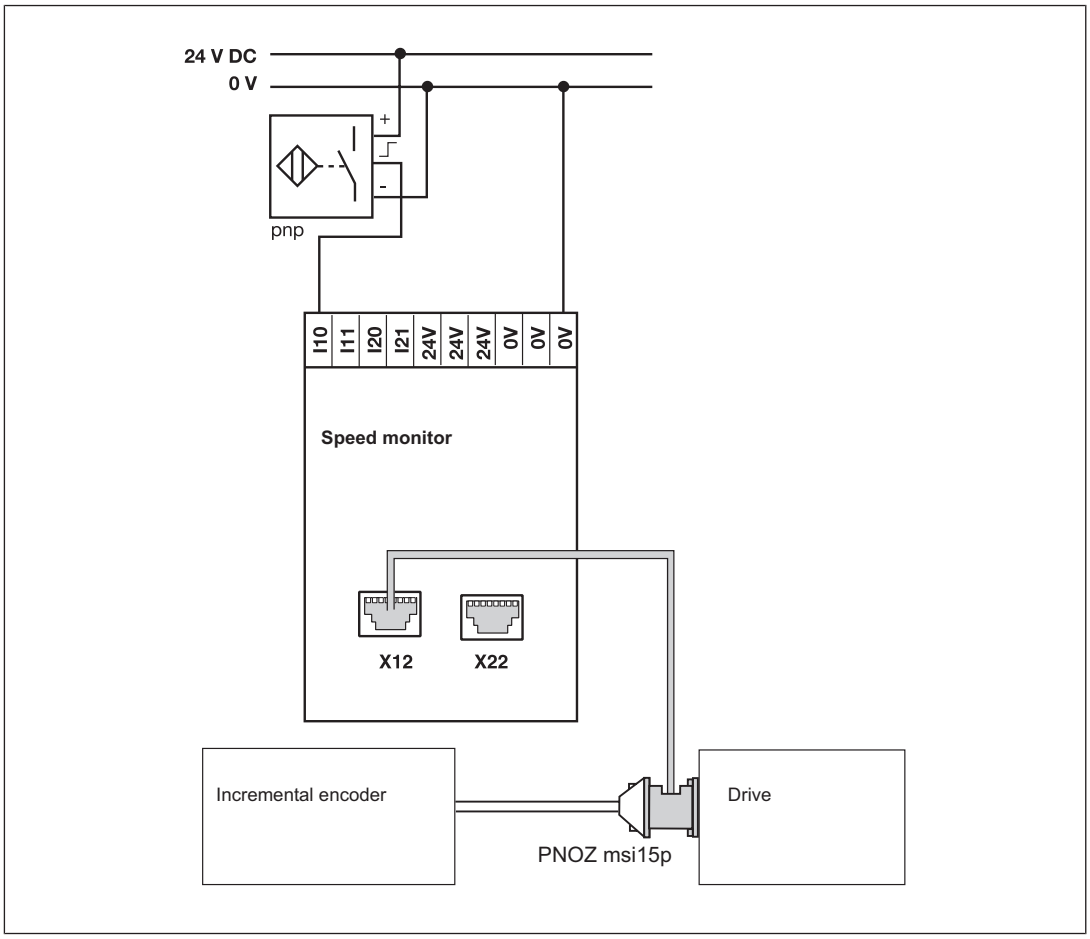



Fig.: Connection of an incremental encoder and proximity switch, pnp-switching, on an axis

# Speed monitors
PNOZ ms1p

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cU-Lus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **1,0 W** |
| Status indicator | **LED** |
| **Proximity switch input** | |
| Number of inputs | **4** |
| Input signal level | |
| Signal level at "1" | **11 - 30 V** |
| Signal level at "0" | **-3 - 5 V** |
| Input resistance | **3 kOhm** |
| Input's frequency range | **0 - 3 kHz** |
| Configurable monitoring frequency | |
| Without hysteresis | **0.1 Hz - 3 kHz** |
| With hysteresis | **0.2 Hz - 3 kHz** |
| **Incremental encoder input** | |
| Number of inputs | **2** |
| Connection type | **RJ45 female connector, 8-pin** |
| Supply voltage for incremental encoders | **5 V DC ±10 %, typ.30 mA** |
| Input signal level | **0,5 - 5,0 Vss** |
| Phase position for the differential signals A, /A and B,/B | **90° ±30°** |
| Overload protection | **-30 - 30 V** |
| Input resistance | **10,0 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** |
| **Times** | |
| Configurable switch-off delay | **0 - 2.500 ms** |
| Supply interruption before de-energisation | **20 ms** |

# Speed monitors
PNOZ ms1p

| | |
|---|---|
| **Times** | |
| Reaction time | |
| f>100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms** |
| f<100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms + 1/f** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |

## Speed monitors
PNOZ ms1p

| Mechanical data | |
|---|---|
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **45,0 mm** |
| Depth | **121,0 mm** |
| Weight | **192 g** |

Where standards are undated, the 2009-06 latest editions shall apply.

## Safety characteristic data

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN IEC 62061 SIL CL | EN IEC 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| Initiator | **PL e** | **Cat. 3** | **SIL CL 3** | **3,68E-09** | **SIL 3** | **4,84E-05** | **20** |
| Incremental encoder | **PL e** | **Cat. 3** | **SIL CL 3** | **4,52E-09** | **SIL 3** | **5,80E-05** | **20** |

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

# Speed monitors
PNOZ ms1p

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ ms1p | Expansion module, speed monitor | 773 800 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 800 |
| Set screw terminals | 1 set of screw terminals | 793 800 |

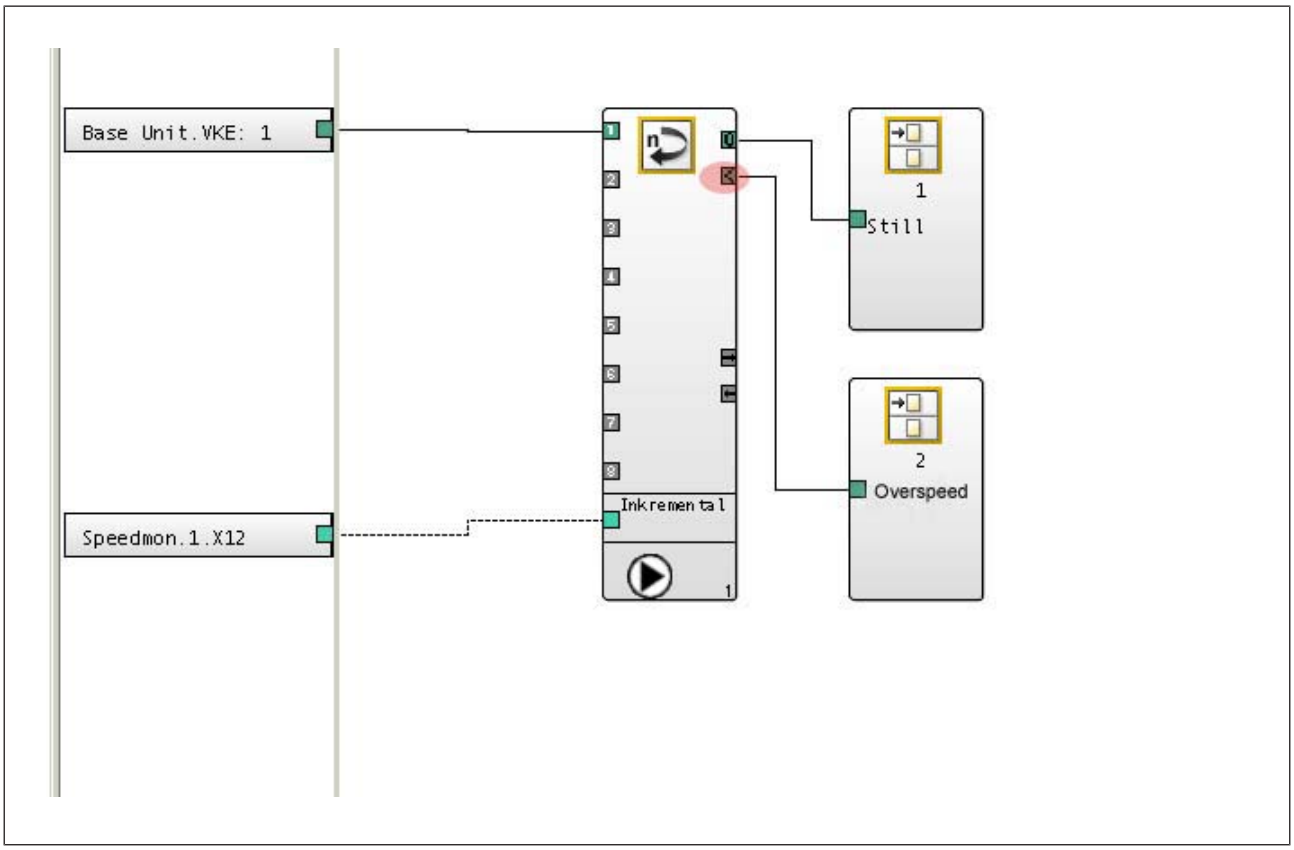
#### Terminator, jumper

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

# Speed monitors
PNOZ ms1p

## Application Examples

**Safe standstill monitoring**



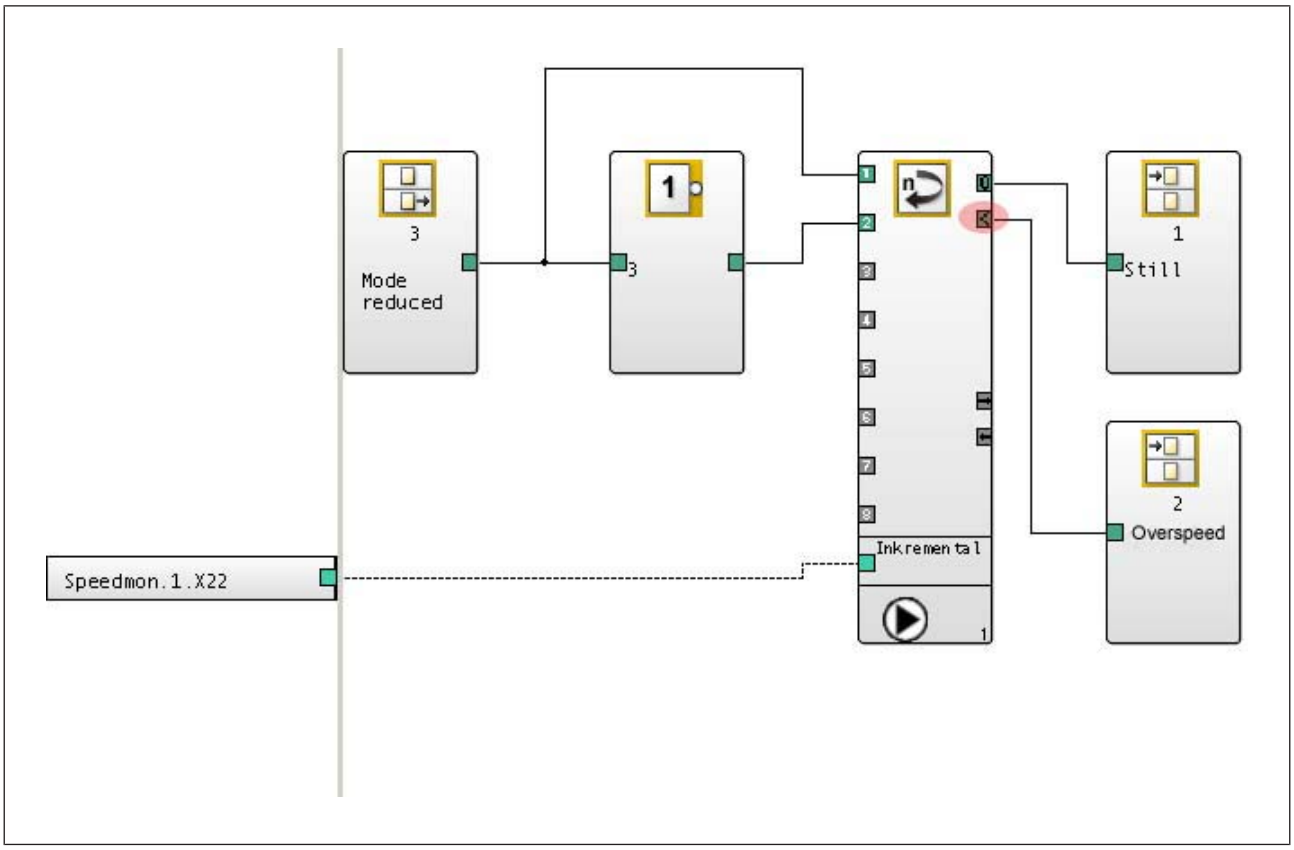

Configuration in the PNOZmulti Configurator

- Standstill: depending on requirement
- Speed n1: greater than the maximum permitted speed.

If the "Overspeed" output (see red marking) = "0", either the maximum permitted speed has been exceeded or the speed monitor has recognised a fault.
"Overdrive" output = "0" must lead to the shutdown of the relevant axis.

## Speed monitors
PNOZ ms1p

**Safe monitoring with "reduced speed" operating mode**




Configuration in the PNOZmulti Configurator

- Standstill: depending on requirement
- Speed n1: reduced speed, depending on requirement
- Speed n2: greater than the maximum permitted speed.

If the "Overspeed" output (see red marking) = "0", either the maximum permitted speed has been exceeded or the speed monitor has recognised a fault.
"Overspeed" output = "0" must lead to the shutdown of the relevant axis, irrespective of whether the "reduced speed" operating mode is active.

# Speed monitors
PNOZ ms2p HTL

## Overview

### Unit features

Using the product PNOZ ms2p HTL:

Speed monitor for connection to a base unit from the configurable control system PNOZmulti

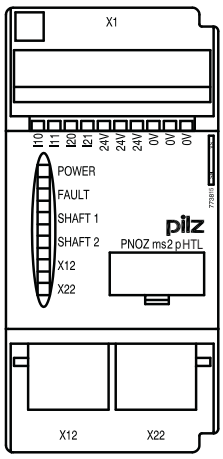
The product has the following features:

- 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 start mode can be selected in the PNOZmulti Configurator
- Status indicators for
  - Supply voltage
  - Incremental encoder
  - Proximity switch
  - 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)

# Speed monitors
PNOZ ms2p HTL

- Incremental encoder connection technology:
  RJ45 female connector
- Galvanic isolation between the connections X1, X12 and X22
- Max. 4 speed monitors can be connected to the base unit

## Front view




Legend:

- X1:
  - I10, I11:
    Connection terminals for proximity switch at axis 1
  - I20, I21:
    Connection terminals for proximity switch at axis 2
  - 0 V, 24 V:
    Supply connections
- X12:
  - female connector for the connection of an incremental encoder at axis 1
- X22:
  - female connector for the connection of an incremental encoder at axis 2
- LEDs:
  - POWER
  - FAULT
  - SHAFT 1
  - SHAFT 2
  - X12

# Speed monitors
PNOZ ms2p HTL

– X22

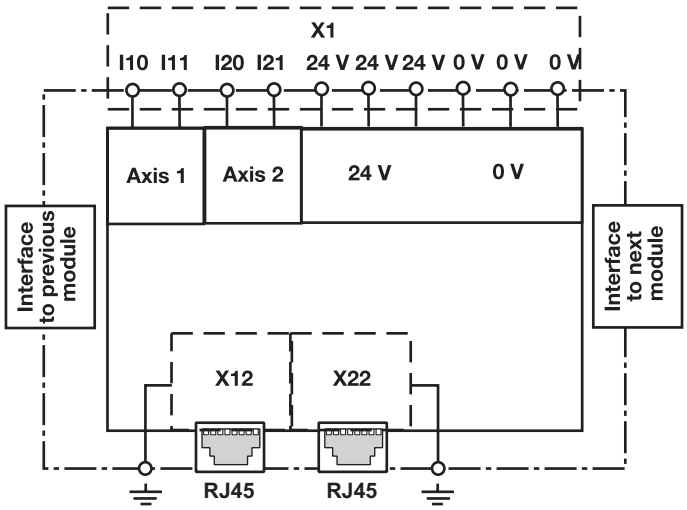
## Function description

### Operation

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.

The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

### Block diagram




### Input device types

- Only "pnp" type proximity switches may be used (N/O contact, switching to positive).
- The proximity switches require a 24 VDC supply.
- The proximity switches must be fitted so that at least one is always activated (carries a high signal).
- The proximity switches must be fitted so that the recorded signals overlap.
- When monitoring with proximity switches we recommend you use proximity switches with hysteresis in order to prevent bounce and therefore incorrect measurements.

# Speed monitors
## PNOZ ms2p HTL

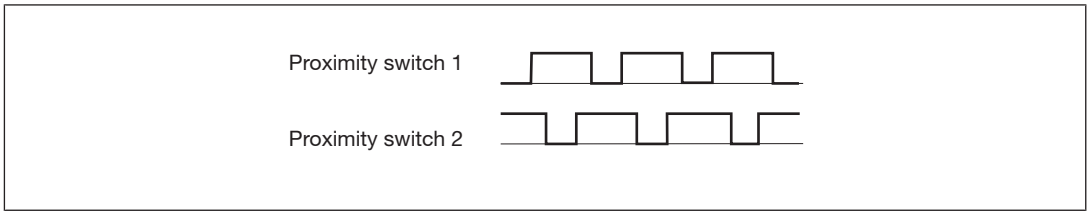



Fig.: Example proximity switch signal behaviour

- Please note the values stated in the technical details
- Only incremental encoders with a differential output of the following type are permitted
  - HTL (12 V – 30 V)
- Please note the values stated in the technical details

The adapter records the data between the encoder and drive and makes it available to the PNOZ ms2p HTL via the RJ45 socket.

Pilz supplies complete adapters as well as ready-made cable with RJ45 connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

In order to increase the availability, a proximity switch and an incremental encoder can be configured on one axis for the speed monitor. The speed monitor then monitors 3 signals on an axis: Track A and track B of the incremental encoder and the proximity switch

**Standstill monitoring**

Standstill is detected when at least two of these signals fall below the standstill frequency.

# Speed monitors
PNOZ ms2p HTL

**Monitoring for broken shearpins**

If the Broken shearpin monitoring option is activated, a shearpin break is recognised if

- both signals of the incremental encoder fall below the set standstill frequency (standstill)

  and

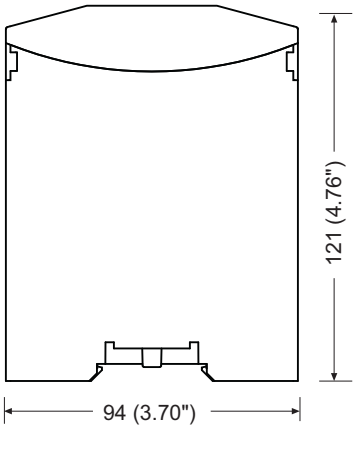
- the proximity switch exceeds the set standstill frequency (rotating shaft).

The recognised broken shearpin leads to safe condition (see status B2 in "Signal statuses" table in Chapter 8 of the operating manual). If individual or multiple signals change, the system may leave a safe state (see "Signal statuses" table).

Hazards that can arise through an automatic restart must be excluded from the user program.

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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 [308] must be followed.
- Use copper wiring with a temperature stability of 75 °C.

# Speed monitors
PNOZ ms2p HTL

On each of the 2 axes you can connect as required:

- 1 incremental encoder

  or

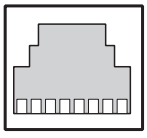
- 2 proximity switches

  or

- 1 incremental encoder and 1 proximity switch

| | Incremental encoder | Proximity switch |
|---|---|---|
| Connection axis 1 | X12 | - |
| | - | I10, I11, 0 V |
| | X12 | I10, 0 V |
| Connection axis 2 | X22 | - |
| | - | I20, I21, 0 V |
| | X22 | I20, 0 V |

## Pin assignment of RJ45 socket

| RJ45 socket<br>8-pin | PIN | Track |
|---|---|---|
|  | 1 | n.c. |
| | 2 | 0 V |
| | 3 | n.c. |
| | 4 | A |
| | 5 | /A |
| | 6 | n.c. |
| | 7 | B |
| | 8 | /B |

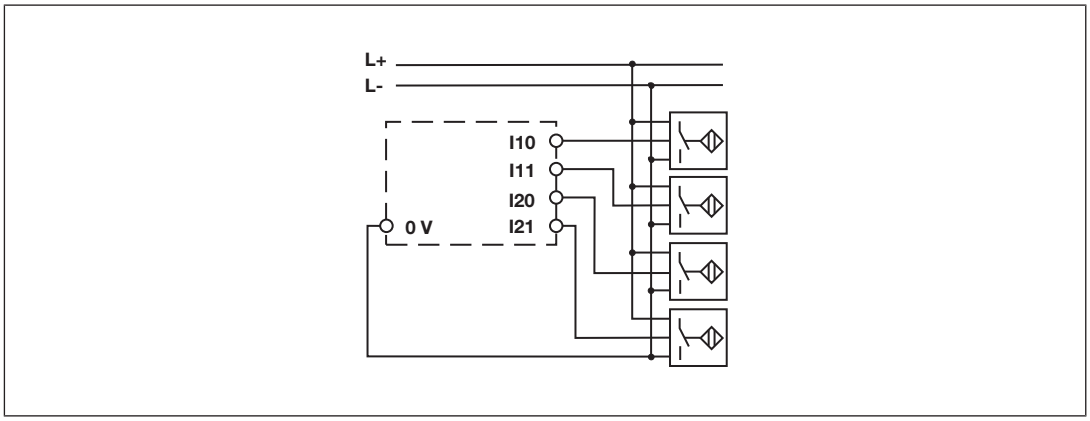
## Connection of proximity switches

Proceed as follows when connecting proximity switches:

- Terminals I10 and I11: connect the proximity switch for axis 1
- Terminals I20 and I21: connect the proximity switch for axis 2.
- If only one axis is to be monitored, either terminals I10 and I11 or terminals I20 and I21 will remain free.
- When connecting incremental encoders and proximity switches on one axis:
  - Terminals I10: connect proximity switch for axis 1 (I11 is not used)
  - Terminals I20: connect proximity switch for axis 2 (I21 is not used)

# Speed monitors
PNOZ ms2p HTL

- The proximity switch must always be connected to a 0 V terminal of the speed monitor. The 0 V terminals are connected internally.
- Connect proximity switch to 24 VDC of the power supply or the speed monitor (the 24 V terminals of the speed monitor are connected internally)




## Connection of the incremental encoder

Proceed as follows when connecting the incremental encoder:

- The incremental encoder may be connected via an adapter or directly to the speed monitor.
- The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- Use only shielded cables for all connections
- 0 V from the incremental encoder and speed monitor should always be connected.
- Position the terminating resistors of the signal lines as close as possible to the speed monitor input.

Encoder types: 24 V-HTL

- Apply 24 VDC supply voltage to incremental encoder only
- Do not terminate incremental encoder with Z0 = 120 Ohm

## Speed monitors
PNOZ ms2p HTL

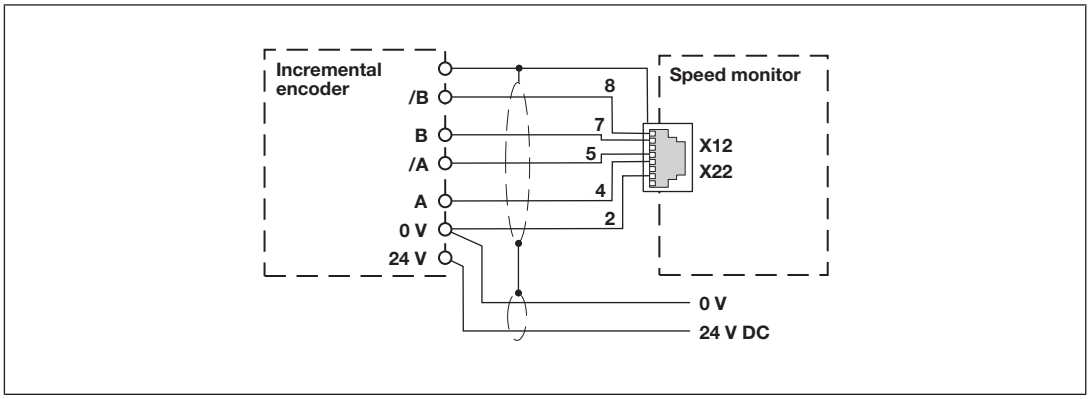



Fig.: Connection to incremental encoder type 24 V-HTL

- The adapter is connected between the incremental encoder and the drive. The output on the adapter is connected to the female RJ45 connector on the speed monitor.
- The adapter can also be used without connecting to a drive.
- The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated under "Connect incremental encoder signals to the speed monitor" and in the adapter operating manual must be observed when connecting the supply voltage.
- Supply voltage (12 V – 30 V) to incremental encoder only.
- HTL signals may not be fitted with a terminating resistor.

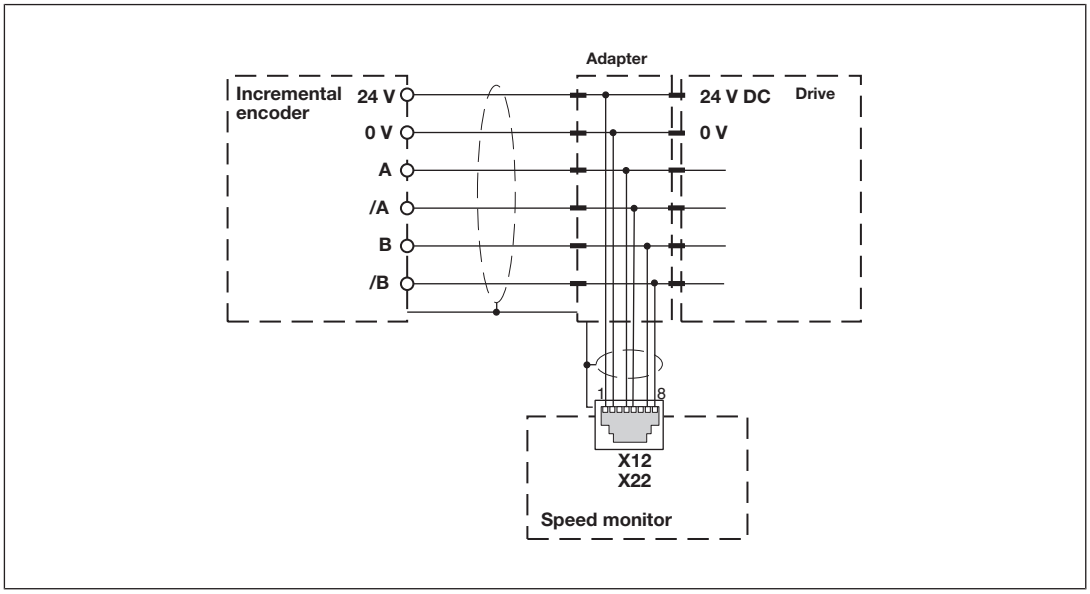



Fig.: Connection via adapter and drive

## Speed monitors
PNOZ ms2p HTL

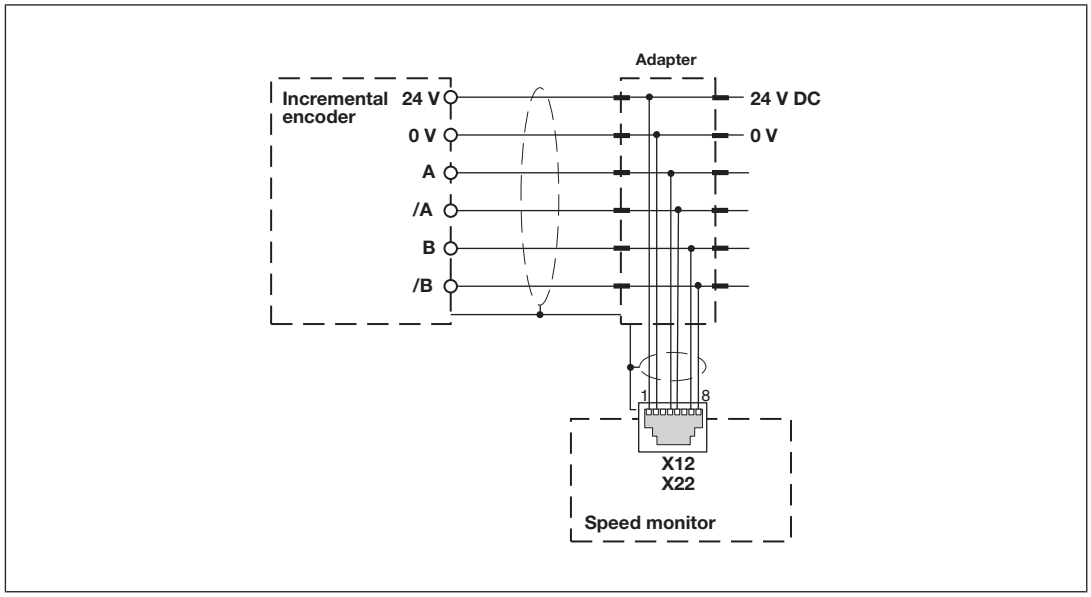



Fig.: Connection via adapter

### Connection of proximity switches and incremental encoder

Axis 1:
Proximity switch at I10, I11
or
incremental encoder at X12

Axis 2:
Proximity switch at I20, I21
or
incremental encoder at X22

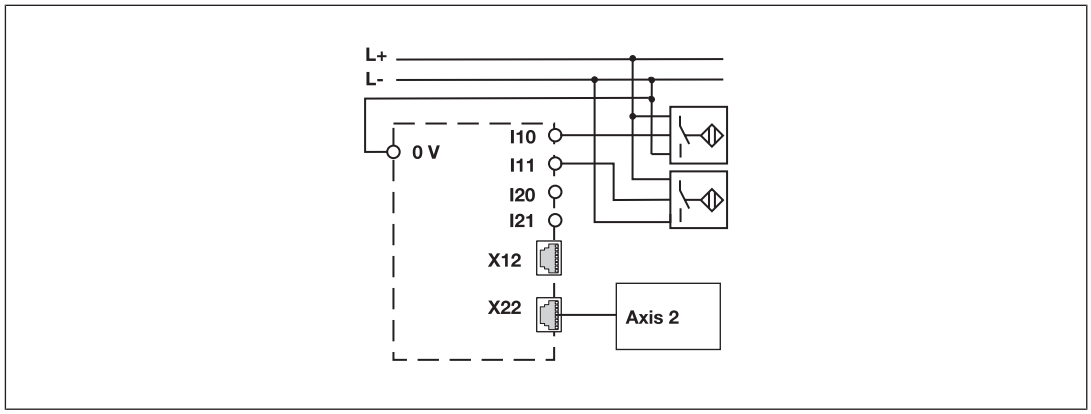



Fig.: Proximity switch and incremental encoder on various axes

## Speed monitors
PNOZ ms2p HTL

Axis 1:
Proximity switch at I10 (I11 is unused)
and
Incremental encoder at X12
Axis 2:
Proximity switch at I20 (I21 is unused)
and
Incremental encoder at X22

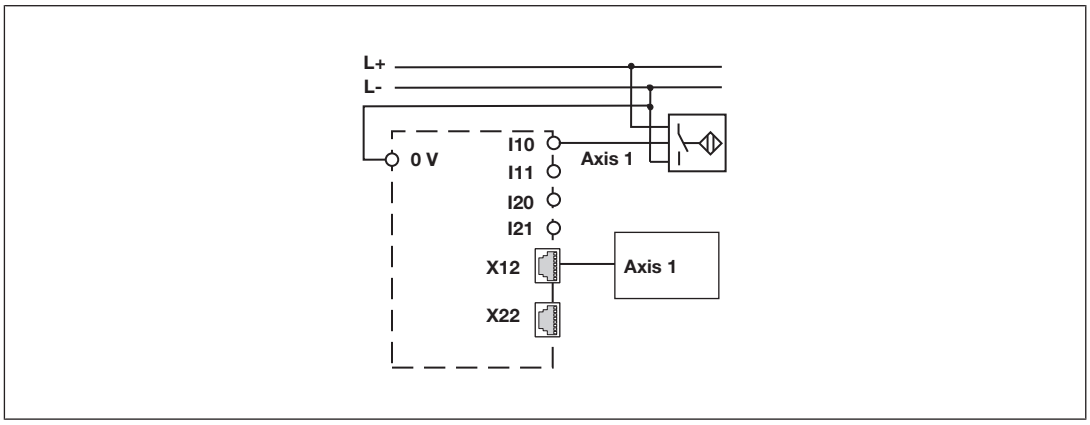



Fig.: Proximity switch and incremental encoder on one axis

# Speed monitors
PNOZ ms2p HTL

## Connection examples

### Description

- 2 proximity switches, pnp-switching
- 1 incremental encoder

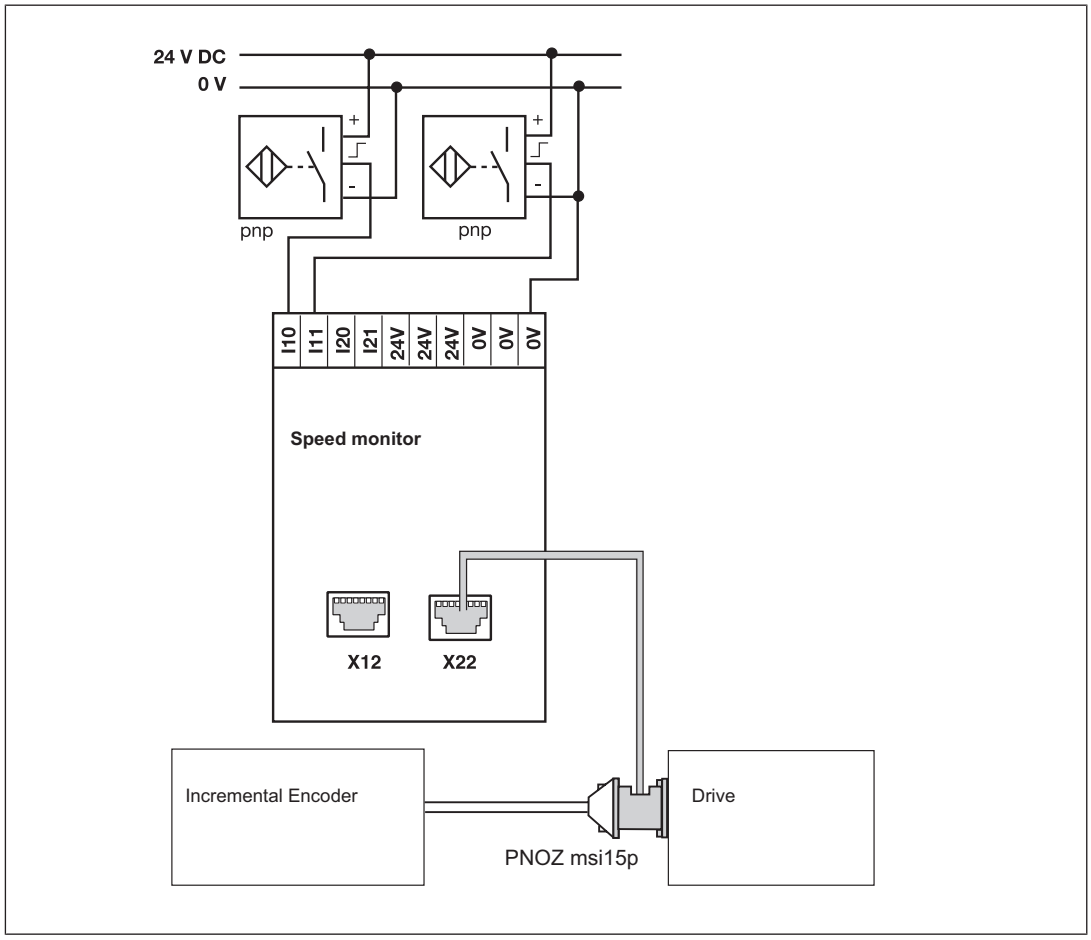



Fig.: Connection of 2 proximity switches, pnp-switching, one incremental encoder

# Speed monitors
PNOZ ms2p HTL

**Description**

- 4 proximity switches, pnp-switching
- Connection through 24 V terminals and 0 V

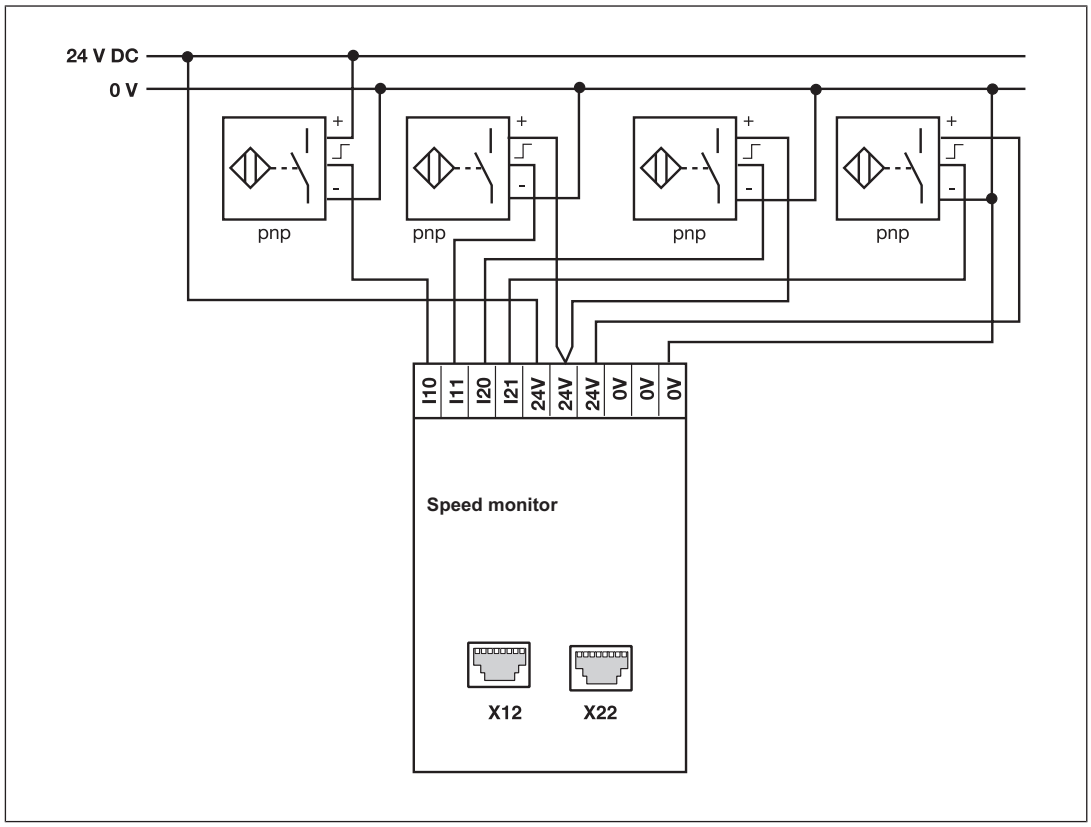



Fig.: Connection of 4 proximity switches, pnp-switching, connection through 24 V terminals and 0 V

# Speed monitors
## PNOZ ms2p HTL

**Description**

- 1 proximity switch, pnp-switching
- 1 incremental encoder
- Incremental encoder and proximity switch on one axis

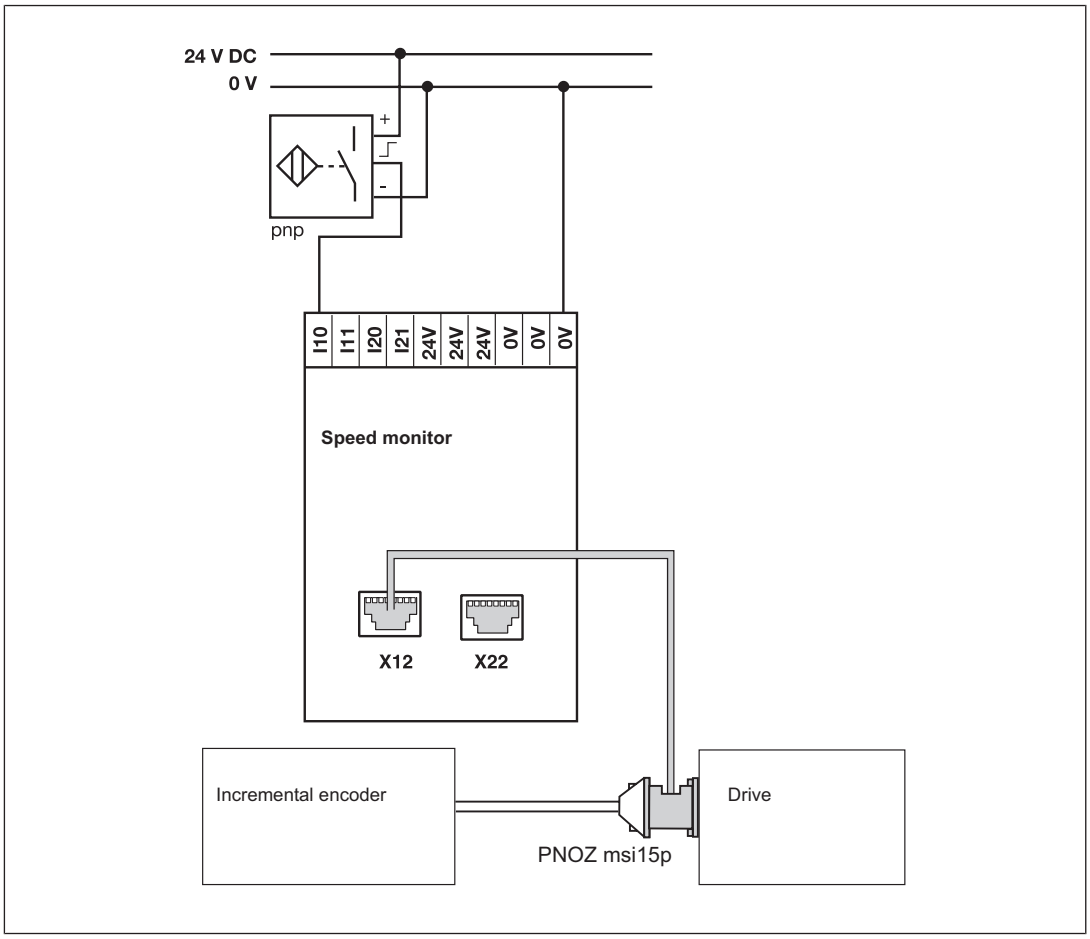



Fig.: Connection of an incremental encoder and proximity switch, pnp-switching, on an axis

# Speed monitors
PNOZ ms2p HTL

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cU-Lus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **1,0 W** |
| Status indicator | **LED** |
| **Proximity switch input** | |
| Number of inputs | **4** |
| Input signal level | |
| Signal level at "1" | **11 - 30 V** |
| Signal level at "0" | **-3 - 5 V** |
| Input resistance | **3 kOhm** |
| Input's frequency range | **0 - 3 kHz** |
| Configurable monitoring frequency | |
| Without hysteresis | **0.1 Hz - 3 kHz** |
| With hysteresis | **0.2 Hz - 3 kHz** |
| **Incremental encoder input** | |
| Number of inputs | **2** |
| Connection type | **RJ45 female connector, 8-pin** |
| Input signal level | **12,0 - 30,0 Vss** |
| Phase position for the differential signals A, /A and B,/B | **90° ±30°** |
| Overload protection | **-30 - 30 V** |
| Input resistance | **10,0 kOhm** |
| Input's frequency range | **0 - 200 kHz** |
| Configurable monitoring frequency | |
| Without hysteresis | **0.1 Hz - 200 kHz** |
| With hysteresis | **0.2 Hz - 200 kHz** |
| **Times** | |
| Configurable switch-off delay | **0 - 2.500 ms** |
| Supply interruption before de-energisation | **20 ms** |

# Speed monitors
## PNOZ ms2p HTL

| | |
|---|---|
| **Times** | |
| Reaction time | |
| f>100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms** |
| f<100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms + 1/f** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |

# Speed monitors
PNOZ ms2p HTL

| Mechanical data | |
|---|---|
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **45,0 mm** |
| Depth | **121,0 mm** |
| Weight | **220 g** |

Where standards are undated, the 2009-06 latest editions shall apply.

## Safety characteristic data

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN IEC 62061 SIL CL | EN IEC 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| Initiator | **PL e** | **Cat. 3** | **SIL CL 3** | **3,68E-09** | **SIL 3** | **4,84E-05** | **20** |
| Incremental encoder | **PL e** | **Cat. 3** | **SIL CL 3** | **6,73E-09** | **SIL 3** | **8,18E-05** | **20** |

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

# Speed monitors
PNOZ ms2p HTL

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ ms2p HTL | Expansion module, speed monitor | 773 815 |

### Accessories

#### Terminator, jumper

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

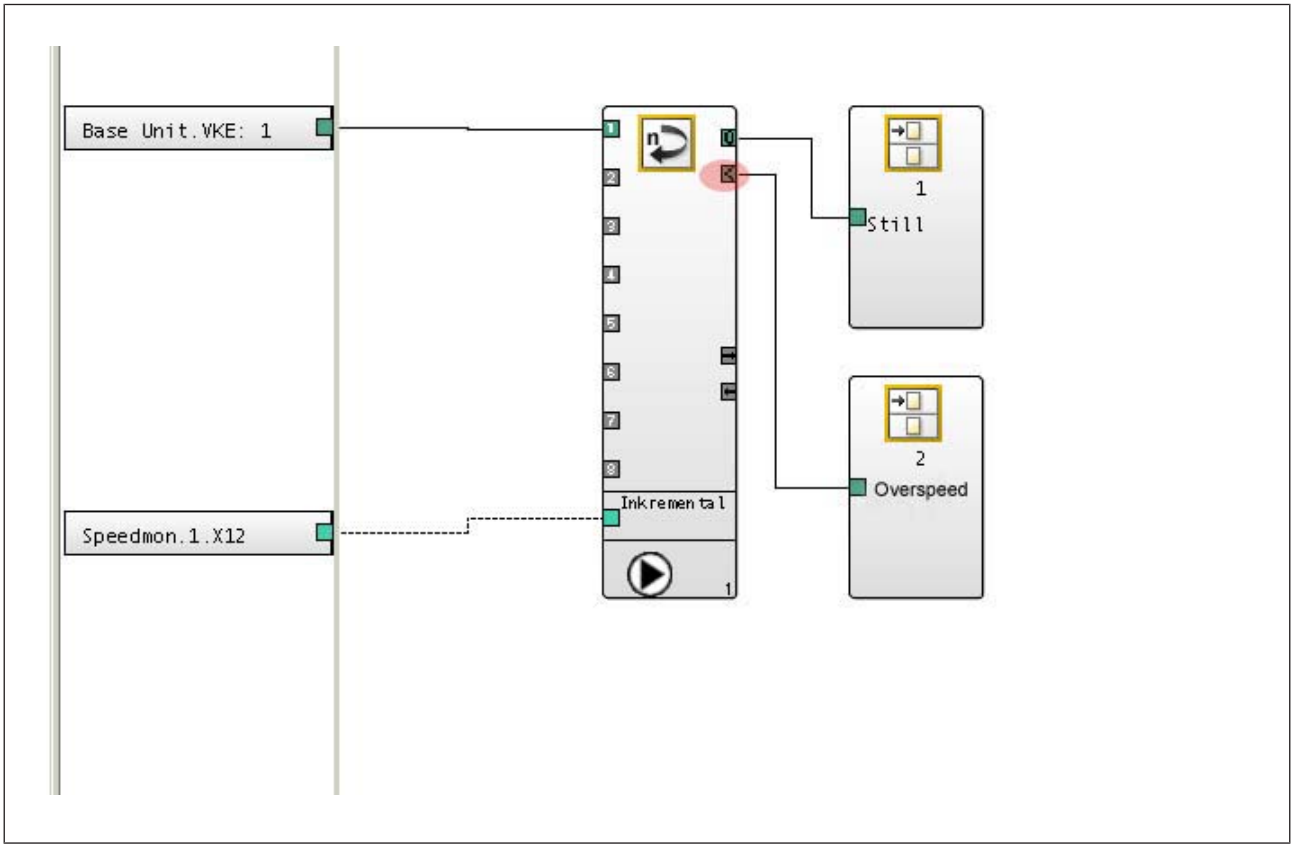
#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 800 |
| Set screw terminals | 1 set of screw terminals | 793 800 |

# Speed monitors
PNOZ ms2p HTL

## Application Examples

### Safe standstill monitoring



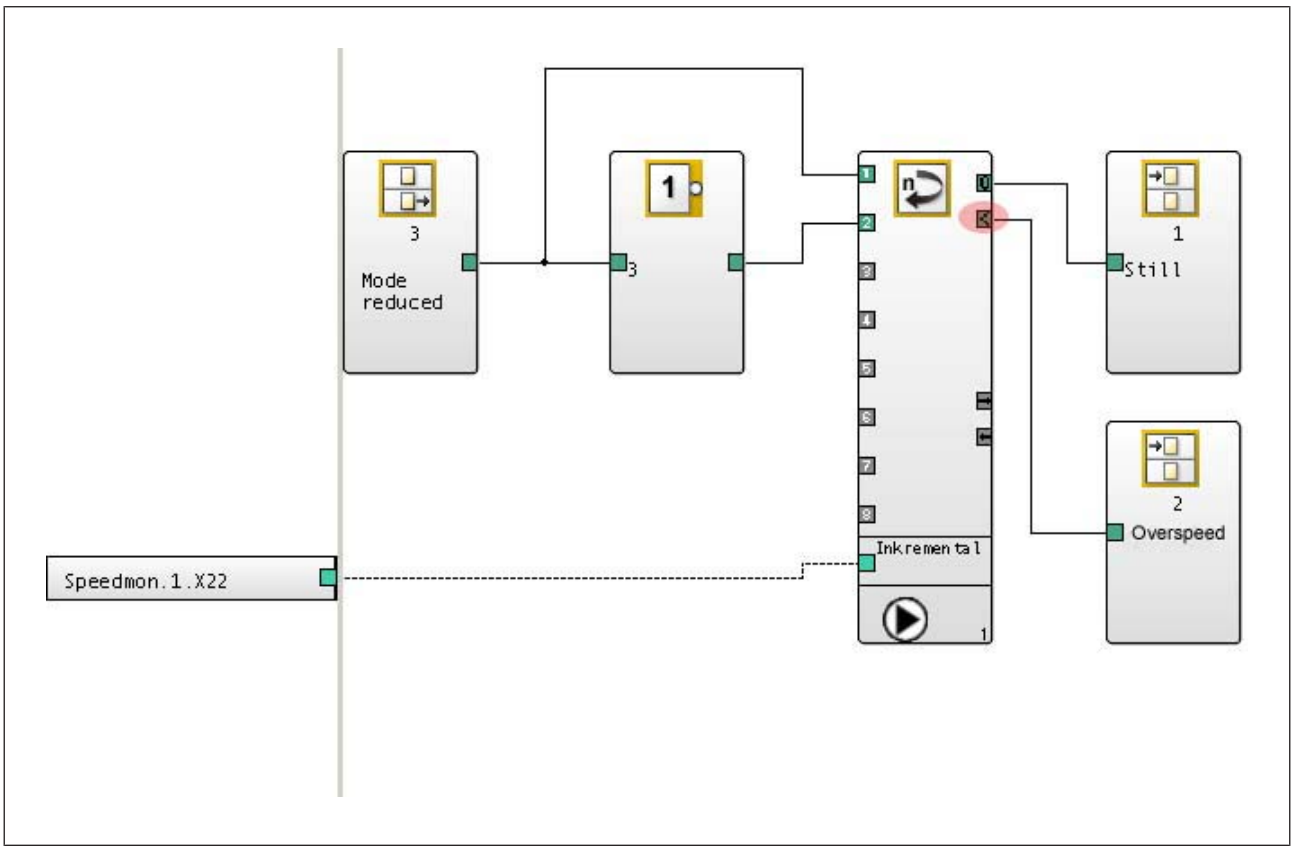

Configuration in the PNOZmulti Configurator

- Standstill: depending on requirement
- Speed n1: greater than the maximum permitted speed.

If the "Overspeed" output (see red marking) = "0", either the maximum permitted speed has been exceeded or the speed monitor has recognised a fault.
"Overspeed" output = "0" must lead to the shutdown of the relevant axis.

## Speed monitors
PNOZ ms2p HTL

**Safe monitoring with "reduced speed" operating mode**




Configuration in the PNOZmulti Configurator

- Standstill: depending on requirement
- Speed n1: reduced speed, depending on requirement
- Speed n2: greater than the maximum permitted speed.

If the "Overspeed" output (see red marking) = "0", either the maximum permitted speed has been exceeded or the speed monitor has recognised a fault.
"Overspeed" output = "0" must lead to the shutdown of the relevant axis, irrespective of whether the "reduced speed" operating mode is active.

# Speed monitors
PNOZ ms2p TTL (Coated Version)

## Overview

### Unit features

Using the product PNOZ ms2p TTL (Coated Version):

Speed monitor for connection to a base unit from the configurable control system PNOZmulti

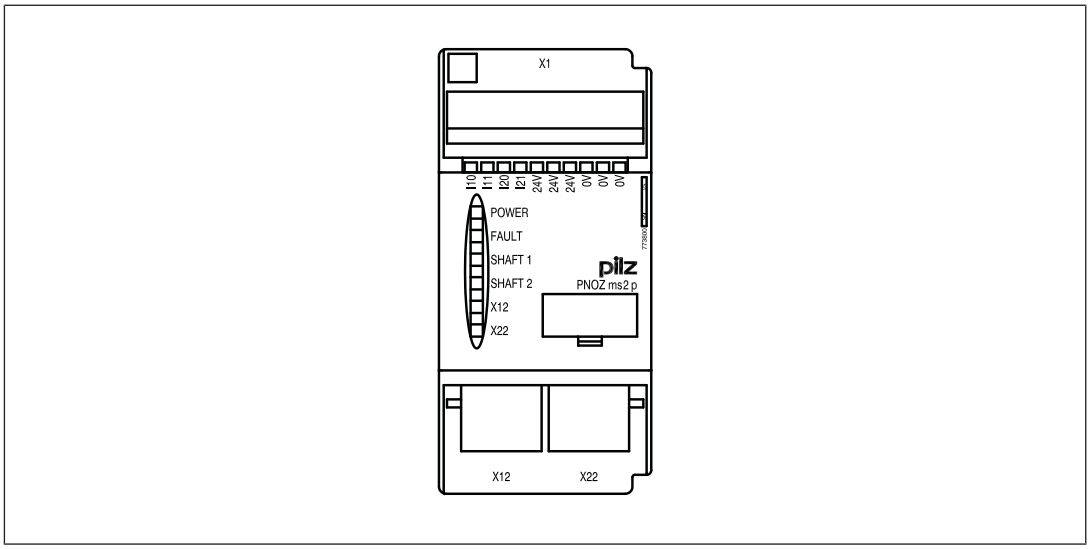
The product has the following features:

- 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 start mode can be selected in the PNOZmulti Configurator
- Status indicators for
  - Supply voltage
  - Incremental encoder
  - Proximity switch
  - 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)

# Speed monitors
## PNOZ ms2p TTL (Coated Version)

- Incremental encoder connection technology:
  RJ45 female connector
- Galvanic isolation between the connections X1, X12 and X22
- Max. 4 speed monitors can be connected to the base unit
- Coated version:
  Increased environmental requirements (see Technical details [📖 327])

### Front view




Key:

- X1:
  - I10, I11:
    connection terminals for proximity switch at axis 1
  - I20, I21:
    connection terminals for proximity switch at axis 2
  - 0 V, 24 V:
    supply connections
- X12:
  - female connector for the connection of an incremental encoder at axis 1
- X22:
  - female connector for the connection of an incremental encoder at axis 2
- LEDs:
  - POWER
  - FAULT
  - SHAFT 1
  - SHAFT 2

# Speed monitors
PNOZ ms2p TTL (Coated Version)

– X12
– X22

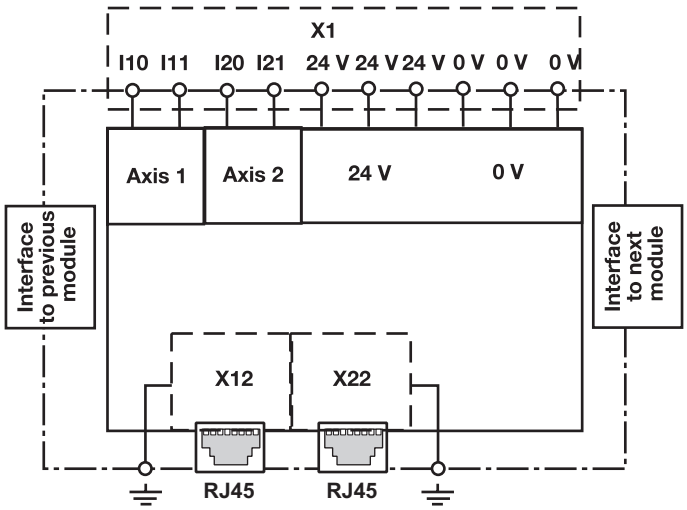
## Function description

### Operation

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.

The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

### Block diagram




### Input device types

- Only "pnp" type proximity switches may be used (N/O contact, switching to positive).
- The proximity switches require a 24 VDC supply.
- The proximity switches must be fitted so that at least one is always activated (carries a high signal).
- The proximity switches must be fitted so that the recorded signals overlap.
- When monitoring with proximity switches we recommend you use proximity switches with hysteresis in order to prevent bounce and therefore incorrect measurements.

# Speed monitors
## PNOZ ms2p TTL (Coated Version)

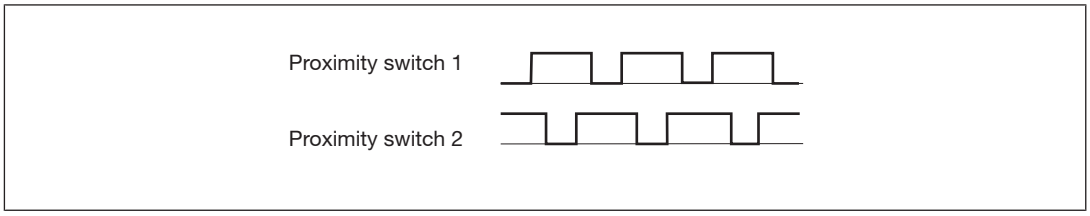



Fig.: Example proximity switch signal behaviour

- Please note the values stated in the technical details
- Only incremental encoders with a differential output of the following type are permitted
  - Sin/Cos
  - TTL (RS422)
- Please note the values stated in the technical details

The adapter records the data between the encoder and drive and makes it available to the PNOZ ms2p TTL (Coated Version) via the RJ45 socket.

Pilz supplies complete adapters as well as ready-made cable with RJ45 connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

In order to increase the availability, a proximity switch and an incremental encoder can be configured on one axis for the speed monitor. The speed monitor then monitors 3 signals on an axis: Track A and track B of the incremental encoder and the proximity switch

**Standstill monitoring**

Standstill is detected when at least two of these signals fall below the standstill frequency.

**Monitoring for broken shearpins**

If the Broken shearpin monitoring option is activated, a shearpin break is recognised if

- both signals of the incremental encoder fall below the set standstill frequency (standstill)

  and
- the proximity switch exceeds the set standstill frequency (rotating shaft).

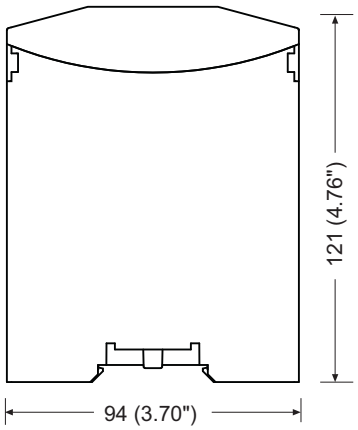
The recognised broken shearpin leads to safe condition (see status B2 in "Signal statuses" table in Chapter 8 of the operating manual). If individual or multiple signals change, the system may leave a safe state (see "Signal statuses" table).

Hazards that can arise through an automatic restart must be excluded from the user program.

# Speed monitors
PNOZ ms2p TTL (Coated Version)

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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 [📖 327] must be followed.
- Use copper wiring with a temperature stability of 75 °C.

On each of the 2 axes you can connect as required:

- 1 incremental encoder

  or
- 2 proximity switches

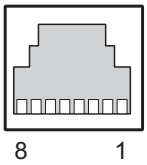
  or
- 1 incremental encoder and 1 proximity switch

| | Incremental encoder | Proximity switch |
|---|---|---|
| Connection axis 1 | X12 | - |
| | - | I10, I11, 0 V |
| | X12 | I10, 0 V |

# Speed monitors
## PNOZ ms2p TTL (Coated Version)

| | | |
|---|---|---|
| Connection axis 2 | X22 | - |
| | - | I20, I21, 0 V |
| | X22 | I20, 0 V |

### Pin assignment of RJ45 socket

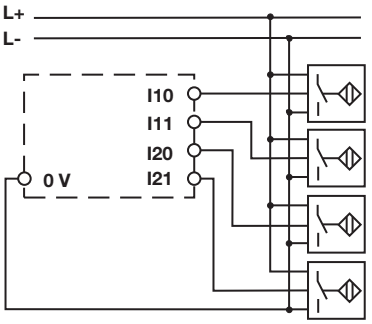
| RJ45 socket<br>8-pin | PIN | Track |
|---|---|---|
|  | 1 | n.c. |
| | 2 | 0 V |
| | 3 | n.c. |
| | 4 | A |
| | 5 | /A |
| | 6 | n.c. |
| | 7 | B |
| | 8 | /B |

### Connection of proximity switches

Proceed as follows when connecting proximity switches:

- Terminals I10 and I11: connect the proximity switch for axis 1
- Terminals I20 and I21: connect the proximity switch for axis 2.
- If only one axis is to be monitored, either terminals I10 and I11 or terminals I20 and I21 will remain free.
- When connecting incremental encoders and proximity switches on one axis:
  - Terminals I10: connect proximity switch for axis 1 (I11 is not used)
  - Terminals I20: connect proximity switch for axis 2 (I21 is not used)
- The proximity switch must always be connected to a 0 V terminal of the speed monitor. The 0 V terminals are connected internally.
- Connect proximity switch to 24 VDC of the power supply or the speed monitor (the 24 V terminals of the speed monitor are connected internally)

# Speed monitors
## PNOZ ms2p TTL (Coated Version)




### Connection of the incremental encoder

Proceed as follows when connecting the incremental encoder:

- The incremental encoder may be connected via an adapter or directly to the speed monitor.
- The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- Use only shielded cables for all connections
- 0 V from the incremental encoder and speed monitor should always be connected.
- Position the terminating resistors of the signal lines as close as possible to the speed monitor input.

Encoder types: 1 Vss, 5 V-TTL

- Apply 5 VDC to incremental encoder only
- Terminate incremental encoder with $Z_0$ = 120 Ohm

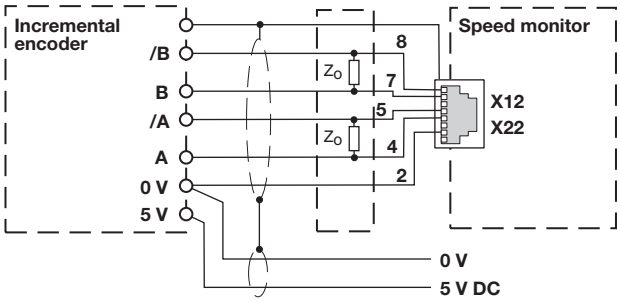



Fig.: Connection to incremental encoder type 1 Vss, 5 V-TTL

- The adapter is connected between the incremental encoder and the drive. The output on the adapter is connected to the female RJ45 connector on the speed monitor.

## Speed monitors
PNOZ ms2p TTL (Coated Version)

- The adapter can also be used without connecting to a drive. The signal lines can then be terminated directly at the adapter with $Z_O$ = 120 Ohm.
- If the signal lines in the drive are already terminated with $Z_O$ = 120 Ohm, the incremental encoder may no longer be terminated.
- The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated under "Connect incremental encoder signals to the speed monitor" and in the adapter operating manual must be observed when connecting the supply voltage.
- Supply only incremental encoder with 5 VDC.

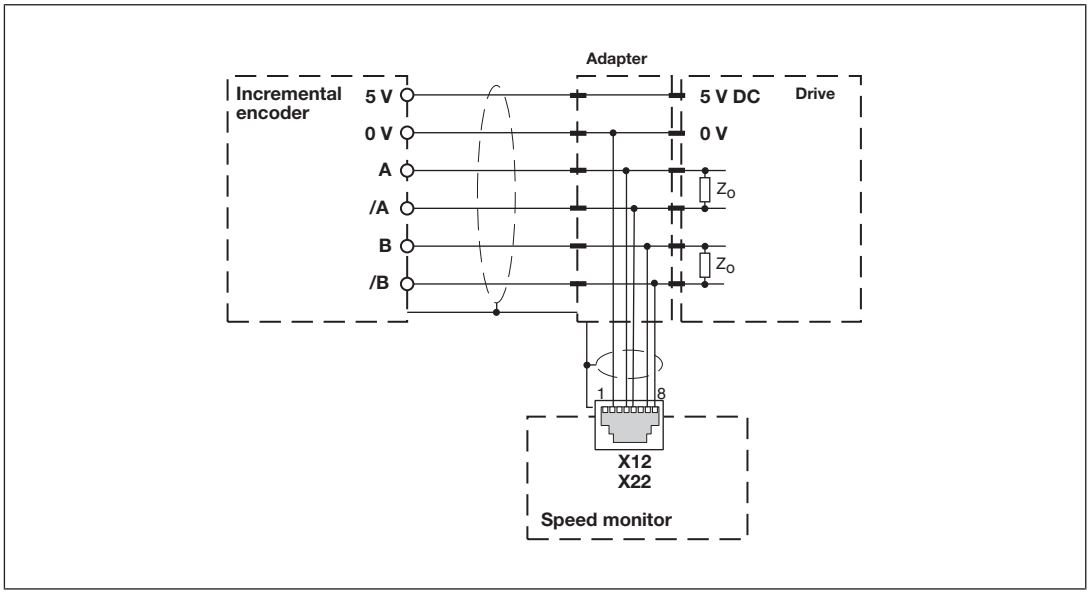



Fig.: Connection via adapter and drive

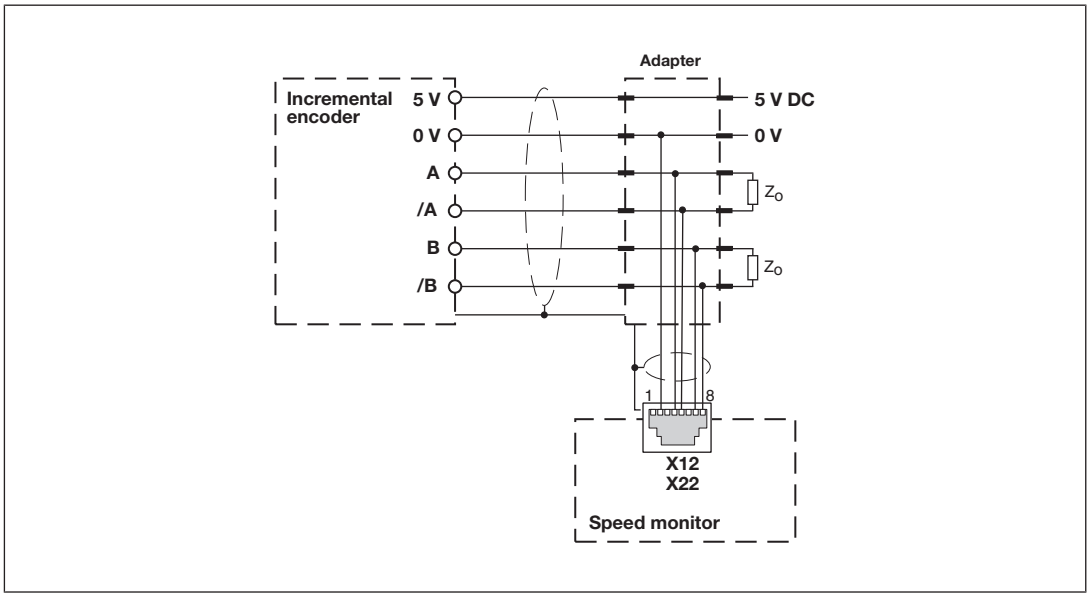



Fig.: Connection via adapter

# Speed monitors
PNOZ ms2p TTL (Coated Version)

## Connection of proximity switches and incremental encoder

Axis 1:
Proximity switch at I10, I11
or
incremental encoder at X12

Axis 2:
Proximity switch at I20, I21
or
incremental encoder at X22

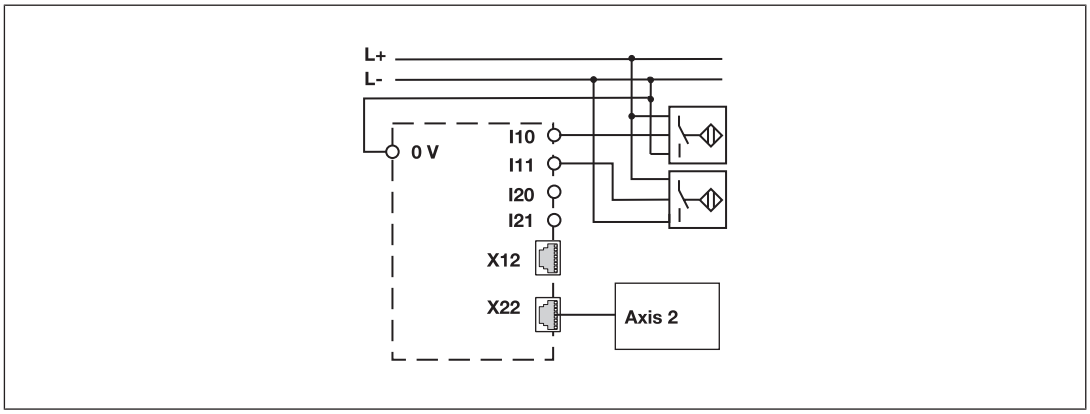



Fig.: Proximity switch and incremental encoder on various axes

Axis 1:
Proximity switch at I10 (I11 is unused)
and
Incremental encoder at X12
Axis 2:
Proximity switch at I20 (I21 is unused)
and
Incremental encoder at X22

## Speed monitors
PNOZ ms2p TTL (Coated Version)

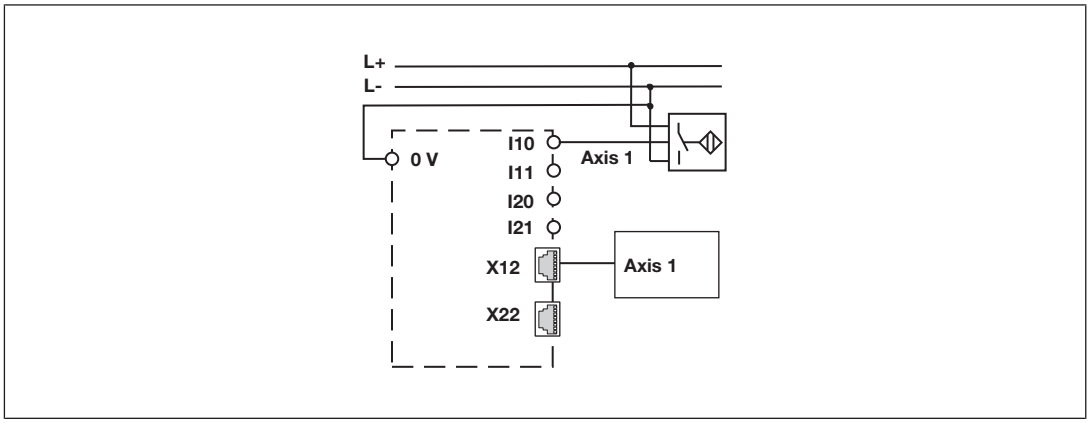



Fig.: Proximity switch and incremental encoder on one axis

# Speed monitors
PNOZ ms2p TTL (Coated Version)

## Connection examples

### Description

- 2 proximity switches, pnp-switching
- 1 incremental encoder

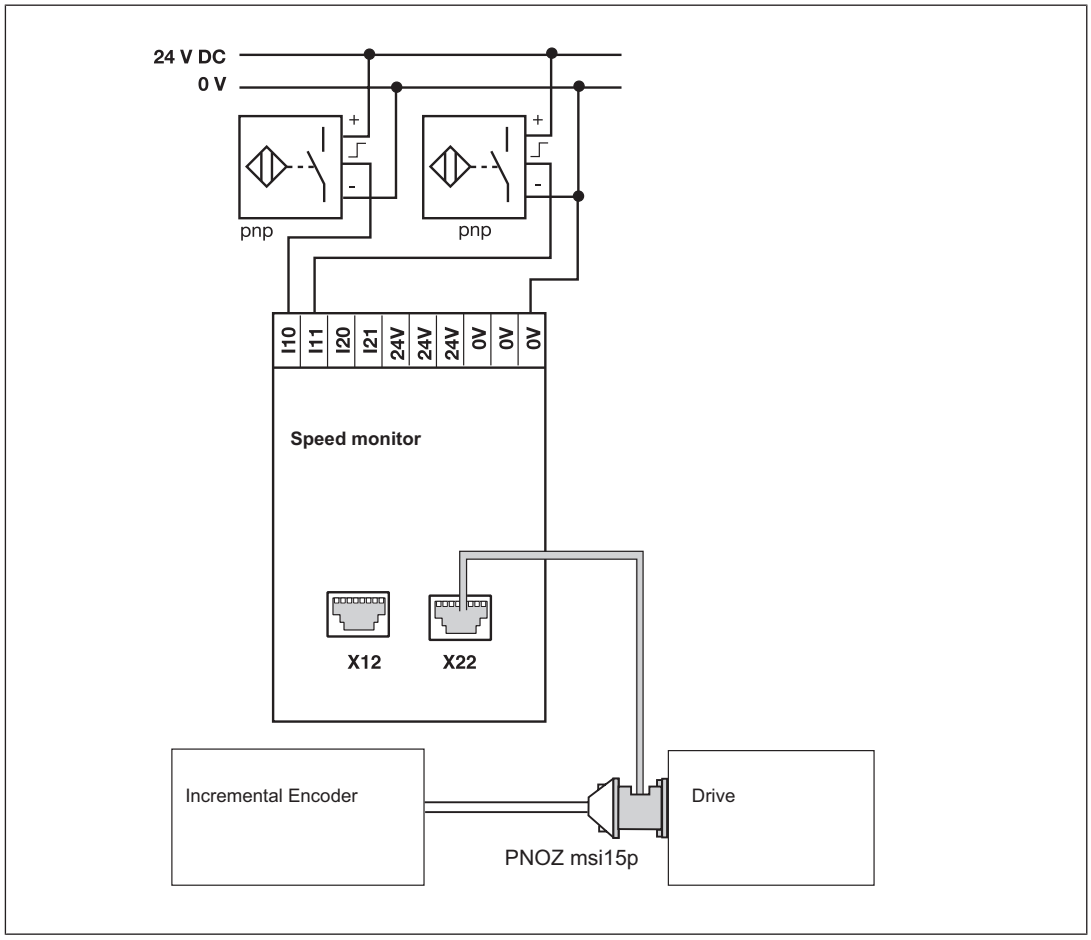



Fig.: Connection of 2 proximity switches, pnp-switching, one incremental encoder

# Speed monitors
## PNOZ ms2p TTL (Coated Version)

**Description**

- 4 proximity switches, pnp-switching
- Connection through 24 V terminals and 0 V

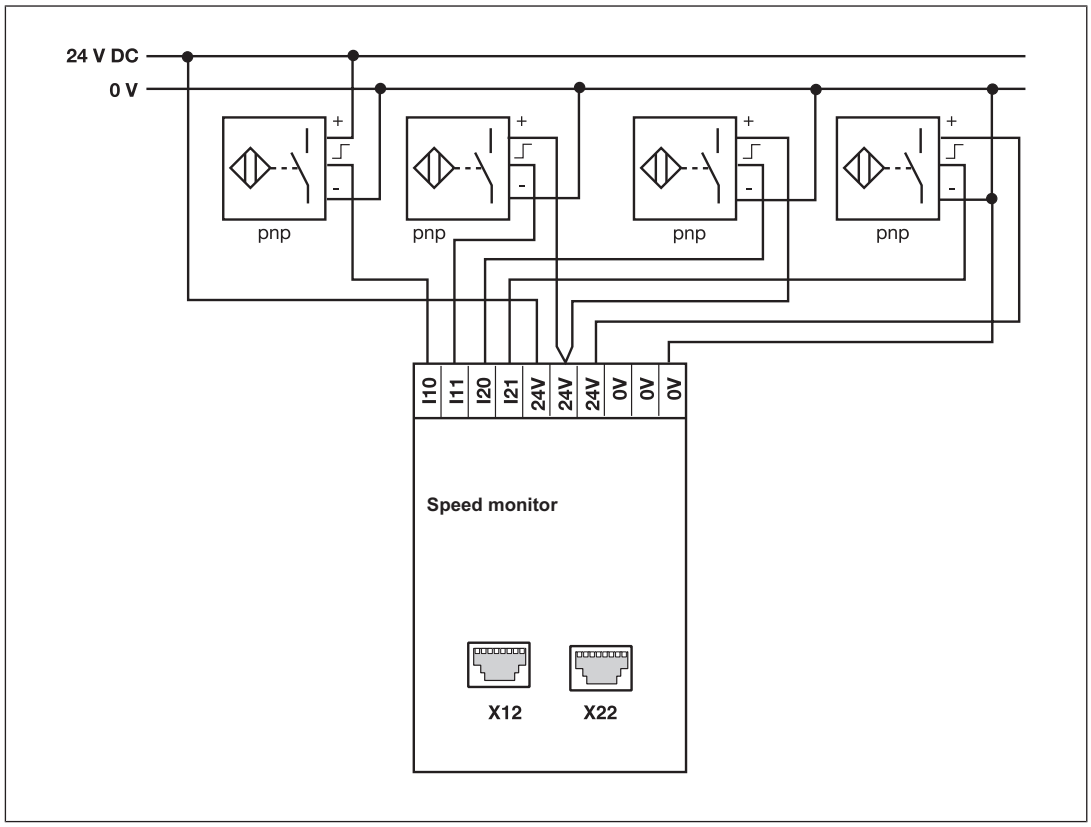



Fig.: Connection of 4 proximity switches, pnp-switching, connection through 24 V terminals and 0 V

# Speed monitors
## PNOZ ms2p TTL (Coated Version)

**Description**

- 1 proximity switch, pnp-switching
- 1 incremental encoder
- Incremental encoder and proximity switch on one axis

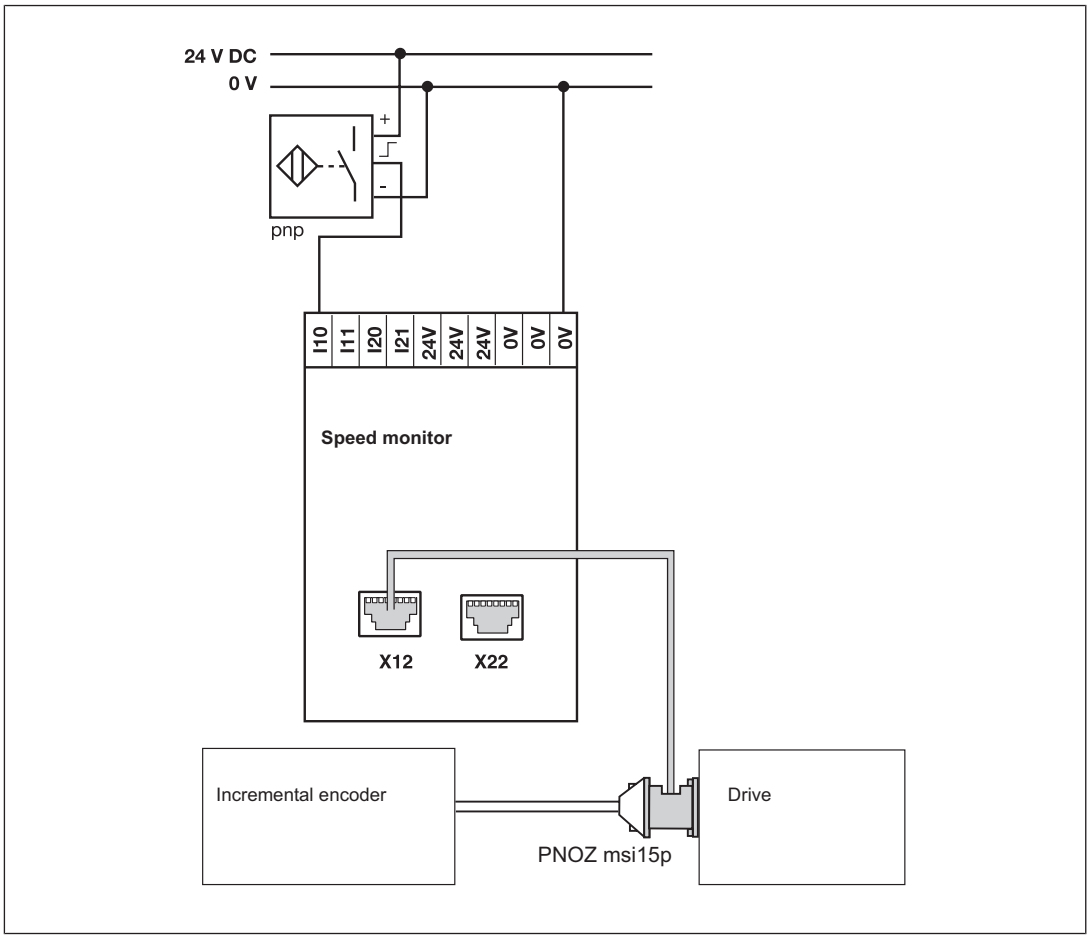



Fig.: Connection of an incremental encoder and proximity switch, pnp-switching, on an axis

# Speed monitors
PNOZ ms2p TTL (Coated Version)

## Technical details

| General | 773811 | 773816 |
|---|---|---|
| Approvals | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed** | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed** |
| **Electrical data** | **773811** | **773816** |
| Supply voltage | | |
| for | **Module supply** | **Module supply** |
| internal | **Via base unit** | **Via base unit** |
| Voltage | **5,0 V** | **5,0 V** |
| Kind | **DC** | **DC** |
| Voltage tolerance | **-2 %/+2 %** | **-2 %/+2 %** |
| Power consumption | **1,0 W** | **1,0 W** |
| Status indicator | **LED** | **LED** |
| **Proximity switch input** | **773811** | **773816** |
| Number of inputs | **4** | **4** |
| Input signal level | | |
| Signal level at "1" | **11 - 30 V** | **11 - 30 V** |
| Signal level at "0" | **-3 - 5 V** | **-3 - 5 V** |
| Input resistance | **3 kOhm** | **3 kOhm** |
| Input's frequency range | **0 - 3 kHz** | **0 - 3 kHz** |
| Configurable monitoring frequency | | |
| Without hysteresis | **0.1 Hz - 3 kHz** | **0.1 Hz - 3 kHz** |
| With hysteresis | **0.2 Hz - 3 kHz** | **0.2 Hz - 3 kHz** |
| **Incremental encoder input** | **773811** | **773816** |
| Number of inputs | **2** | **2** |
| Connection type | **RJ45 female connector, 8-pin** | **RJ45 female connector, 8-pin** |
| Input signal level | **0,5 - 5,0 Vss** | **0,5 - 5,0 Vss** |
| Phase position for the differential signals A, /A and B,/B | **90° ±30°** | **90° ±30°** |
| Overload protection | **-30 - 30 V** | **-30 - 30 V** |
| Input resistance | **10,0 kOhm** | **10,0 kOhm** |
| Input's frequency range | **0 - 500 kHz** | **0 - 500 kHz** |
| Configurable monitoring frequency | | |
| Without hysteresis | **0.1 Hz - 500 kHz** | **0.1 Hz - 500 kHz** |
| With hysteresis | **0.2 Hz - 500 kHz** | **0.2 Hz - 500 kHz** |
| **Times** | **773811** | **773816** |
| Configurable switch-off delay | **0 - 2.500 ms** | **0 - 2.500 ms** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |

## Speed monitors
PNOZ ms2p TTL (Coated Version)

| Times | 773811 | 773816 |
|---|---|---|
| Reaction time | | |
| f>100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms** | **10 ms** |
| f<100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms + 1/f** | **10 ms + 1/f** |
| **Environmental data** | **773811** | **773816** |
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **-25 - 60 °C** | **0 - 60 °C** |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Short-term** | **Not permitted** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **5,0 - 500,0 Hz** | **10,0 - 150,0 Hz** |
| Acceleration | **1g** | **1g** |
| Broadband noise | | |
| In accordance with the standard | **EN 60068-2-64** | – |
| Frequency | **5 - 500 Hz** | – |
| Acceleration | **1,9grms** | – |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** |

# Speed monitors
## PNOZ ms2p TTL (Coated Version)

| Environmental data | 773811 | 773816 |
|---|---|---|
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Mechanical data** | **773811** | **773816** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **45,0 mm** | **45,0 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **220 g** | **220 g** |

Where standards are undated, the 2009-10 latest editions shall apply.

# Speed monitors
PNOZ ms2p TTL (Coated Version)

## Safety characteristic data

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN IEC 62061 SIL CL | EN IEC 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| Initiator | **PL e** | **Cat. 3** | **SIL CL 3** | **3,68E-09** | **SIL 3** | **4,84E-05** | **20** |
| Incremental encoder | **PL e** | **Cat. 3** | **SIL CL 3** | **6,73E-09** | **SIL 3** | **8,18E-05** | **20** |

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

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ ms2p TTL | Expansion module, speed monitor | 773 816 |
| PNOZ ms2p TTL coated version | Expansion module, speed monitor, coated version | 773 811 |

### Accessories

#### Terminator, jumper

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

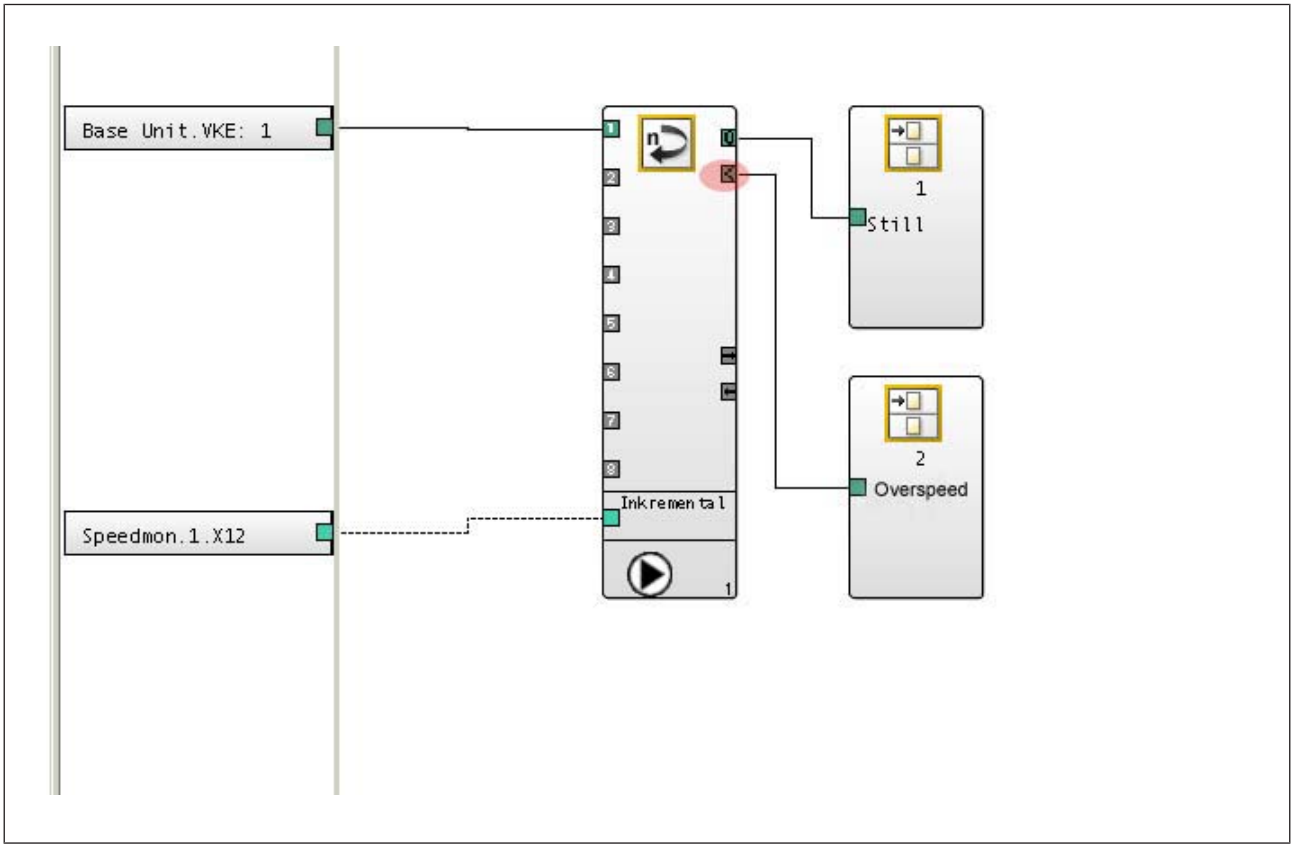
#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 800 |
| Set screw terminals | 1 set of screw terminals | 793 800 |

# Speed monitors
PNOZ ms2p TTL (Coated Version)

## Application Examples

### Safe standstill monitoring



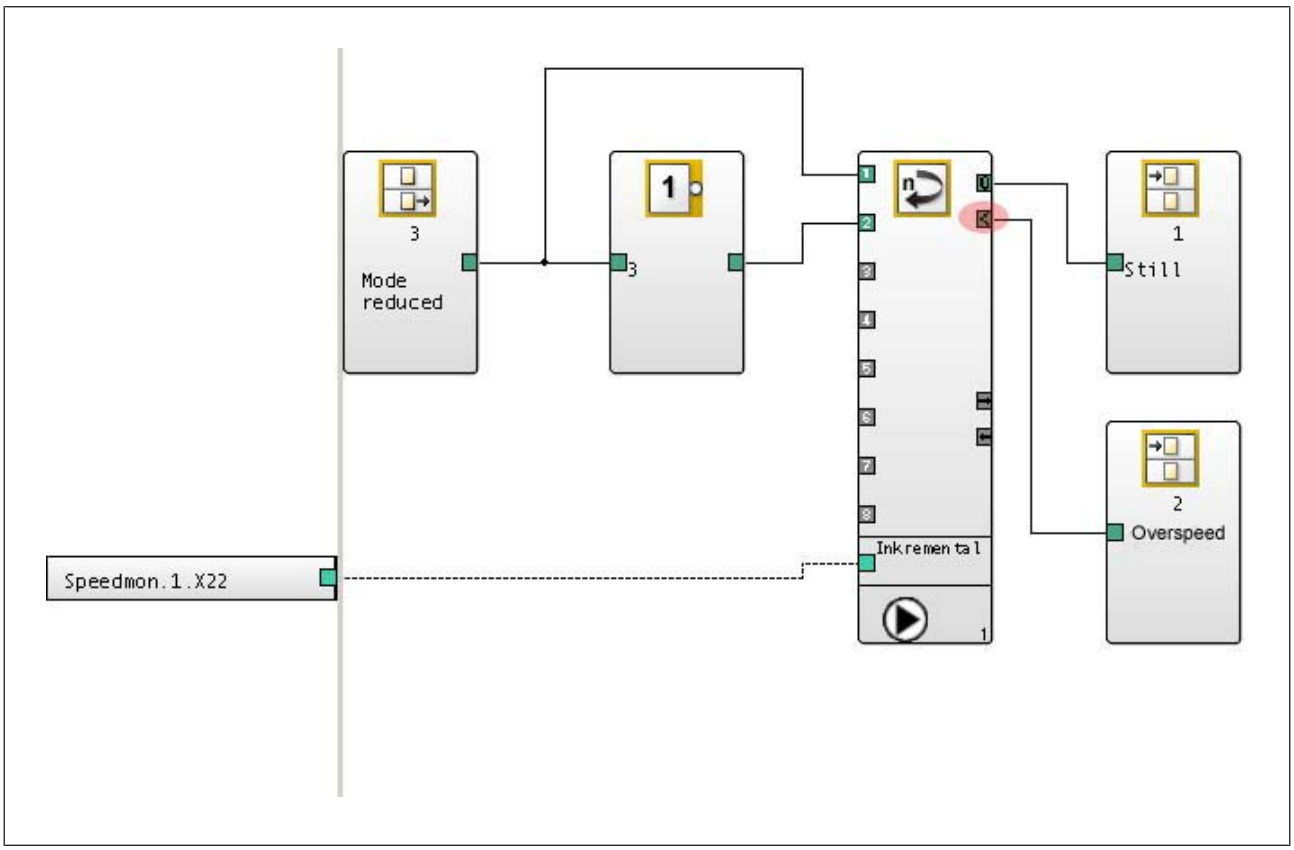

Configuration in the PNOZmulti Configurator

- Standstill: depending on requirement
- Speed n1: greater than the maximum permitted speed.

If the "Overspeed" output (see red marking) = "0", either the maximum permitted speed has been exceeded or the speed monitor has recognised a fault.
"Overspeed" output = "0" must lead to the shutdown of the relevant axis.

## Speed monitors
PNOZ ms2p TTL (Coated Version)

**Safe monitoring with "reduced speed" operating mode**




Configuration in the PNOZmulti Configurator

- Standstill: depending on requirement
- Speed n1: reduced speed, depending on requirement
- Speed n2: greater than the maximum permitted speed.

If the "Overspeed" output (see red marking) = "0", either the maximum permitted speed has been exceeded or the speed monitor has recognised a fault.
"Overspeed" output = "0" must lead to the shutdown of the relevant axis, irrespective of whether the "reduced speed" operating mode is active.

# Speed monitors
PNOZ ms3p

## Overview

### Unit features

Using the product PNOZ ms3p:

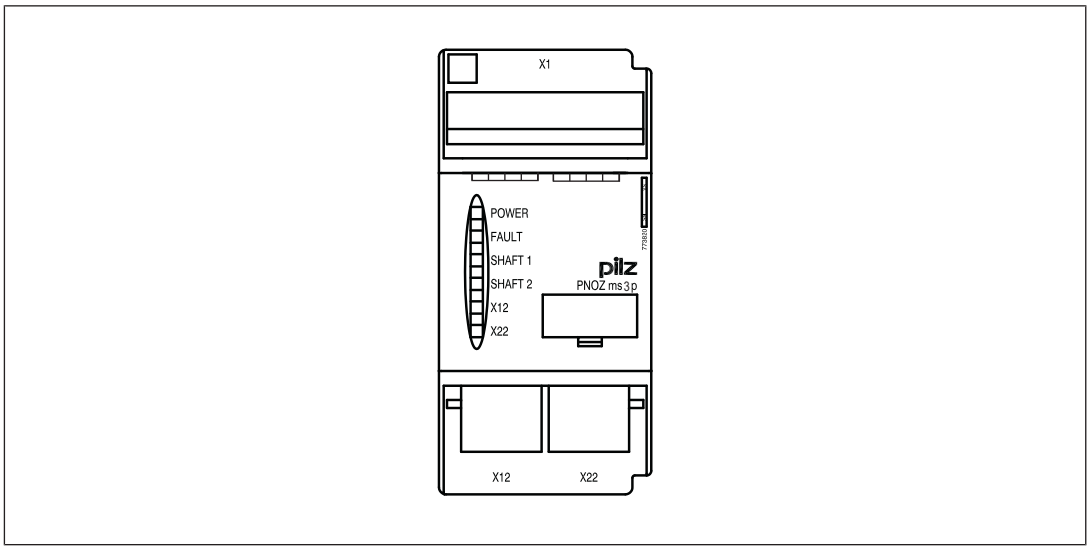
Speed monitor for connection to a base unit from the configurable control system PNOZmulti

The product has the following 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, start 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:
  RJ45 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

# Speed monitors
PNOZ ms3p

### Front view




Key:

- X12:
  - Female connector for connecting an incremental encoder to axis 1
- X22:
  - Female connector for connecting an incremental encoder to axis 2
- LEDs:
  - POWER
  - FAULT
  - SHAFT 1
  - SHAFT 2
  - X12
  - X22

## Function description

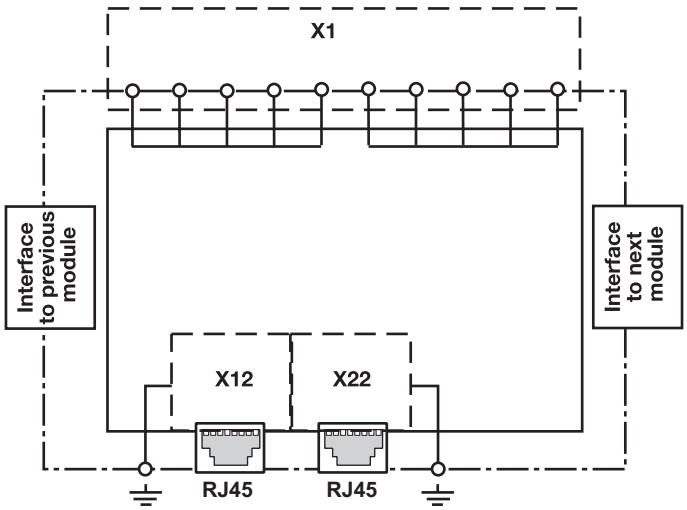
### Operation

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 implemented safety circuit, the values may be transferred from the base unit to a relay output on the safety system, for example. Incremental encoders may be used to record the values.

The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

# Speed monitors
PNOZ ms3p

## Block diagram




## Incremental encoders

- 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

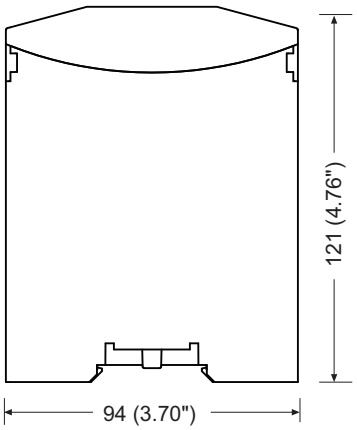
The adapter records the data between the encoder and drive and makes it available to the PNOZ ms3p via the RJ45 socket.

Pilz supplies complete adapters as well as ready-made cable with RJ45 connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

# Speed monitors
PNOZ ms3p

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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

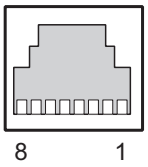
Details of the input type, axis type and reset mode, plus the values for standstill, speed monitoring and direction of rotation are also defined in the PNOZmulti Configurator.

Please note:

- Information given in the Technical details [📖 327] must be followed.
- Use copper wiring with a temperature stability of 75 °C.

# Speed monitors
PNOZ ms3p

## Pin assignment of RJ45 socket

| RJ45 socket<br>8-pin | PIN | Track |
|---|---|---|
|  | 1 | n.c. |
| | 2 | 0 V |
| | 3 | n.c. |
| | 4 | A |
| | 5 | /A |
| | 6 | n.c. |
| | 7 | B |
| | 8 | /B |

## Connecting the incremental encoder

Proceed as follows when connecting the incremental encoder:

- The incremental encoder may be connected via an adapter or directly to the speed monitor.
- The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- Use only shielded cables for all connections
- 0 V from the incremental encoder and speed monitor should always be connected.
- Position the terminating resistors of the signal lines as close as possible to the speed monitor input.

Encoder types: 1 Vss, 5 V-TTL

- Apply 5 V DC to incremental encoder only
- Do not terminate incremental encoder with $Z_0$ = 120 Ohm

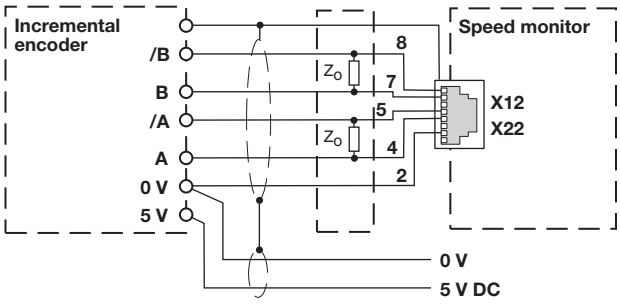



Fig.: Connection to incremental encoder type 1 Vss, 5 V-TTL

# Speed monitors
## PNOZ ms3p

Encoder types: 24 V-HTL

- Apply 24 V DC supply voltage to incremental encoder only
- Do not terminate incremental encoder with Z0 = 120 Ohm

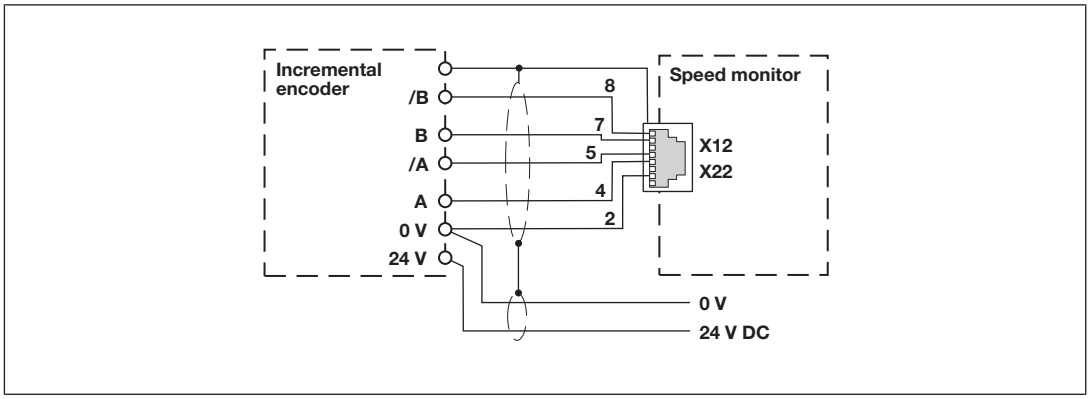



Fig.: Connection to incremental encoder type 24 V-HTL

- The adapter is connected between the incremental encoder and the drive. The output on the adapter is connected to the female RJ45 connector on the speed monitor.
- The adapter can also be used without connecting to a drive. The signal lines can then be terminated directly at the adapter with $Z_O$ = 120 Ohm.
- If the signal lines in the drive are already terminated with $Z_O$ = 120 Ohm, the incremental encoder may no longer be terminated.
- The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated under "Connect incremental encoder signals to the speed monitor" and in the adapter operating manual must be observed when connecting the supply voltage.
- Supply only incremental encoder with 5 VDC. 24 V-HTL signals may not be terminated.

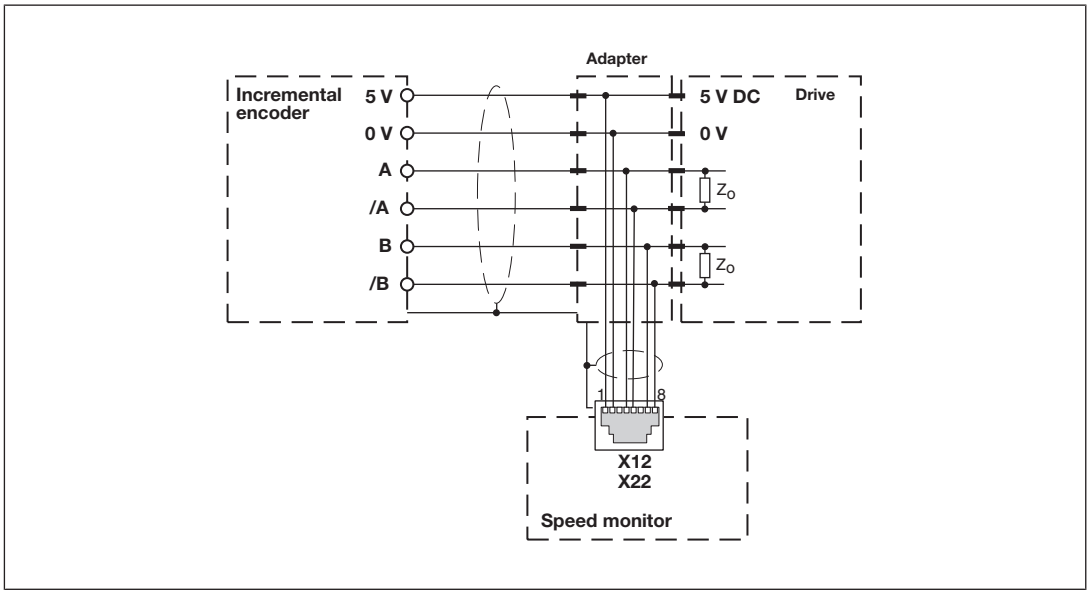



Fig.: Connection via adapter and drive

# Speed monitors
PNOZ ms3p

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **1,0 W** |
| Status indicator | **LED** |
| **Incremental encoder input** | |
| Number of inputs | **2** |
| Connection type | **RJ45 female connector, 8-pin** |
| Input signal level | **0,5 - 30,0 Vss** |
| Phase position for the differential signals A, /A and B,/B | **90° ±30°** |
| Overload protection | **-30 - 30 V** |
| Input resistance | **10,0 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** |
| **Times** | |
| Configurable switch-off delay | **0 - 2.500 ms** |
| Supply interruption before de-energisation | **20 ms** |
| Reaction time | |
| f>100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms** |
| f<100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms + 1/f** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |

# Speed monitors
PNOZ ms3p

| | |
|---|---|
| **Environmental data** | |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |

# Speed monitors
PNOZ ms3p

| Mechanical data | |
|---|---|
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **45,0 mm** |
| Depth | **121,0 mm** |
| Weight | **211 g** |

Where standards are undated, the 2009-10 latest editions shall apply.

## Safety characteristic data

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN IEC 62061 SIL CL | EN IEC 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| Incremental encoder | **PL e** | **Cat. 3** | **SIL CL 3** | **6,36E-09** | **SIL 3** | **8,45E-05** | **20** |

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

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ ms3p | Expansion module, speed monitor | 773 820 |

### Accessories

**Terminator, jumper**

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

# Speed monitors
PNOZ ms3p

**Connection terminals**

| Product type | Features | Order no. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 800 |
| Set screw terminals | 1 set of screw terminals | 793 800 |

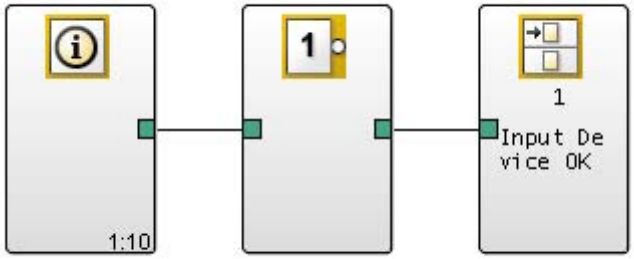
## Application examples

### Examples without position control

**Evaluation of bit: "Unfeasible or single-channel signal from the incremental encoder", without position control**

Diagnostic bit 10: "Unfeasible or single-channel signal from the incremental encoder" must be evaluated in the user program during operation in such a way that a set bit leads to a safety-related error reaction (shutdown).

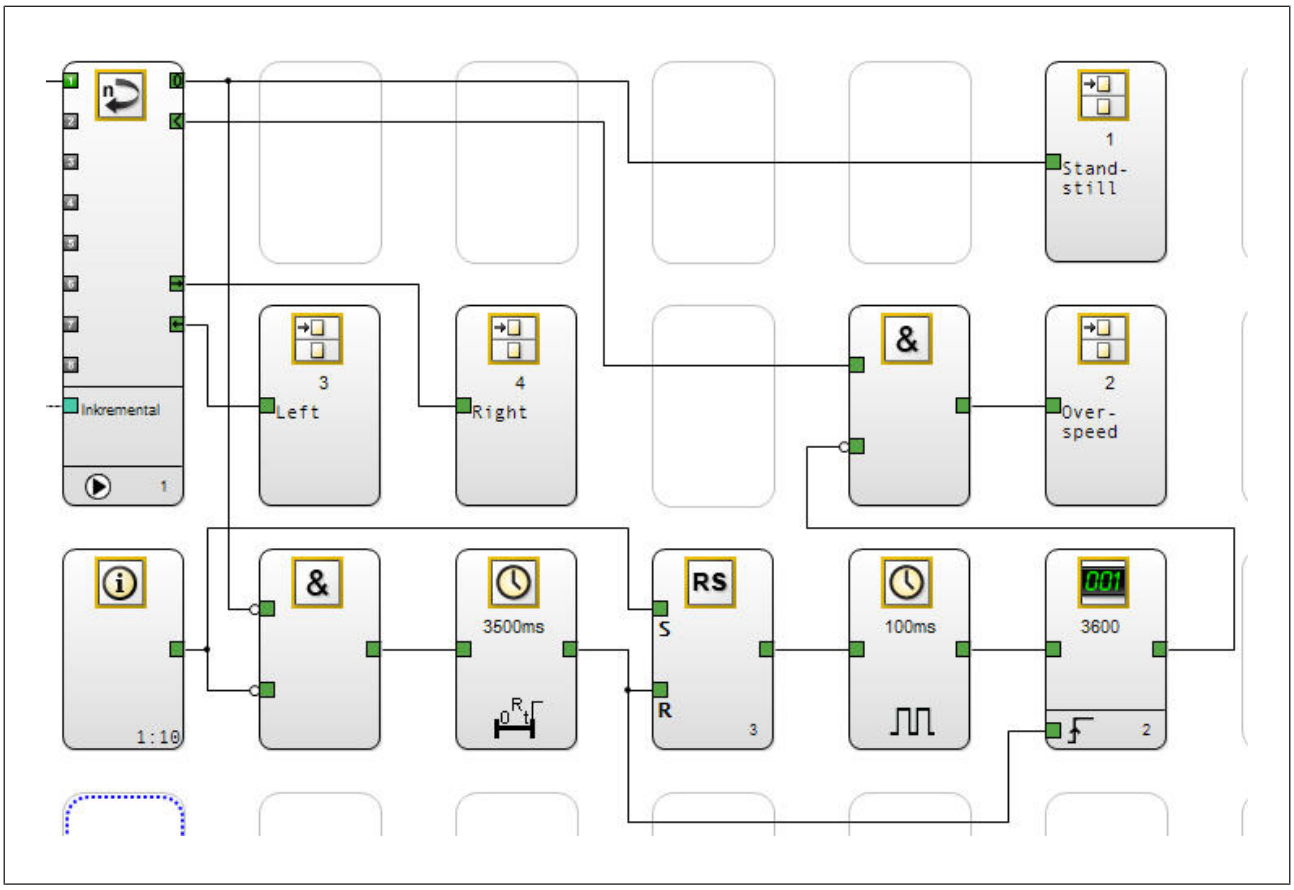
Immediate shutdown as soon as diagnostic bit 10 is set.
The bit is evaluated as follows:




The connection point "Input Device OK" must be incorporated into the application and evaluated in such a way that a shutdown occurs if the connection point "Input Device OK"= 0.

## Speed monitors
PNOZ ms3p

A set diagnostic bit 10 can be tolerated for a maximum of 4 hours (occurrence of second error). If no feasible signals above standstill frequency are measured within this time, a shutdown will occur.
In this case, the bit will be evaluated as follows:




Please note that the direction of rotation must be evaluated for this example!

# Speed monitors
PNOZ ms3p

## Example with position control

**Evaluation of bit: "Unfeasible or single-channel signal from the incremental encoder", with position control**

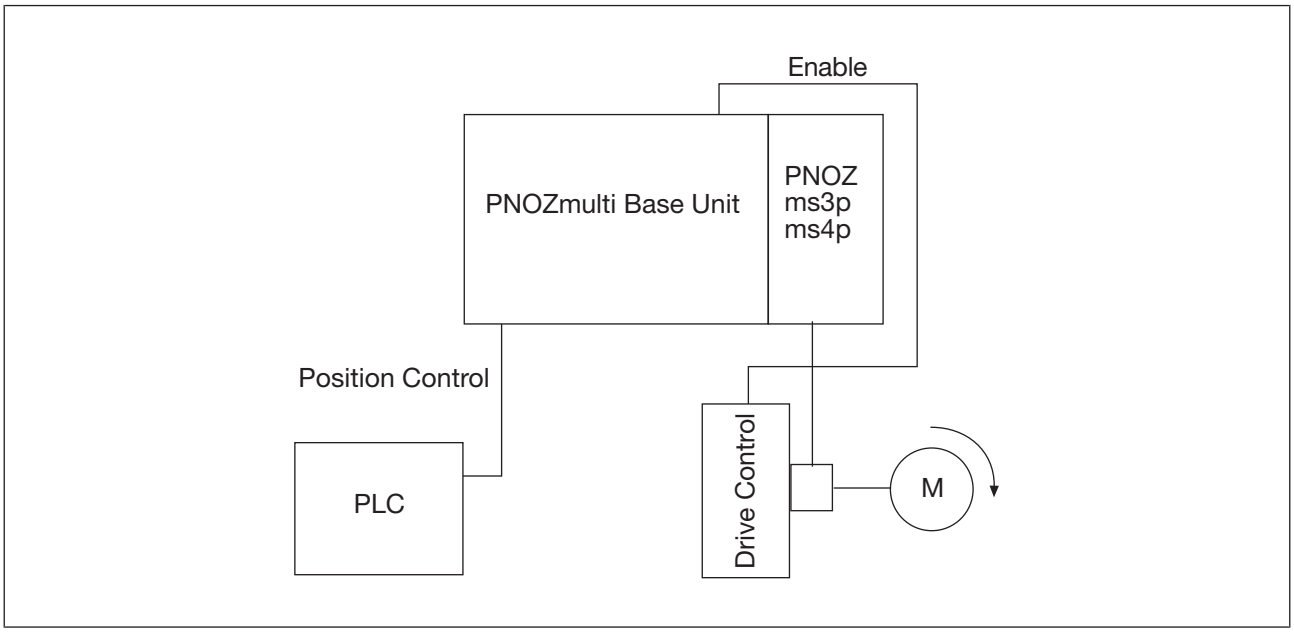
Diagnostic bit 10: "Unfeasible or single-channel signal from the incremental encoder" may be set during position control as a result of jitter on the encoder.

The set bit can be tolerated, i.e. evaluated in the user program in such a way that a shut-down will not occur if the following conditions are met:

- An additional position control signal must be provided from an external control system (e.g. PLC) and
- The signal must have the following status conditions:
  - Position control: Signal status = 1
  - Operation: Signal status = 0

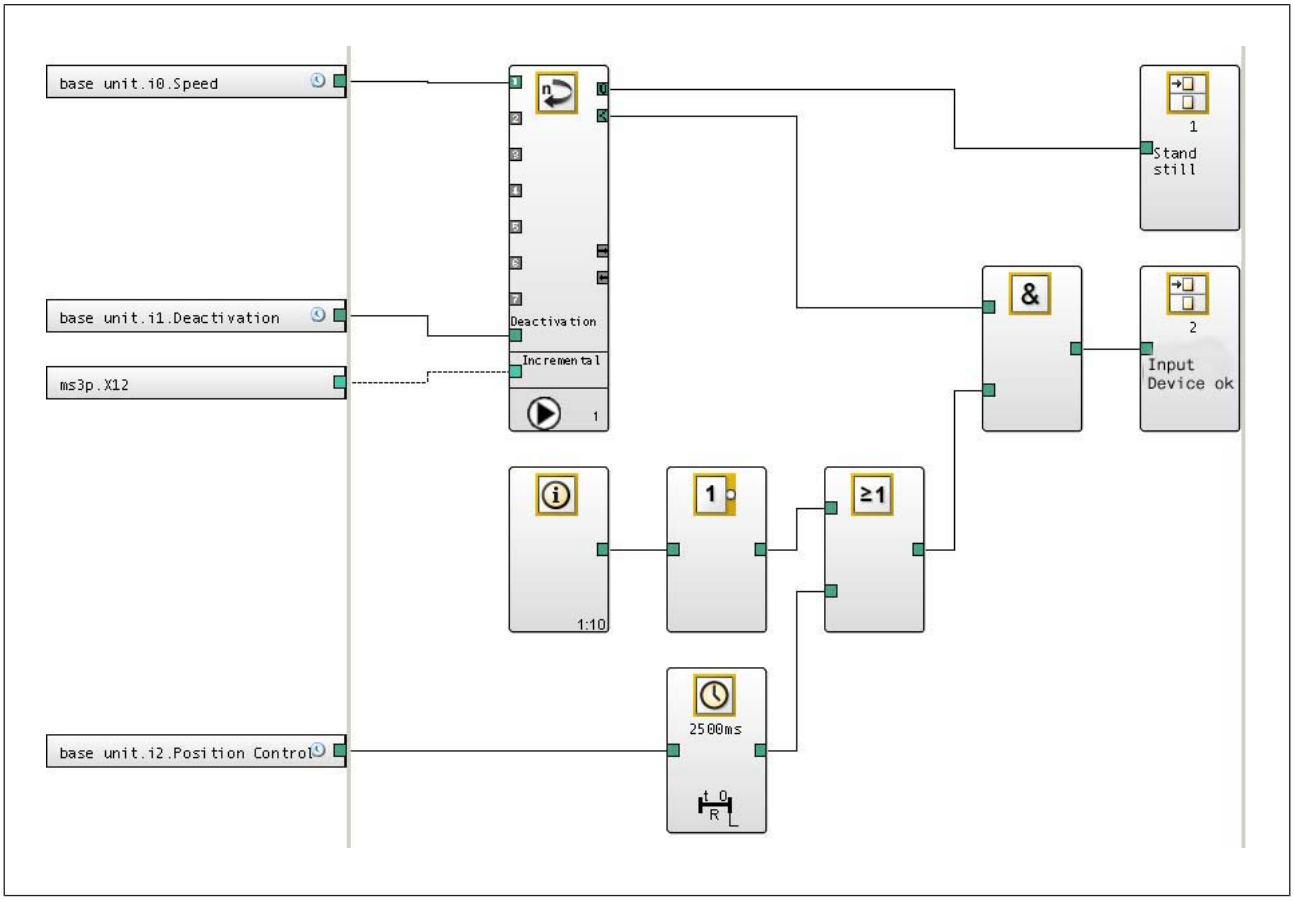
During operation, diagnostic bit 10 must be evaluated in the user program in such a way that a set bit leads to a safety-related error reaction (shutdown).

**Application example:**



## Speed monitors
PNOZ ms3p

Depending on the operating mode, evaluation of diagnostic bit 10 can be implemented in the user program as follows:




An additional "Position Control" signal is incorporated. This signal indicates whether the relevant axis is in position control (signal status = 1) or in operation (signal status = 0).

The time element with configured switch-off delay operates as a start-up suppressor, as the bit: "Unfeasible or single-channel signal from the incremental encoder" may still be present for 2 s after leaving standstill.

The connection point "Input Device OK" must be incorporated into the application and evaluated in such a way that a shutdown occurs if the connection point "Input Device OK"= 0.

# Speed monitors
PNOZ ms3p HTL

## Overview

### Unit features

Using the product PNOZ ms3p HTL:

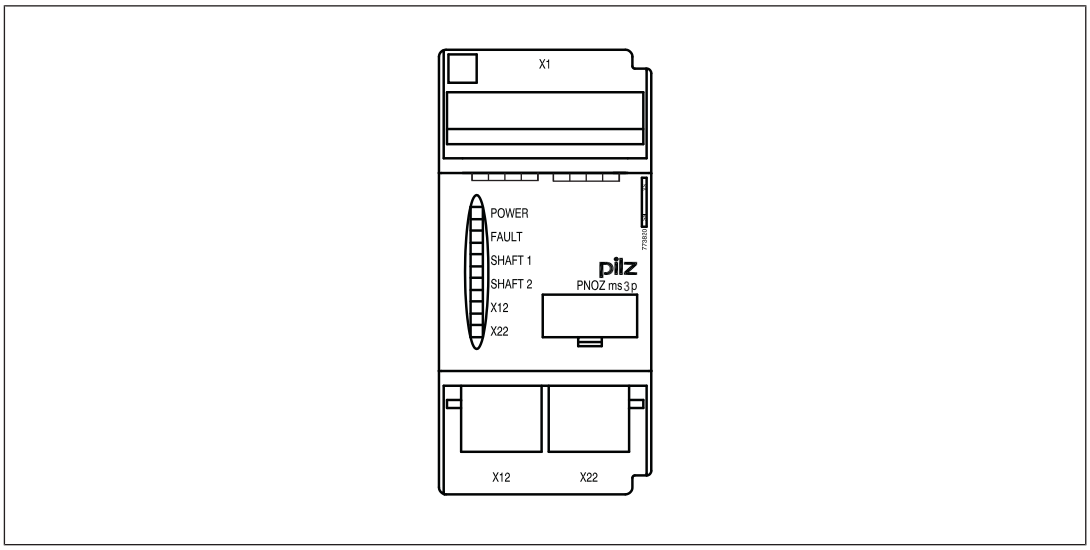
Speed monitor for connection to a base unit from the configurable control system PNOZmulti

The product has the following 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, start 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:
  RJ45 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

# Speed monitors
PNOZ ms3p HTL

### Front view




Key:

- X12:
  - Female connector for connecting an incremental encoder to axis 1
- X22:
  - Female connector for connecting an incremental encoder to axis 2
- LEDs:
  - POWER
  - FAULT
  - SHAFT 1
  - SHAFT 2
  - X12
  - X22

## Function description

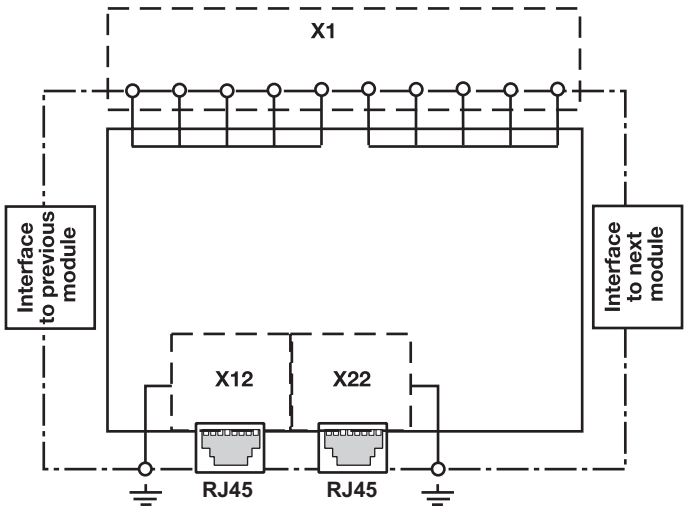
### Operation

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 implemented safety circuit, the values may be transferred from the base unit to a relay output on the safety system, for example. Incremental encoders may be used to record the values.

The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

# Speed monitors
PNOZ ms3p HTL

## Block diagram




## Incremental encoders

- Only incremental encoders with a differential output of the following type are permitted
  - HTL (12 V – 30 V)
- Please note the values stated in the technical details

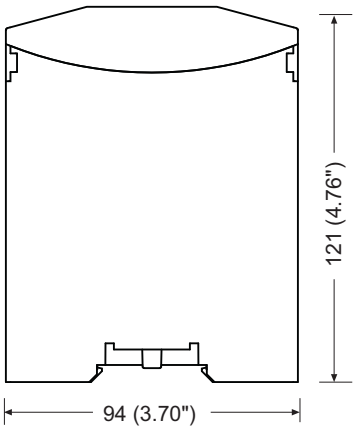
The adapter records the data between the encoder and drive and makes it available to the PNOZ ms3p HTL via the RJ45 socket.

Pilz supplies complete adapters as well as ready-made cable with RJ45 connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

# Speed monitors
PNOZ ms3p HTL

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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

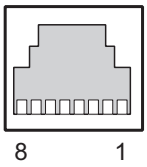
Details of the input type, axis type and reset mode, plus the values for standstill, speed monitoring and direction of rotation are also defined in the PNOZmulti Configurator.

Please note:

- Information given in the Technical details [📖 327] must be followed.
- Use copper wiring with a temperature stability of 75 °C.

# Speed monitors
PNOZ ms3p HTL

## Pin assignment of RJ45 socket

| RJ45 socket<br>8-pin | PIN | Track |
|---|---|---|
|  | 1 | 5 V |
| | 2 | 0 V |
| | 3 | T |
| | 4 | A |
| | 5 | /A |
| | 6 | /Z |
| | 7 | B |
| | 8 | /B |

## Connecting the incremental encoder

Proceed as follows when connecting the incremental encoder:

- The incremental encoder may be connected via an adapter or directly to the speed monitor.
- The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- Use only shielded cables for all connections
- 0 V from the incremental encoder and speed monitor should always be connected.
- Position the terminating resistors of the signal lines as close as possible to the speed monitor input.

Encoder types: 24 V-HTL

- Apply 24 VDC supply voltage to incremental encoder only
- Do not terminate incremental encoder with Z0 = 120 Ohm

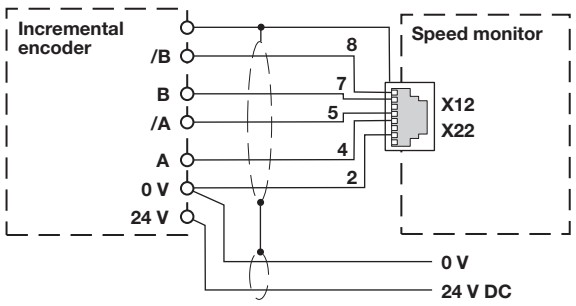



Fig.: Connection to incremental encoder type 24 V-HTL

## Speed monitors
PNOZ ms3p HTL

- The adapter is connected between the incremental encoder and the drive. The output on the adapter is connected to the female RJ45 connector on the speed monitor.
- The adapter can also be used without connecting to a drive.
- The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated under "Connect incremental encoder signals to the speed monitor" and in the adapter operating manual must be observed when connecting the supply voltage.
- Supply voltage (12 V – 30 V) to incremental encoder only.
- HTL signals may not be fitted with a terminating resistor.

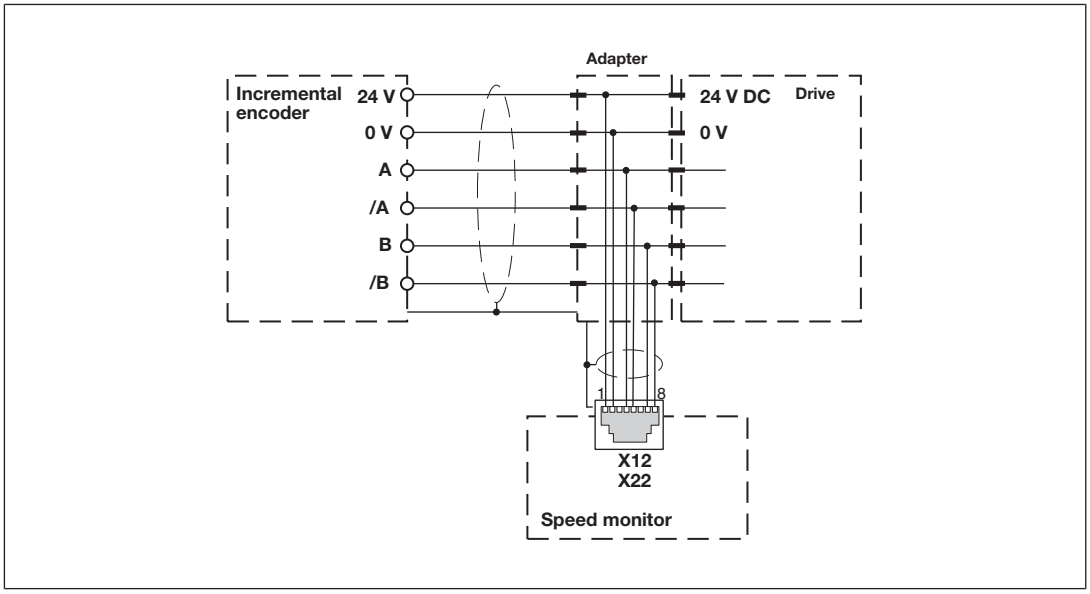



Fig.: Connection via adapter and drive

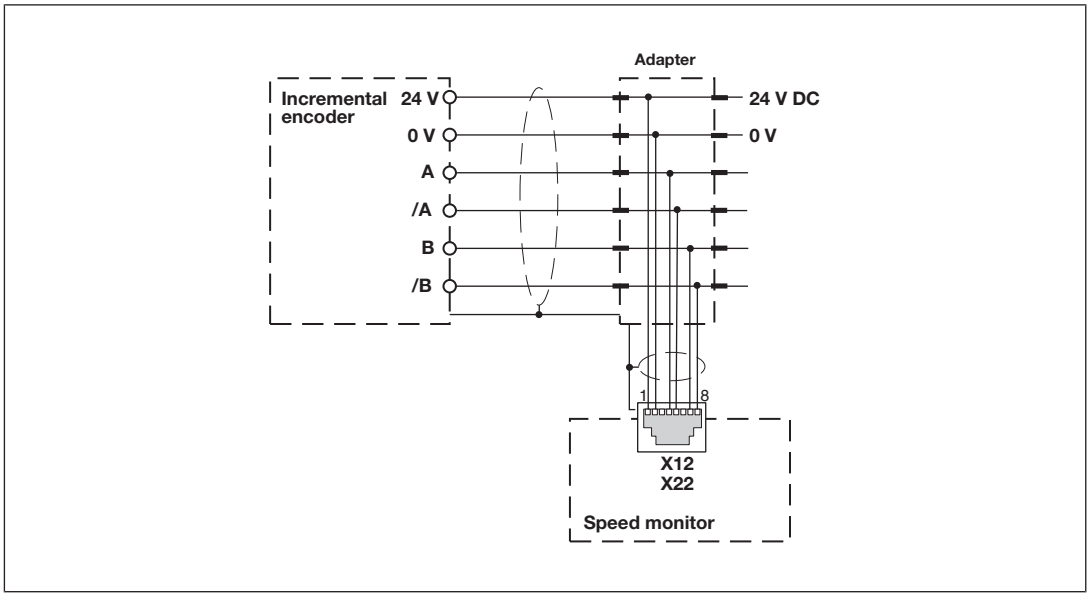



Fig.: Connection via adapter

# Speed monitors
PNOZ ms3p HTL

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **1,0 W** |
| Status indicator | **LED** |
| **Incremental encoder input** | |
| Number of inputs | **2** |
| Connection type | **RJ45 female connector, 8-pin** |
| Input signal level | **12,0 - 30,0 Vss** |
| Phase position for the differential signals A, /A and B,/B | **90° ±30°** |
| Overload protection | **-30 - 30 V** |
| Input resistance | **10,0 kOhm** |
| Input's frequency range | **0 - 200 kHz** |
| Configurable monitoring frequency | |
| Without hysteresis | **0.1 Hz - 200 kHz** |
| With hysteresis | **0.2 Hz - 200 kHz** |
| **Times** | |
| Configurable switch-off delay | **0 - 2.500 ms** |
| Supply interruption before de-energisation | **20 ms** |
| Reaction time | |
| f>100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms** |
| f<100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms + 1/f** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |

# Speed monitors
## PNOZ ms3p HTL

| | |
|---|---|
| **Environmental data** | |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |

# Speed monitors
PNOZ ms3p HTL

| Mechanical data | |
|---|---|
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **45,0 mm** |
| Depth | **121,0 mm** |
| Weight | **211 g** |

Where standards are undated, the 2009-10 latest editions shall apply.

## Safety characteristic data

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN IEC 62061 SIL CL | EN IEC 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| Incremental encoder | **PL e** | **Cat. 3** | **SIL CL 3** | **6,36E-09** | **SIL 3** | **8,45E-05** | **20** |

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

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ ms3p HTL | Expansion module, speed monitor | 773 825 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 800 |
| Set screw terminals | 1 set of screw terminals | 793 800 |

**Terminator, jumper**

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

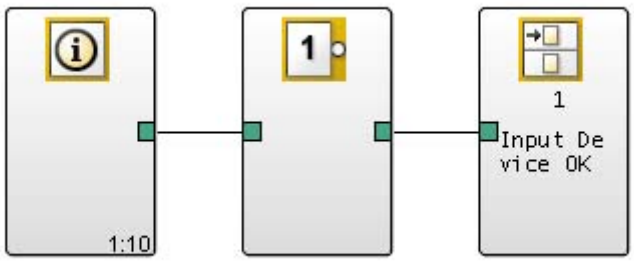
## Application examples

### Examples without position control

**Evaluation of bit: "Unfeasible or single-channel signal from the incremental encoder", without position control**

Diagnostic bit 10: "Unfeasible or single-channel signal from the incremental encoder" must be evaluated in the user program during operation in such a way that a set bit leads to a safety-related error reaction (shutdown).

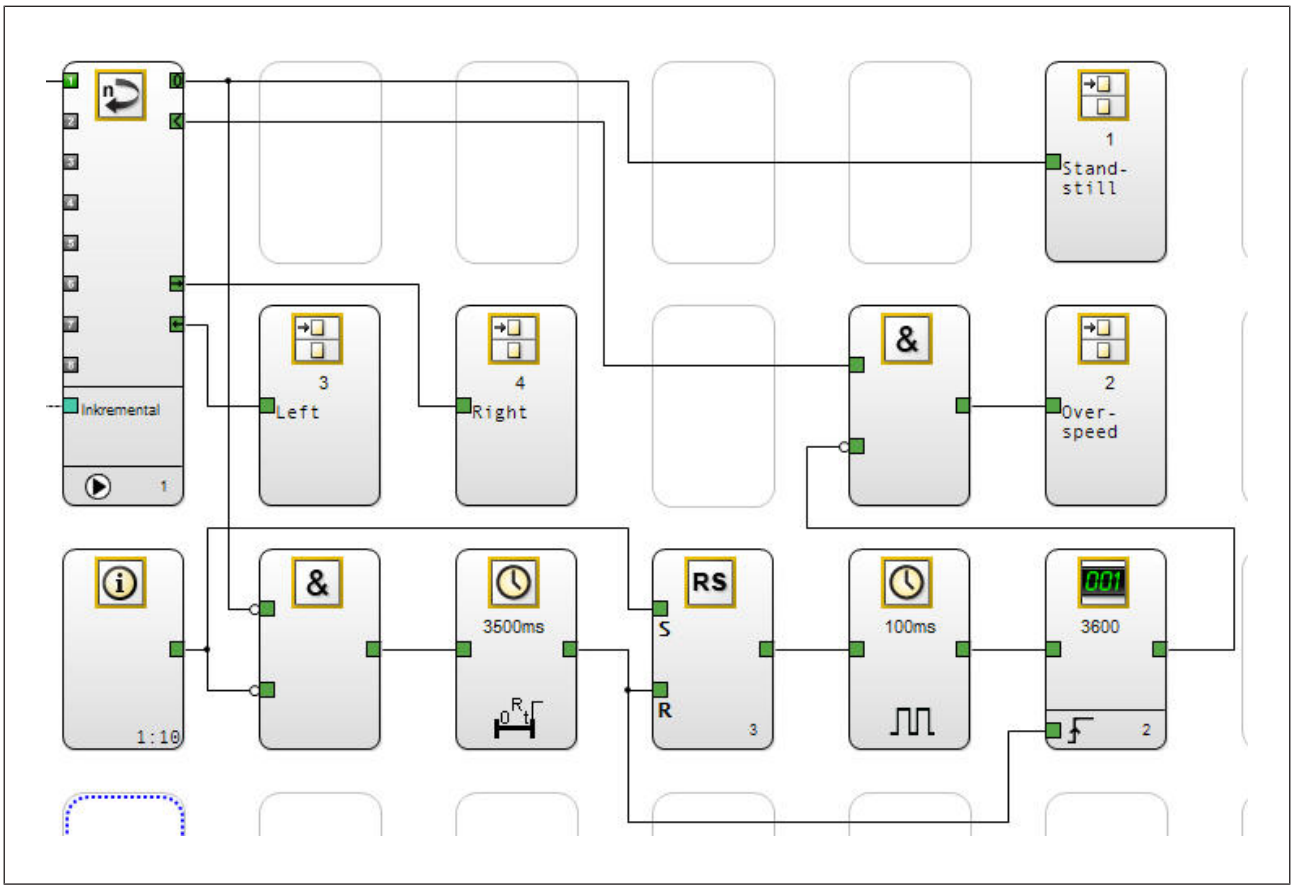
Immediate shutdown as soon as diagnostic bit 10 is set.
The bit is evaluated as follows:




The connection point "Input Device OK" must be incorporated into the application and evaluated in such a way that a shutdown occurs if the connection point "Input Device OK"= 0.

## Speed monitors
PNOZ ms3p HTL

A set diagnostic bit 10 can be tolerated for a maximum of 4 hours (occurrence of second error). If no feasible signals above standstill frequency are measured within this time, a shutdown will occur.
In this case, the bit will be evaluated as follows:




Please note that the direction of rotation must be evaluated for this example!

# Speed monitors
PNOZ ms3p HTL

## Example with position control

**Evaluation of bit: "Unfeasible or single-channel signal from the incremental encoder", with position control**

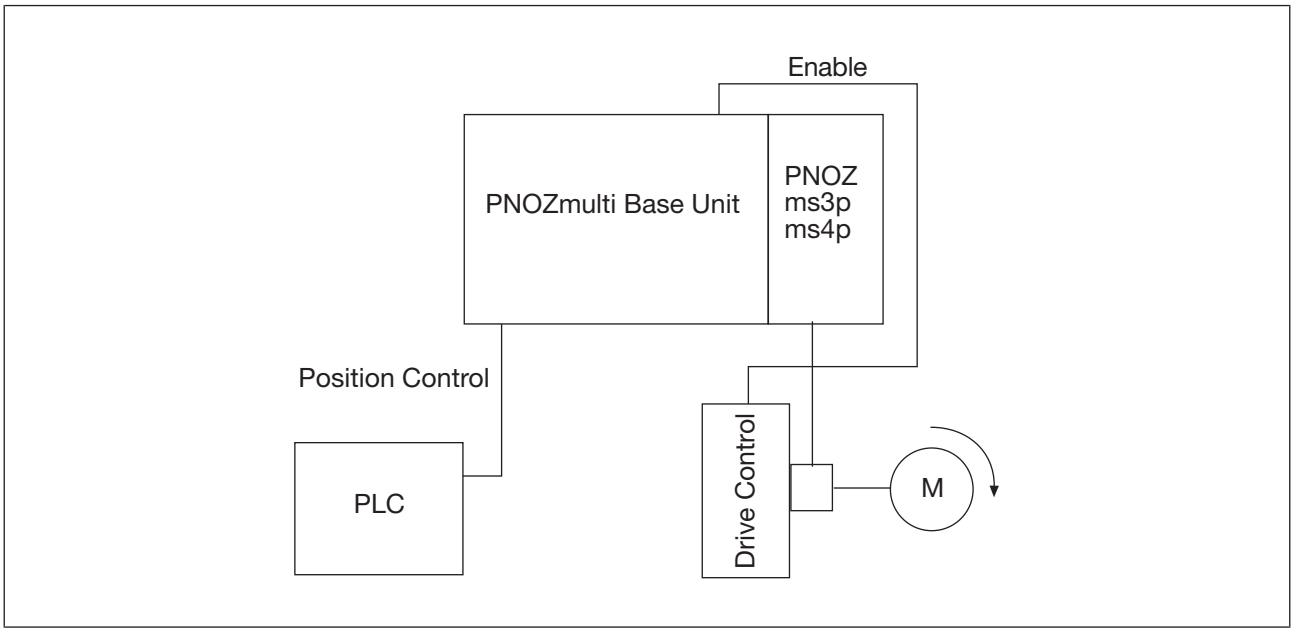
Diagnostic bit 10: "Unfeasible or single-channel signal from the incremental encoder" may be set during position control as a result of jitter on the encoder.

The set bit can be tolerated, i.e. evaluated in the user program in such a way that a shut-down will not occur if the following conditions are met:

- An additional position control signal must be provided from an external control system (e.g. PLC) and
- The signal must have the following status conditions:
  - Position control: Signal status = 1
  - Operation: Signal status = 0

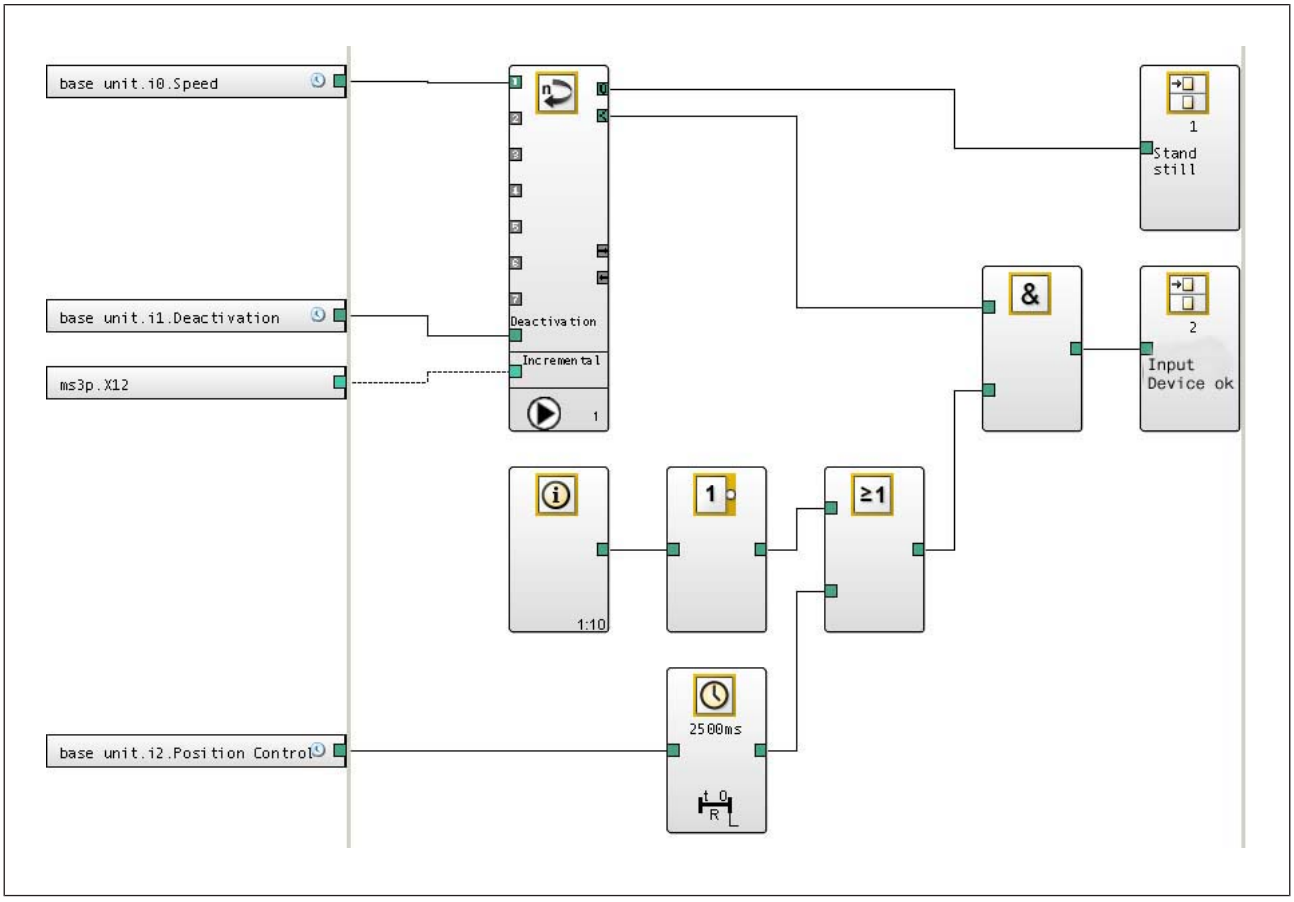
During operation, diagnostic bit 10 must be evaluated in the user program in such a way that a set bit leads to a safety-related error reaction (shutdown).

**Application example:**



## Speed monitors
PNOZ ms3p HTL

Depending on the operating mode, evaluation of diagnostic bit 10 can be implemented in the user program as follows:




An additional "Position Control" signal is incorporated. This signal indicates whether the relevant axis is in position control (signal status = 1) or in operation (signal status = 0).

The time element with configured switch-off delay operates as a start-up suppressor, as the bit: "Unfeasible or single-channel signal from the incremental encoder" may still be present for 2 s after leaving standstill.

The connection point "Input Device OK" must be incorporated into the application and evaluated in such a way that a shutdown occurs if the connection point "Input Device OK"= 0.

# Speed monitors
PNOZ ms3p TTL

## Overview

### Unit features

Using the product PNOZ ms3p TTL:

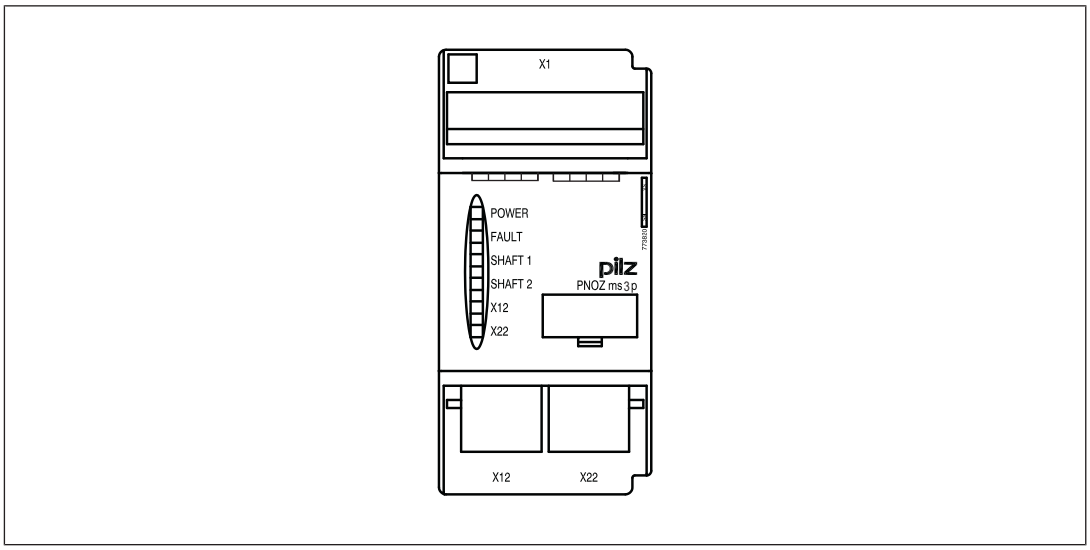
Speed monitor for connection to a base unit from the configurable control system PNOZmulti

The product has the following 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, start 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:
  RJ45 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

# Speed monitors
PNOZ ms3p TTL

### Front view




Key:

- X12:
  - Female connector for connecting an incremental encoder to axis 1
- X22:
  - Female connector for connecting an incremental encoder to axis 2
- LEDs:
  - POWER
  - FAULT
  - SHAFT 1
  - SHAFT 2
  - X12
  - X22

## Function description

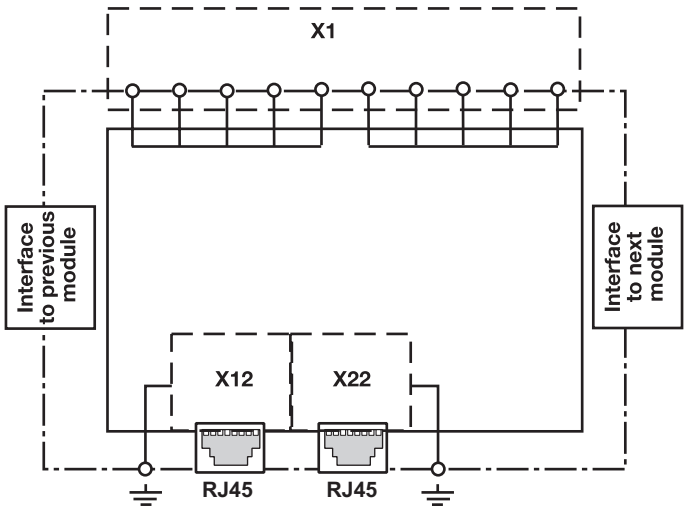
### Operation

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 implemented safety circuit, the values may be transferred from the base unit to a relay output on the safety system, for example. Incremental encoders may be used to record the values.

The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

# Speed monitors
PNOZ ms3p TTL

## Block diagram




## Incremental encoders

- Only incremental encoders with a differential output of the following type are permitted
  - Sin/Cos
  - TTL (RS422)
- Please note the values stated in the technical details

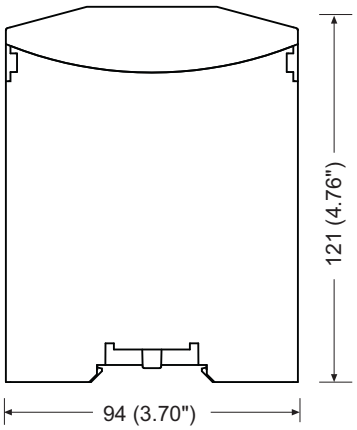
The adapter records the data between the encoder and drive and makes it available to the PNOZ ms3p TTL via the RJ45 socket.

Pilz supplies complete adapters as well as ready-made cable with RJ45 connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

# Speed monitors
PNOZ ms3p TTL

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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

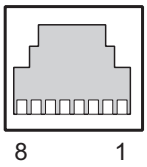
Details of the input type, axis type and reset mode, plus the values for standstill, speed monitoring and direction of rotation are also defined in the PNOZmulti Configurator.

Please note:

- Information given in the Technical details [📖 327] must be followed.
- Use copper wiring with a temperature stability of 75 °C.

# Speed monitors
PNOZ ms3p TTL

## Pin assignment of RJ45 socket

| RJ45 socket<br>8-pin | PIN | Track |
|---|---|---|
|  | 1 | n.c. |
| | 2 | 0 V |
| | 3 | n.c. |
| | 4 | A |
| | 5 | /A |
| | 6 | n.c. |
| | 7 | B |
| | 8 | /B |

## Connecting the incremental encoder

Proceed as follows when connecting the incremental encoder:

- The incremental encoder may be connected via an adapter or directly to the speed monitor.
- The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- Use only shielded cables for all connections
- 0 V from the incremental encoder and speed monitor should always be connected.
- Position the terminating resistors of the signal lines as close as possible to the speed monitor input.

Encoder types: 1 Vss, 5 V-TTL

- Apply 5 VDC to incremental encoder only
- Do not terminate incremental encoder with $Z_0$ = 120 Ohm

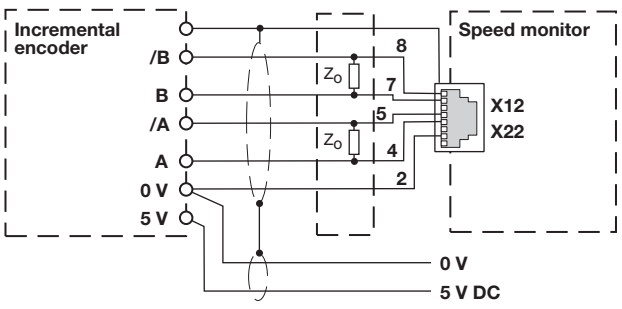



Fig.: Connection to incremental encoder type 1 Vss, 5 V-TTL

## Speed monitors
PNOZ ms3p TTL

- The adapter is connected between the incremental encoder and the drive. The output on the adapter is connected to the female RJ45 connector on the speed monitor.
- The adapter can also be used without connecting to a drive. The signal lines can then be terminated directly at the adapter with $Z_O$ = 120 Ohm.
- If the signal lines in the drive are already terminated with $Z_O$ = 120 Ohm, the incremental encoder may no longer be terminated.
- The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated under "Connect incremental encoder signals to the speed monitor" and in the adapter operating manual must be observed when connecting the supply voltage.
- Supply only incremental encoder with 5 VDC.

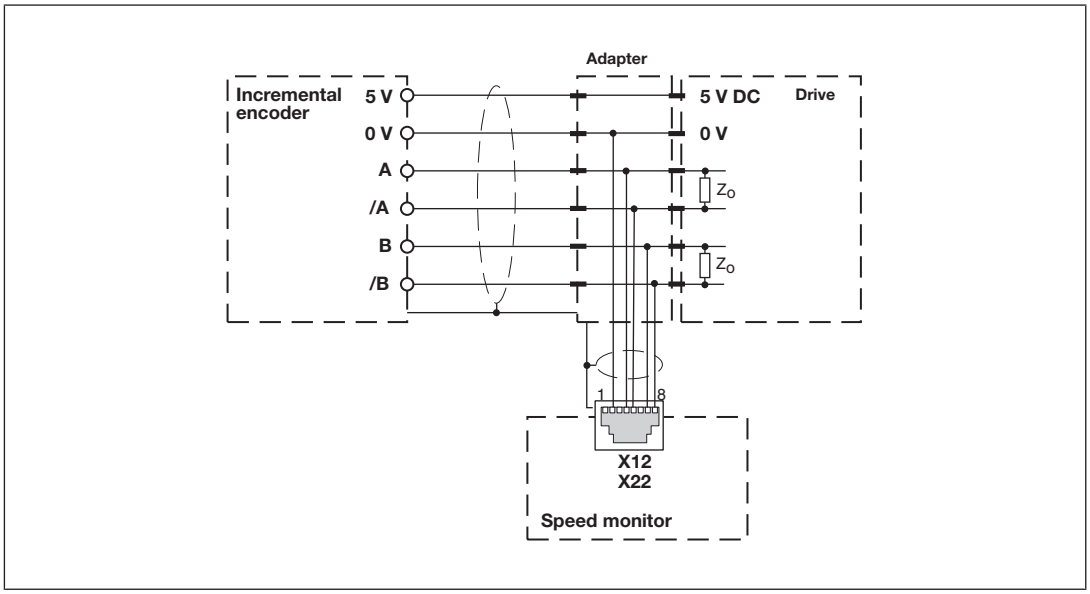



Fig.: Connection via adapter and drive

## Speed monitors
PNOZ ms3p TTL

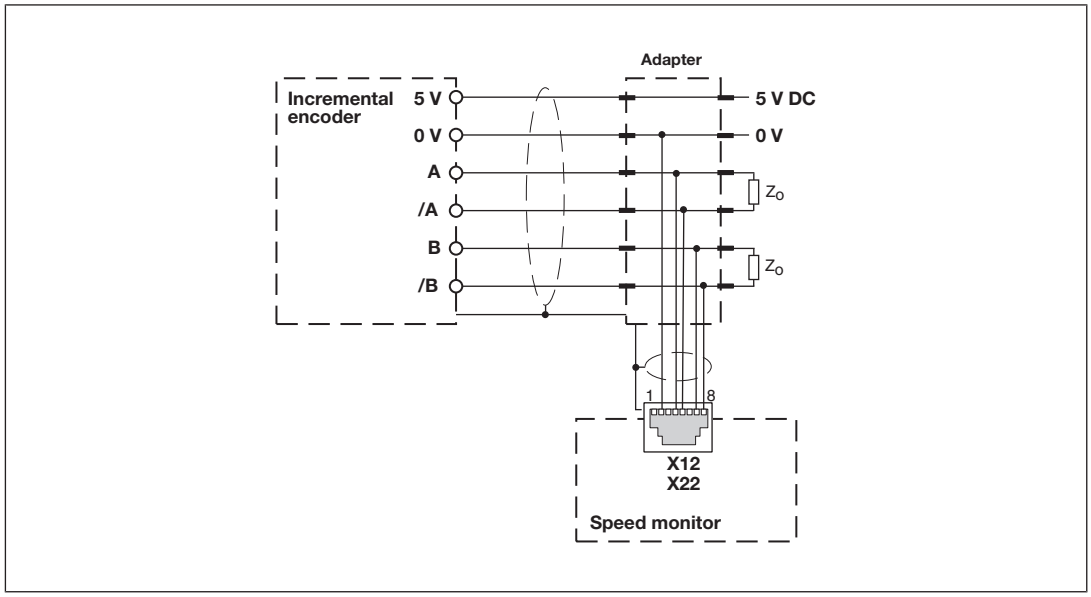



Fig.: Connection via adapter

# Speed monitors
PNOZ ms3p TTL

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **1,0 W** |
| Status indicator | **LED** |
| **Incremental encoder input** | |
| Number of inputs | **2** |
| Connection type | **RJ45 female connector, 8-pin** |
| Input signal level | **0,5 - 5,0 Vss** |
| Phase position for the differential signals A, /A and B,/B | **90° ±30°** |
| Overload protection | **-30 - 30 V** |
| Input resistance | **10,0 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** |
| **Times** | |
| Configurable switch-off delay | **0 - 2.500 ms** |
| Supply interruption before de-energisation | **20 ms** |
| Reaction time | |
| f>100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms** |
| f<100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms + 1/f** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |

# Speed monitors
## PNOZ ms3p TTL

| | |
|---|---|
| **Environmental data** | |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |

# Speed monitors
PNOZ ms3p TTL

| Mechanical data | |
|---|---|
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **45,0 mm** |
| Depth | **121,0 mm** |
| Weight | **220 g** |

Where standards are undated, the 2009-10 latest editions shall apply.

## Safety characteristic data

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN IEC 62061 SIL CL | EN IEC 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| Incremental encoder | **PL e** | **Cat. 3** | **SIL CL 3** | **6,36E-09** | **SIL 3** | **8,45E-05** | **20** |

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

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ ms3p TTL | Expansion module, speed monitor | 773 826 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 800 |
| Set screw terminals | 1 set of screw terminals | 793 800 |

**Terminator, jumper**

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

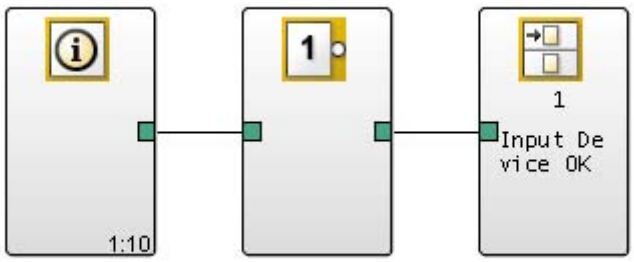
## Application examples

### Examples without position control

**Evaluation of bit: "Unfeasible or single-channel signal from the incremental encoder", without position control**

Diagnostic bit 10: "Unfeasible or single-channel signal from the incremental encoder" must be evaluated in the user program during operation in such a way that a set bit leads to a safety-related error reaction (shutdown).

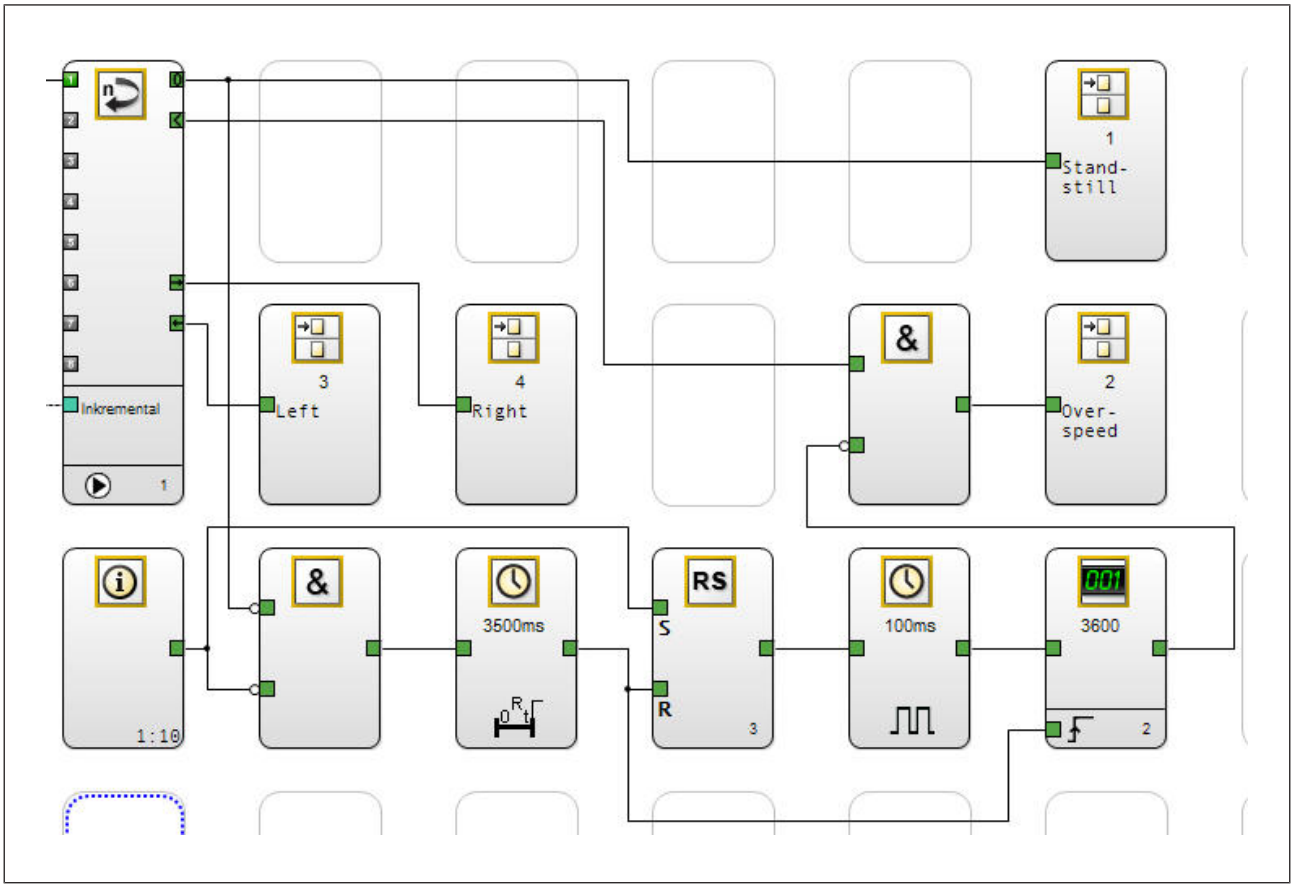
Immediate shutdown as soon as diagnostic bit 10 is set.
The bit is evaluated as follows:




The connection point "Input Device OK" must be incorporated into the application and evaluated in such a way that a shutdown occurs if the connection point "Input Device OK"= 0.

A set diagnostic bit 10 can be tolerated for a maximum of 4 hours (occurrence of second error). If no feasible signals above standstill frequency are measured within this time, a shutdown will occur.
In this case, the bit will be evaluated as follows:

## Speed monitors
PNOZ ms3p TTL




Please note that the direction of rotation must be evaluated for this example!

# Speed monitors
PNOZ ms3p TTL

## Example with position control

**Evaluation of bit: "Unfeasible or single-channel signal from the incremental encoder", with position control**

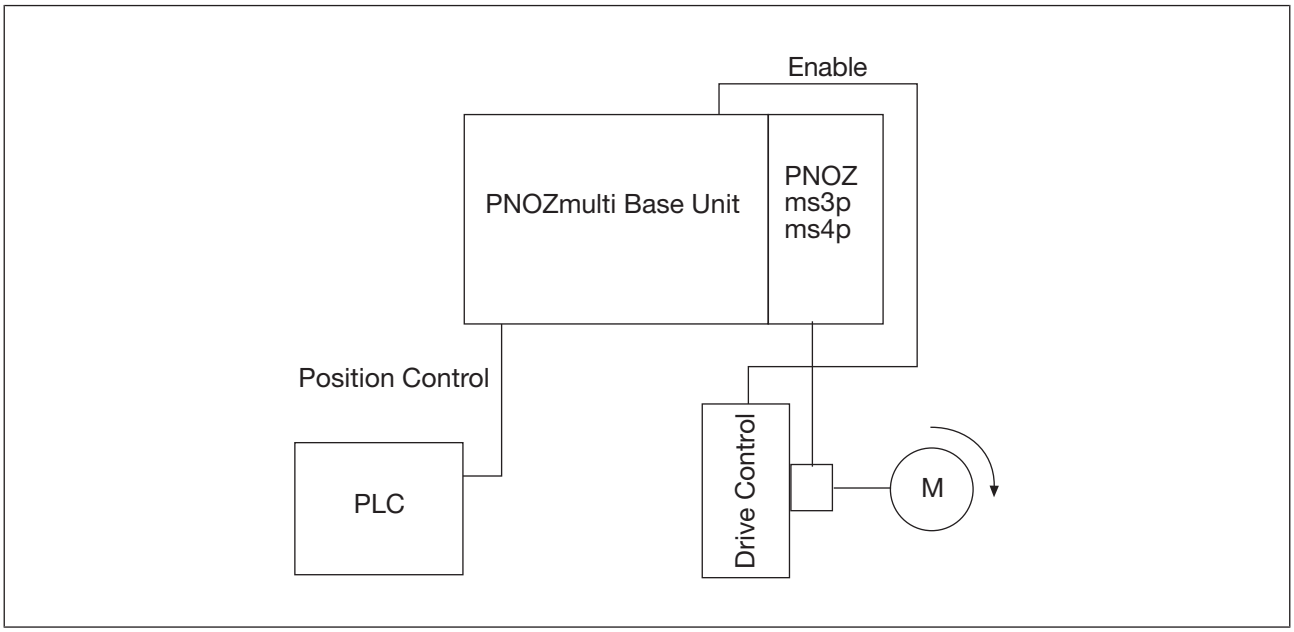
Diagnostic bit 10: "Unfeasible or single-channel signal from the incremental encoder" may be set during position control as a result of jitter on the encoder.

The set bit can be tolerated, i.e. evaluated in the user program in such a way that a shut-down will not occur if the following conditions are met:

- An additional position control signal must be provided from an external control system (e.g. PLC) and
- The signal must have the following status conditions:
  - Position control: Signal status = 1
  - Operation: Signal status = 0

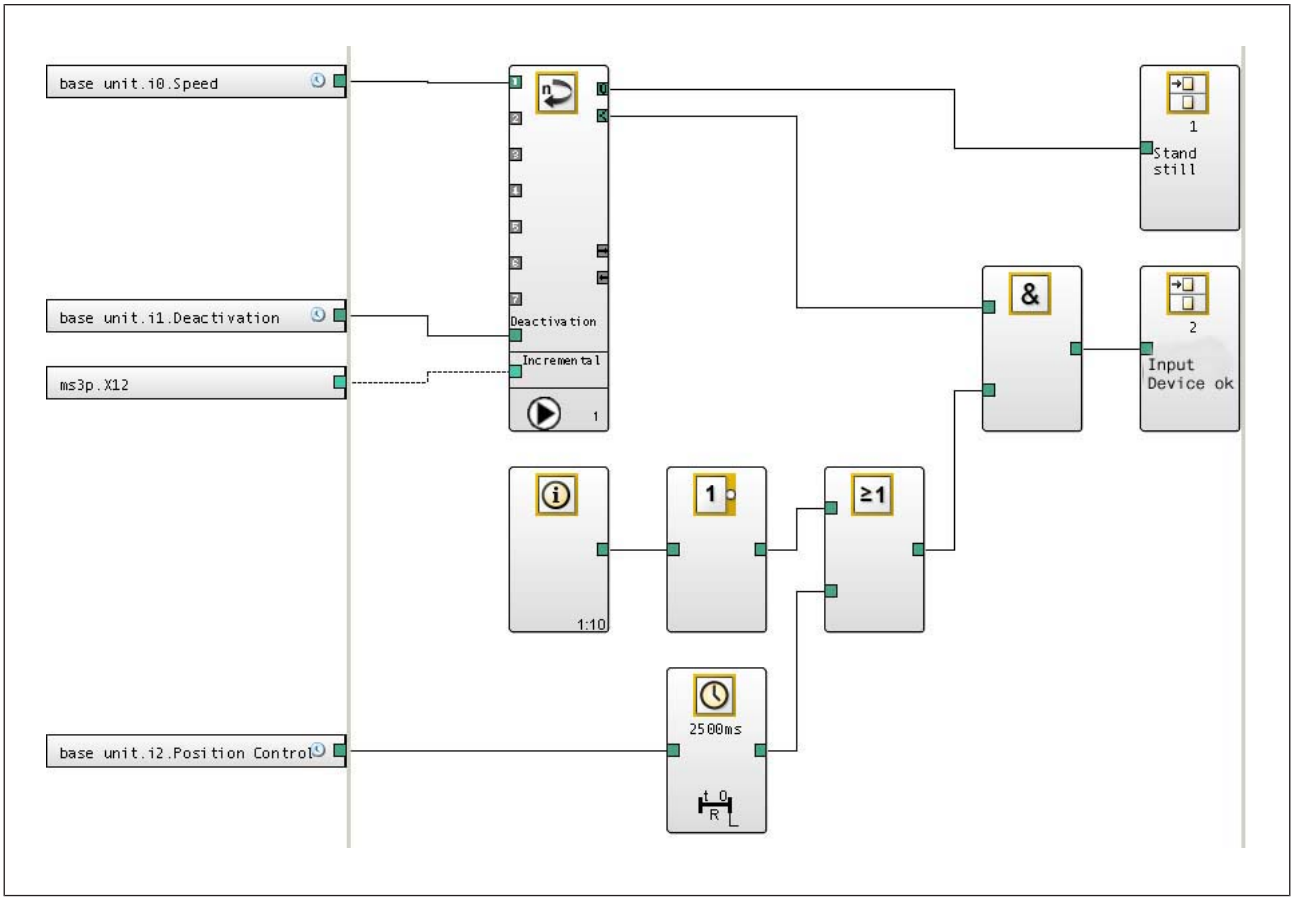
During operation, diagnostic bit 10 must be evaluated in the user program in such a way that a set bit leads to a safety-related error reaction (shutdown).

**Application example:**



## Speed monitors
PNOZ ms3p TTL

Depending on the operating mode, evaluation of diagnostic bit 10 can be implemented in the user program as follows:




An additional "Position Control" signal is incorporated. This signal indicates whether the relevant axis is in position control (signal status = 1) or in operation (signal status = 0).

The time element with configured switch-off delay operates as a start-up suppressor, as the bit: "Unfeasible or single-channel signal from the incremental encoder" may still be present for 2 s after leaving standstill.

The connection point "Input Device OK" must be incorporated into the application and evaluated in such a way that a shutdown occurs if the connection point "Input Device OK"= 0.

# Speed monitors
PNOZ ms4p

## Overview

### Unit features

Using the product PNOZ ms4p:

Speed monitor for connection to a base unit from the configurable control system PNOZmulti

The product has the following features:

- Monitoring of 1 axis
- Connection: 1 incremental encoder
- Measured variables:
  - Standstill
  - Speed (16 values can be set)
  - Direction of rotation
- Axis types, start 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:
  RJ45 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

# Speed monitors
PNOZ ms4p

### Front view

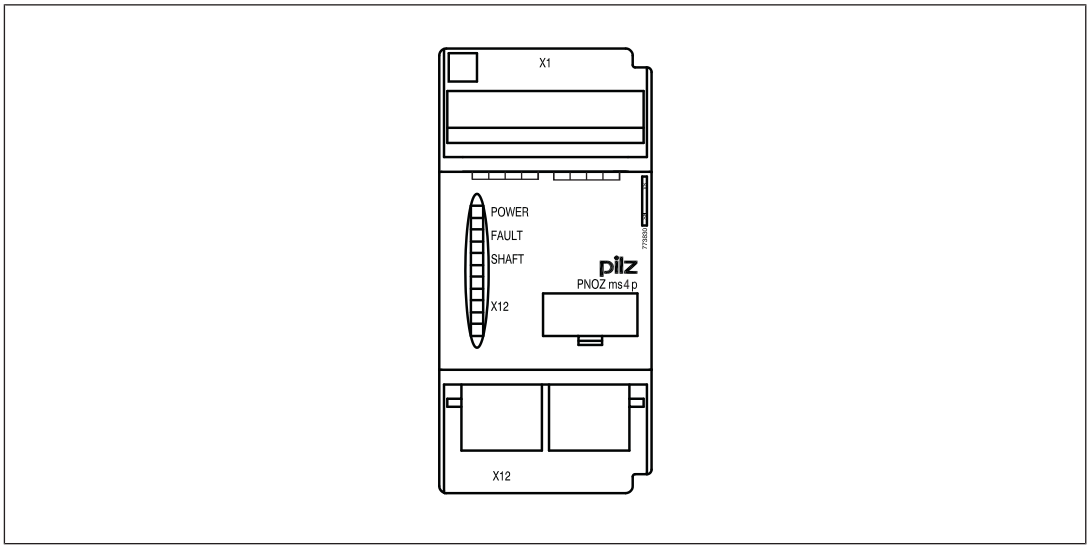



Fig.: Front view of PNOZ ms4p

Key:

- X12:
  - Female connector for connecting an incremental encoder
- LEDs:
  - POWER
  - FAULT
  - SHAFT
  - X12

## Function description

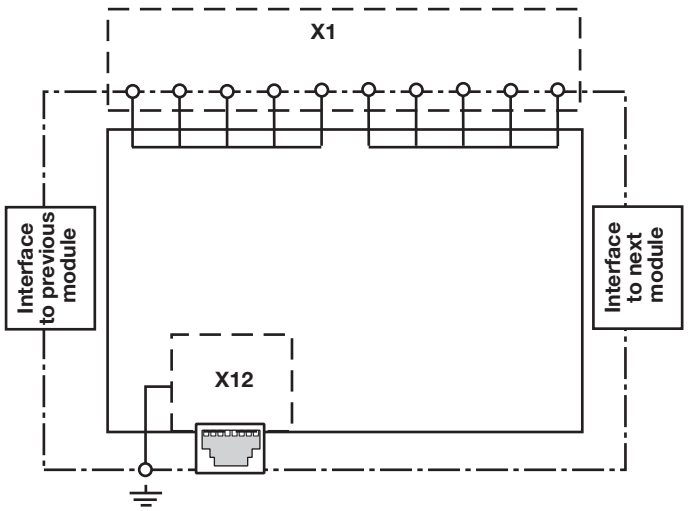
### Operation

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 implemented safety circuit, the values may be transferred from the base unit to a relay output on the safety system, for example. Incremental encoders may be used to record the values.

The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

# Speed monitors
PNOZ ms4p

## Block diagram




## Incremental encoders

- 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

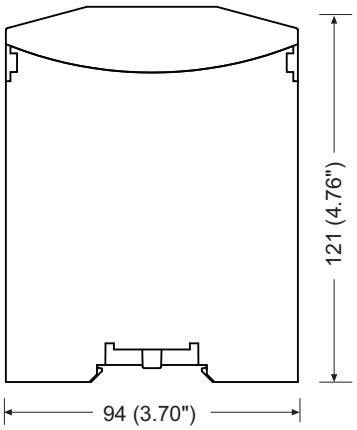
The adapter records the data between the encoder and drive and makes it available to the PNOZ ms4p via the RJ45 socket.

Pilz supplies complete adapters as well as ready-made cable with RJ45 connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

# Speed monitors
PNOZ ms4p

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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

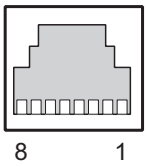
Details of the input type, axis type and reset mode, plus the values for standstill, speed monitoring and direction of rotation are also defined in the PNOZmulti Configurator.

Please note:

- Information given in the Technical details [📖 327] must be followed.
- Use copper wiring with a temperature stability of 75 °C.

# Speed monitors
PNOZ ms4p

## Pin assignment of RJ45 socket

| RJ45 socket<br>8-pin | PIN | Track |
|---|---|---|
|  | 1 | 5 V |
| | 2 | 0 V |
| | 3 | T |
| | 4 | A |
| | 5 | /A |
| | 6 | /Z |
| | 7 | B |
| | 8 | /B |

## Connecting the incremental encoder

Proceed as follows when connecting the incremental encoder:

- The incremental encoder may be connected via an adapter (e.g. MM A Mini-IO-CAB99) or directly to the speed monitor.
- The incremental encoder on connector X12 monitors the axis
- Use only shielded cables for all connections
- 0 V from the incremental encoder and speed monitor should always be connected.
- Position the terminating resistors of the signal lines as close as possible to the speed monitor input.

Encoder types: 1 Vss, 5 V-TTL

- Apply 5 V DC to incremental encoder only
- Do not terminate incremental encoder with $Z_0$ = 120 Ohm

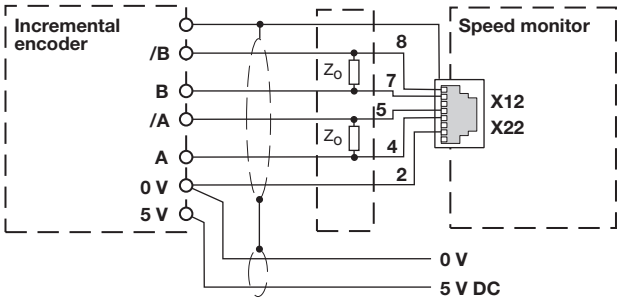



Fig.: Connection to incremental encoder type 1 Vss, 5 V-TTL

Encoder types: 24 V-HTL

- Apply 24 V DC supply voltage to incremental encoder only

## Speed monitors
PNOZ ms4p

- Do not terminate incremental encoder with Z0 = 120 Ohm

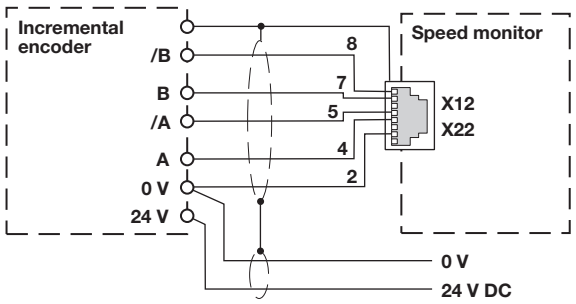



Fig.: Connection to incremental encoder type 24 V-HTL

- 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 adapter can also be used without connecting to a drive. The signal lines can then be terminated directly at the adapter with $Z_O$ = 120 Ohm.
- If the signal lines in the drive are already terminated with $Z_O$ = 120 Ohm, the incremental encoder may no longer be terminated.
- The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated under "Connect incremental encoder signals to the speed monitor" and in the adapter operating manual must be observed when connecting the supply voltage.
- Supply only incremental encoder with 5 V DC. 24 V-HTL signals may not be terminated.

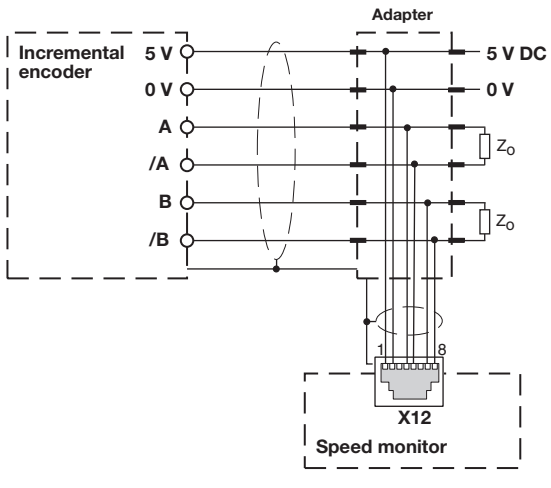



Fig.: Connection via adapter

## Speed monitors
PNOZ ms4p

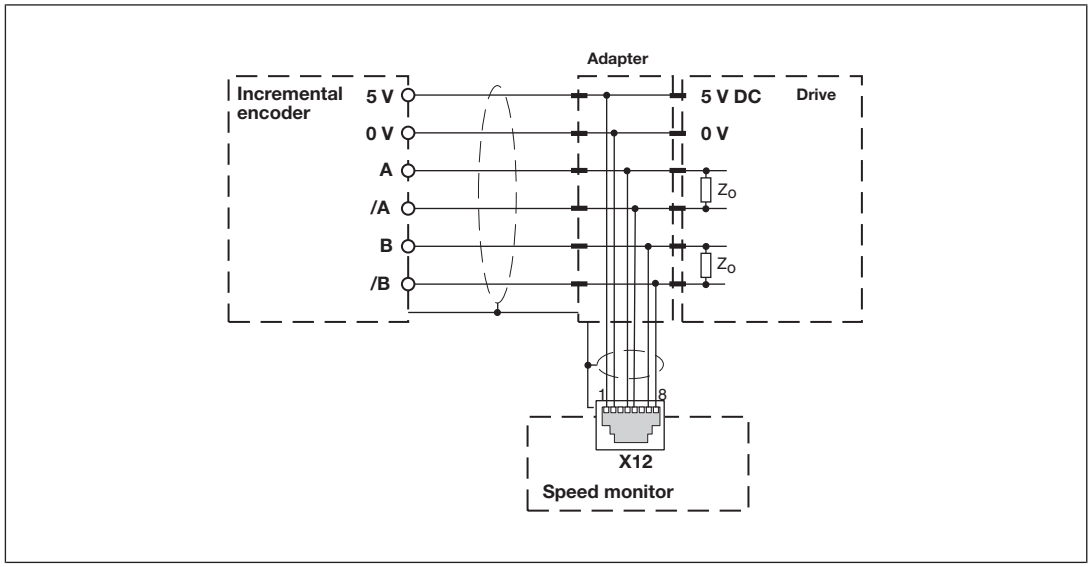



Fig.: Connection via adapter and drive

# Speed monitors
PNOZ ms4p

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **1,0 W** |
| Status indicator | **LED** |
| **Incremental encoder input** | |
| Number of inputs | **1** |
| Connection type | **RJ45 female connector, 8-pin** |
| Input signal level | **0,5 - 30,0 Vss** |
| Phase position for the differential signals A, /A and B,/B | **90° ±30°** |
| Overload protection | **-30 - 30 V** |
| Input resistance | **10,0 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** |
| **Times** | |
| Configurable switch-off delay | **0 - 2.500 ms** |
| Supply interruption before de-energisation | **20 ms** |
| Reaction time | |
| f>100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms** |
| f<100 Hz: Configurable switch-off delay + switch-off delay of base unit | **10 ms + 1/f** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |

# Speed monitors
PNOZ ms4p

| | |
|---|---|
| **Environmental data** | |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |

# Speed monitors
PNOZ ms4p

| Mechanical data | |
|---|---|
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **45,0 mm** |
| Depth | **121,0 mm** |
| Weight | **203 g** |

Where standards are undated, the 2008-12 latest editions shall apply.

## Safety characteristic data

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN IEC 62061 SIL CL | EN IEC 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| Incremental encoder | **PL e** | **Cat. 3** | **SIL CL 3** | **6,36E-09** | **SIL 3** | **8,45E-05** | **20** |

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

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ ms4p | Expansion module, speed monitor | 773 830 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 800 |
| Set screw terminals | 1 set of screw terminals | 793 800 |

**Terminator, jumper**

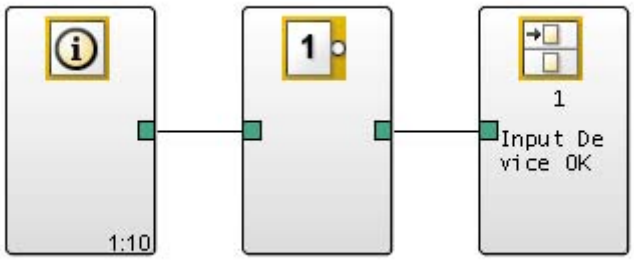
| Product type | Features | Order no. |
|---|---|---|
| PNOZmulti bus terminator | Terminator | 779 110 |
| KOP-XE | Jumper | 774 639 |

## Application examples

### Example without position control

**Evaluation of bit: "Unfeasible or single-channel signal from the incremental encoder", without position control**

Diagnostic bit 10: "Unfeasible or single-channel signal from the incremental encoder" must be evaluated in the user program during operation in such a way that a set bit leads to a safety-related error reaction (shutdown).




The connection point "Input Device OK" must be incorporated into the application and evaluated in such a way that a shutdown occurs if the connection point "Input Device OK"= 0.

### Example with position control

**Evaluation of bit: "Unfeasible or single-channel signal from the incremental encoder", with position control**

Diagnostic bit 10: "Unfeasible or single-channel signal from the incremental encoder" may be set during position control as a result of jitter on the encoder.

The set bit can be tolerated, i.e. evaluated in the user program in such a way that a shutdown will not occur if the following conditions are met:

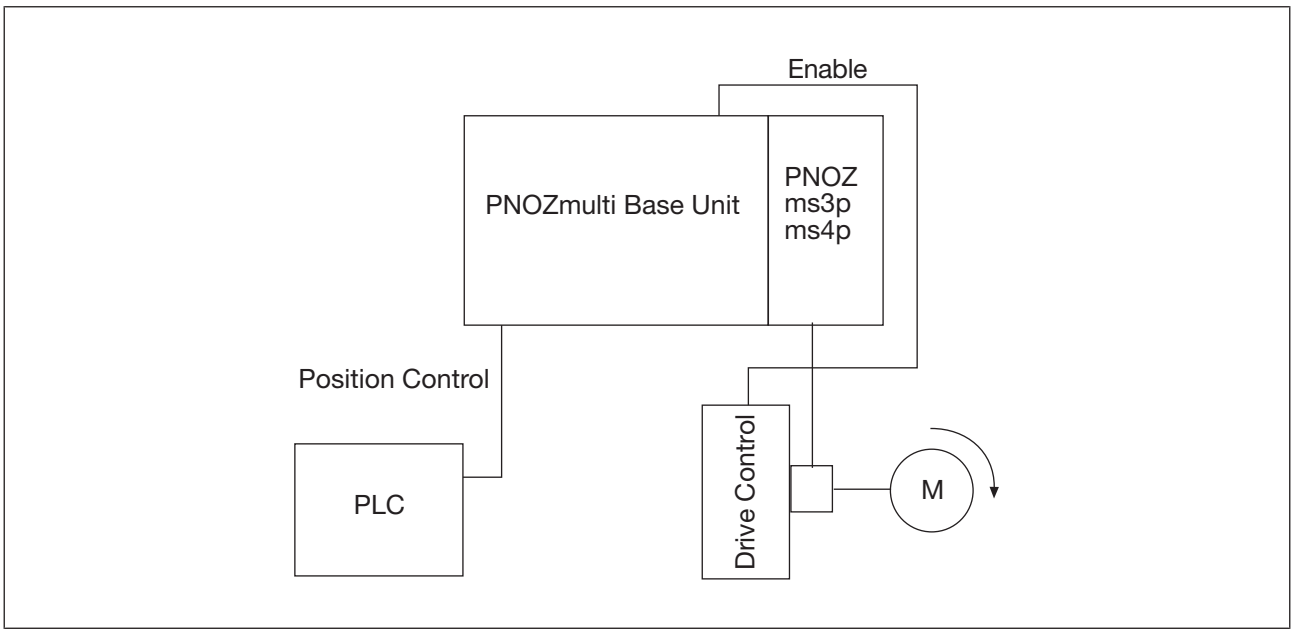
- An additional position control signal must be provided from an external control system (e.g. PLC) and

## Speed monitors
PNOZ ms4p

- The signal must have the following status conditions:
  - Position control: Signal status = 1
  - Operation: Signal status = 0

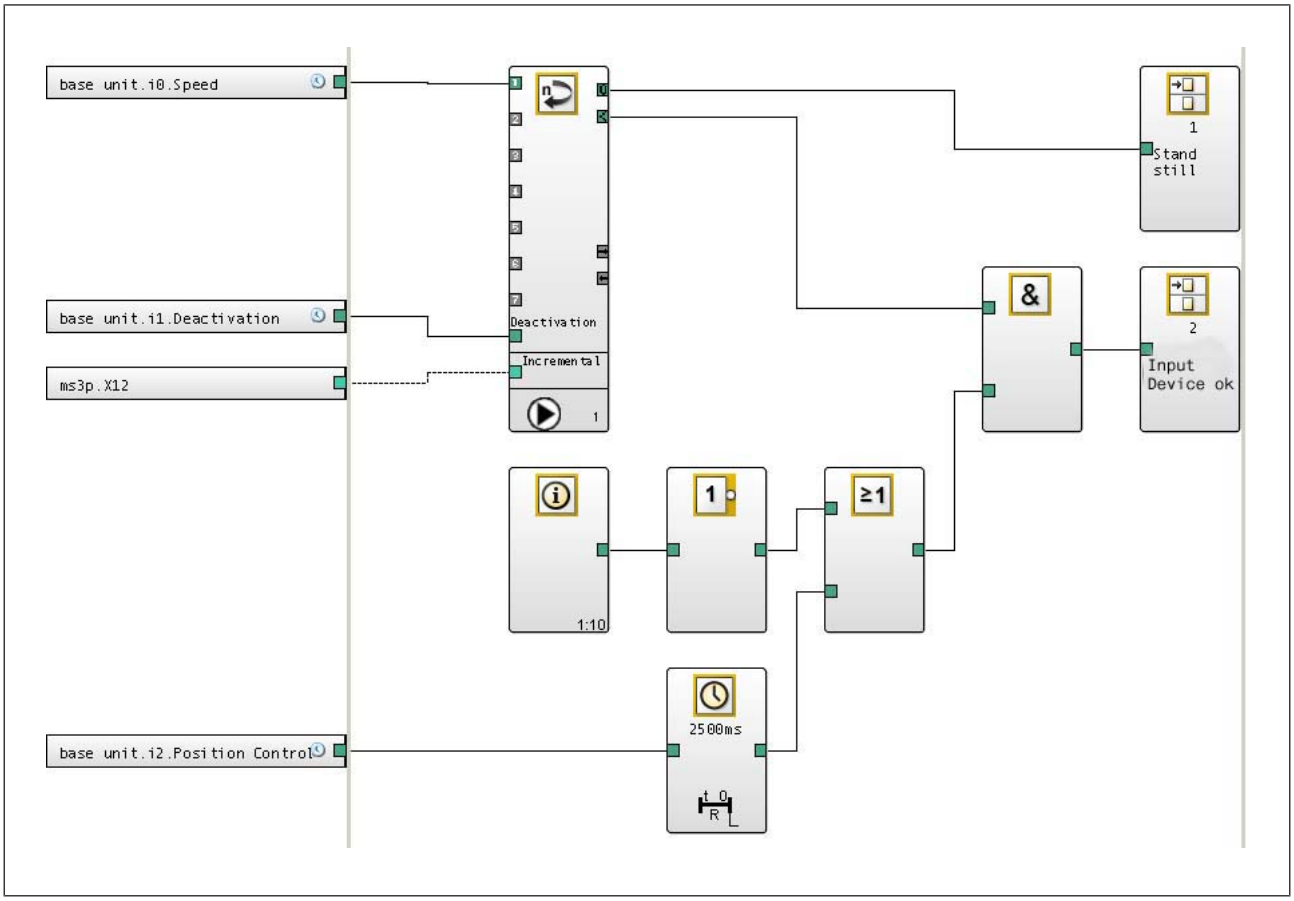
During operation, diagnostic bit 10 must be evaluated in the user program in such a way that a set bit leads to a safety-related error reaction (shutdown).

**Application example:**




Depending on the operating mode, evaluation of diagnostic bit 10 can be implemented in the user program as follows:

## Speed monitors
PNOZ ms4p




An additional "Position Control" signal is incorporated. This signal indicates whether the relevant axis is in position control (signal status = 1) or in operation (signal status = 0).

The time element with configured switch-off delay operates as a start-up suppressor, as the bit: "Unfeasible or single-channel signal from the incremental encoder" may still be present for 2 s after leaving standstill.

The connection point "Input Device OK" must be incorporated into the application and evaluated in such a way that a shutdown occurs if the connection point "Input Device OK"= 0.

# Fieldbus modules
PNOZ mc0p


## Overview

### Unit features

Using the product PNOZ mc0p:

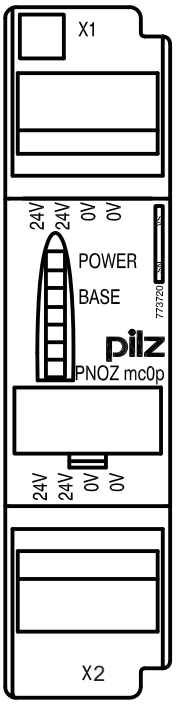
Power supply used to supply voltage to the fieldbus modules PNOZ mc5p or PNOZ mc5.1p LWL.

The product has the following 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 V DC
- Status indicators
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Fieldbus modules
PNOZ mc0p

### Front view



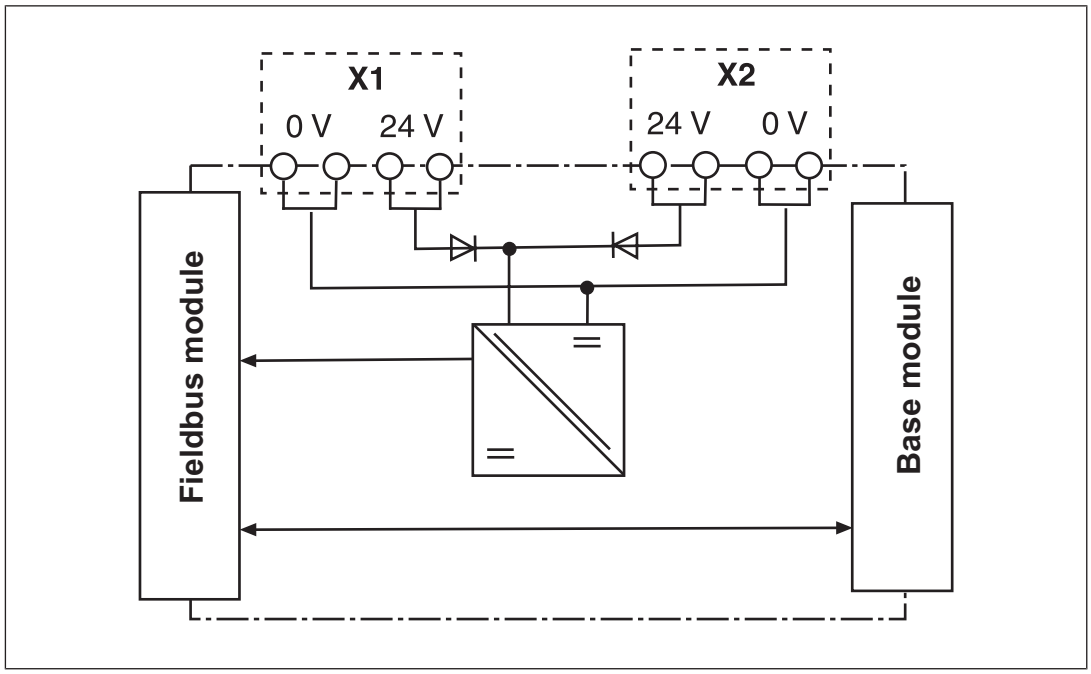

## Function description

### Functions

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.

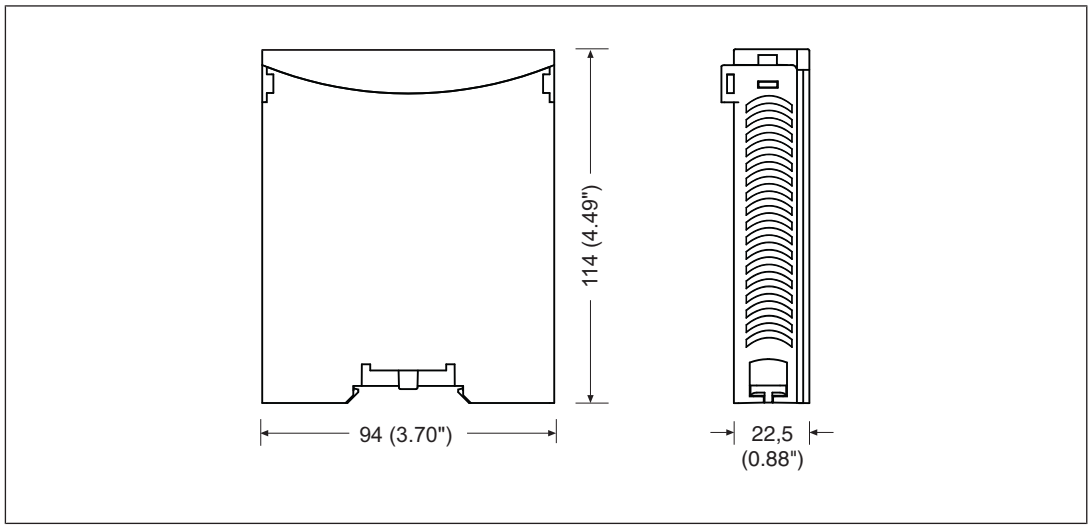
# Fieldbus modules
PNOZ mc0p

### Block diagram




## Installation

### Dimensions in mm



# Fieldbus modules
PNOZ mc0p

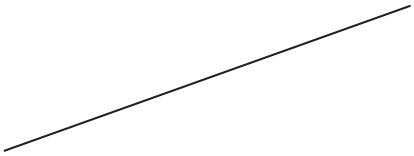
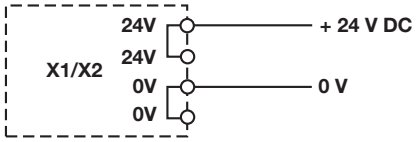
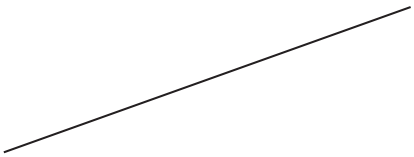
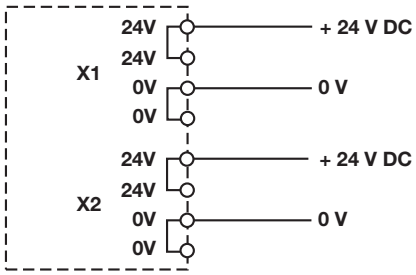
## Commissioning

### General wiring guidelines

Please note:

- The PNOZ mc0p can be supplied by a separate power supply (see Connection example [391]). The power supply must meet the regulations for extra low voltages with protective separation (SELV, PELV).
- The torque setting of the screws on the connection terminals is specified under Technical details [391].
- Use copper wiring with a temperature stability of 75 °C.
- Information given in the Technical details [391] must be followed.

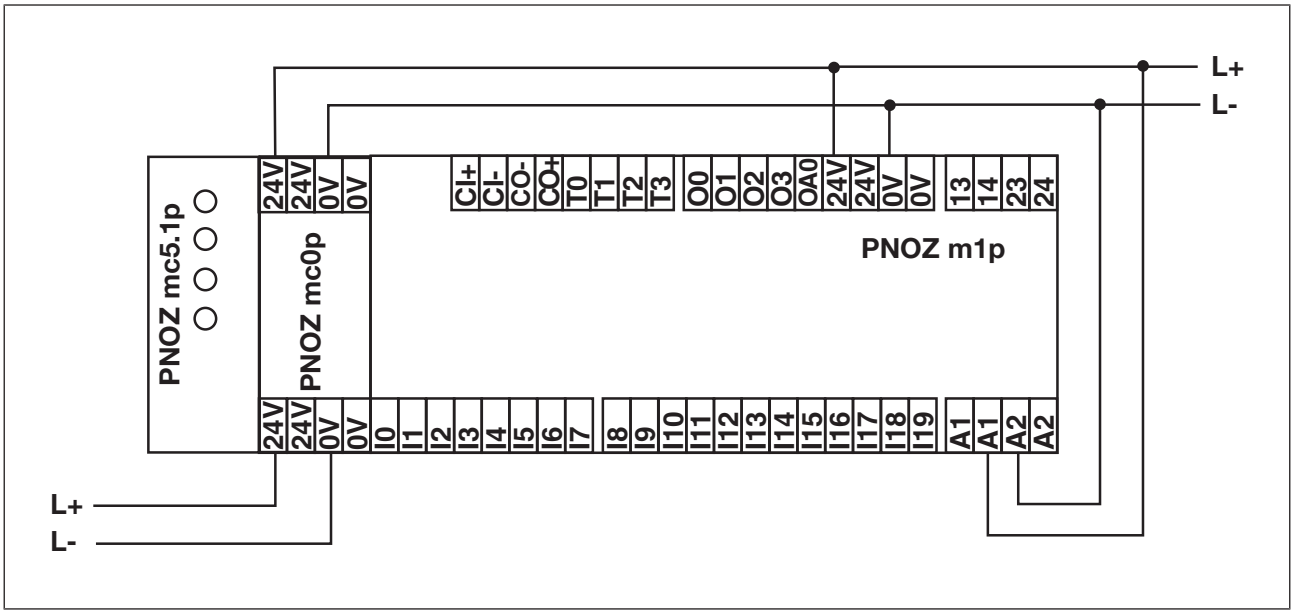
### Connection

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

# Fieldbus modules
PNOZ mc0p

### Connection example

Redundant power supply




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **5,0 W** |
| Residual ripple DC | **5 %** |
| Potential isolation | **yes** |
| Status indicator | **LED** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 55 °C** |

## Fieldbus modules
PNOZ mc0p

| | |
|---|---|
| **Environmental data** | |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Module and system voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** |

# Fieldbus modules
PNOZ mc0p

| Mechanical data | |
|---|---|
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** |
| Conductor cross section with spring-loaded terminals | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **121,0 mm** |
| Weight | **125 g** |

Where standards are undated, the 2007-05 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc0p | Expansion module, power supply for fieldbus modules | 773 720 |

### Accessories

#### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |

#### Connection terminals

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

# Fieldbus modules
PNOZ mc1p

## Overview

### Unit features

Using the product PNOZ mc1p:

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

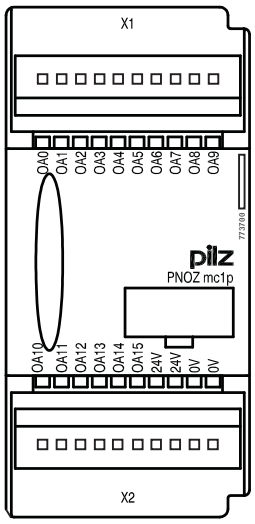
The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  - 16 auxiliary outputs
- Status indicators
- Coated version:

  Increased environmental requirements (see Technical details [398])
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- For details of the base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
PNOZ mc1p

### Front view




## Function description

### Functions

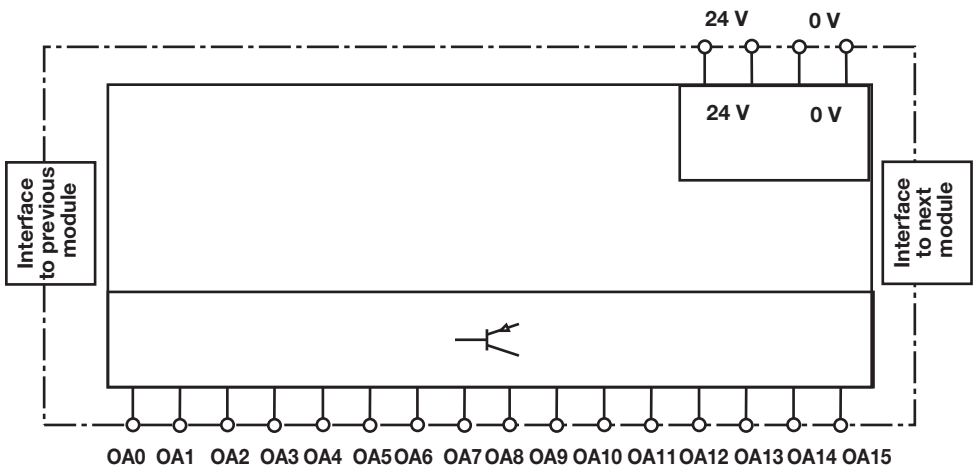
The expansion module operates as a signal module with non-safety-related outputs.

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.

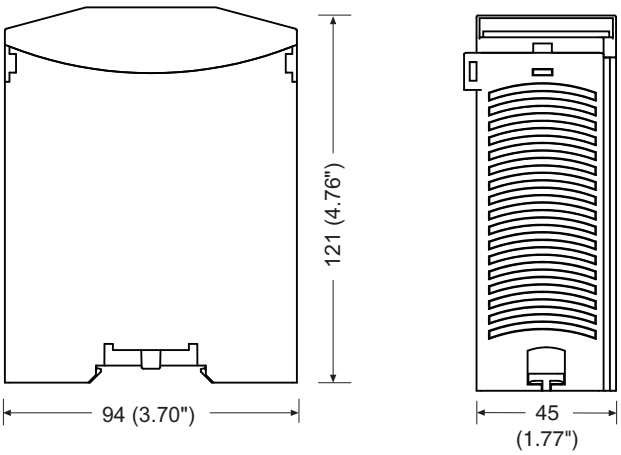
# Fieldbus modules
PNOZ mc1p

### Block diagram




## Installation

### Dimensions



# Fieldbus modules
PNOZ mc1p

## Commissioning

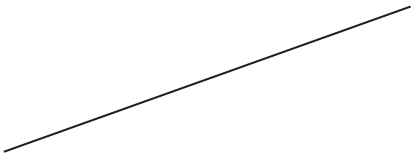
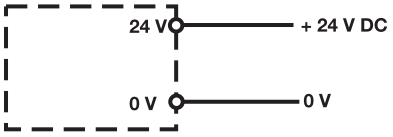
### General wiring guidelines

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

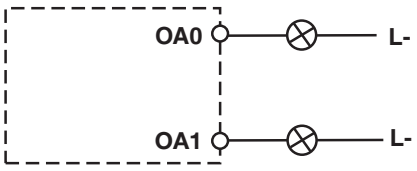
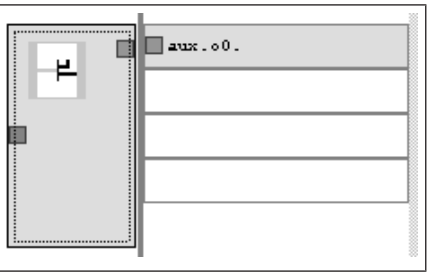
Please note:

- 2 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. The current at each terminal may not exceed 3 A.
- Outputs OA0 to OA15 are auxiliary outputs using semiconductor technology.
- Use copper wiring with a temperature stability of 75 °C.
- Information given in the Technical details [398] must be followed.

### Connection

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

Supply voltage

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

Semiconductor outputs

# Fieldbus modules
PNOZ mc1p

## Technical details

| General | 773700 | 773705 |
|---|---|---|
| Approvals | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed** | **BG, CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed** |
| **Electrical data** | **773700** | **773705** |
| Supply voltage | | |
| for | **Supply to the SC outputs** | **Supply to the SC outputs** |
| Voltage | **24 V** | **24 V** |
| Kind | **DC** | **DC** |
| Voltage tolerance | **-15 %/+20 %** | **-15 %/+20 %** |
| Output of external power supply (DC) | **192,0 W** | **192,0 W** |
| Potential isolation | **yes** | **yes** |
| Supply voltage | | |
| for | **Module supply** | **Module supply** |
| internal | **Via base unit** | **Via base unit** |
| Voltage | **5,0 V** | **5,0 V** |
| Kind | **DC** | **DC** |
| Voltage tolerance | **-2 %/+2 %** | **-2 %/+2 %** |
| Power consumption | **0,6 W** | **0,6 W** |
| Status indicator | **LED** | **LED** |
| **Semiconductor outputs (standard)** | **773700** | **773705** |
| Number | **16** | **16** |
| Switching capability | | |
| Voltage | **24 V** | **24 V** |
| Current | **0,50 A** | **0,50 A** |
| Power | **12,0 W** | **12,0 W** |
| Max. permitted overall performance of semiconductor outputs at an ambient temperature of > 50 °C | – | **144 W** |
| Galvanic isolation | **yes** | **yes** |
| Short circuit-proof | **yes** | **yes** |
| Residual current at "0" | **0,5 mA** | **0,5 mA** |
| Signal level at "1" | **UB - 0.5 VDC at 0.5 A** | **UB - 0.5 VDC at 0.5 A** |
| **Times** | **773700** | **773705** |
| Switch-on delay | **5,00 s** | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** | **20 ms** |

## Fieldbus modules
PNOZ mc1p

| Environmental data | 773700 | 773705 |
|---|---|---|
| Ambient temperature | | |
| In accordance with the standard | **EN 60068-2-14** | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** | **-25 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** | – |
| Storage temperature | | |
| In accordance with the standard | **EN 60068-2-1/-2** | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** | **-25 - 70 °C** |
| Climatic suitability | | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** | **Short-term** |
| EMC | **EN 61131-2** | **EN 61131-2** |
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **10,0 - 150,0 Hz** |
| Acceleration | **1g** | **1g** |
| Corrosive gas check | | |
| SO2: Concentration 10 ppm, duration 10 days, passive | – | **DIN V 40046-36** |
| H2S: Concentration 1 ppm, duration 10 days, passive | – | **DIN V 40046-37** |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** |
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Mechanical data** | **773700** | **773705** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |

## Fieldbus modules
PNOZ mc1p

| Mechanical data | 773700 | 773705 |
|---|---|---|
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Connection type | **Spring-loaded terminal, screw terminal** | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | | |
| 1 core flexible | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Torque setting with screw terminals | **0,25 Nm** | **0,25 Nm** |
| Stripping length with screw terminals | **7 mm** | **7 mm** |
| Conductor cross section with spring-loaded terminals | | |
| 1 core flexible without crimp connector | **0,25 - 1,50 mm², 24 - 16 AWG** | **0,25 - 1,50 mm², 24 - 16 AWG** |
| 1 core flexible with crimp connector | **0,25 - 0,75 mm², 24 - 20 AWG** | **0,25 - 0,75 mm², 24 - 20 AWG** |
| Spring-loaded terminals: Terminal points per connection | **1** | **1** |
| Stripping length with spring-loaded terminals | **9 mm** | **9 mm** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **45,0 mm** | **45,0 mm** |
| Depth | **121,0 mm** | **121,0 mm** |
| Weight | **164 g** | **166 g** |

Where standards are undated, the 2008-03 latest editions shall apply.

# Fieldbus modules
PNOZ mc1p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc1p | Expansion module, 16 semiconductor outputs, standard | 773 700 |
| PNOZ mc1p coated version | Expansion module, 16 semiconductor outputs, standard, coated version | 773 705 |

### Accessories

#### Terminator, jumper

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

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 783 700 |
| Set screw terminals | 1 set of screw terminals | 793 700 |

# Fieldbus modules
PNOZ mc2.1p

## Overview

### Unit features

Using the product PNOZ mc2.1p:

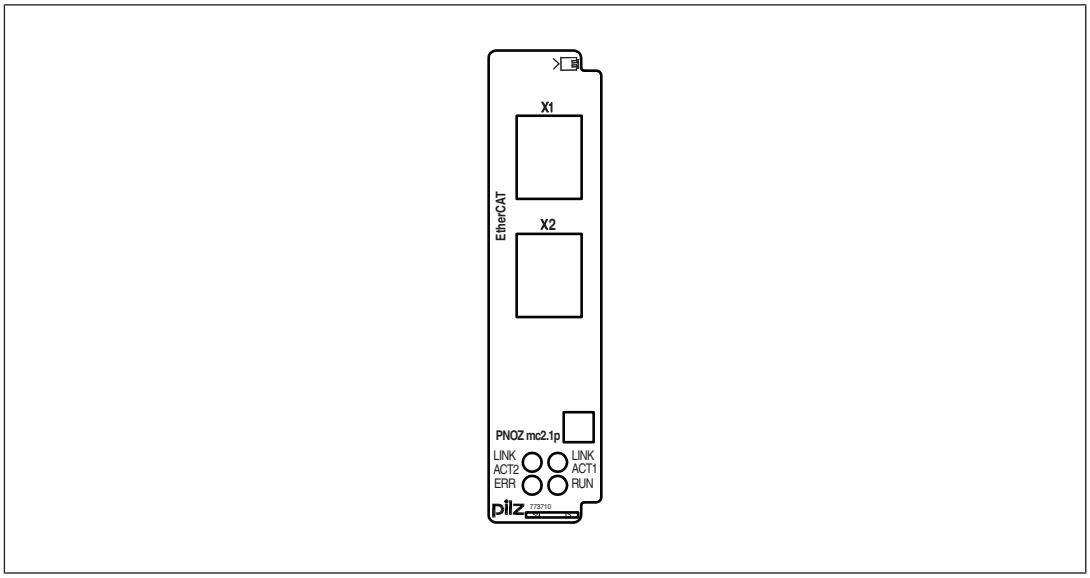
Expansion module for connection to a base unit from the configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Network protocols: EtherCAT
- supports CANopen over EtherCAT (DS301 V4.02-compliant)
- Status indicators for communication with EtherCAT and for errors
- The data length and the content of the PDOs can be freely configured from EtherCAT-Master (max. 148 Bytes TxPDO and 20 Bytes RxPDO). The data are described in the document entitled "Communication Interfaces".
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus EtherCAT . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mc2.1p can be connected to the base unit
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Fieldbus modules
PNOZ mc2.1p

### Front view




Legend:

- X1: EtherCAT IN
- X2: EtherCAT OUT
- LEDs:
  - LINK ACT1
  - LINK ACT2
  - ERR
  - RUN

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via EtherCAT are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ mc2.1p are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module PNOZ mc2.1p is configured and started automatically.

The connection to EtherCAT is made via the two RJ45 sockets.

LEDs indicate the status of the expansion module on EtherCAT.

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
PNOZ mc2.1p

### Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

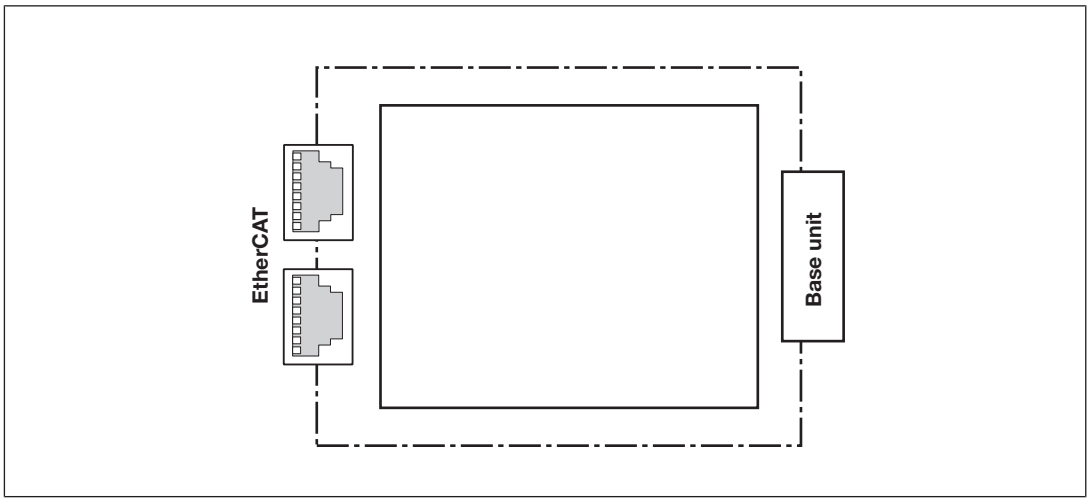
### Assigning the inputs/outputs in the PNOZmulti Configurator to the EtherCAT inputs/outputs

| | | | |
|---|---|---|---|
| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
| Input data EtherCAT | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data EtherCAT | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

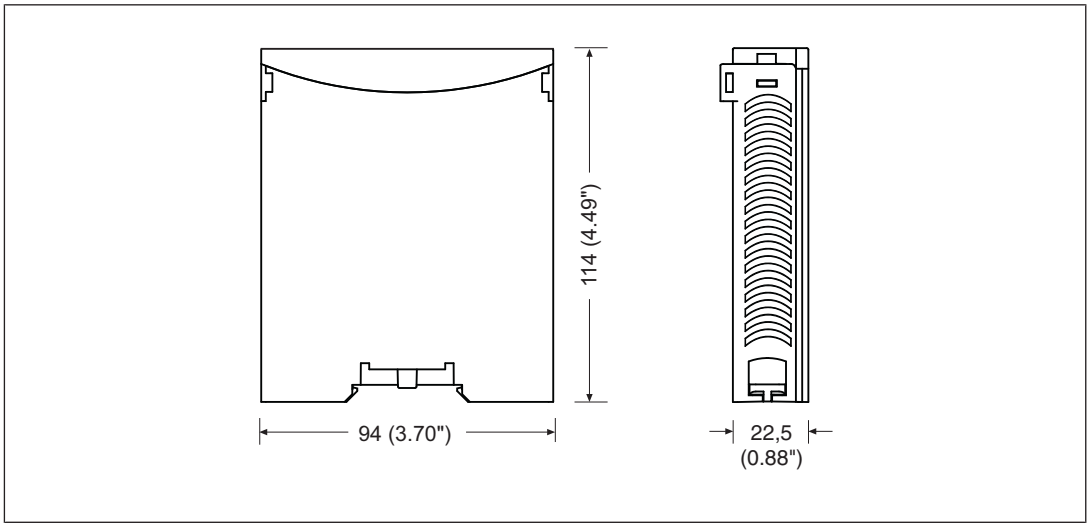
# Fieldbus modules
PNOZ mc2.1p

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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 EtherCAT.

Please note:

- Information given in the Technical details [📖 407] must be followed.

# Fieldbus modules
PNOZ mc2.1p

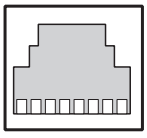
- Use copper wiring with a temperature stability of 75 °C.

Please note the following when connecting to EtherCAT:

- 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 EtherCAT are met, as stated in the Installation Manual published by the User Group.

## Interface assignment

| RJ45 socket<br>8-pin | 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

## Preparing for operation

- Install Device Description File

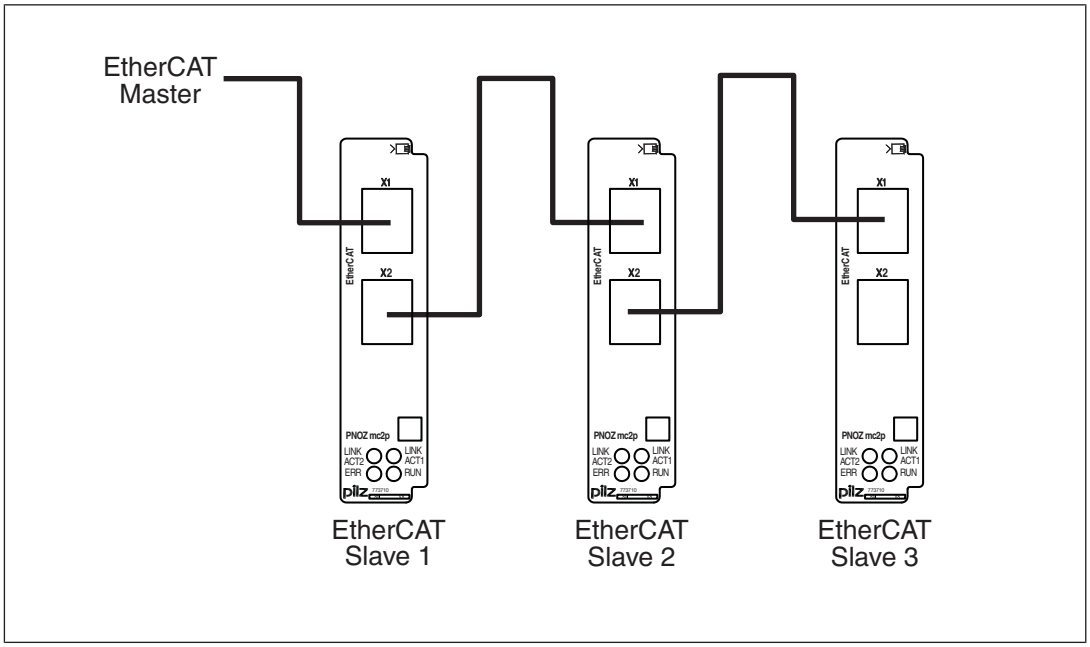
  Install the *Device Description File* in your configuration software. You can only then use the PNOZ mc2.1p.
- Connect the supply voltage to the base unit:

  Terminals **24 V** and **A1 (+)**: + 24 VDC

  Terminals **0 V** and **A2 (-)** : 0 V

# Fieldbus modules
PNOZ mc2.1p

### Connection example




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **1,6 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **EtherCAT** |
| Device type | **Slave** |
| Log | **CANopen over EtherCAT** |
| Transmission rates | **100 MBit/s** |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |
| Test voltage | **500 V AC** |

# Fieldbus modules
## PNOZ mc2.1p

| | |
|---|---|
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |

# Fieldbus modules
PNOZ mc2.1p

| Mechanical data | |
|---|---|
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **114,0 mm** |
| Weight | **140 g** |

Where standards are undated, the 2011-09 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc2.1p | Fieldbus module, EtherCAT | 773 713 |

### Accessories

#### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |

# Fieldbus modules
PNOZ mc3p

## Overview

### Unit features

Using the product PNOZ mc3p:

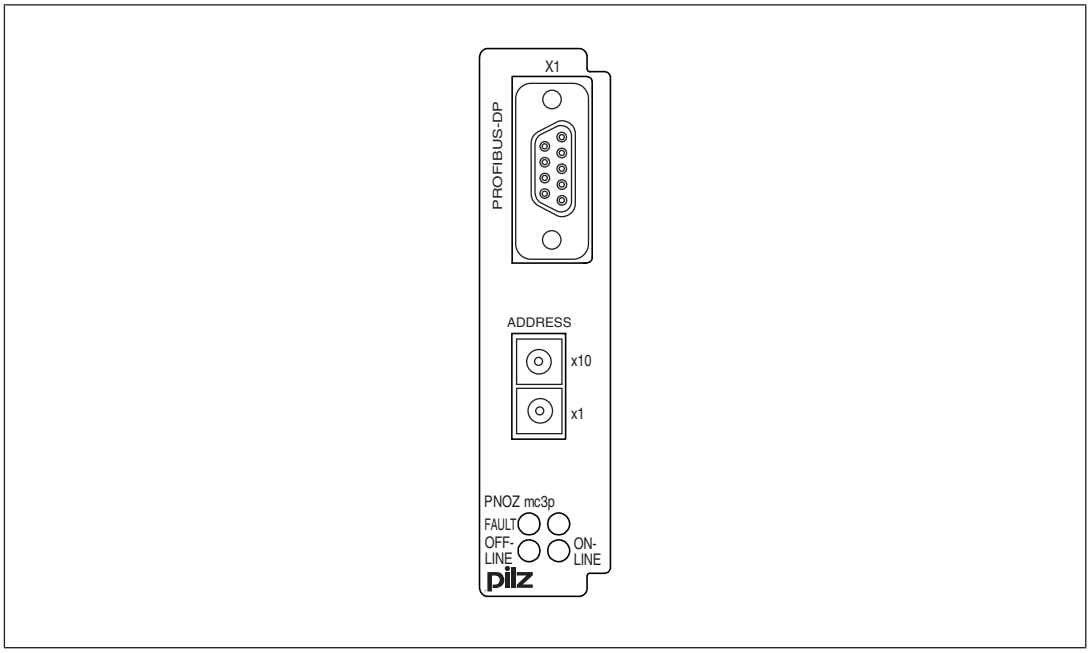
Expansion module for connection to a base unit from the configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for PROFIBUS-DP
- Station addresses from 0 ... 99, selected via rotary switch
- Status indicators for communication with PROFIBUS-DP and for errors
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus PROFIBUS-DP . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mc3p can be connected to the base unit
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Fieldbus modules
PNOZ mc3p

### Front view




Key:

- X1:
  PROFIBUS-DP interface (female 9-pin D-Sub connector)
- LEDs:
  - FAULT
  - OFFLINE
  - ONLINE

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via PROFIBUS are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ mc3p are connected via a jumper. The expansion module PNOZ mc3p is also supplied with voltage via this jumper.

The station address is set via rotary switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module PNOZ mc3p is configured and started automatically.

LEDs indicate the status of the expansion module on PROFIBUS.

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
PNOZ mc3p

### Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

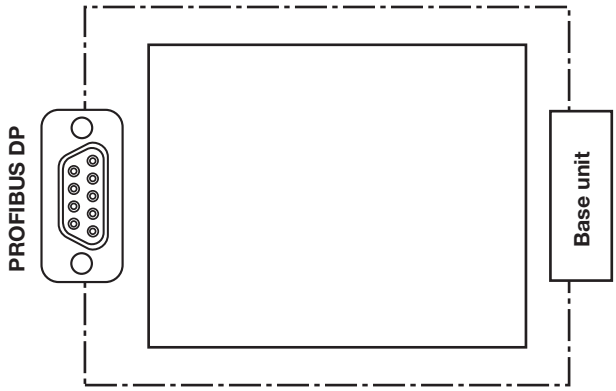
### Assigning the inputs/outputs in the PNOZmulti Configurator to the EtherCAT inputs/outputs

| | | | |
|---|---|---|---|
| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
| Input data PROFIBUS-DP | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data PROFIBUS-DP | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

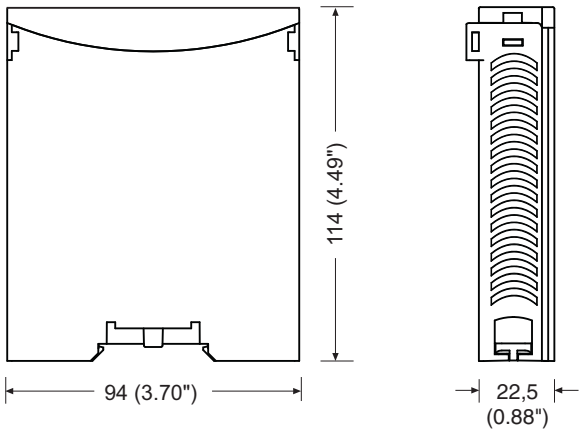
## Fieldbus modules
PNOZ mc3p

### Block diagram




## Installation

### Dimensions in mm



## Commissioning

### Wiring

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

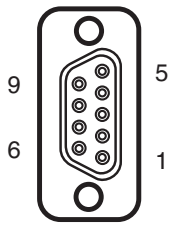
Please note:

- Information given in the Technical details [416] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

Connect the supply voltage to the base unit:

- Terminal **24 V** and **A1 (+)**: + 24 VDC
- Terminal **0 V** and **A2 (-)**: 0 V

It is possible to define which outputs on the control system will communicate with PROFIBUS-DP. The connection to PROFIBUS-DP is made via a female 9-pin D-Sub connector in accordance with the guidelines of the PROFIBUS User Group (PNO).




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

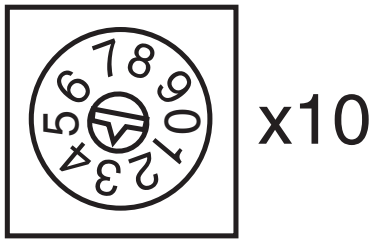
Please note the following when connecting to PROFIBUS-DP:

- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces

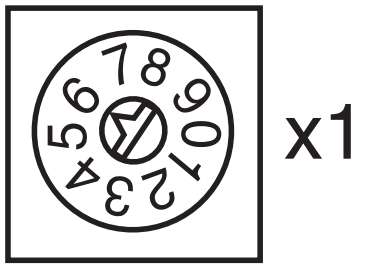
### Preparing for operation

The station address of the expansion module PNOZ mc3p is set between 0 ... 99 (decimal) via two rotary switches x1 and x10.

## Fieldbus modules
PNOZ mc3p




- On the upper rotary switch x10, use a small screwdriver to set the tens digit for the address (“3” in the example).

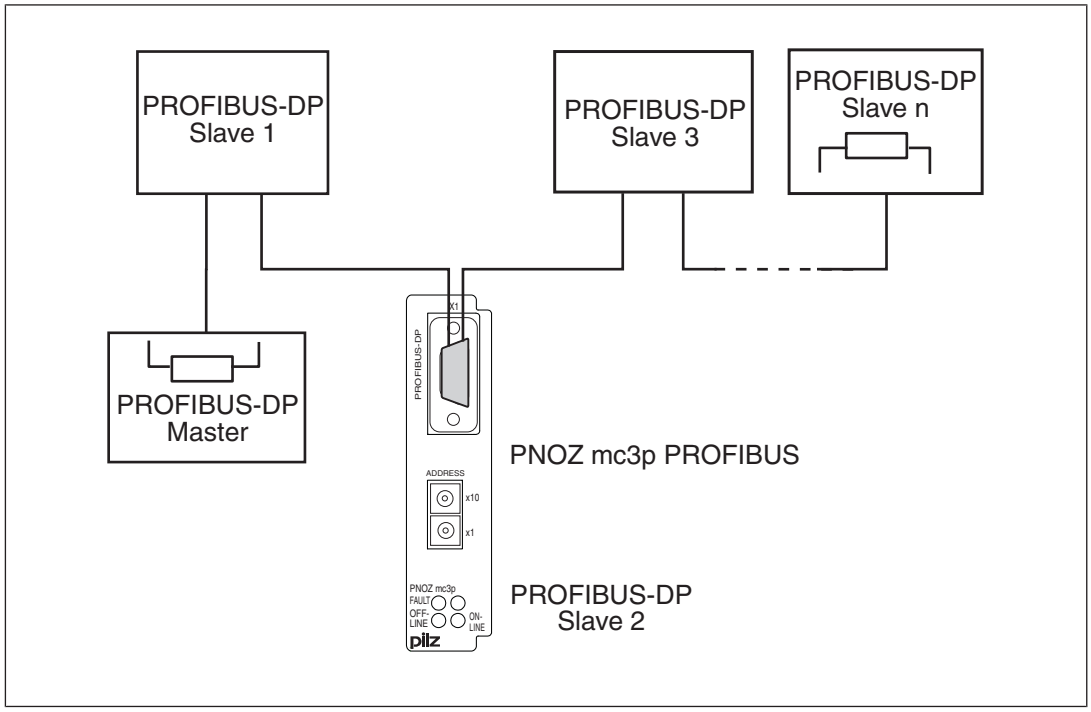



- On the lower rotary switch x1, set the ones digit for the address (“6” in the example).

Station address 36 is set in the diagrams as an example.

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

# Fieldbus modules
PNOZ mc3p




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cU-Lus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **2,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **PROFIBUS DP** |
| Device type | **Slave** |
| Station address | **0 - 99d** |
| Transmission rate | **9,6 kBit/s - 12 MBit/s** |
| Connection | **9-pin D-Sub female connector** |
| Galvanic isolation | **yes** |
| Test voltage | **500 V AC** |

# Fieldbus modules
## PNOZ mc3p

| | |
|---|---|
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |

# Fieldbus modules
PNOZ mc3p

| Mechanical data | |
|---|---|
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **119,0 mm** |
| Weight | **119 g** |

Where standards are undated, the 2011-09 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc3p | Fieldbus module, PROFIBUS-DP | 773 732 |

### Accessories

#### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |

# Fieldbus modules
PNOZ mc4p

## Overview

### Unit features

Using the product PNOZ mc4p:

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

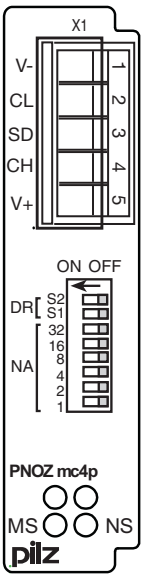
The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for DeviceNet
- Station addresses from 0 ... 63 can be selected via DIP switches
- Status indicators for communication with DeviceNet and for errors
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.
- Coated version:

  Increased environmental requirements (see Technical details [📖 425])

# Fieldbus modules
PNOZ mc4p

### Front view




**Legend:**

- X1: DeviceNet interface (5-pin screw connector)
- LED:
  - Power
  - NS
  - MS

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via DeviceNet are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ mc4p are connected via a jumper. The expansion module 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 control system is reset, the expansion module PNOZ mc4p is configured and started automatically.

LEDs indicate the status of the expansion module on DeviceNet.

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
PNOZ mc4p

### Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

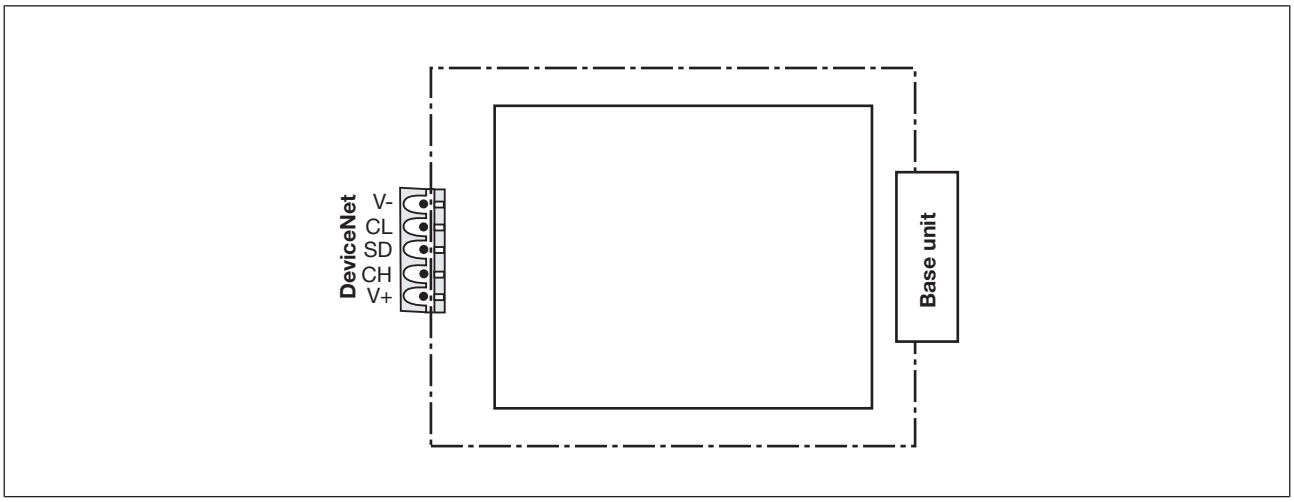
### Assigning the inputs/outputs in the PNOZmulti Configurator to the DeviceNet inputs/outputs

| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
|---|---|---|---|
| Input data DeviceNet | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data DeviceNet | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

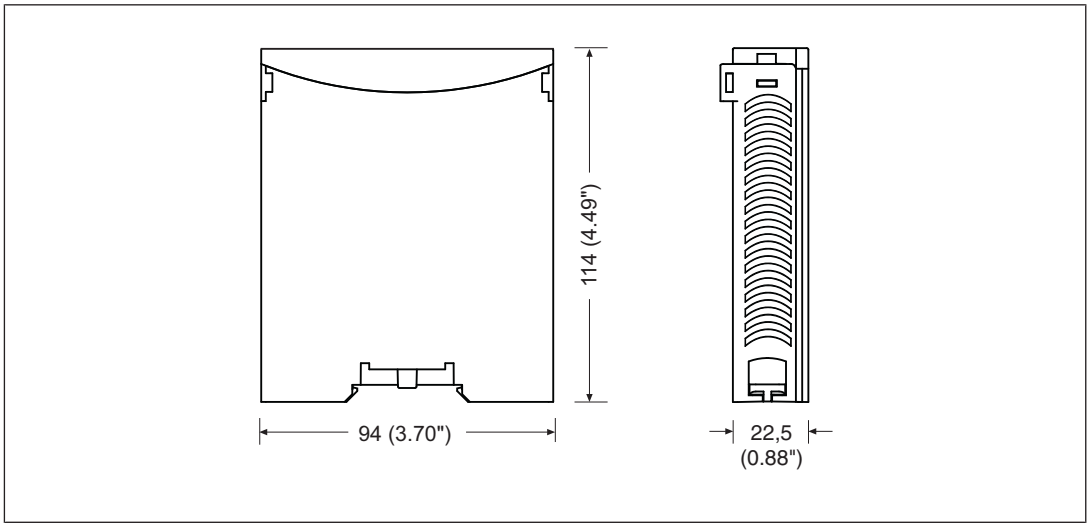
# Fieldbus modules
PNOZ mc4p

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 425] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.

- Use copper wire that can withstand 75° C.
- The power supply must meet the regulations for extra low voltages with protective separation.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.

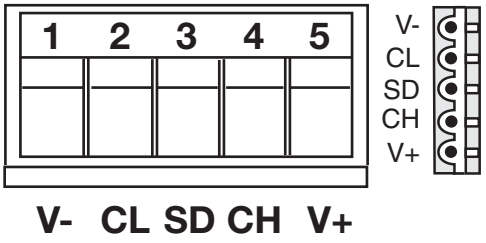
## Connecting the supply voltage

Connect the supply voltage to the base unit:

- Terminal **24 V** and **A1 (+)**: + 24 VDC
- Terminal **0 V** and **A2 (-)**: 0 V

## DeviceNet interface

It is possible to define which outputs on the control system will communicate with DeviceNet. The connection to DeviceNet is made via a 5-pin screw connector.




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

### Termination DeviceNet

To minimise cable reflection and to guarantee a defined rest signal on the transmission line, DeviceNetmust be terminated at both ends.

## Setting the transmission rate

Set the transmission rate using DIP switches S1 and S2 (DR).

| Transmission rate | DIP switch | |
|---|---|---|
| | S1 | S2 |
| 125 kBit/s | Off | Off |
| 250 kBit/s | On | Off |
| 500 kBit/s | Off | On |
| --- | On | On |

# Fieldbus modules
PNOZ mc4p

## Setting the station address

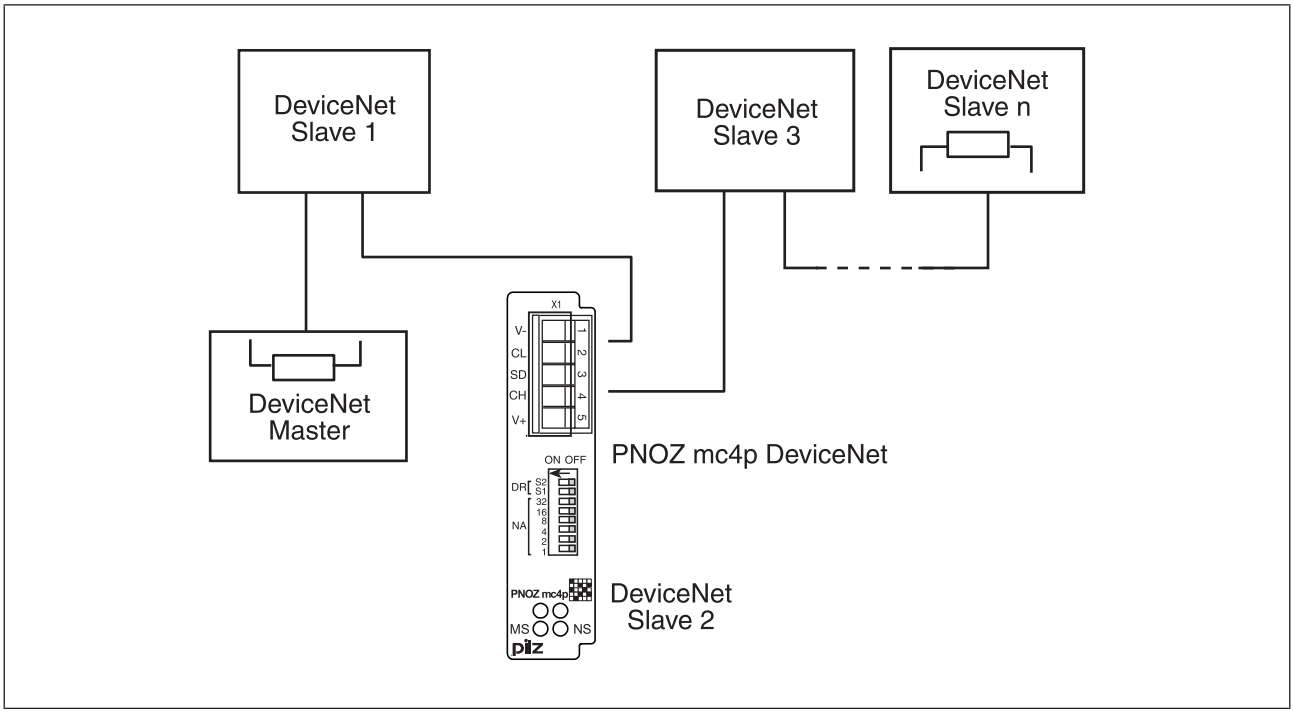
The station address of the expansion module PNOZ mc4p is set from 0 ... 63 (binary) using DIP switches 1 to 32.

| Station address | DIP switch | | | | | |
|---|---|---|---|---|---|---|
| | **32** | **16** | **8** | **4** | **2** | **1** |
| 0 | Off | Off | Off | Off | Off | Off |
| 1 | Off | Off | Off | Off | Off | On |
| 2 | Off | Off | Off | Off | On | Off |
| 3 | Off | Off | Off | Off | On | On |
| ... | ... | ... | ... | ... | ... | ... |
| 62 | On | On | On | On | On | Off |
| 63 | On | On | On | On | On | On |

## Download modified project to the PNOZmulti safety system

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

## Connection example



# Fieldbus modules
PNOZ mc4p

## Technical Details

| General | 773711 | 773729 |
|---|---|---|
| Approvals | CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed | CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed |
| **Electrical data** | **773711** | **773729** |
| Supply voltage | | |
| for | Module supply | Module supply |
| internal | Via base unit | Via base unit |
| Voltage | 5,0 V | 5,0 V |
| Kind | DC | DC |
| Voltage tolerance | -2 %/+2 % | -2 %/+2 % |
| Power consumption | 1,0 W | 1,6 W |
| Status indicator | LED | LED |
| **Fieldbus interface** | **773711** | **773729** |
| Fieldbus interface | DeviceNet | DeviceNet |
| External supply (DC) | 24 V | 24 V |
| Power consumption | 0,75 W | 0,75 W |
| Device type | Slave | Slave |
| Station address | 0 ... 63d | 0 ... 63d |
| Transmission rates | 125 kBit/s, 250 kBit/s, 500 kBit/s | 125 kBit/s, 250 kBit/s, 500 kBit/s |
| Connection | 5-pin Combicon plug-in connector | 5-pin Combicon plug-in connector |
| Galvanic isolation | yes | yes |
| Test voltage | 500 V AC | 500 V AC |
| **Times** | **773711** | **773729** |
| Supply interruption before de-energisation | 20 ms | 20 ms |
| **Environmental data** | **773711** | **773729** |
| Ambient temperature | | |
| In accordance with the standard | EN 60068-2-14 | EN 60068-2-14 |
| Temperature range | 0 - 60 °C | 0 - 50 °C |
| Storage temperature | | |
| In accordance with the standard | EN 60068-2-1/-2 | EN 60068-2-1/-2 |
| Temperature range | -25 - 70 °C | -25 - 70 °C |
| Climatic suitability | | |
| In accordance with the standard | EN 60068-2-30, EN 60068-2-78 | EN 60068-2-30, EN 60068-2-78 |
| Humidity | 93 % r. h. at 40 °C | 93 % r. h. at 40 °C |
| Condensation during operation | Not permitted | Short-term |
| EMC | EN 61131-2 | EN 61131-2 |

## Fieldbus modules
PNOZ mc4p

| Environmental data | 773711 | 773729 |
|---|---|---|
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** | **10,0 - 150,0 Hz** |
| Acceleration | **1g** | **1g** |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** |
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Mechanical data** | **773711** | **773729** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **22,5 mm** | **22,5 mm** |
| Depth | **122,0 mm** | **122,0 mm** |
| Weight | **110 g** | **143 g** |

Where standards are undated, the 2010-05 latest editions shall apply.

# Fieldbus modules
PNOZ mc4p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc4p | Fieldbus module, DeviceNet | 773 711 |
| PNOZ mc4p coated version | Fieldbus module, DeviceNet, coated version | 773 729 |

### Accessories

#### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |

# Fieldbus modules
PNOZ mc5p

## Overview

### Unit features

Using the product PNOZ mc5p:

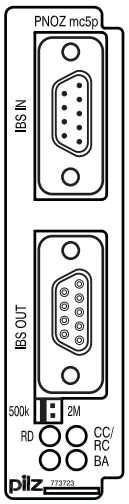
Expansion module for connection to a base unit from the configurable control system PNOZmulti .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- 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 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.
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Fieldbus modules
PNOZ mc5p

### Front view




## Function description

### Functions

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

### Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT

  – Bit 1: IFAULT

# Fieldbus modules
PNOZ mc5p

– Bit 2: FAULT
– Bit 3: DIAG
– Bit 4: RUN

Bit 5: Data is being exchanged.

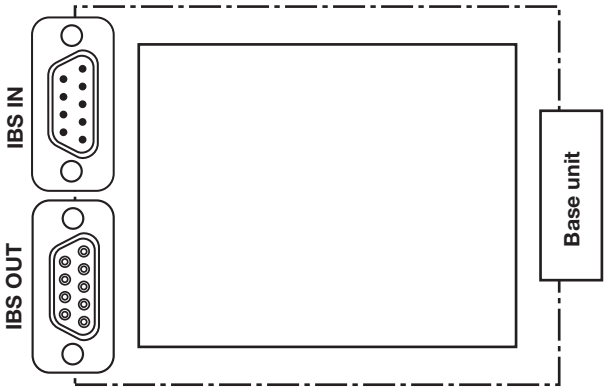
Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

## Assigning the inputs/outputs in the PNOZmulti Configurator to the INTERBUS inputs/outputs

| | | | |
|---|---|---|---|
| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
| Input data INTERBUS | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data INTERBUS | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

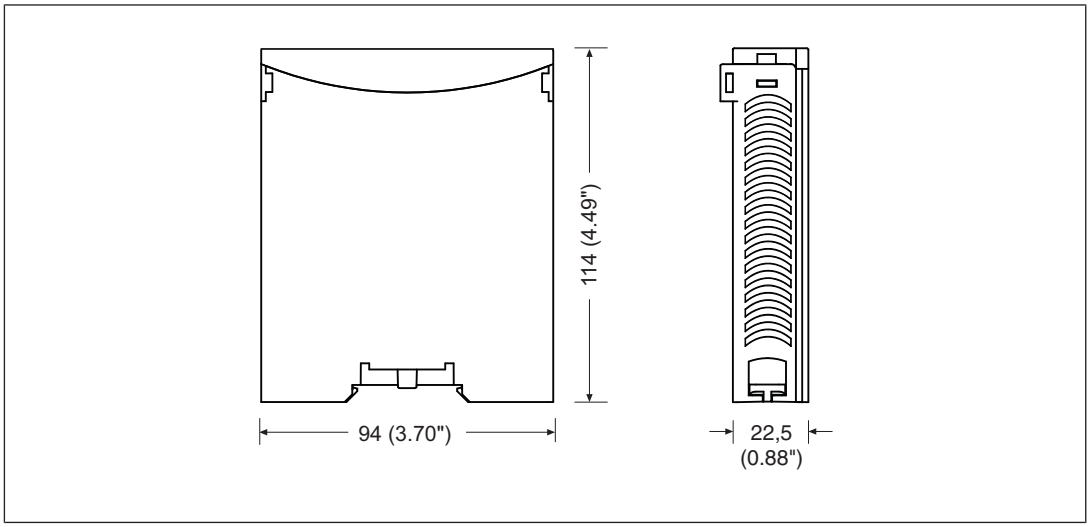
## Block diagram



# Fieldbus modules
PNOZ mc5p

## Installation

### Dimensions in mm

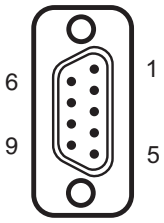



## Commissioning

### Preparing for commissioning

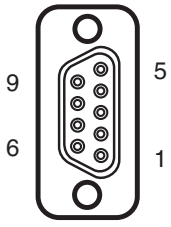
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

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

**IBS IN**




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

**IBS OUT**

n. c. = not connected

# Fieldbus modules
PNOZ mc5p

Please note:

- Information given in the "Technical details" must be followed.
- Use copper wiring with a temperature stability of 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

## Setting the transmission rate

The transmission rate is set using a jumper. You can choose between 500 kBit/s and 2 MBit/s.

| | |
|---|---|
| 500 kBit/s: | 500k  2M |
| 2 MBit/s | 500k  2M |

## Connecting the supply voltage

Connect the supply voltage to the base unit:

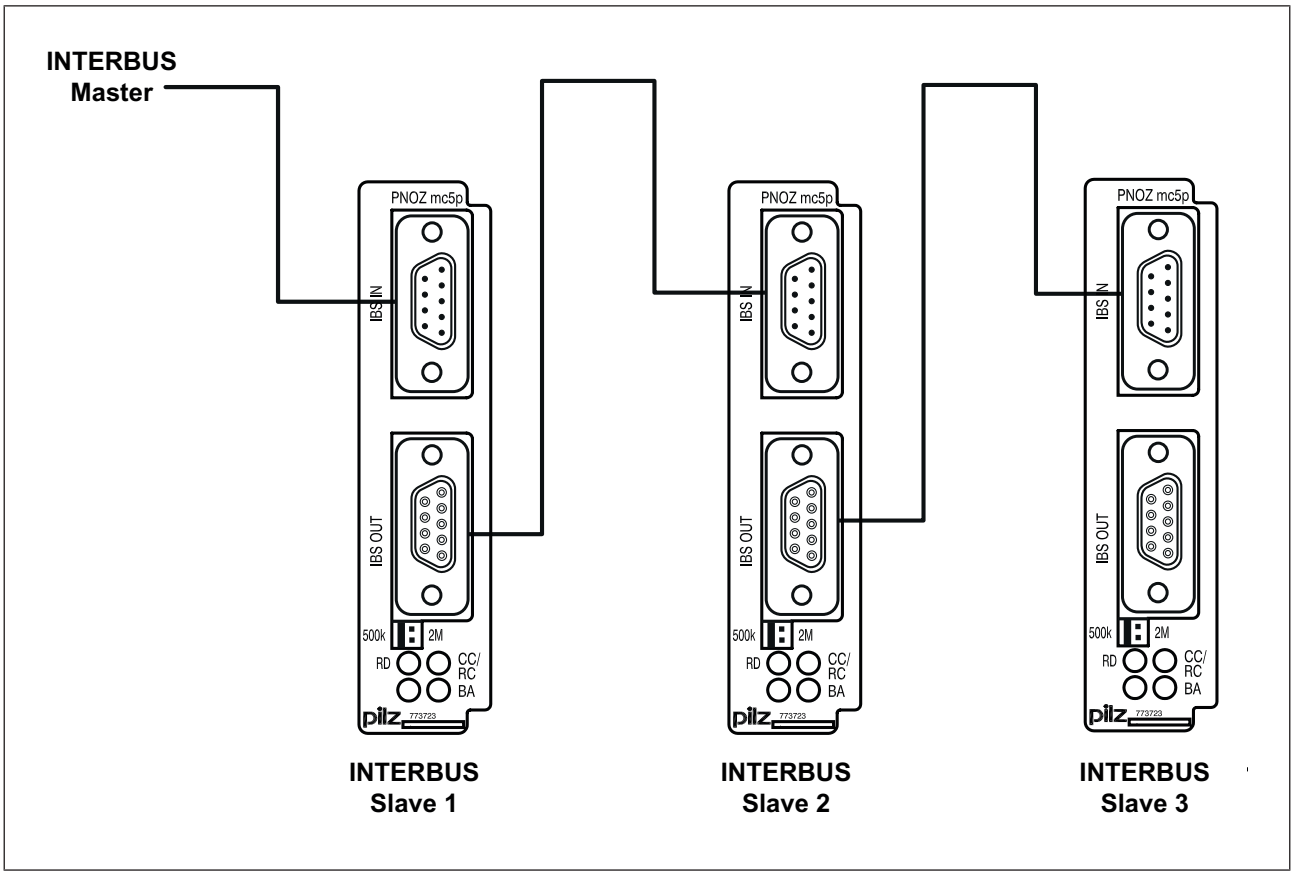
- Terminal **24 V** and **A1 (+)**: + 24 VDC
- Terminal **0 V** and **A2 (-)**: 0 V

## Download modified project to the PNOZmulti safety system

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

# Fieldbus modules
PNOZ mc5p

### Connection example




## Technical Details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cU-Lus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **2,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **Interbus S** |
| Device type | **Slave** |

# Fieldbus modules
## PNOZ mc5p

| | |
|---|---|
| **Fieldbus interface** | |
| Transmission rates | **2 MBit/s, 500 kBit/s** |
| Connection IBS IN | **9-pin D-Sub male connector** |
| Connection IBS OUT | **9-pin D-Sub female connector** |
| Galvanic isolation | **yes** |
| Test voltage | **500 V AC** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |

# Fieldbus modules
PNOZ mc5p

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **119,0 mm** |
| Weight | **155 g** |

Where standards are undated, the 2007-05 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc5p | Fieldbus module, INTERBUS | 773 723 |

### Accessories

#### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |

# Fieldbus modules
PNOZ mc5.1p

## Overview

### Unit features

Using the product PNOZ mc5.1p:

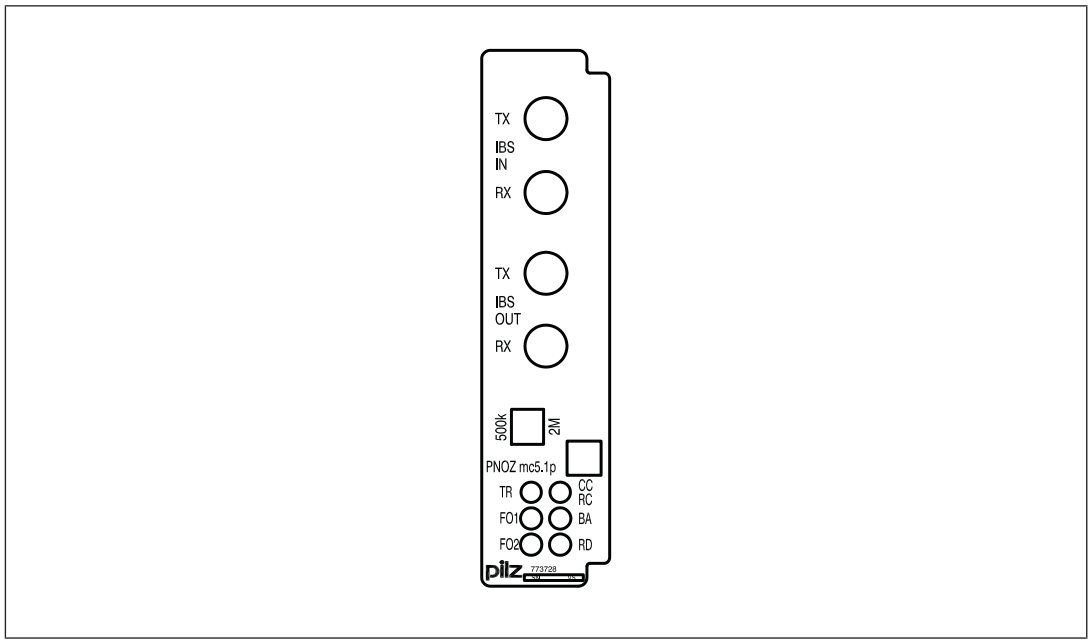
Expansion module for connection to a base unit from the configurable control system PNOZmulti .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- 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.
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Fieldbus modules
PNOZ mc5.1p

### Front view




**Legend**

| | |
|---|---|
| **IBS IN** | Remote bus IN |
| TX | Transmitter |
| RX | Receiver |
| **IBS OUT** | Remote bus OUT |
| TX | Transmitter |
| RX | Receiver |
| **LEDs:** | CR/CC, BA, RD, TR, FO1, FO2 |

## Function description

### Functions

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

# Fieldbus modules
PNOZ mc5.1p

### Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

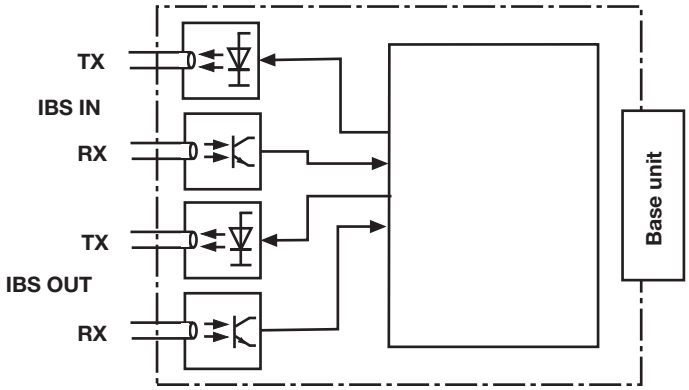
### Assigning the inputs/outputs in the PNOZmulti Configurator to the INTERBUS inputs/outputs

| | | | |
|---|---|---|---|
| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
| Input data INTERBUS LWL | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data INTERBUS LWL | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

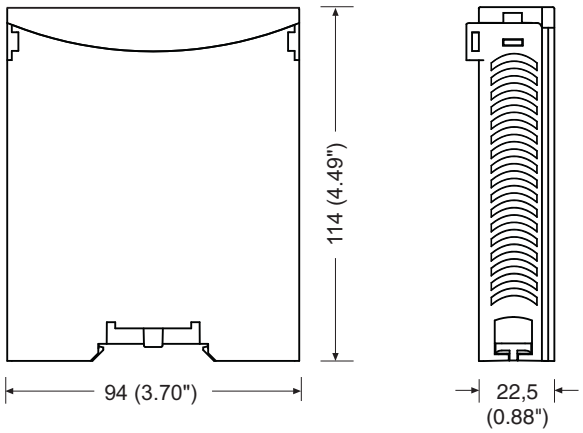
# Fieldbus modules
PNOZ mc5.1p

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### Preparing for commissioning

Please note the following when preparing for commissioning:

The fieldbus module PNOZ mc5.1p features F-SMA connection technology for fibre-optic cables. The visible light of the FO sender LED presents no danger to human skin or eyes. Do, however, avoid extended periods of direct eye contact with the LED.

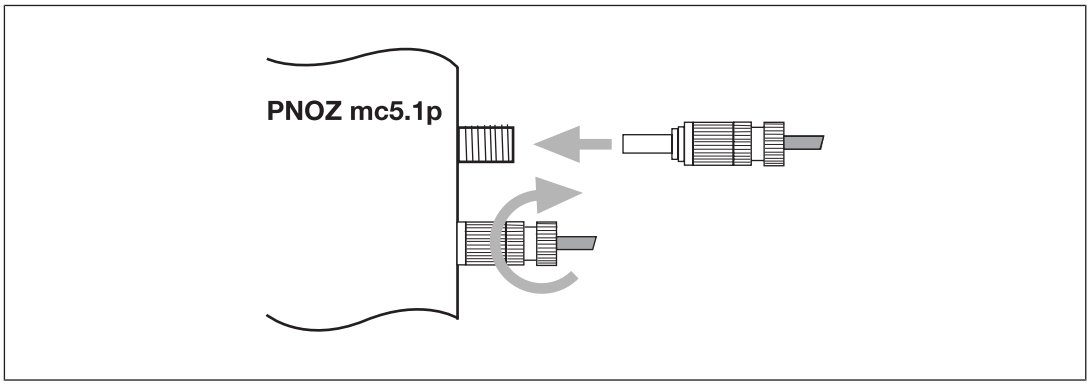
# Fieldbus modules
PNOZ mc5.1p

Use only the following fibre-optic cables:

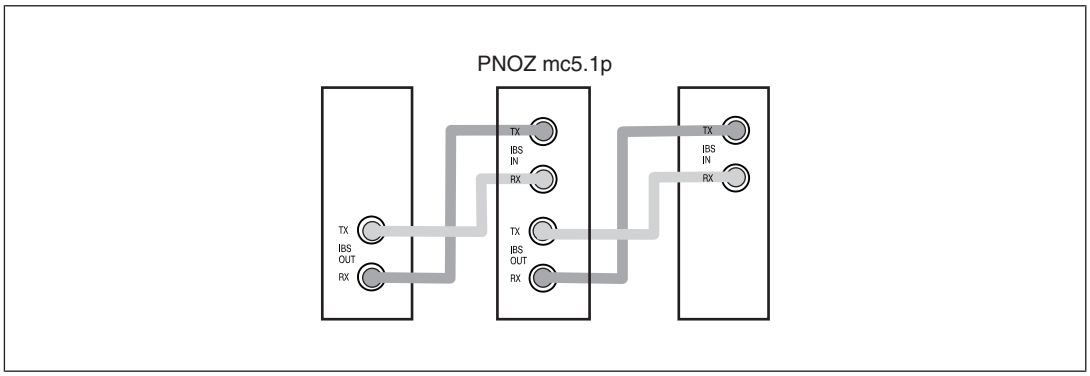
- Polymer fibre, fibre type 980/1000 µm
- HCS fibre, fibre type 200/230 µm

## Preparing for operation

- Connect fibre-optic cable
  - Connect the FO cable to the F-SMA plug-in connector on the transmitter and receiver.
  - Hand-tighten the union nut in a clockwise direction.



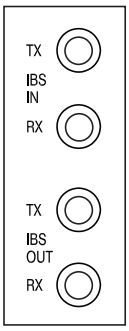

- Connect the TX transmitter of the IBS OUT remote bus to the RX receiver of the IBS IN remote bus.
- Connect the RX receiver of the IBS OUT remote bus to the TX transmitter of the IBS IN remote bus.



# Fieldbus modules
PNOZ mc5.1p

## INTERBUS interface

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.




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

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

## Setting the transmission rate

The transmission rate is set using a jumper. You can choose between 500 kBit/s and 2 MBit/s.

| | |
|---|---|
| 500 kBit/s: | 500k  2M |
| 2 MBit/s | 500k  2M |

## Connecting the supply voltage

Connect the supply voltage to the base unit:

- Terminal **24 V** and **A1 (+)**: + 24 VDC
- Terminal **0 V** and **A2 (-)**: 0 V

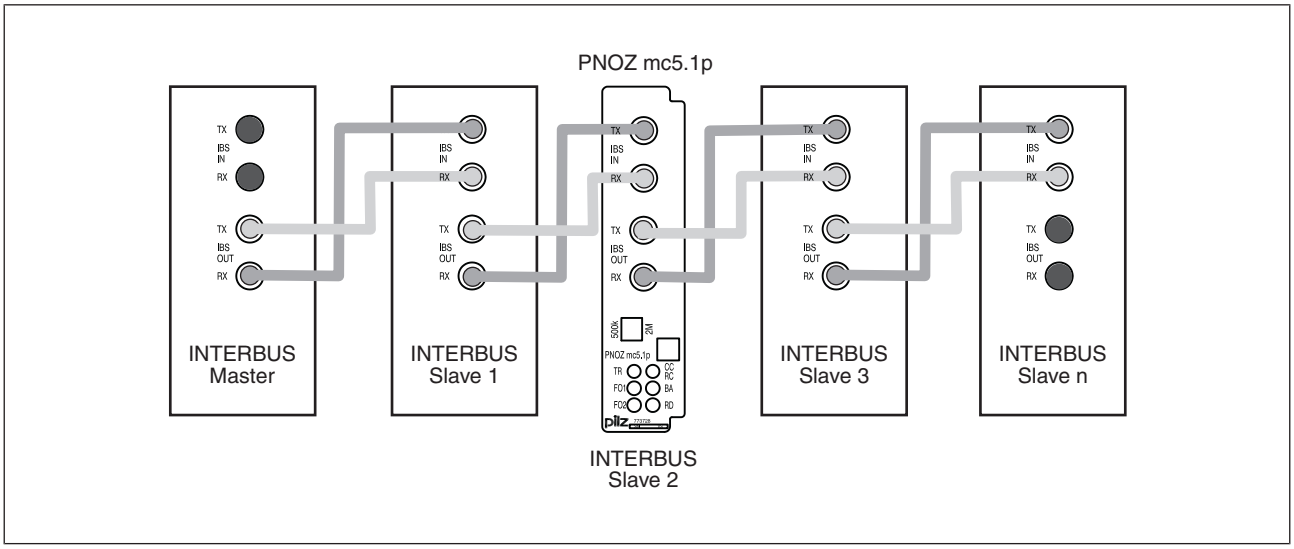
## Download modified project to the PNOZmulti safety system

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

# Fieldbus modules
PNOZ mc5.1p

### Connection example

The sender and receiver of the incoming and outgoing remote buses are configured in a crossover formation. Cover unused connections with a protective cap.




## Technical Details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cU-Lus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **2,0 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **INTERBUS LWL** |
| Device type | **Slave** |
| Transmission rates | **2 MBit/s, 500 kBit/s** |
| Connection | **F-SMA connector** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |

# Fieldbus modules
## PNOZ mc5.1p

| | |
|---|---|
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |

# Fieldbus modules
PNOZ mc5.1p

| Mechanical data | |
|---|---|
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **121,0 mm** |
| Weight | **145 g** |

Where standards are undated, the 2007-05 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc5.1p | Fieldbus module, INTERBUS FO | 773 728 |

### Accessories

#### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |

# Fieldbus modules
PNOZ mc6p/mc6.1p

## Overview

### Unit features

Using the product PNOZ mc6p/mc6.1p:

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

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for CANopen
- Station addresses from 0 ... 99, selected via rotary switch
- Transmission rate selected via rotary switch (1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s)
- Status indicators for communication with CANopen and for errors
- Supported protocols:

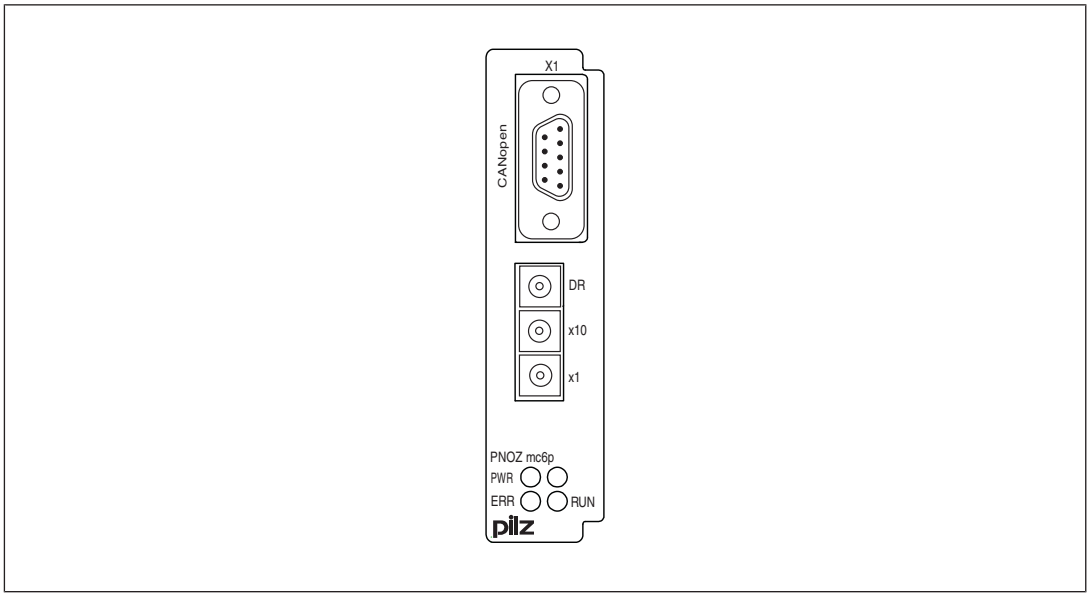
  **PNOZ mc6p**: CiA DS-301 V3.0

  **PNOZ mc6.1p**: CiA DS-301 V4.0.2
- **PNOZ mc6.1p**: Default COB-ID has been adapted for RPDO 3 (400 h) and TPDO 3 (380 h)
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus CANopen . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mc6p/mc6.1p can be connected to the base unit
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.
- Coated version:

  Increased environmental requirements (see Technical details [451])

# Fieldbus modules
PNOZ mc6p/mc6.1p

### Front view




- X1: CANopen interface (male 9-pin D-Sub connector)
- LED:
  - Power
  - Run
  - Error

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via CANopen are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ mc6p/mc6.1p are connected via a jumper. The station address and the transmission rate are set using rotary switches. The fieldbus module is also supplied with voltage via this jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module PNOZ mc6p/mc6.1p is configured and started automatically.

LEDs indicate the status of the expansion module on CANopen.

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
PNOZ mc6p/mc6.1p

## Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

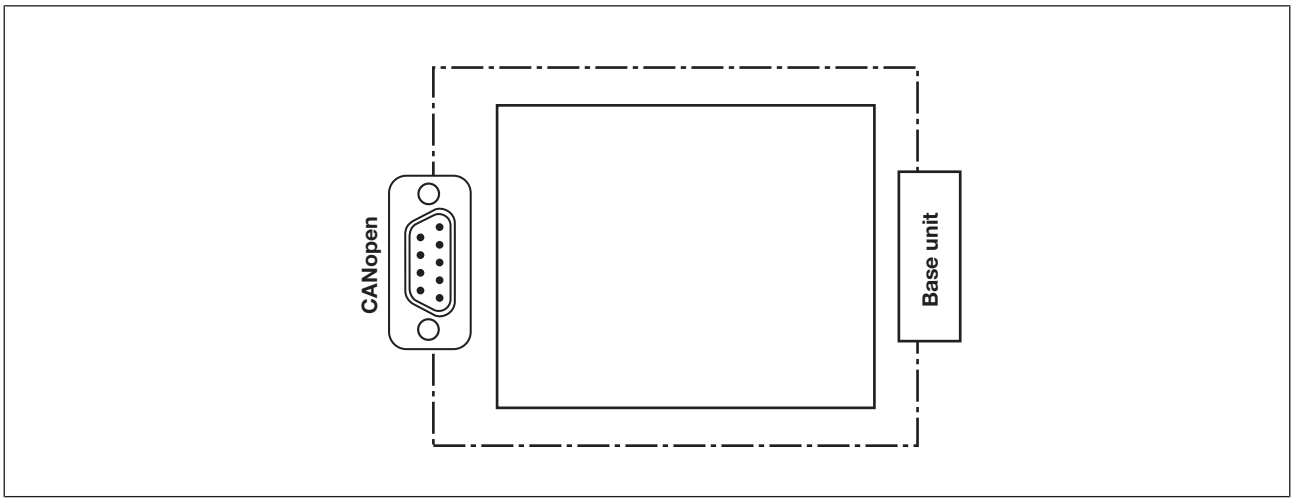
## Assigning the inputs/outputs in the PNOZmulti Configurator to the CANopen inputs/outputs

| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
|---|---|---|---|
| Input data CANopen | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data CANopen | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

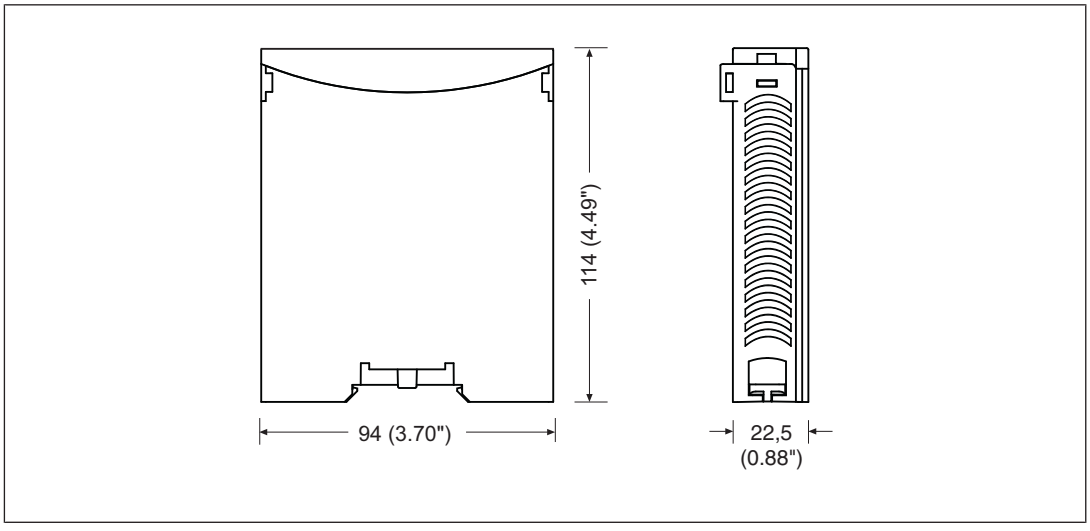
# Fieldbus modules
PNOZ mc6p/mc6.1p

### Block diagram




## Installation

### Dimensions in mm



# Commissioning

## General wiring guidelines

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

Please note:

- Information given in the Technical details [451] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

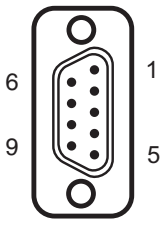
## Connecting the supply voltage

Connect the supply voltage to the base unit:

- Terminal **24 V** and **A1 (+)**: + 24 VDC
- Terminal **0 V** and **A2 (-)**: 0 V

## CANopen interface

The connection to CANopen is made via a male 9-pin D-Sub connector.




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

n.c. = not connected

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

To minimise cable reflection and to guarantee a defined rest signal on the transmission line, CANopen must be terminated at both ends.

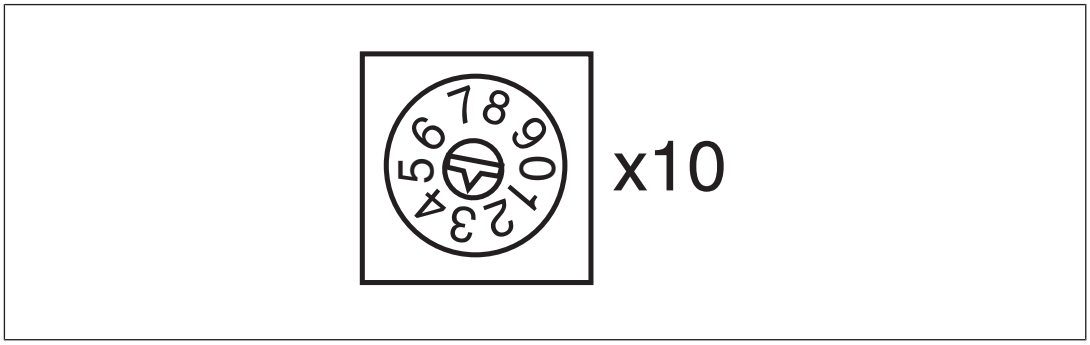
# Fieldbus modules
PNOZ mc6p/mc6.1p

## Preparing for operation

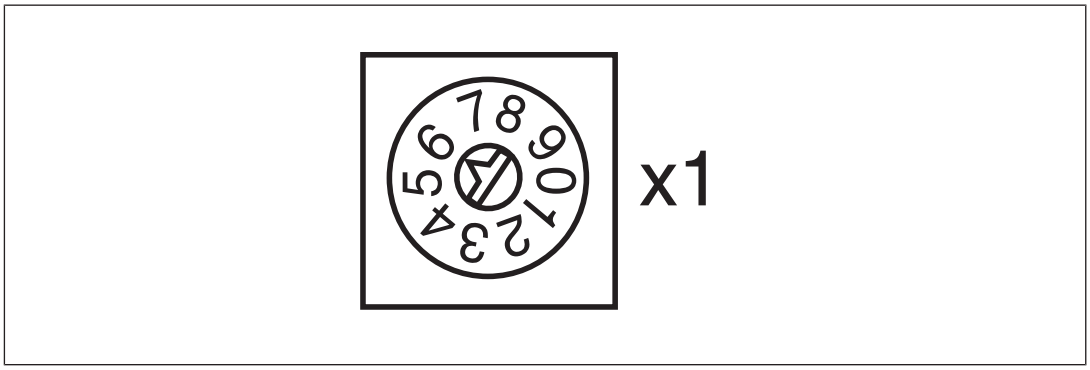

- On the upper rotary switch DR, use a small screwdriver to set the transmission rate (in the example, "3" corresponds to 50 kBit/s).

| Switch setting | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Transmission rate | - | 10 kBit/s | 20 kBit/s | 50 kBit/s | 125 kBit/s | 250 kBit/s | 500 kBit/s | 800 kBit/s | 1 MBit/s | - |

The station address of the expansion module PNOZ mc6p/mc6.1p is set between 0 ... 99 (decimal) via two rotary switches x1 and x10.




- On the middle rotary switch x10, use a small screwdriver to set the tens digit for the address (“3” in the example).

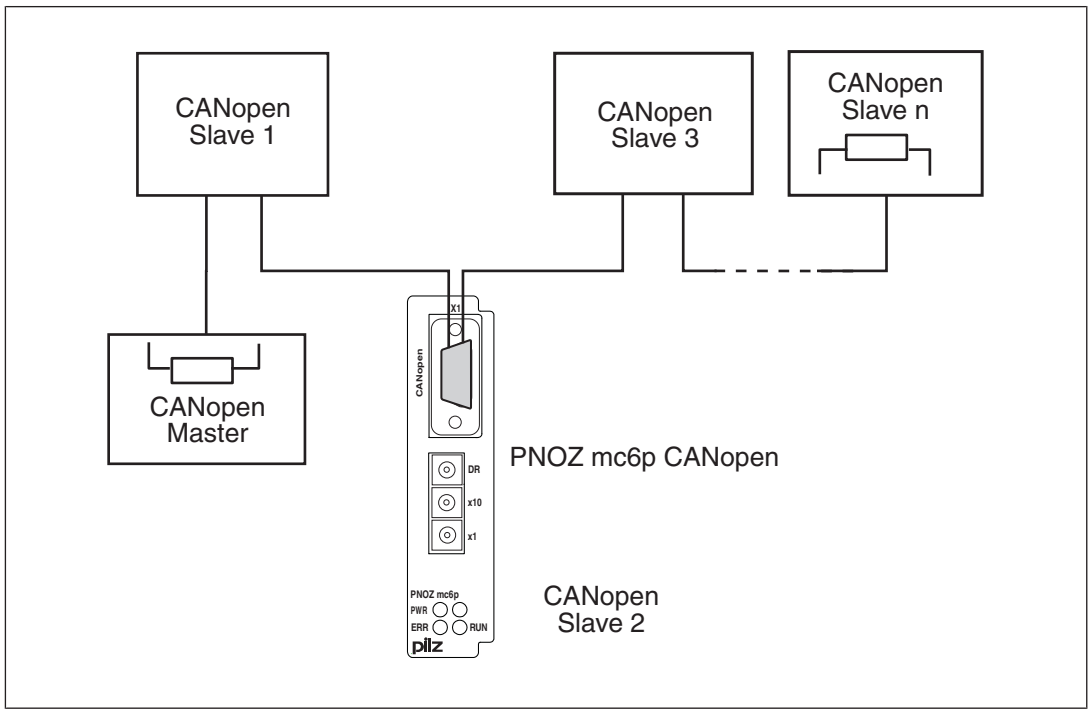



- On the lower rotary switch x1, set the ones digit for the address (“6” in the example).

## Fieldbus modules
PNOZ mc6p/mc6.1p

Station address 36 is set in the diagrams as an example.

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




# Technical details

| General | 773712 | 773727 | 773733 |
|---|---|---|---|
| Approvals | **CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed** | **CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed** | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | **773712** | **773727** | **773733** |
| Supply voltage | | | |
| for | **Module supply** | **Module supply** | **Module supply** |
| internal | **Via base unit** | **Via base unit** | **Via base unit** |
| Voltage | **5,0 V** | **5,0 V** | **5,0 V** |
| Kind | **DC** | **DC** | **DC** |
| Voltage tolerance | **-2 %/+2 %** | **-2 %/+2 %** | **-2 %/+2 %** |
| Power consumption | **1,0 W** | **2,5 W** | **1,0 W** |
| Status indicator | **LED** | **LED** | **LED** |
| **Fieldbus interface** | **773712** | **773727** | **773733** |
| Fieldbus interface | **CANopen** | **CANopen** | **CANopen** |
| Device type | **Slave** | **Slave** | **Slave** |

## Fieldbus modules
PNOZ mc6p/mc6.1p

| Fieldbus interface | 773712 | 773727 | 773733 |
|---|---|---|---|
| Log | CiA DS-301 V3.0 | CiA DS-301 V3.0 | CiA DS-301 V4.02 |
| Station address | 0 - 99d | 0 - 99d | 0 - 99d |
| Transmission rates | 1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s | 1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s | 1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s |
| Connection | 9-pin D-Sub male connector | 9-pin D-Sub male connector | 9-pin D-Sub male connector |
| Galvanic isolation | yes | yes | yes |
| Test voltage | 500 V AC | 500 V AC | 500 V AC |
| **Times** | **773712** | **773727** | **773733** |
| Supply interruption before de-energisation | 20 ms | 20 ms | 20 ms |
| **Environmental data** | **773712** | **773727** | **773733** |
| Ambient temperature | | | |
| In accordance with the standard | EN 60068-2-14 | EN 60068-2-14 | EN 60068-2-14 |
| Temperature range | 0 - 60 °C | 0 - 50 °C | 0 - 60 °C |
| Storage temperature | | | |
| In accordance with the standard | EN 60068-2-1/-2 | EN 60068-2-1/-2 | EN 60068-2-1/-2 |
| Temperature range | -25 - 70 °C | -25 - 70 °C | -25 - 70 °C |
| Climatic suitability | | | |
| In accordance with the standard | EN 60068-2-30, EN 60068-2-78 | EN 60068-2-30, EN 60068-2-78 | EN 60068-2-30, EN 60068-2-78 |
| Humidity | 93 % r. h. at 40 °C | 93 % r. h. at 40 °C | 93 % r. h. at 40 °C |
| Condensation during operation | Not permitted | Short-term | Not permitted |
| EMC | EN 61131-2 | EN 61131-2 | EN 61131-2 |
| Vibration | | | |
| In accordance with the standard | EN 60068-2-6 | EN 60068-2-6 | EN 60068-2-6 |
| Frequency | 10,0 - 150,0 Hz | 10,0 - 150,0 Hz | 10,0 - 150,0 Hz |
| Acceleration | 1g | 1g | 1g |
| Corrosive gas check | | | |
| SO2: Concentration 10 ppm, duration 10 days, passive | – | DIN V 40046-36 | – |
| H2S: Concentration 1 ppm, duration 10 days, passive | – | DIN V 40046-37 | – |

## Fieldbus modules
PNOZ mc6p/mc6.1p

| Environmental data | 773712 | 773727 | 773733 |
|---|---|---|---|
| Shock stress | | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** | **2000 m** |
| Airgap creepage | | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** | **III** |
| Pollution degree | **2** | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** | **30 V** |
| Protection type | | | |
| In accordance with the standard | **EN 60529** | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** | **IP20** |
| **Mechanical data** | **773712** | **773727** | **773733** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** | **27 mm** |
| Material | | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Dimensions | | | |
| Height | **94,0 mm** | **94,0 mm** | **94,0 mm** |
| Width | **22,5 mm** | **22,5 mm** | **22,5 mm** |
| Depth | **119,0 mm** | **119,0 mm** | **119,0 mm** |
| Weight | **110 g** | **145 g** | **110 g** |

Where standards are undated, the 2011-09 latest editions shall apply.

# Fieldbus modules
PNOZ mc6p/mc6.1p

## Order reference

### Product

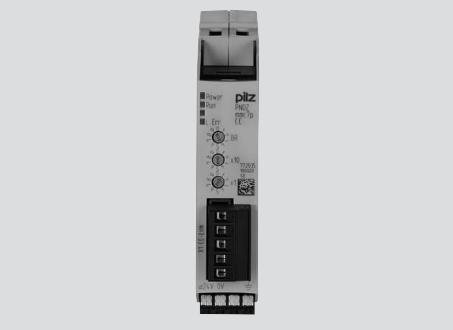
| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc6p | Fieldbus module, CANopen, protocol: CiA DS-301 V3.0 | 773 712 |
| PNOZ mc6p coated version | Fieldbus module, CANopen, coated version, protocol: CiA DS-301 V3.0 | 773 727 |
| PNOZ mc6.1p | Fieldbus module, CANopen, protocol: CiA DS-301 4.0.2 | 773 733 |

### Accessories

#### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |
| KOP-XE coated | Jumper, coated version | 774 640 |

# Fieldbus modules
PNOZ mc7p



## Overview

### Unit features

Using the product PNOZ mc7p:

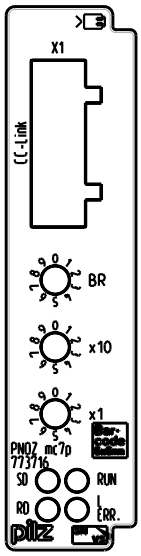
Expansion module for connection to a base unit from the configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for CC-Link
- Station addresses from 0 ... 63, selected via rotary switch
- Station type: Remote Device
- Occupied stations: 2
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus CC-Link . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mc7p can be connected to the base unit
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Fieldbus modules
PNOZ mc7p

### Front view




**Legend:**

- LED:
  - Run
  - SD
  - RD
  - L Err

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via the fieldbus CC-Link are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ mc7p are connected via a jumper. The fieldbus module is also supplied with voltage via this jumper. After the supply voltage is switched on or the control system PNOZmulti is reset, the fieldbus module PNOZ mc7p is configured and started automatically.

LEDs indicate the status of the fieldbus module on the fieldbus CC-Link .

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
PNOZ mc7p

## Input and output data

The data is structured as follows:

- Input area
  - Inputs on PNOZmulti Configurator: i00 … i23
  - Input data CC-Link: RY0n, RY1n with n = 0 … F

    Example: i23 -> RY17

| n | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RY0n** | i15 | i14 | i13 | i12 | i11 | i10 | i09 | i08 | i07 | i06 | i05 | i04 | i03 | i02 | i01 | i00 |
| **RY1n** | - | - | - | - | - | - | - | - | i23 | i22 | i21 | i20 | i19 | i18 | i17 | i16 |

- Output range
  - Outputs on PNOZmulti Configurator: o00 … o23
  - Output data CC-Link: RXn, RX1n with n = 0 … F

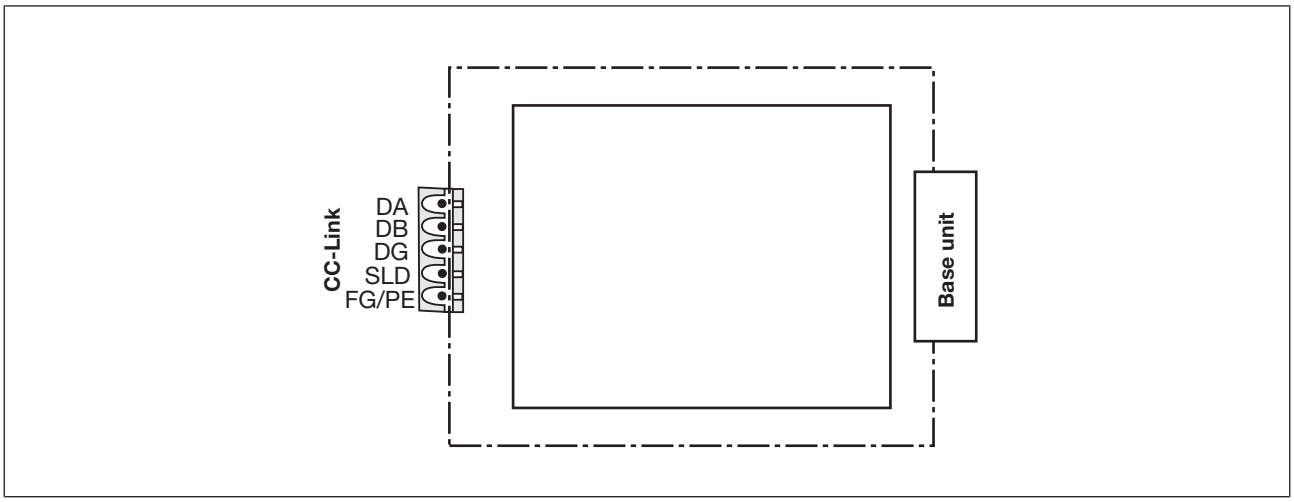
    Example: o22 -> Rx16

| n | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RX 0n** | o15 | o14 | o13 | o12 | o11 | o10 | o09 | o08 | o07 | o06 | o05 | o04 | o03 | o02 | o01 | o00 |
| **RX 1n** | - | - | - | - | - | - | - | - | o23 | o22 | o21 | o20 | o19 | o18 | o17 | o16 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

Detailed information on data exchange is available in the document "Communication Interfaces PNOZmulti 2" in the section entitled "Fieldbus modules".

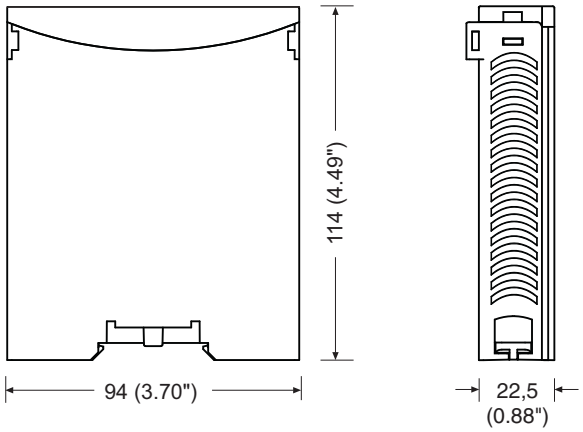
## Block diagram



# Fieldbus modules
PNOZ mc7p

## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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

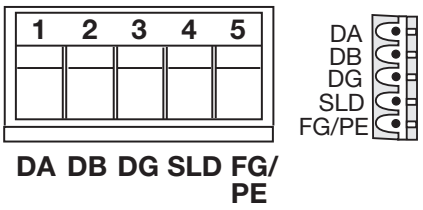
Please note:

- Information given in the Technical details [📖 460] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

# Fieldbus modules
PNOZ mc7p

## Interface assignment

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.




1: DA (Channel A)

2: DB (Channel B)

3: DG (Earth)

4: SLD (Cable shield)

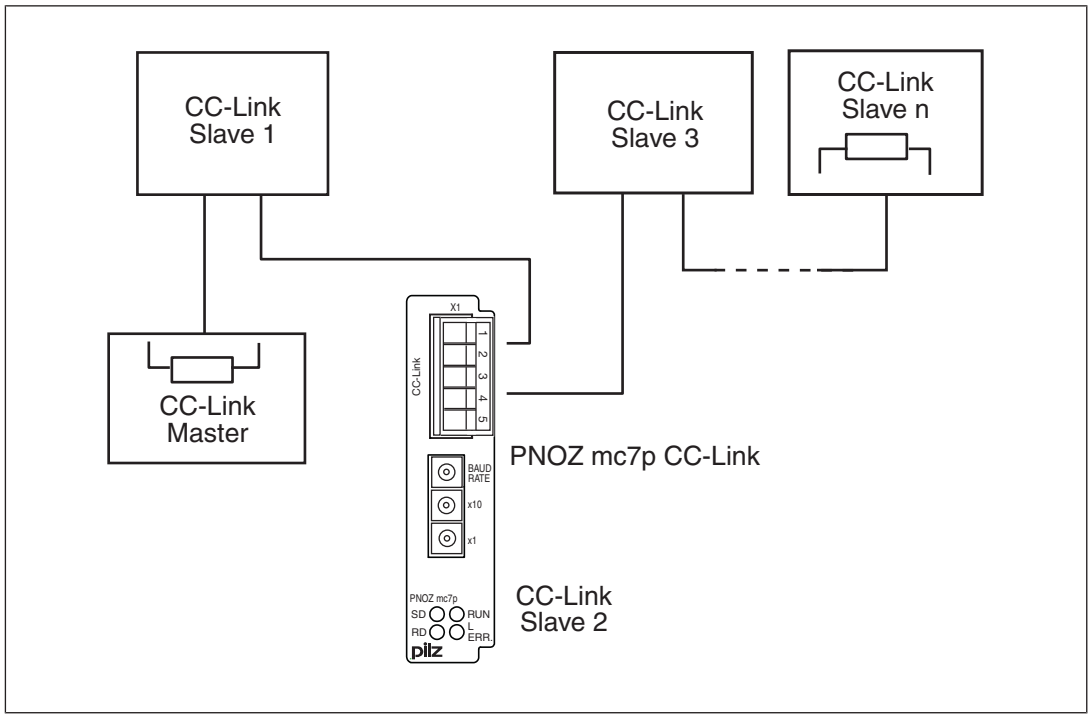
5: FG/PE (Functional earth)

## Download modified project to the PNOZmulti safety system

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

# Fieldbus modules
PNOZ mc7p

### Connection example




## Technical Details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **2,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **CC-Link V1.10** |
| Device type | **Slave** |
| Station address | **0 ... 63d** |
| Transmission rates | **10 MBit/s, 156 kbit/s, 2,5 MBit/s, 5 MBit/s, 625 kbit/s** |
| Connection | **5-pin Combicon plug-in connector** |
| Assigned stations | **2** |
| Galvanic isolation | **yes** |

# Fieldbus modules
## PNOZ mc7p

| | |
|---|---|
| **Fieldbus interface** | |
| Test voltage | **500 V AC** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |

# Fieldbus modules
PNOZ mc7p

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **122,0 mm** |
| Weight | **110 g** |

Where standards are undated, the 2012-03 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mc7p | Fieldbus module, CC-Link | 773 716 |

### Accessories

#### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |

# Fieldbus modules
PNOZ mc8p

## Overview

### Unit features

Using the product PNOZ mc8p:

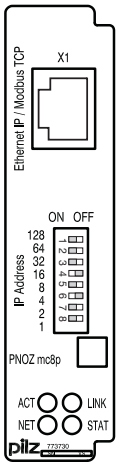
Expansion module for connection to a base unit from the configurable control system PNOZmulti .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for Ethernet/IP and Modbus TCP
- Transmission rate 10 MBit/s (10BaseT) and 100 MBit/s (100BaseTX), full and half duplex
- IP address is set via DIP switches on the front of the unit
- Status indicators for communication and for errors
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus EtherNet/IP, Modbus TCP . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mc8p can be connected to the base unit
- For details of the PNOZmulti base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
PNOZ mc8p

### Front view




**Legend**

| | |
|---|---|
| X1: | EtherNet/IP, Modbus TCP interface |
| IP address: | for setting the IP address |
| LEDs: | ACT, LINK, STAT, NET |

EtherNet/IP™ is registered trademark and patented technology, licensed by ODVA.

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via the fieldbus EtherNet/IP, Modbus TCP are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ mc8p are connected via a jumper. The fieldbus module is also supplied with voltage via this jumper. After the supply voltage is switched on or the control system PNOZmulti is reset, the fieldbus module PNOZ mc8p is configured and started automatically.

LEDs indicate the status of the fieldbus module on the fieldbus EtherNet/IP, Modbus TCP .

The configuration is described in detail in the PNOZmulti Configurator's online help.

## Data exchange

Twenty bytes always must be sent and received for communication with the PNOZmulti.

### Ethernet/IP

The input/output data from the PNOZmulti can be polled using the assembly object (Class 04h).

- Data from the PNOZmulti are requested with instance 64h.
- Instance 96h writes the data from the Ethernet IP scanner to the PNOZmulti.

### Modbus TCP

No connection needs to be configured for the PNOZ mc8p. Port 502 is used in accordance with the Modbus TCP specification.

The Modbus TCP supports the following function codes:

3,16 and 23 (refer to the document "PNOZmulti Communication Interfaces" for details of additional function codes)

The address input range begins with Register 0. The address output range begins with Register 1024. The Byte sequence for a Word is High Byte/Low Byte

| Word | |
|---|---|
| **Left Byte** | **Right Byte** |
| Low Byte<br>(Bit 7 ... 00) | High Byte<br>(Bit 15 ... 08) |

## Input and output data

The data is structured as follows:

### Input area

The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number I12.

| | | | | | |
|---|---|---|---|---|---|
| Virtual inputs<br>PNOZmulti Configurator | I0 … I7 | I8 … I15 | I16 … I23 | ... | I120…I127 |
| EtherNet/IP, Modbus TCP | Byte 0:<br>Bit 0 … 7 | Byte 1:<br>Bit 0 … 7 | Byte 2:<br>Bit 0 … 7 | ... | Byte 15:<br>Bit 0 … 7 |

# Fieldbus modules
PNOZ mc8p

**Output range**

The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. O0, O5... .
The status of output O0 is stored in bit 0 of byte 0; the status of output O5 is stored in bit 5 of byte 0 etc.

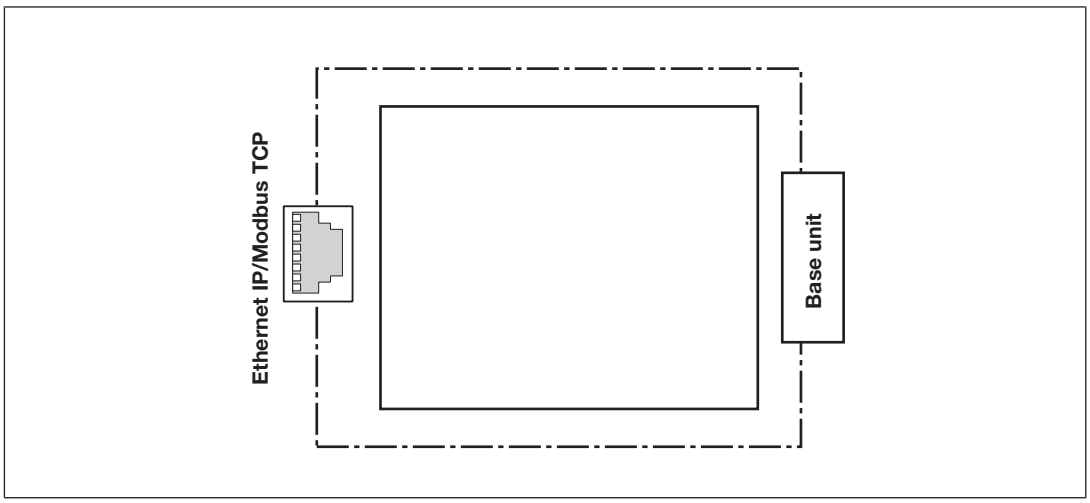
| | | | | | |
|---|---|---|---|---|---|
| Virtual inputs<br>PNOZmulti Configurator | O0 … O7 | O8 … O15 | O16 … O23 | ... | O120… O127 |
| EtherNet/IP, Modbus TCP | Byte 0:<br>Bit 0 … 7 | Byte 1:<br>Bit 0 … 7 | Byte 2:<br>Bit 0 … 7 | ... | Byte 15:<br>Bit 0 … 7 |

- Bits 0 … 4: Status of LEDs on the PNOZmulti
  Bit 0: OFAULT
  Bit 1: IFAULT
  Bit 2: FAULT
  Bit 3: DIAG
  Bit 4: RUN
- Data exchange is displayed in Bit 5.
- Polling the payload data: 2 Bytes with the table number and segment number are sent by the Master for access to the payload data table (15 Bytes are returned to the Master).

Detailed information on data exchange is available in the document "Communication Interfaces", under "Fieldbus modules".

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces", under "Fieldbus modules").

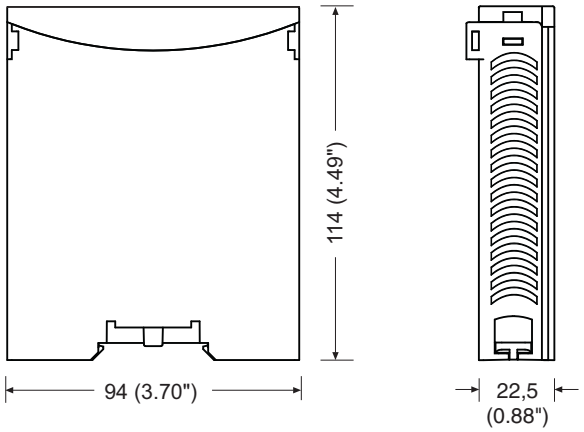
## Block diagram



# Fieldbus modules
PNOZ mc8p

## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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, Modbus TCP.

Please note:

- Information given in the "Technical details [📖 470]" must be followed.
- Use copper wiring with a temperature stability of 75 °C.

Please note the following when connecting to EtherNet/IP, 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).
  - 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/IP, Modbus TCP are met, as stated in the Installation Manual published by the User Group.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.

# Fieldbus modules
PNOZ mc8p

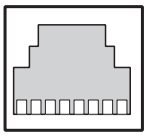
- The power supply must meet the regulations for extra low voltages with protective separation.

## Connecting the supply voltage

Connect the supply voltage to the base unit:

- Terminal **24 V** and **A1 (+)**: + 24 VDC
- Terminal **0 V** and **A2 (-)**: 0 V

## Interface assignment

| RJ45 socket<br>8-pin | 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. |

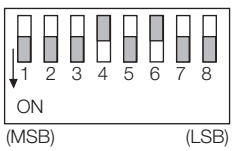
n.c.: Not connected

## Set IP address

The IP address of the fieldbus module PNOZ mc8p is set using the DIP switch on the front.

- The first three bytes of the IP address are: 192.168.0.
- Subnet mask: 255.255.255.0.
- The last byte of the IP address is configured (value range: 1 ...255).

Example: DIP switch: 00010100 (20 decimal)




IP address: 192.168.0.20

### Change IP settings

Once the IP addresses of the computer and PNOZ mc8p have been configured, you can change the IP settings of the PNOZ mc8p.

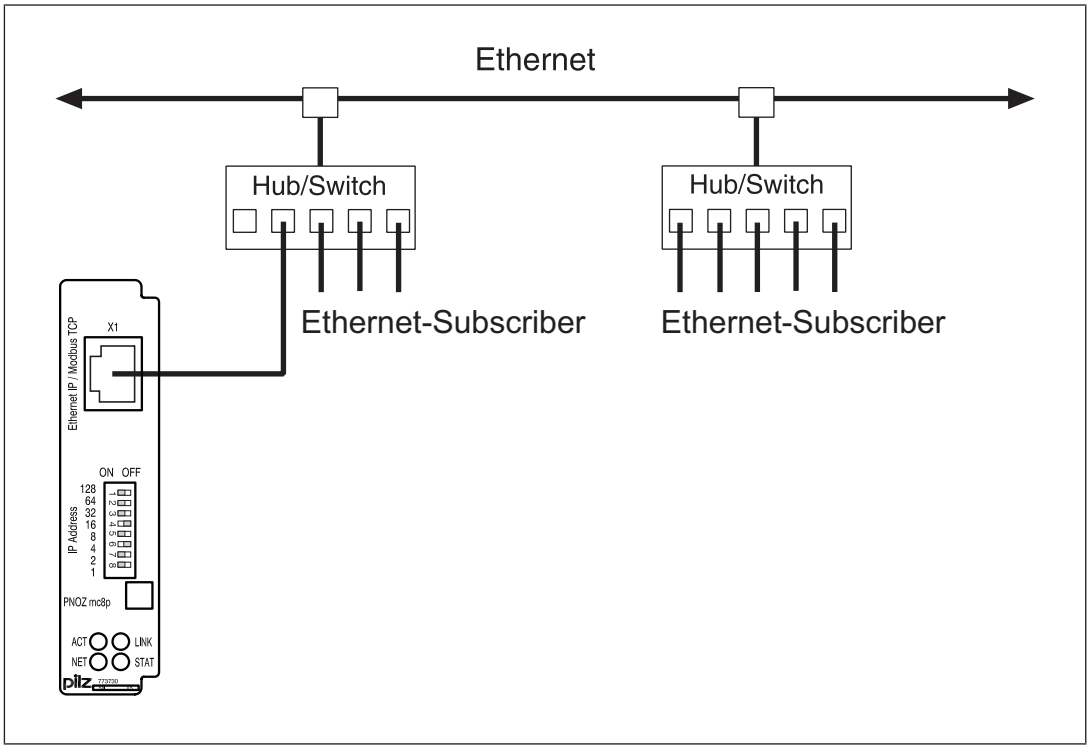
- Connect the PNOZ mc8p to the computer.
- Call up the following html page: http://192.168.0.20/config.htm
- Configure the settings for the PNOZ mc8p.
  Example:
  IP address: 172.16.216.139
  Subnet mask: 255.255.0.0
  Gateway address: --
  DNS1 address: --

  DNS1 address: --
  Host name: ---
  Domain name: --

  SMTP server: --

  DHCP enabled: No
- Click on ***Store Configuration***. The settings are transferred to the expansion module.
- Switch off the supply voltage.
- Set all DIP switches to zero.
- Switch on the supply voltage. The new IP address for the unit is now set.

## Connection example



# Fieldbus modules
PNOZ mc8p

## Technical Details

| General | 773730 | 773734 |
|---|---|---|
| Approvals | CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed | CCC, CE, EAC (Eurasian), KOSHA, TÜV, cULus Listed |
| **Electrical data** | **773730** | **773734** |
| Supply voltage | | |
| for | Module supply | Module supply |
| internal | Via base unit | Via base unit |
| Voltage | 5,0 V | 5,0 V |
| Kind | DC | DC |
| Voltage tolerance | -2 %/+2 % | -2 %/+2 % |
| Power consumption | 2,5 W | 2,5 W |
| Status indicator | LED | LED |
| **Fieldbus interface** | **773730** | **773734** |
| Fieldbus interface | Ethernet IP, Modbus TCP | Ethernet IP, Modbus TCP |
| Device type | Slave | Slave |
| Transmission rates | 10 MBit/s, 100 MBit/s | 10 MBit/s, 100 MBit/s |
| Connection | RJ45 | RJ45 |
| Galvanic isolation | yes | yes |
| Test voltage | 500 V AC | 500 V AC |
| **Times** | **773730** | **773734** |
| Supply interruption before de-energisation | 20 ms | 20 ms |
| **Environmental data** | **773730** | **773734** |
| Ambient temperature | | |
| In accordance with the standard | EN 60068-2-14 | EN 60068-2-14 |
| Temperature range | 0 - 60 °C | -25 - 60 °C |
| Forced convection in control cabinet off | 50 °C | 50 °C |
| Storage temperature | | |
| In accordance with the standard | EN 60068-2-1/-2 | EN 60068-2-1/-2 |
| Temperature range | -25 - 70 °C | -25 - 70 °C |
| Climatic suitability | | |
| In accordance with the standard | EN 60068-2-30, EN 60068-2-78 | EN 60068-2-30, EN 60068-2-78 |
| Humidity | 93 % r. h. at 40 °C | 93 % r. h. at 40 °C |
| Condensation during operation | Not permitted | Short-term |
| EMC | EN 61131-2 | EN 61131-2 |

## Fieldbus modules
PNOZ mc8p

| Environmental data | 773730 | 773734 |
|---|---|---|
| Vibration | | |
| In accordance with the standard | **EN 60068-2-6** | **EN 60068-2-6** |
| Frequency | **5,0 - 500,0 Hz** | **5,0 - 500,0 Hz** |
| Acceleration | **1g** | **1g** |
| Broadband noise | | |
| In accordance with the standard | – | **EN 60068-2-64** |
| Frequency | – | **5 - 500 Hz** |
| Acceleration | – | **1,9grms** |
| Shock stress | | |
| In accordance with the standard | **EN 60068-2-27** | **EN 60068-2-27** |
| Acceleration | **15g** | **15g** |
| Duration | **11 ms** | **11 ms** |
| Max. operating height above sea level | **2000 m** | **2000 m** |
| Airgap creepage | | |
| In accordance with the standard | **EN 61131-2** | **EN 61131-2** |
| Overvoltage category | **III** | **III** |
| Pollution degree | **2** | **2** |
| Rated insulation voltage | **30 V** | **30 V** |
| Protection type | | |
| In accordance with the standard | **EN 60529** | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** | **IP54** |
| Housing | **IP20** | **IP20** |
| Terminals | **IP20** | **IP20** |
| **Mechanical data** | **773730** | **773734** |
| Mounting position | **Horizontal on top hat rail** | **Horizontal on top hat rail** |
| DIN rail | | |
| Top hat rail | **35 x 7,5 EN 50022** | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** | **27 mm** |
| Material | | |
| Bottom | **PPO UL 94 V0** | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** | **ABS UL 94 V0** |
| Dimensions | | |
| Height | **94,0 mm** | **94,0 mm** |
| Width | **22,5 mm** | **22,5 mm** |
| Depth | **114,0 mm** | **114,0 mm** |
| Weight | **137 g** | **140 g** |

Where standards are undated, the 2009-10 latest editions shall apply.

# Fieldbus modules
PNOZ mc8p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc8p | Fieldbus module, Ethernet/IP, Modbus TCP | 773 730 |
| PNOZ mc8p coated version | Fieldbus module, Ethernet/IP, Modbus TCP | 773 734 |

### Accessories

#### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |
| KOP-XE coated | Jumper, coated version | 774 640 |

# Fieldbus modules
PNOZ mc9p

## Overview

### Unit features

Using the product PNOZ mc9p:

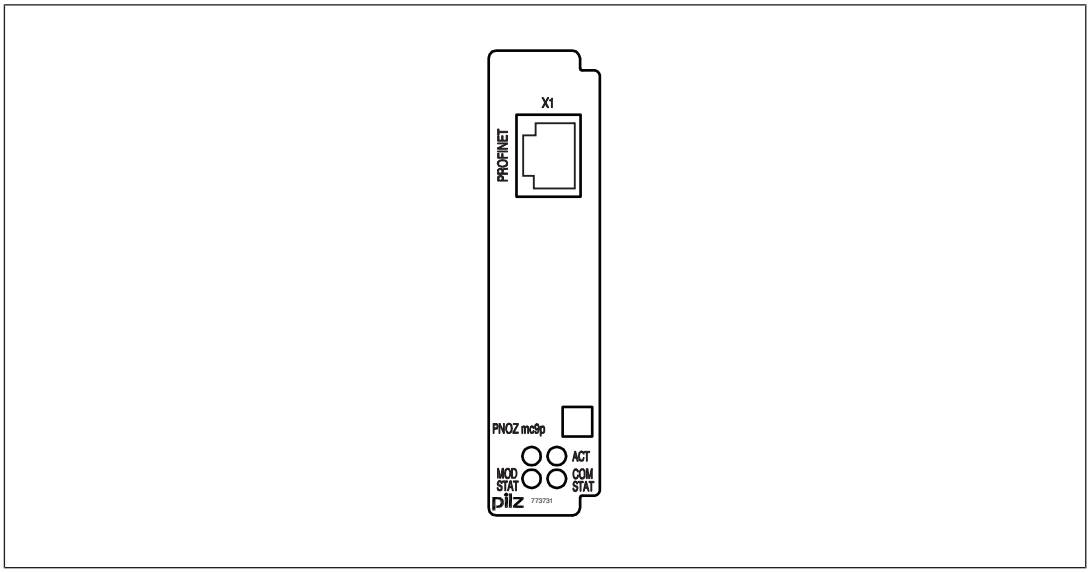
Expansion module for connection to a base unit from the configurable control system PNOZmulti .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for PROFINET IO
- Transmission rate 100 MBit/s (100BaseTX), full and half duplex
- Status indicators for communication and for errors
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus PROFINET . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mc9p can be connected to the base unit
- For details of the PNOZmulti base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
PNOZ mc9p

### Front view




**Legend:**

- X1: Profinet interface
- LED:
  - ACT
  - COM STAT
  - MOD STAT

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via the fieldbus PROFINET are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ mc9p are connected via a jumper. The fieldbus module is also supplied with voltage via this jumper. After the supply voltage is switched on or the control system PNOZmulti is reset, the fieldbus module PNOZ mc9p is configured and started automatically.

LEDs indicate the status of the fieldbus module on the fieldbus PROFINET .

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
PNOZ mc9p

## Input and output data

32 bytes must always be sent and received for communication with the PNOZmulti. Only the first 20 bytes are used (see document "PNOZmulti Communication Interfaces").

The data is structured as follows:

### Input area

The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number I12.

| | | | | | |
|---|---|---|---|---|---|
| Virtual inputs<br>PNOZmulti Configurator | I0 … I7 | I8 … I15 | I16 … I23 | ... | I120…I127 |
| PROFINET | Byte 0:<br>Bit 0 … 7 | Byte 1:<br>Bit 0 … 7 | Byte 2:<br>Bit 0 … 7 | ... | Byte 15:<br>Bit 0 … 7 |

### Output range

The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. O0, O5... .
The status of output O0 is stored in bit 0 of byte 0; the status of output O5 is stored in bit 5 of byte 0 etc.

| | | | | | |
|---|---|---|---|---|---|
| Virtual inputs<br>PNOZmulti Configurator | O0 … O7 | O8 … O15 | O16 …<br>O23 | ... | O120…<br>O127 |
| PROFINET | Byte 0:<br>Bit 0 … 7 | Byte 1:<br>Bit 0 … 7 | Byte 2:<br>Bit 0 … 7 | ... | Byte 15:<br>Bit 0 … 7 |

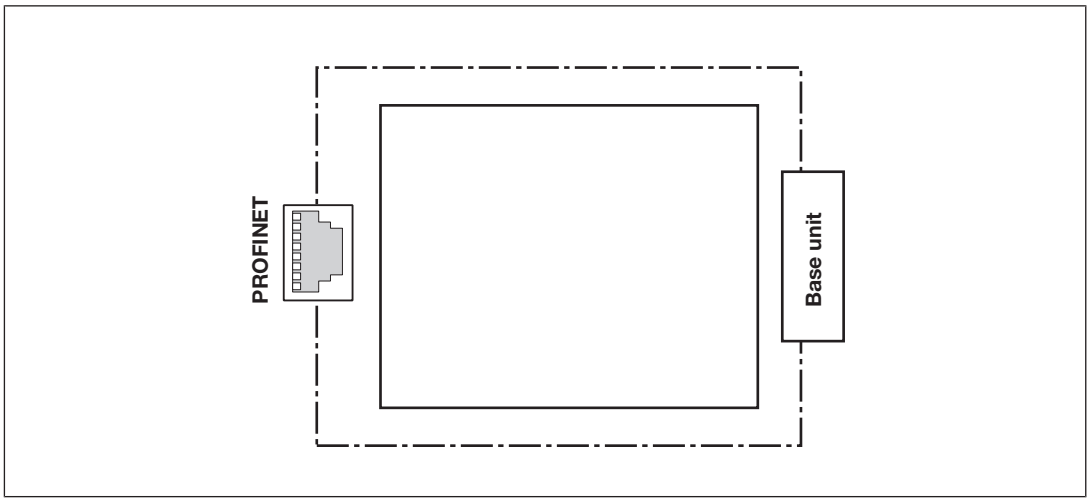
- Bits 0 … 4: Status of LEDs on the PNOZmulti
  Bit 0: OFAULT
  Bit 1: IFAULT
  Bit 2: FAULT
  Bit 3: DIAG
  Bit 4: RUN
- Data exchange is displayed in Bit 5.
- Polling the payload data: 2 Bytes with the table number and segment number are sent by the Master for access to the payload data table (15 Bytes are returned to the Master).

Detailed information on data exchange is available in the document "Communication Interfaces", under "Fieldbus modules".

The number of virtual inputs and outputs can be extended to 128 (see document "PNOZmulti Communication Interfaces", under "Fieldbus modules")

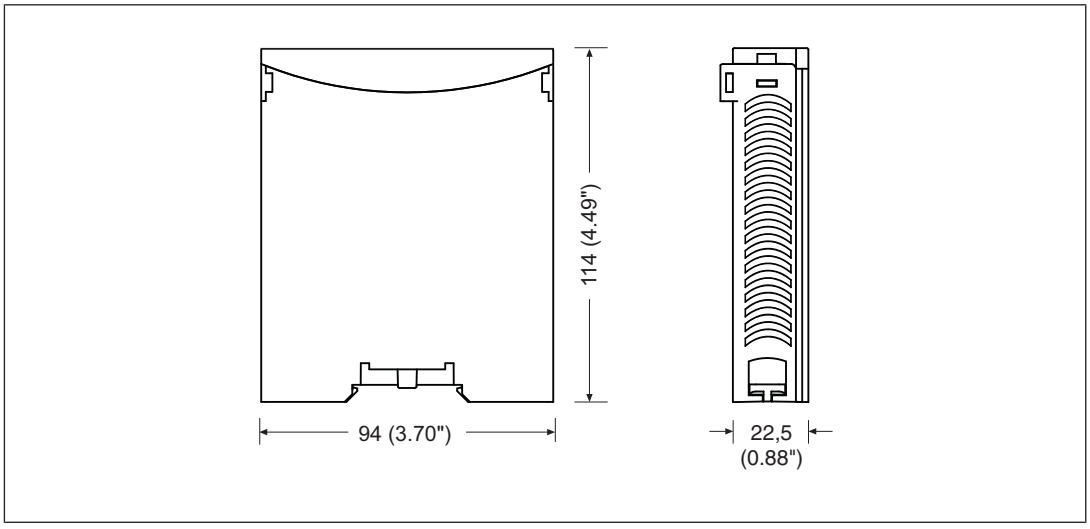
# Fieldbus modules
PNOZ mc9p

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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.

Please note:

- Information given in the "Technical details [📖 479]" must be followed.
- Use copper wiring with a temperature stability of 75 °C.

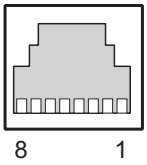
# Fieldbus modules
PNOZ mc9p

Please note the following when connecting to PROFINET:

- 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 are met, as stated in the Installation Manual published by the User Group.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

## Interface assignment

| RJ45 socket<br>8-pin | 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

## Preparing for operation

The unit name is assigned in the PNOZmulti Configurator. When selecting the PNOZ mc9p, enter the unit name under ***Equipment Identifier***.

- You can also assign the unit name through the IO Controller. In this case, insert a "$" symbol in front of the unit name in the PNOZmulti Configurator, under ***Equipment Identifier***.
- The unit name on the Ethernet subnet must be unique. It must comply with the DNS conventions:
  - Max. 127 characters (letters, numbers, hyphen or period)

  - Max. 63 characters between two periods
- The following characters are invalid: ä ö ü ( ) _ / space
- The unit name may not
  - Begin or end with the "-" character.
  - Have the form n.n.n.n (n = 0 ... 999).
  - Start with the sequence "port-xyz-" (x, y, z = 0 ... 9).

Install the GSD file. The GSD file is available on the Internet at www.pilz.de.

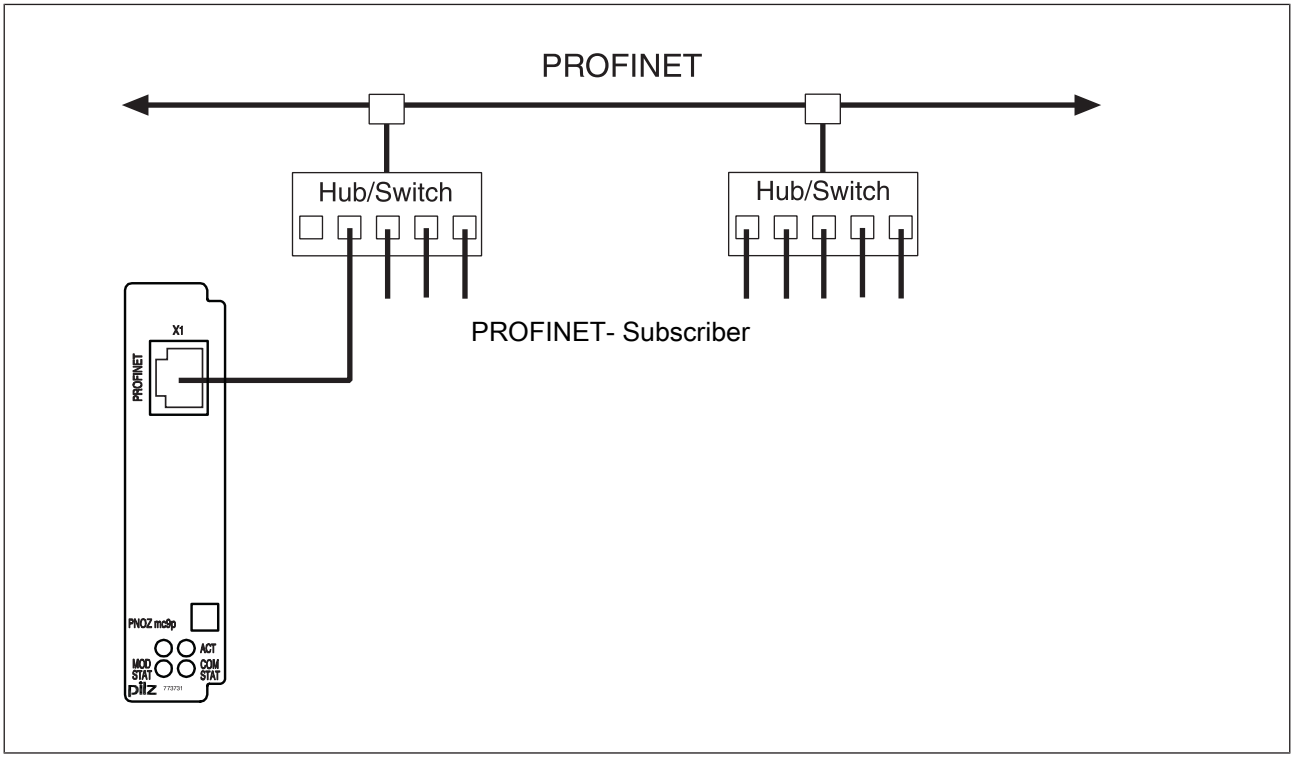
There are two options:

- Automatic assignment of the IP address with the Dynamic Host Configuration Protocol (DHCP)
- Assignment of the IP address by the IO controller before system startup based on the unique unit name.

Connect the supply voltage to the base unit:

- Terminal **24 V** and **A1 (+)**: + 24 VDC
- Terminal **0 V** and **A2 (-)**: 0 V

### Connection example



# Fieldbus modules
PNOZ mc9p

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cU-Lus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **2,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **PROFINET IO** |
| Device type | **Slave** |
| Transmission rates | **100 MBit/s** |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |
| Test voltage | **500 V AC** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **50 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |

# Fieldbus modules
PNOZ mc9p

| Environmental data | |
|---|---|
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **114,0 mm** |
| Weight | **135 g** |

Where standards are undated, the 2009-10 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc9p | Fieldbus module, PROFINET IO | 773 731 |

# Fieldbus modules
PNOZ mc9p

## Accessories

### Jumper

| Product type | Features | Order No. |
|---|---|---|
| KOP-XE | Jumper | 774 639 |

# Fieldbus modules
PNOZ mc10p

## Overview

### Unit features

Using the product PNOZ mc10p:

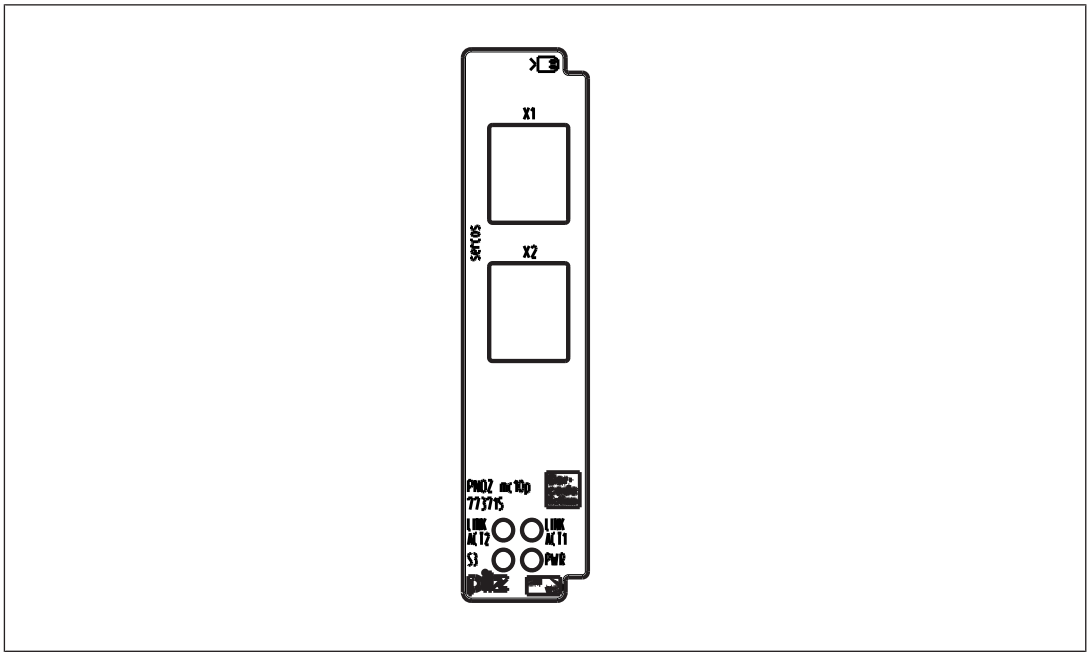
Expansion module for connection to a base unit from the configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for sercos III
- Status indicators for communication with sercos III and for errors
- Delivery configuration with IP address: 192.168.1.64 and Sercos address: 64
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus sercos III . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mc10p can be connected to the base unit
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Fieldbus modules
PNOZ mc10p

### Front view




**Legend**

- X1, X2: sercos III interfaces
- LED:
  - LINK ACT1
  - LINK ACT2
  - PWR
  - S3

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via the fieldbus sercos III are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ mc10p are connected via a jumper. The fieldbus module is also supplied with voltage via this jumper. After the supply voltage is switched on or the control system PNOZmulti is reset, the fieldbus module PNOZ mc10p is configured and started automatically.

LEDs indicate the status of the fieldbus module on the fieldbus sercos III .

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
PNOZ mc10p

### Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

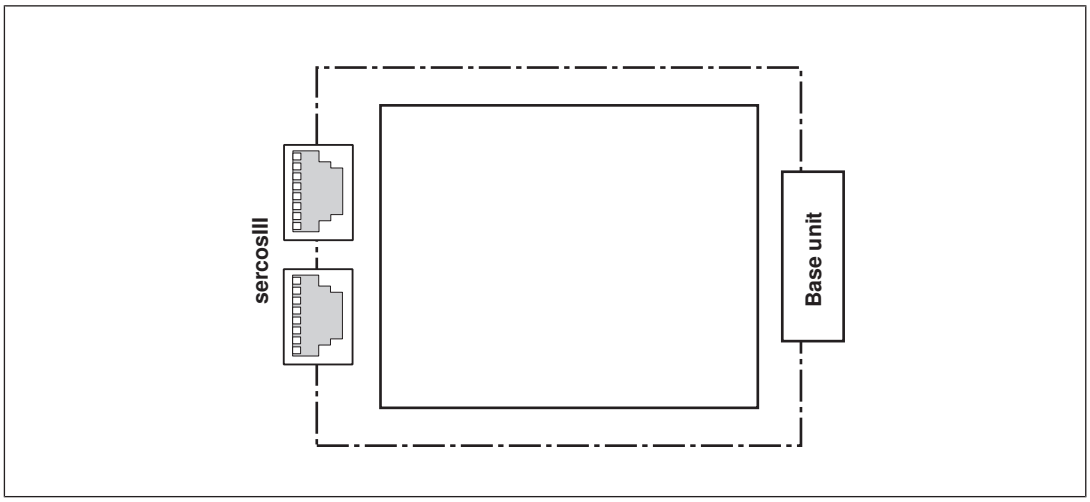
### Assigning the inputs/outputs in the PNOZmulti Configurator to the sercos III inputs/outputs

| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
|---|---|---|---|
| Input data sercos III | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data sercos III | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

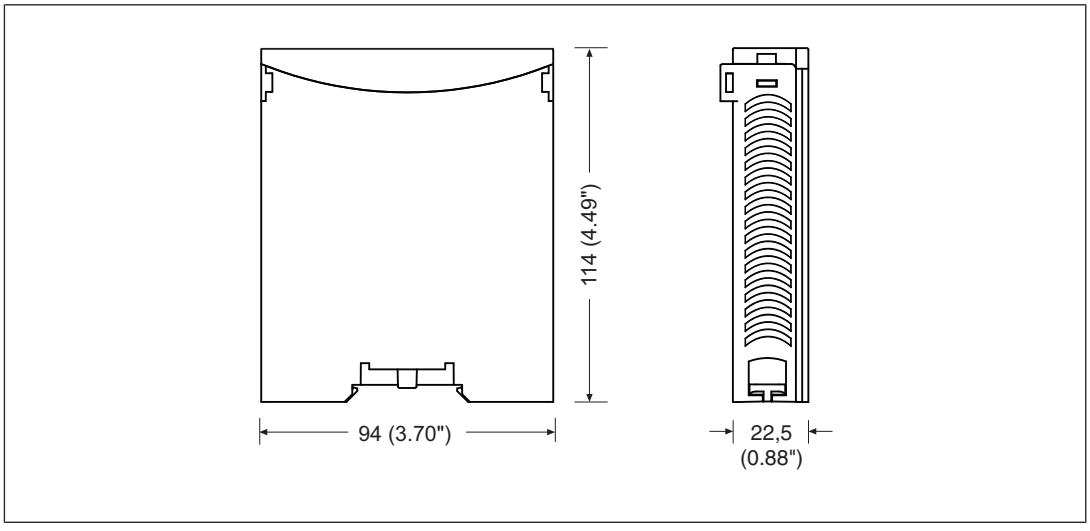
# Fieldbus modules
PNOZ mc10p

### Block diagram




## Installation

### Dimensions in mm



# Commissioning

## General wiring guidelines

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 sercos III.

Please note:

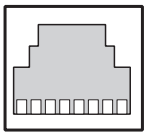
- Information given in the “Technical details” must be followed.
- Use copper wire that can withstand 75 °C.

Please note the following when connecting to sercos III:

- 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 sercos III are met, as stated in the Installation Manual published by the User Group.

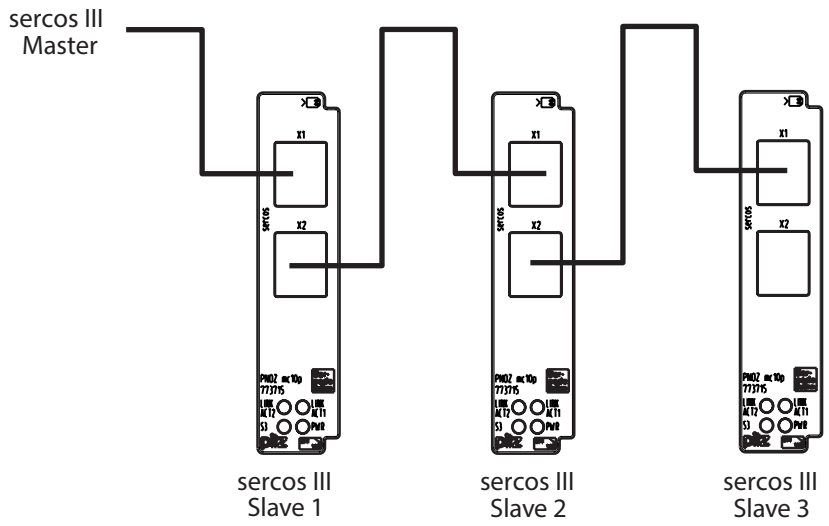
## Interface assignment

| RJ45 socket<br>8-pin | 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

# Fieldbus modules
PNOZ mc10p

### Connection example




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **2,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **sercos III** |
| Device type | **Slave** |
| Transmission rates | **100 MBit/s** |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |
| Test voltage | **500 V AC** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |

# Fieldbus modules
## PNOZ mc10p

| | |
|---|---|
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |

# Fieldbus modules
PNOZ mc10p

| Mechanical data | |
|---|---|
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **114,0 mm** |
| Weight | **125 g** |

Where standards are undated, the 2012-04 latest editions shall apply.

## Order reference

| Order reference | | |
|---|---|---|
| | | |

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mc10p | Fieldbus module, sercos III | 773 715 |

**Terminator, jumper**

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

# Fieldbus modules
PNOZ mc12p

## Overview

### Unit features

Using the product PNOZ mc12p:

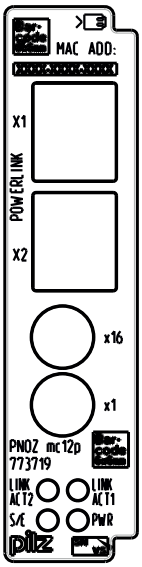
Expansion module for connection to a base unit from the configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for Ethernet POWERLINK (Ethernet POWERLINK V 2 protocol)
- Station addresses from 1 ... 239, selected via rotary switch
- The minimum cycle time for an application of 20 Byte Output and 50 Byte Input is 350µs. The minimum cycle time is 500 µs at the maximum PDO size of 240 Byte Input and 20 Byte Output (the inputs and outputs in this case are viewed from the Managing Node).
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus Ethernet POWERLINK . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mc12p can be connected to the base unit
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Fieldbus modules
PNOZ mc12p

### Front view




**Legend:**

- X1, X2 Ethernet POWERLINK interfaces
- LED:
  - LINK ACT1
  - LINK ACT2
  - PWR
  - S/E (Status/Error)

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via the fieldbus Ethernet POWERLINK are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ mc12p are connected via a jumper. The fieldbus module is also supplied with voltage via this jumper. After the supply voltage is switched on or the control system PNOZmulti is reset, the fieldbus module PNOZ mc12p is configured and started automatically.

LEDs indicate the status of the fieldbus module on the fieldbus Ethernet POWERLINK .

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
PNOZ mc12p

## Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the Managing Node and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of SDO 2100:02 has the number i12.

| | | | |
|---|---|---|---|
| Virtual inputs<br>PNOZmulti Configurator | I0 … I7 | I8 … I15 | I16 … I23 |
| Ethernet POWERLINK | SDO 2100:01:<br>Bit 0 … 7 | SDO 2100:02:<br>Bit 0 … 7 | SDO 2100:03:<br>Bit 0 … 7 |

- Output range

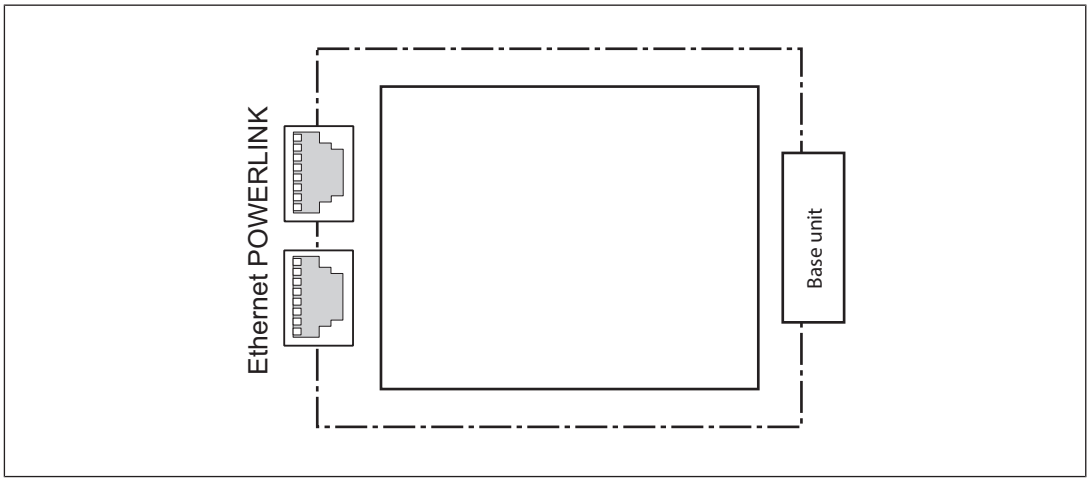
  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The state of output o0 is stored in Bit 0 of SDO 2000:01.

| | | | |
|---|---|---|---|
| Virtual outputs<br>PNOZmulti Configurator | O0 … O7 | O8 … O15 | O16 … O23 |
| Ethernet POWERLINK | SDO 2000:01:<br>Bit 0 … 7 | SDO 2000:02:<br>Bit 0 … 7 | SDO 2000:03:<br>Bit 0 … 7 |

Detailed information on data exchange is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

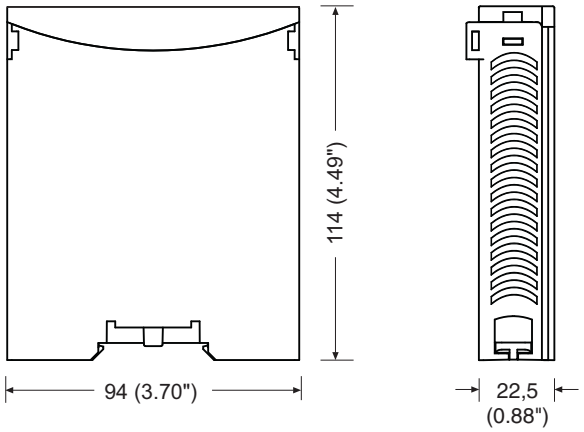
## Block diagram



# Fieldbus modules
PNOZ mc12p

## Installation

### Dimensions in mm




## Commissioning

### 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 Ethernet POWERLINK.

Please note:

- Information given in the Technical details [📖 495] must be followed.
- Use copper wiring with a temperature stability of 75 °C.

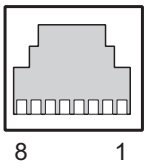
Please note the following when connecting to Ethernet POWERLINK:

- 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 Ethernet POWERLINK are met, as stated in the Installation Manual published by the User Group.

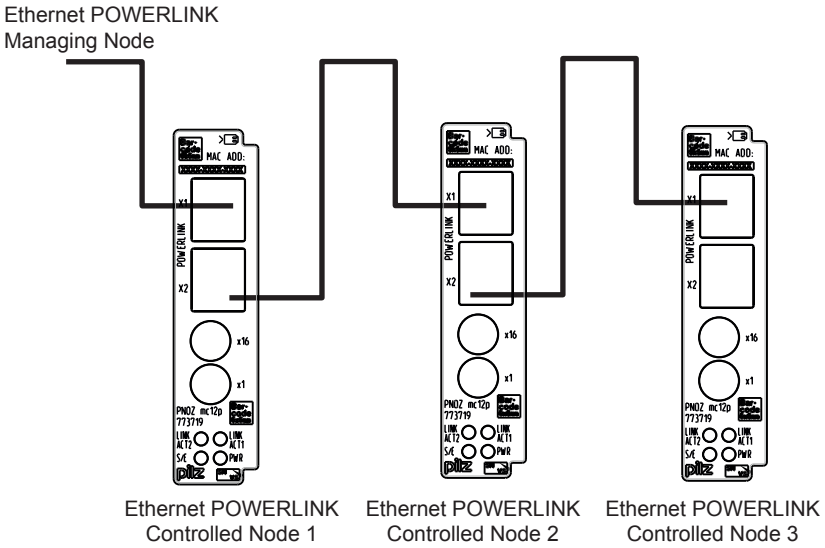
# Fieldbus modules
PNOZ mc12p

## Interface assignment

| RJ45 socket<br>8-pin | 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

## Connection example



# Fieldbus modules
PNOZ mc12p

## Technical Details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **5,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **1,6 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **Ethernet POWERLINK V2** |
| Device type | **Controlled Node** |
| Transmission rates | **100 MBit/s** |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |

# Fieldbus modules
## PNOZ mc12p

| | |
|---|---|
| **Environmental data** | |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **III** |
| Pollution degree | **2** |
| Rated insulation voltage | **25 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PPO UL 94 V0** |
| Front | **ABS UL 94 V0** |
| Dimensions | |
| Height | **94,0 mm** |
| Width | **22,5 mm** |
| Depth | **114,0 mm** |
| Weight | **115 g** |

Where standards are undated, the 2012-06 latest editions shall apply.

# Fieldbus modules
PNOZ mc12p

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mc12p | Fieldbus module, Ethernet POWERLINK | 773 719 |

### Accessories

#### Terminator, jumper

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

# PNOZmulti Mini products

| Contents | Page |
|---|---|

# Base units
PNOZ mm0p

## Overview

### Unit features

Using the product PNOZ mm0p:

Base unit from the configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:

  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- 12 inputs for connecting, for example:
  - E-STOP pushbuttons
  - Two-hand button
  - Safety gate limit switches
  - Start buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN
  - Operating mode selector switches
  - Safety mats
- 8 configurable inputs/outputs

  Can be configured as:
  - Inputs (see above for connection options)

  or
  - Outputs for standard applications

# Base units
PNOZ mm0p

- 4 configurable outputs
  Can be configured as:
  - Outputs for standard applications

  or
  - Test pulse outputs
- LED indicator for:
  - Error messages
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Display for:
  - Error messages
  - State of supply voltage
  - State of the inputs and outputs
  - Status information
  - Unit information
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals:
  Either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Rotary knob for menu control

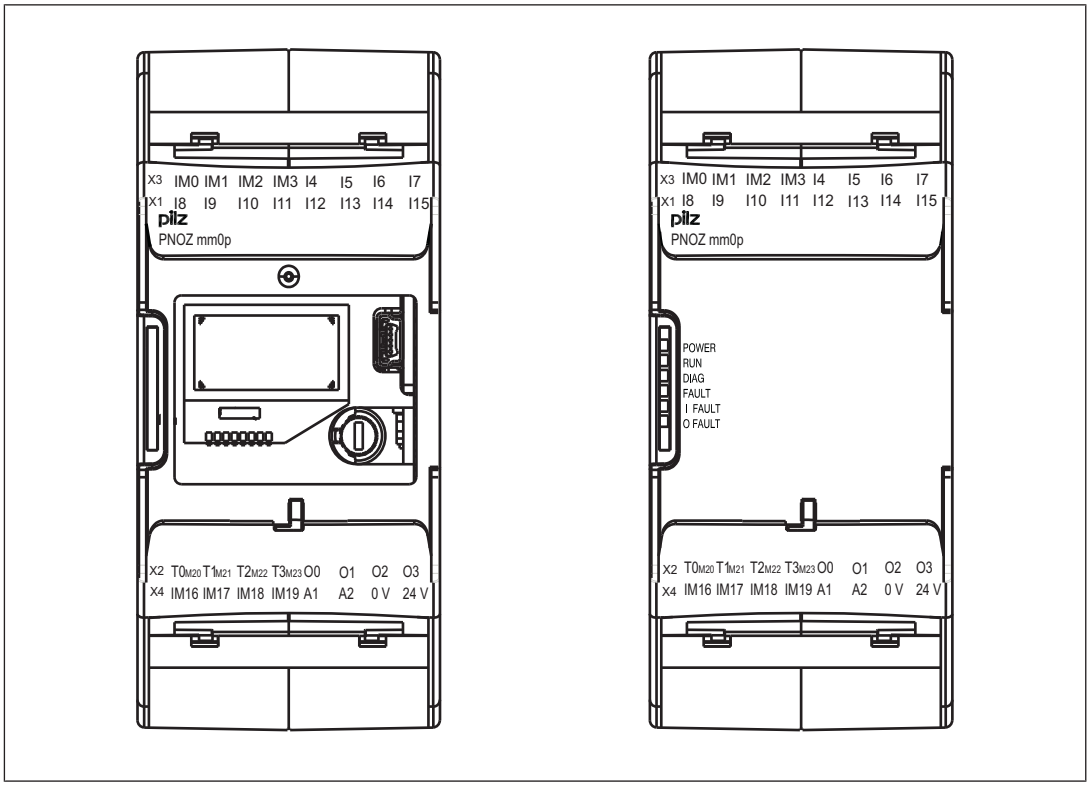
## Chip card

To be able to use the product you will need a 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 Technical Catalogue: Accessories chapter).

# Base units
PNOZ mm0p

## Front view




Front view with and without cover

### Legend

| | |
|---|---|
| X1: | Inputs I8 ... I15 |
| X1: | Configurable test pulse/auxiliary outputs T0M20 ... T3M23 |
| | Semiconductor outputs O0 ... O3 |
| X3: | Configurable inputs/outputs IM0 – IM3 |
| | Inputs I4 ... I7 |
| X4: | Configurable inputs/outputs IM16 – IM19 |
| | Supply connections |
| LEDs: | PWR |
| | RUN |
| | DIAG |
| | FAULT |
| | I FAULT |
| | O FAULT |

# Base units
PNOZ mm0p

## Function description

### Functions

The function of the safety system's inputs and outputs 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 and switch the outputs accordingly.

The LEDs indicate the status of the PNOZmulti safety system.

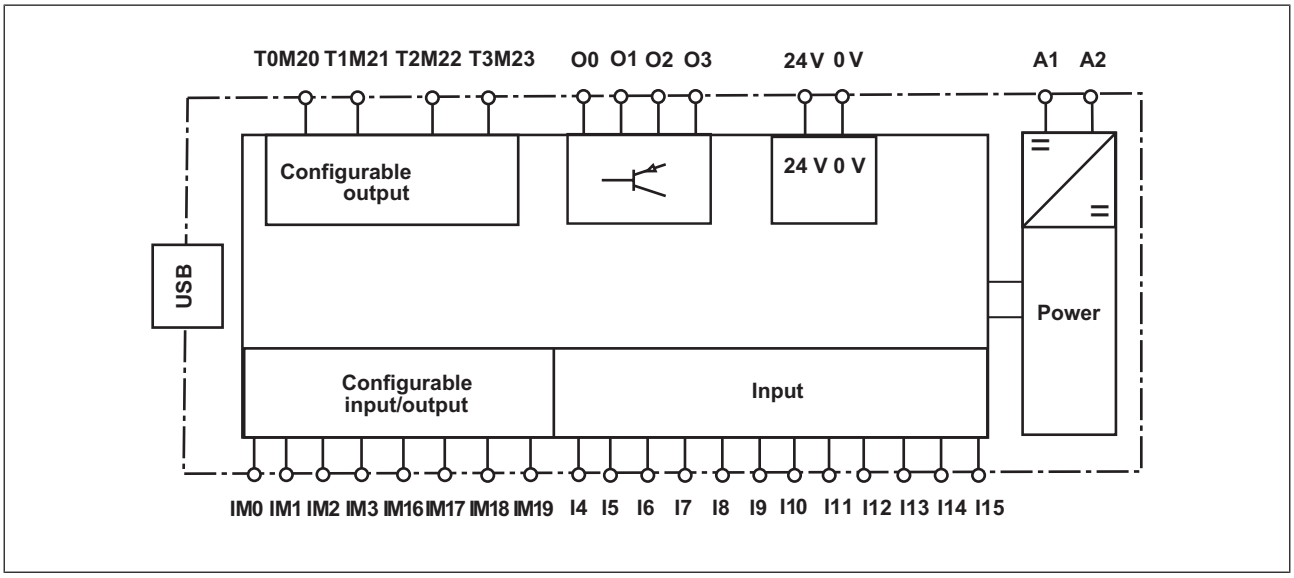
The LC display indicates the status of the inputs/outputs and the supply voltage.

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.

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

### Block diagram

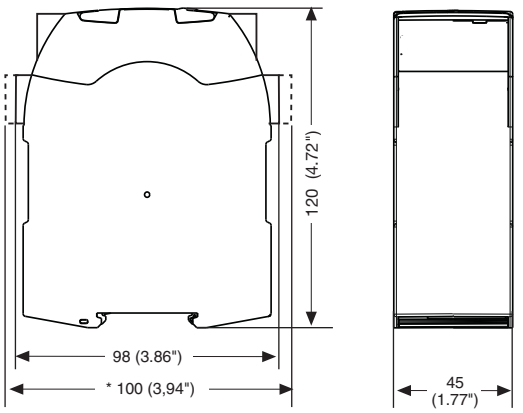


# Base units
PNOZ mm0p

## Installation

### Dimensions

*with spring-loaded terminals




## Commissioning

### General wiring guidelines

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

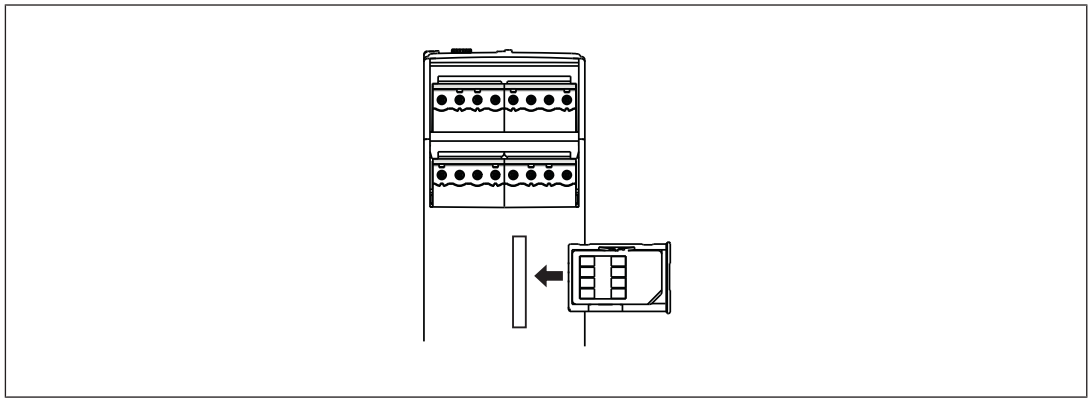
Please note:

- Information given in the Technical details [📖 509] must be followed.
- Outputs O0 to O3 are semiconductor outputs
- Use copper wiring with a temperature stability of 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation.
- 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.
  Test pulses that are used for the safety mat may not be reused for other purposes.

# Base units
PNOZ mm0p

## Preparing for operation

Make sure that you do not bend the chip card as you insert it into the chip card slot.



Procedure:

- Wire the inputs and outputs on the base unit in accordance with the circuit diagram.
- Connect the supply voltage:
  - Supply voltage for the control system:
  - Terminal A1: + 24 VDC
  - Terminal A2: 0 V
  - Supply voltage for the semiconductor outputs:
  - 24 V terminal: + 24 VDC
  - 0V terminal: 0 V

Please note: The supply voltage for the semiconductor outputs must always be present, even if you are not using the semiconductor outputs.

Procedure:

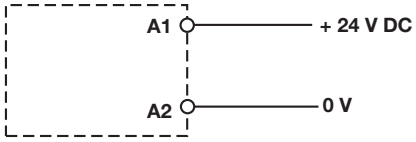
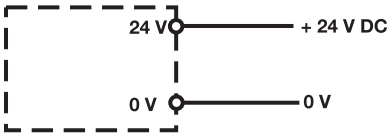
- Insert the chip card containing the current project into the card slot on the base unit.
- Switch on the supply voltage. The LC display shows the project name, CRC sum and the date the project was created. Please check this information.
- Load the project by pressing the rotary knob. For the project to be downloaded, the rotary knob must be held down for between 3 and 8 seconds. Once the project has been successfully downloaded, the status of the inputs and outputs will be shown on the display.

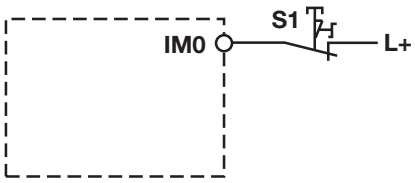
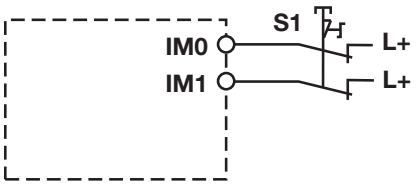
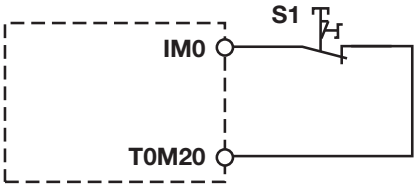
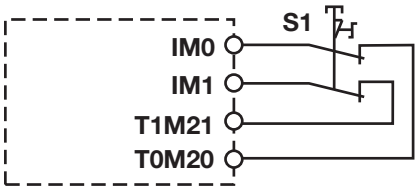
Procedure:

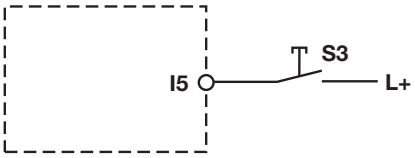
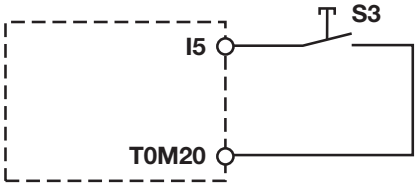
- Insert a chip card into the card slot on the base unit.
- Connect the computer containing the PNOZmulti Configurator to the base unit via the USB port.
- Switch on the supply voltage.
- Download the project (see PNOZmulti Configurator's online help).

## Base units
PNOZ mm0p

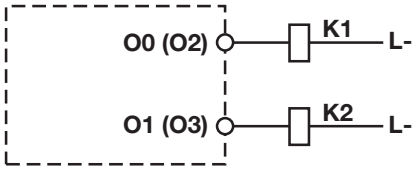
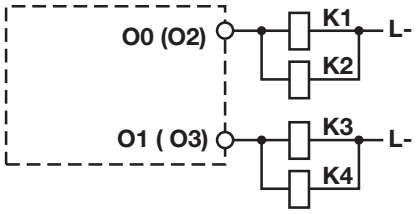
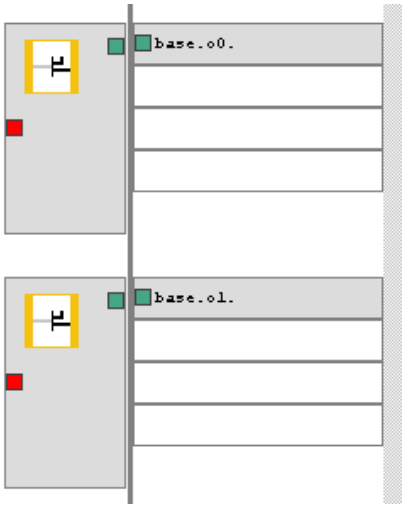
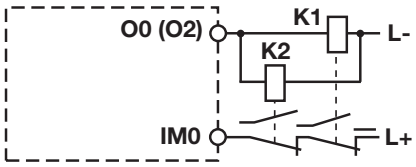
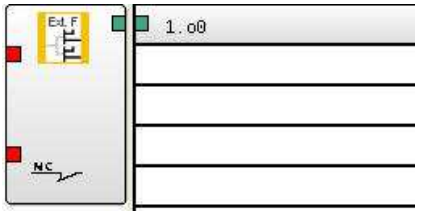
- Once the project has been successfully downloaded, the status of the inputs and outputs and the supply voltage will be shown on the display. The "RUN" LED will be lit.

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

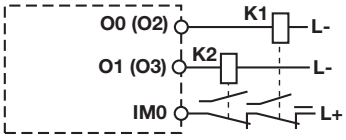
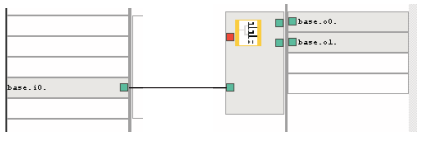
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

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

## Base units
PNOZ mm0p

| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |
| Single output with advanced fault detection* |  |  |

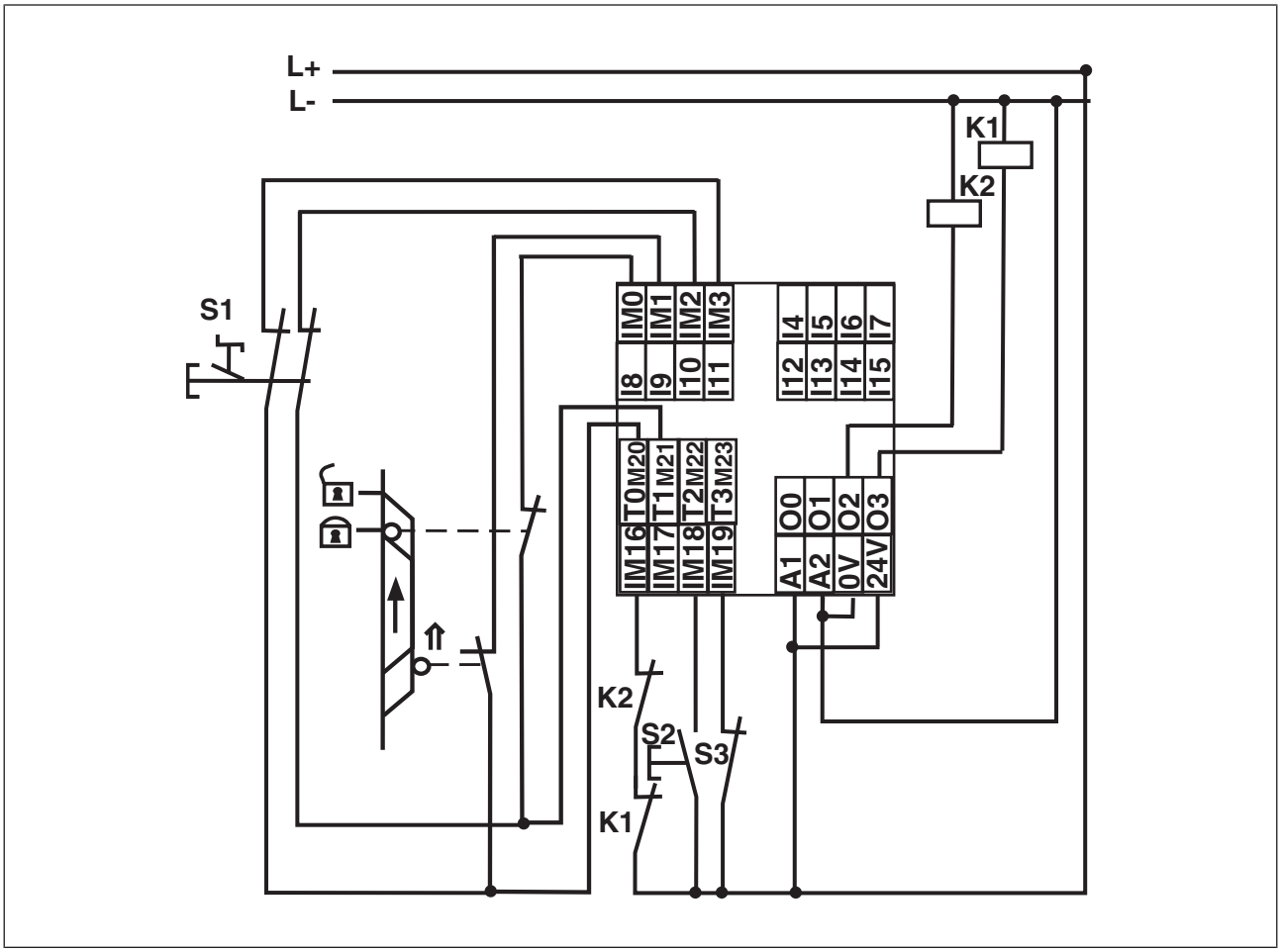
*Two loads may be connected to each safety output with advanced fault detection, even on applications in accordance with EN IEC 62061, SIL CL 3. Prerequisite: Feedback loop is connected, shorts across contacts and external power sources are excluded (e.g. through separate multicore cables). Please note that, in the event of an error in the feedback loop, the safety system switches to a safe condition and shuts down **all** the outputs.

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

## Base units
PNOZ mm0p

### Connection example

Dual-channel E-STOP and safety gate wiring, monitored start (IM18), feedback loop (IM16)



# Base units
PNOZ mm0p

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), KCC, TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Supply to the system** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **35,0 W** |
| Output of external power supply (DC) at no load | **8,0 W** |
| Residual ripple DC | **5 %** |
| Supply voltage | |
| for | **Supply to the SC outputs** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **192,0 W** |
| Status indicator | **Display, LED** |
| **Configurable inputs/outputs (inputs or auxiliary outputs)** | |
| Number | **8** |
| Galvanic isolation | **No** |
| Configurable inputs | |
| Input voltage in accordance with EN 61131-2 Type 1 | **24,0 V** |
| Input current at rated voltage | **5 mA** |
| Min. pulse duration | **16 ms** |
| Pulse suppression | **0,6 ms** |
| Signal level at "1" | **15 ... 30 V DC** |
| Signal level at "0" | **-3 ... +5 V DC** |
| Maximum input delay | **4,0 ms** |
| Configurable auxiliary outputs | |
| Voltage | **24,0 V** |
| Output current | **75 mA** |
| Power | **1,8 W** |
| Short circuit-proof | **yes** |
| Residual current at "0" | **0,5 mA** |
| Voltage at "1" | **UB - 2 V at 0.1 A** |

# Base units
## PNOZ mm0p

| | |
|---|---|
| **Inputs** | |
| Number | **12** |
| Signal level at "0" | **-3 - +5 V DC** |
| Signal level at "1" | **15 - 30 V DC** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** |
| Input current at rated voltage | **5 mA** |
| Min. pulse duration | **16 ms** |
| Pulse suppression | **0,6 ms** |
| Maximum input delay | **4 ms** |
| Potential isolation | **No** |
| **Semiconductor outputs** | |
| Number | **4** |
| Switching capability | |
| Voltage | **24 V** |
| Current | **2,0 A** |
| Power | **48 W** |
| Signal level at "1" | **UB - 0.5 VDC at 2 A** |
| Residual current at "0" | **0,5 mA** |
| Max. capacitive load | **1 µF** |
| Max. duration of off time during self test | **330 µs** |
| Switch-off delay | **30 ms** |
| Potential isolation | **yes** |
| Short circuit-proof | **yes** |
| **Test pulse outputs** | |
| Number of test pulse outputs | **4** |
| Voltage | **24 V** |
| Current | **0,1 A** |
| Max. duration of off time during self test | **5 ms** |
| Short circuit-proof | **yes** |
| Potential isolation | **No** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| Simultaneity, channel 1 and 2 max. | **3 s** |
| Simultaneity in the two-hand circuit | **0,5 s** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |

## Base units
PNOZ mm0p

| | |
|---|---|
| **Environmental data** | |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1 g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15 g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Rated impulse withstand voltage | **2,50 kV** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **SC output and system voltage** |
| Type of potential isolation | **Basic insulation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **1,0 km** |
| Sum of individual cable lengths at the test pulse output | **2 km** |

# Base units
PNOZ mm0p

| Mechanical data | |
|---|---|
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9,0 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **45,0 mm** |
| Depth | **120,0 mm** |
| Weight | **226 g** |

Where standards are undated, the 2010-08 latest editions shall apply.

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **1,54E-09** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **3,95E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,61E-10** | **20** |
| SC inputs | **Short circuit-forming safety mats** | **PL d** | **Cat. 3** | **SIL CL 2** | **1,86E-09** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **3,95E-10** | **20** |

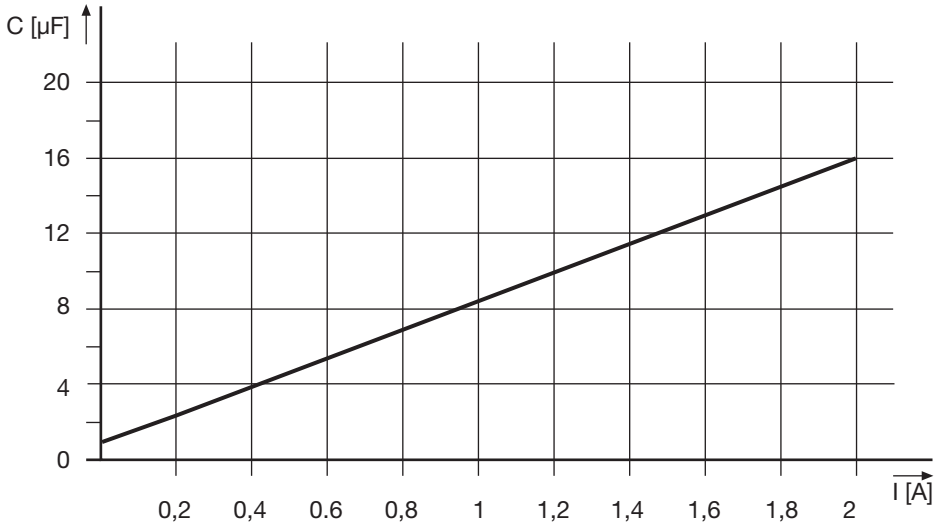
# Base units
PNOZ mm0p

| Output | | | | | | |
|---|---|---|---|---|---|---|
| SC outputs | **1-channel with advanced fault detection** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,65E-10** | **20** |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **8,90E-10** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,86E-10** | **20** |

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

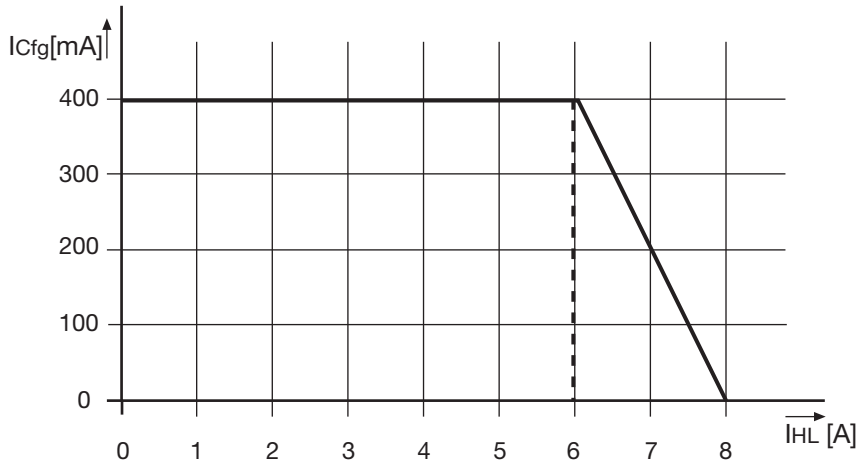
## Supplementary data

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



# Base units
PNOZ mm0p

### Maximum permitted total current of the semiconductor outputs




$I_{Cfg}$: Total current of the configurable semiconductor outputs (auxiliary outputs)

$I_{HL}$: Total current: Semiconductor outputs (safety outputs)

## Order reference

| Order reference | | |
|---|---|---|
| | | |

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mm0p | Base unit | 772 000 |

**Terminals**

| Product type | Features | Order no. |
|---|---|---|
| PNOZ s Set1 spring loaded terminals | 1 set of spring-loaded terminals | 751 008 |
| PNOZ s Set1 screw terminals | 1 set of screw terminals | 750 008 |

**Cable**

| Product type | Features | Order no. |
|---|---|---|
| PSSu A USB-CAB03 | Mini USB cable, 3 m | 312 992 |
| PSSu A USB-CAB05 | Mini USB cable, 5 m | 312 993 |

# Base units
PNOZ mm0p-T

## Overview

### Unit features

Using the product PNOZ mm0p-T:

Base unit from the configurable control system PNOZmulti

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:

  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- 12 inputs for connecting, for example:
  - E-STOP pushbuttons
  - Two-hand pushbuttons
  - Safety gate limit switches
  - Reset buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN
  - Operating mode selector switches
  - Pressure sensitive mats
- 8 configurable inputs/outputs

  Can be configured as:
  - Inputs (see above for connection options)

  or
  - Outputs for standard applications

# Base units
PNOZ mm0p-T

- 4 configurable outputs
  Can be configured as:
  – Outputs for standard applications
  or
  – Test pulse outputs
- LED for:
  – Error messages
  – Diagnostics
  – Supply voltage
  – State of the inputs
  – State of the outputs
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals:
  Either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Pushbutton to change the operating status and download the project.
- Coated version:
  Increased environmental requirements (see Technical details [📖 524])

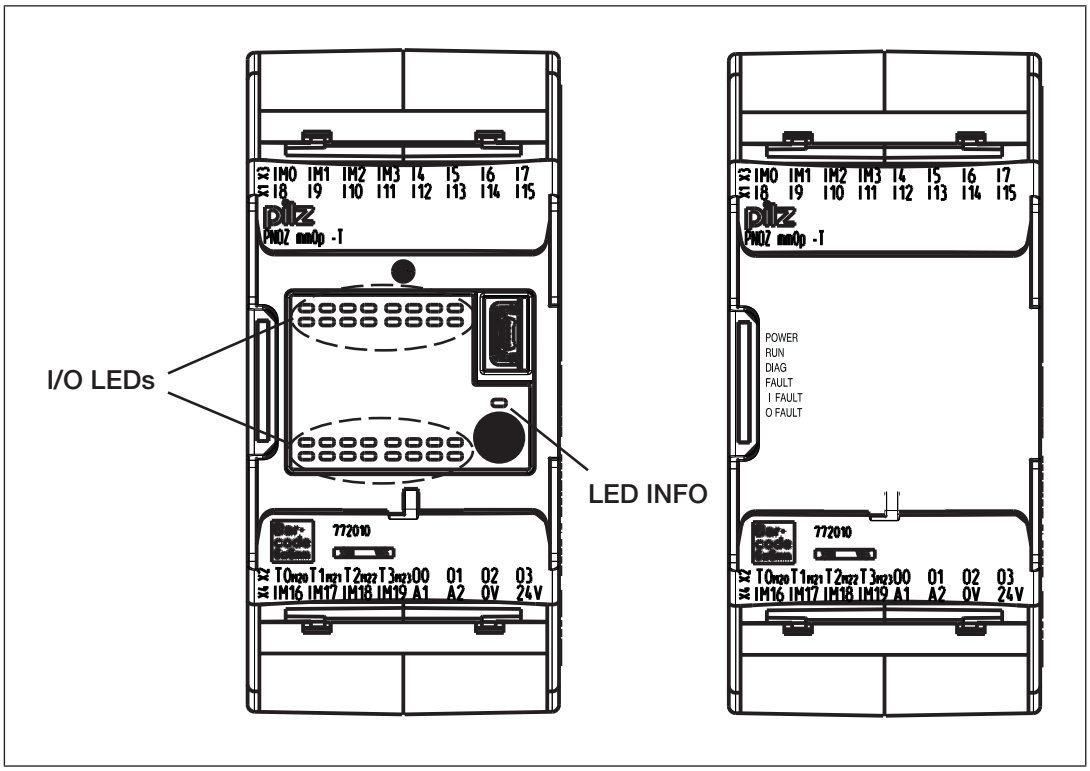
## Chip card

To be able to use the product you will need a 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 Technical Catalogue: Accessories chapter).

# Base units
PNOZ mm0p-T

## Front view




Front view with and without cover

Legend

- X1:
  - Inputs I8 ... I15
- X2:
  - Configurable test pulse/auxiliary outputs T0M20 ... T3M23
  - Semiconductor outputs O0 ... O3
- X3:
  - Configurable inputs/outputs IM0 – IM3
  - Inputs I4 ... I7
- X4:
  - Configurable inputs/outputs IM16 – IM19
  - Supply connections
- LEDs:
  - POWER
  - RUN
  - DIAG

# Base units
PNOZ mm0p-T

- FAULT
- I FAULT
- O FAULT
- INFO
- I/O

## Function description

### Functions

The function of the safety system's inputs and outputs 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 and switch the outputs accordingly.

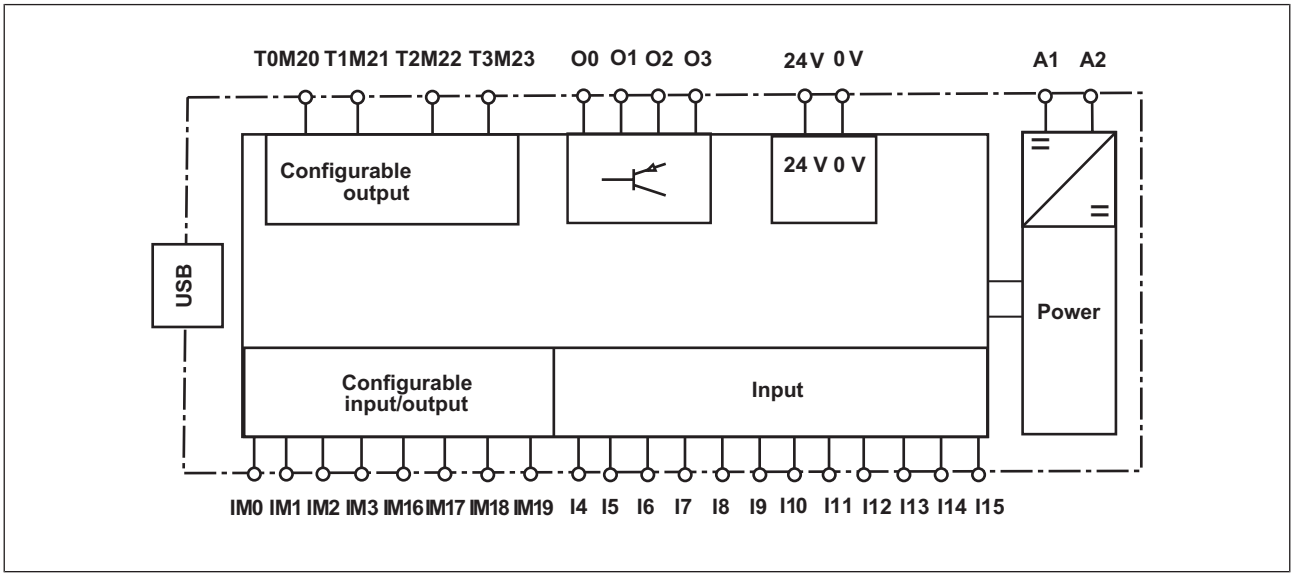
The LEDs indicate the status of the safety system plus the inputs and outputs.

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.

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

### Block diagram

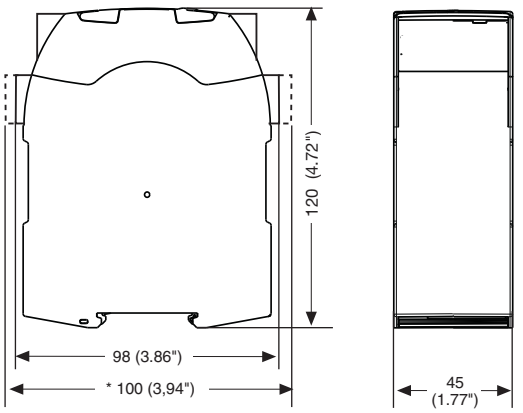


# Base units
PNOZ mm0p-T

## Installation

### Dimensions

*with spring-loaded terminals




## Commissioning

### General wiring guidelines

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

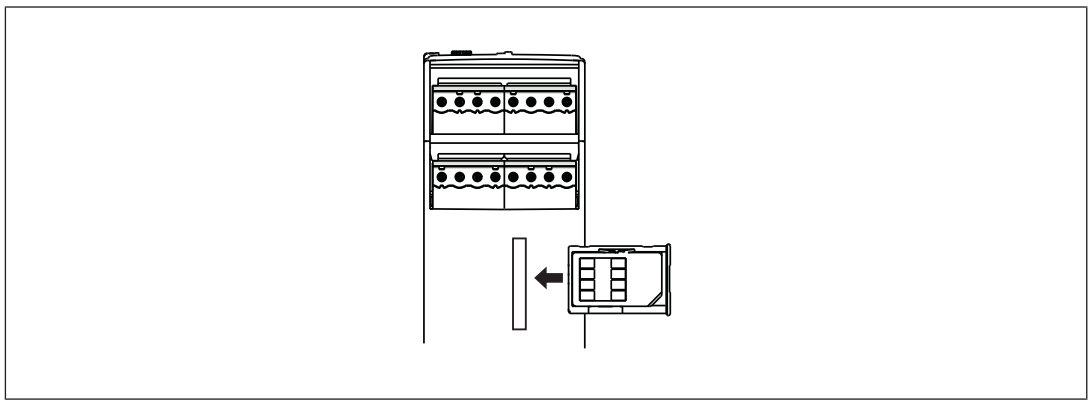
Please note:

- Information given in the Technical details [📖 524] must be followed.
- Outputs O0 to O3 are semiconductor outputs
- Use copper wiring with a temperature stability of 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation.
- 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.
  Test pulses that are used for the safety mat may not be reused for other purposes.

# Base units
PNOZ mm0p-T

### Preparing for operation

Make sure that you do not bend the chip card as you insert it into the chip card slot.



Procedure:

- Wire the inputs and outputs on the base unit in accordance with the circuit diagram.
- Connect the supply voltage:
  - Supply voltage for the control system:
  - Terminal A1: + 24 VDC
  - Terminal A2: 0 V
  - Supply voltage for the semiconductor outputs:
  - 24 V terminal: + 24 VDC
  - 0V terminal: 0 V

Please note: The supply voltage for the semiconductor outputs must always be present, even if you are not using the semiconductor outputs.

Procedure:

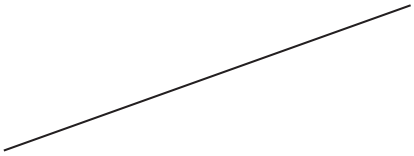
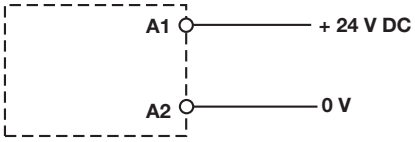
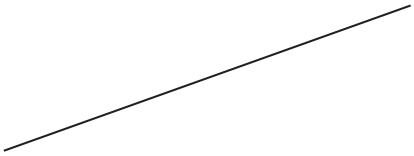
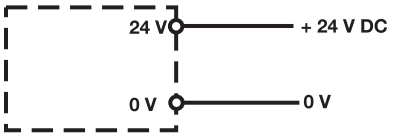
- Insert the chip card containing the current project into the card slot on the base unit.
- Switch on the supply voltage. The INFO LED lights when a new or modified project is present.
- Load the project by pressing the pushbutton. For the project to be downloaded, the pushbutton must be held down for between 4 and 8 seconds. Release the pushbutton while the INFO LED flashes rapidly.
  If you hold the pushbutton down for too long, the process will be aborted and the project will not be downloaded.

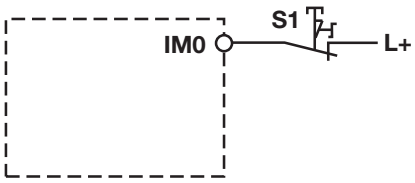
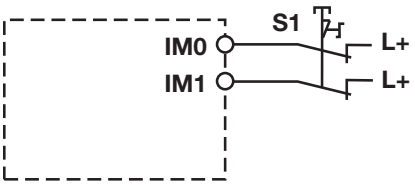
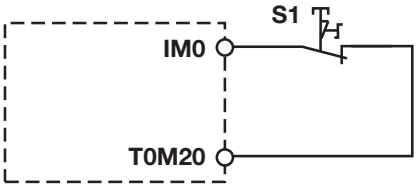
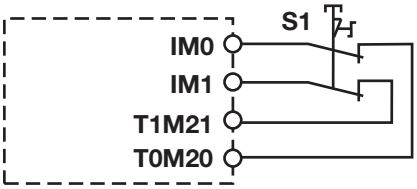
Procedure:

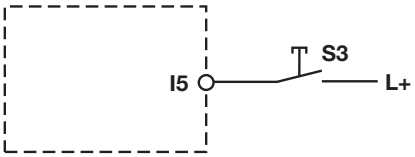
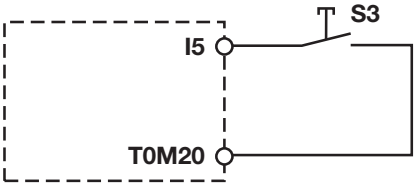
- Insert a chip card into the card slot on the base unit.
- Connect the computer containing the PNOZmulti Configurator to the base unit via the USB port.
- Switch on the supply voltage.
- Download the project (see PNOZmulti Configurator's online help).

## Base units
PNOZ mm0p-T

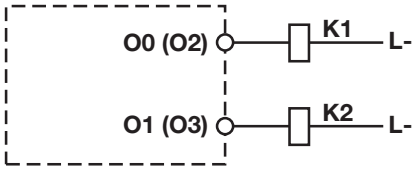
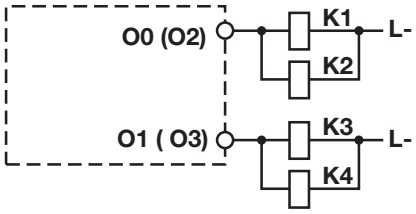
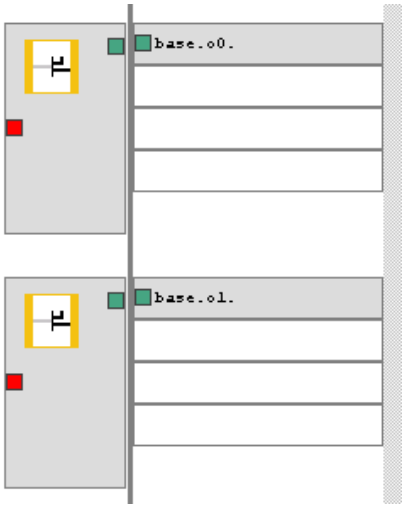
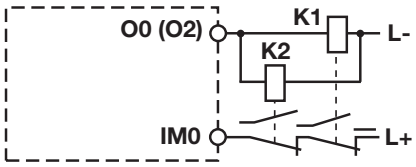
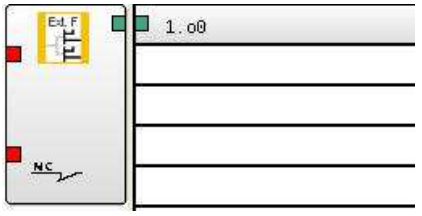
- Once the project has been successfully downloaded, the status of the inputs and outputs and the supply voltage will be shown via the LEDs. The "RUN" LED is lit.

| Supply voltage | AC | DC |
|---|---|---|
| For the safety system |  |  |
| For the semiconductor outputs Must always be present, even if the semiconductor outputs are not used |  |  |

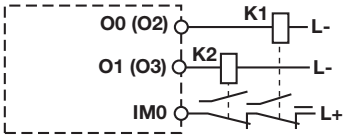
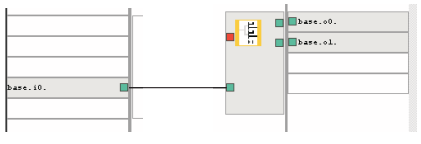
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

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

## Base units
PNOZ mm0p-T

| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |
| Single output with advanced fault detection* |  |  |

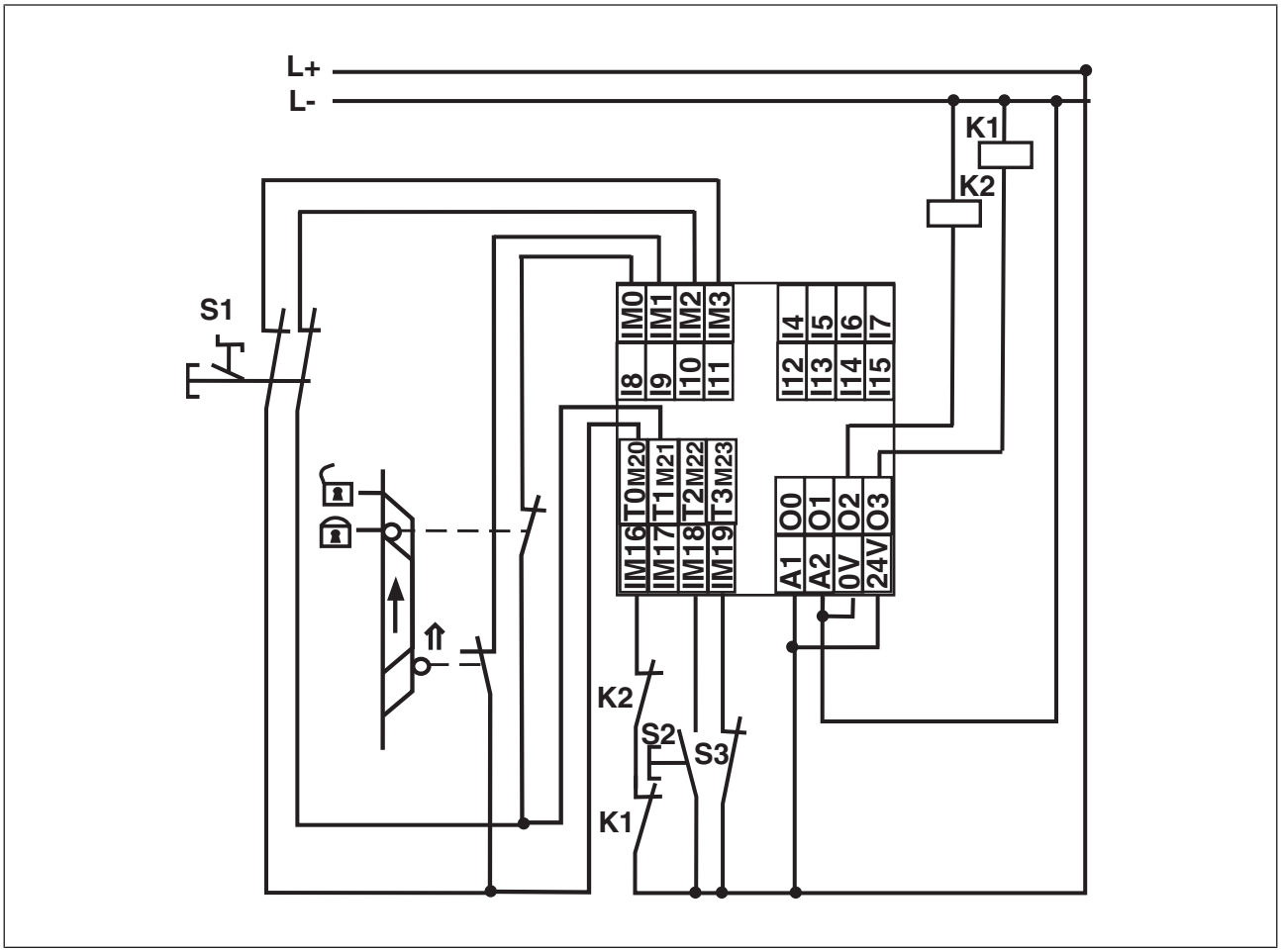
*Two loads may be connected to each safety output with advanced fault detection, even on applications in accordance with EN IEC 62061, SIL CL 3. Prerequisite: Feedback loop is connected, shorts across contacts and external power sources are excluded (e.g. through separate multicore cables). Please note that, in the event of an error in the feedback loop, the safety system switches to a safe condition and shuts down **all** the outputs.

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

## Base units
PNOZ mm0p-T

### Connection example

Dual-channel E-STOP and safety gate wiring, monitored start (IM18), feedback loop (IM16)



# Base units
PNOZ mm0p-T

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Supply to the system** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **35,0 W** |
| Output of external power supply (DC) at no load | **8,0 W** |
| Residual ripple DC | **5 %** |
| Supply voltage | |
| for | **Supply to the SC outputs** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **192,0 W** |
| Potential isolation | **yes** |
| Status indicator | **LED** |
| **Configurable inputs/outputs (inputs or auxiliary outputs)** | |
| Number | **8** |
| Potential isolation | **No** |
| Galvanic isolation | **No** |
| Configurable inputs | |
| Input voltage in accordance with EN 61131-2 Type 1 | **24,0 V** |
| Input current at rated voltage | **5 mA** |
| Min. pulse duration | **16 ms** |
| Pulse suppression | **0,6 ms** |
| Signal level at "1" | **15 ... 30 V DC** |
| Signal level at "0" | **-3 ... +5 V DC** |
| Maximum input delay | **4,0 ms** |
| Configurable auxiliary outputs | |
| Voltage | **24,0 V** |
| Output current | **75 mA** |
| Power | **1,8 W** |
| Short circuit-proof | **yes** |
| Residual current at "0" | **0,5 mA** |
| Voltage at "1" | **UB - 2 V at 0.1 A** |

## Base units
PNOZ mm0p-T

| | |
|---|---|
| **Inputs** | |
| Number | **12** |
| Signal level at "0" | **-3 - +5 V DC** |
| Signal level at "1" | **15 - 30 V DC** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** |
| Input current at rated voltage | **5 mA** |
| Input current range | **2,5 - 5,3 mA** |
| Min. pulse duration | **16 ms** |
| Pulse suppression | **0,6 ms** |
| Maximum input delay | **4 ms** |
| Potential isolation | **No** |
| **Semiconductor outputs** | |
| Number | **4** |
| Switching capability | |
| Voltage | **24 V** |
| Current | **2,0 A** |
| Power | **48 W** |
| | |
| Voltage | **24 V** |
| Current | **1 A** |
| Power | **24 W** |
| Signal level at "1" | **UB - 0.5 VDC at 2 A** |
| Residual current at "0" | **0,5 mA** |
| Max. capacitive load | **1 µF** |
| Max. duration of off time during self test | **330 µs** |
| Switch-off delay | **30 ms** |
| Potential isolation | **yes** |
| Short circuit-proof | **yes** |
| **Test pulse outputs** | |
| Number of test pulse outputs | **4** |
| Voltage | **24 V** |
| Current | **0,1 A** |
| Max. duration of off time during self test | **5 ms** |
| Short circuit-proof | **yes** |
| Potential isolation | **No** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| Simultaneity, channel 1 and 2 max. | **3 s** |
| Simultaneity in the two-hand circuit | **0,5 s** |

## Base units
PNOZ mm0p-T

| | |
|---|---|
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **-25 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Short-term (only with separated extra low voltage)** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1 g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Number of shocks | **3** |
| Acceleration | **15 g** |
| Duration | **11 ms** |
| In accordance with the standard | **EN 60068-2-27** |
| Number of shocks | **500** |
| Acceleration | **25 g** |
| Duration | **6 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Rated impulse withstand voltage | **2,50 kV** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **SC output and system voltage** |
| Type of potential isolation | **Basic insulation** |
| Rated surge voltage | **2500 V** |

# Base units
## PNOZ mm0p-T

| Mechanical data | |
|---|---|
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **1,0 km** |
| Sum of individual cable lengths at the test pulse output | **2 km** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9,0 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **45,0 mm** |
| Depth | **120,0 mm** |
| Weight | **230 g** |

Where standards are undated, the 2012-07 latest editions shall apply.

# Base units
PNOZ mm0p-T

## Safety characteristic data

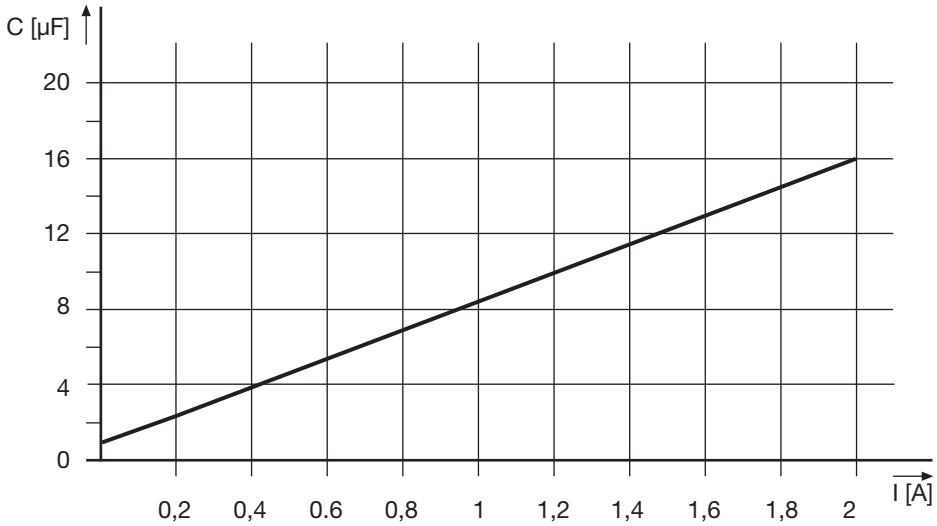
| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **1,54E-09** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **3,95E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,61E-10** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **3,95E-10** | **20** |
| **Output** | | | | | | |
| SC outputs | **1-channel with advanced fault detection** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,65E-10** | **20** |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **8,90E-10** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,86E-10** | **20** |

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

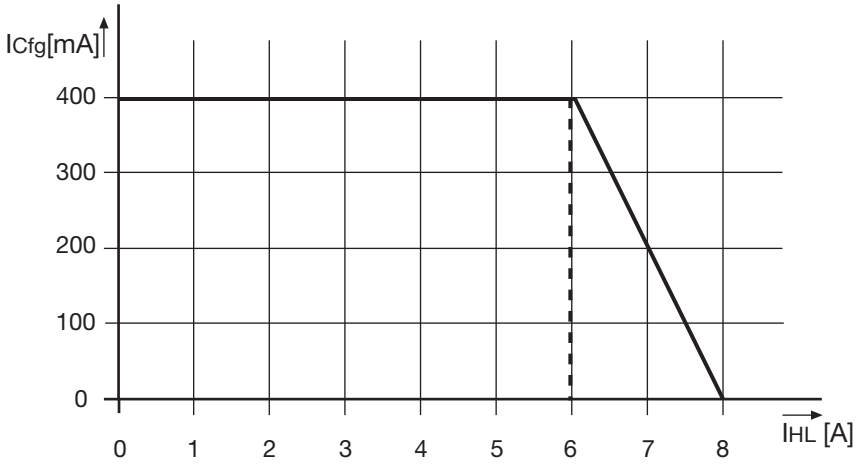
# Base units
PNOZ mm0p-T

## Supplementary data

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




### Maximum permitted total current of the semiconductor outputs




$I_{Cfg}$: Total current of the configurable semiconductor outputs (auxiliary outputs)

$I_{HL}$: Total current: Semiconductor outputs (safety outputs)

# Base units
PNOZ mm0p-T

## Order reference

| Order reference | | |
|---|---|---|
| | | |

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mm0p-T | Base unit | 772 010 |

### Terminals

| Product type | Features | Order no. |
|---|---|---|
| PNOZ s Set1 spring loaded terminals | 1 set of spring-loaded terminals | 751 008 |
| PNOZ s Set1 screw terminals | 1 set of screw terminals | 750 008 |

### Cable

| Product type | Features | Order no. |
|---|---|---|
| PSSu A USB-CAB03 | Mini USB cable, 3 m | 312 992 |
| PSSu A USB-CAB05 | Mini USB cable, 5 m | 312 993 |

# Base units
PNOZ mm0.1p

## Overview

### Unit features

Using the product PNOZ mm0.1p:

PNOZmulti Mini base unit

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:

  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- 12 inputs for connecting, for example:
  - E-STOP pushbuttons
  - Two-hand button
  - Safety gate limit switches
  - Start buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN
  - Operating mode selector switches
  - Safety mats
- 8 configurable inputs/outputs

  Can be configured as:
  - Inputs (see above for connection options)

  or
  - Outputs for standard applications

## Base units
PNOZ mm0.1p

- 4 configurable outputs
  Can be configured as:
  – Outputs for standard applications
  or
  – Test pulse outputs
- LED indicator for:
  – Error messages
  – Diagnostics
  – Supply voltage
  – Output circuits
  – Input circuits
- Display for:
  – Error messages
  – State of supply voltage
  – State of the inputs and outputs
  – Status information
  – Unit information
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals:
  Either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Rotary knob for menu control
- Expansion modules can be connected
  (please refer to the document "PNOZmulti System Expansion" for details of the type and number that can be connected)

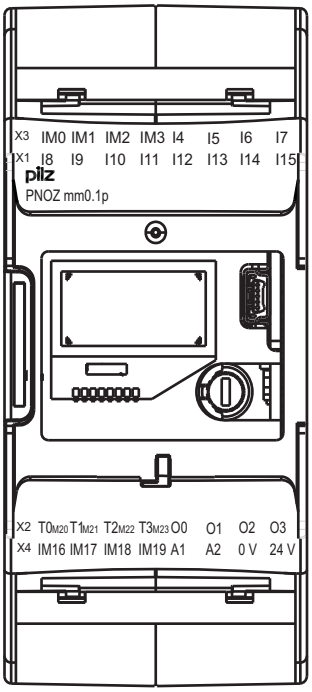
### Chip card

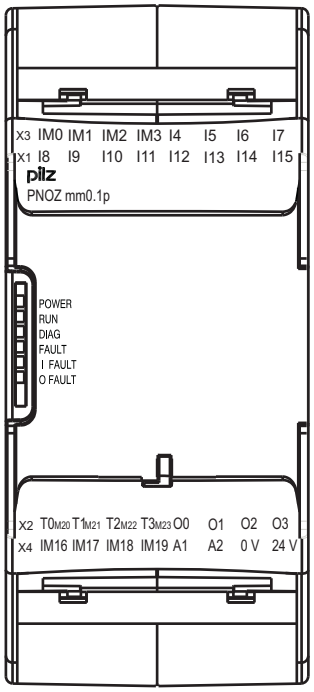
To be able to use the product you will need a chip card.

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see Technical Catalogue: Accessories chapter).

# Base units
PNOZ mm0.1p

## Front view




Front view with and without cover

### Legend

| | |
|---|---|
| X1: | Inputs I8 ... I15 |
| X1: | Configurable test pulse/auxiliary outputs T0M20 ... T3M23 |
| | Semiconductor outputs O0 ... O3 |
| X3: | Configurable inputs/outputs IM0 – IM3 |
| | Inputs I4 ... I7 |
| X4: | Configurable inputs/outputs IM16 – IM19 |
| | Supply connections |
| LEDs: | PWR |
| | RUN |
| | DIAG |
| | FAULT |
| | I FAULT |
| | O FAULT |

# Base units
PNOZ mm0.1p

## Function description

### Functions

The function of the inputs and outputs on the control 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.

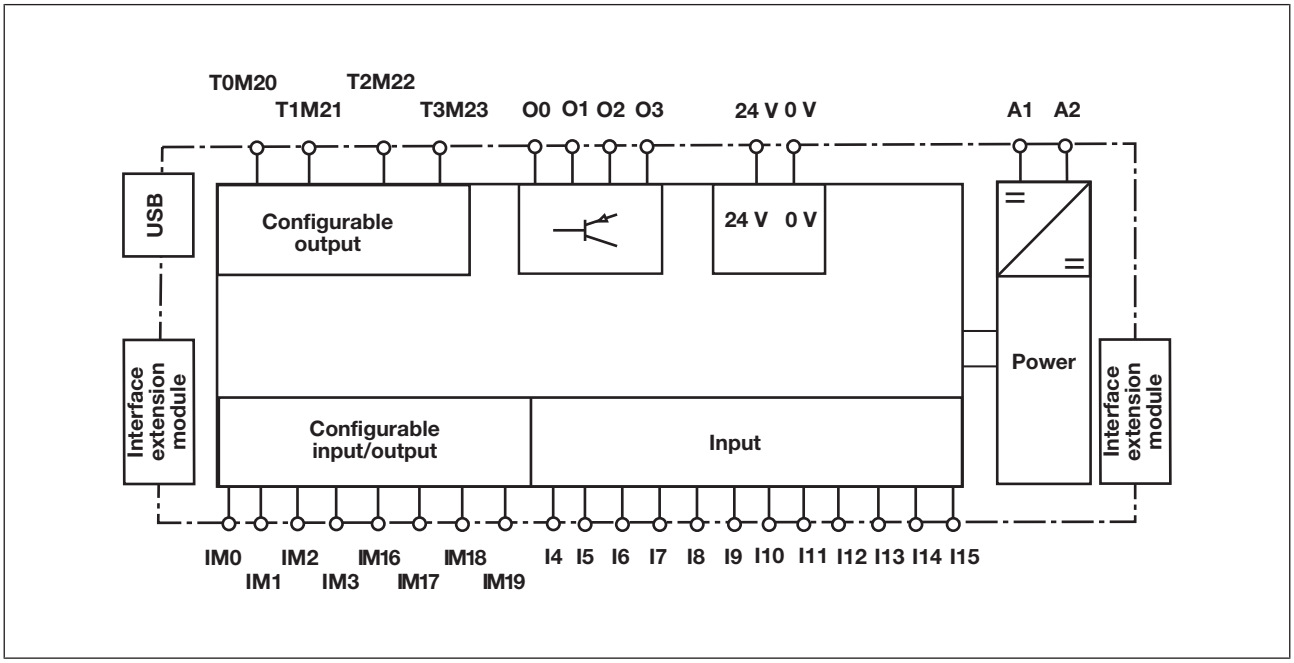
The LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

### Block diagram

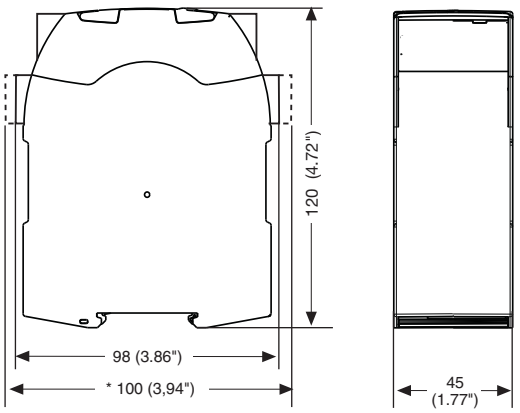


# Base units
PNOZ mm0.1p

## Installation

### Dimensions

*with spring-loaded terminals




## Commissioning

### General wiring guidelines

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

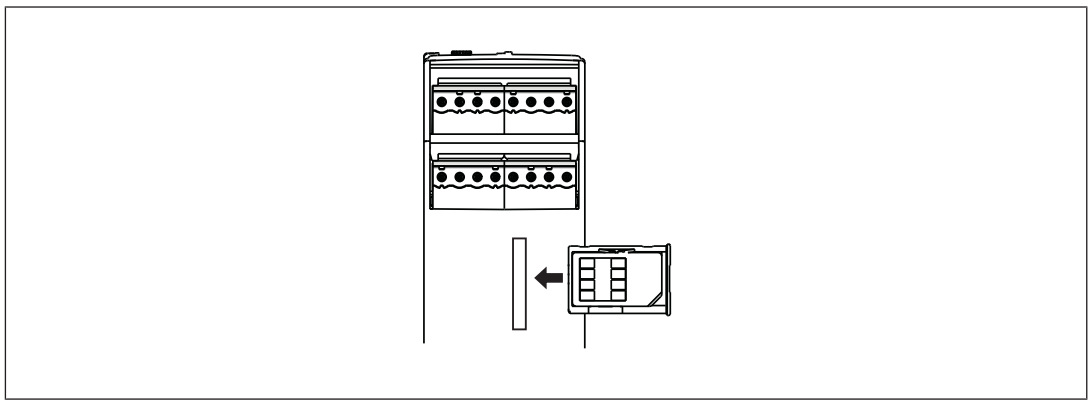
Please note:

- Information given in the Technical details [📖 540] must be followed.
- Outputs O0 to O3 are semiconductor outputs
- Use copper wiring with a temperature stability of 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation.
- 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.
  Test pulses that are used for the safety mat may not be reused for other purposes.

# Base units
PNOZ mm0.1p

### Preparing for operation

Make sure that you do not bend the chip card as you insert it into the chip card slot.



Procedure:

- Wire the inputs and outputs on the base unit in accordance with the circuit diagram.
- Connect the supply voltage:
  - Supply voltage for the control system:
  - Terminal A1: + 24 VDC
  - Terminal A2: 0 V
  - Supply voltage for the semiconductor outputs:
  - 24 V terminal: + 24 VDC
  - 0V terminal: 0 V

Please note: The supply voltage for the semiconductor outputs must always be present, even if you are not using the semiconductor outputs.

Procedure:

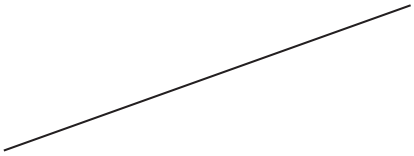
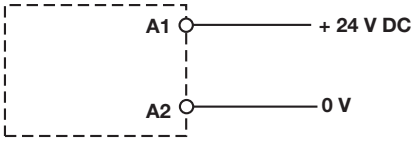
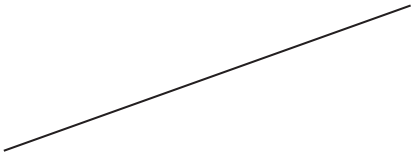
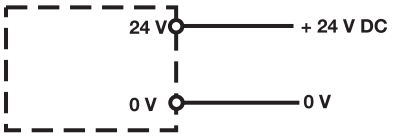
- Insert the chip card containing the current project into the card slot on the base unit.
- Switch on the supply voltage. The LC display shows the project name, CRC sum and the date the project was created. Please check this information.
- Load the project by pressing the rotary knob. For the project to be downloaded, the rotary knob must be held down for between 3 and 8 seconds. Once the project has been successfully downloaded, the status of the inputs and outputs will be shown on the display.

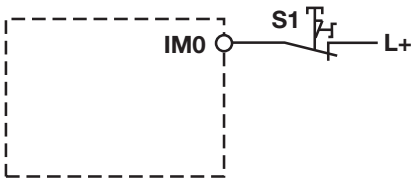
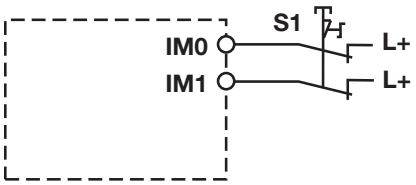
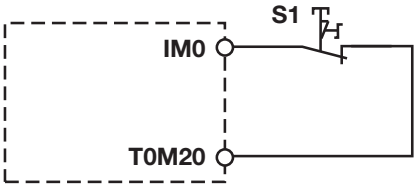
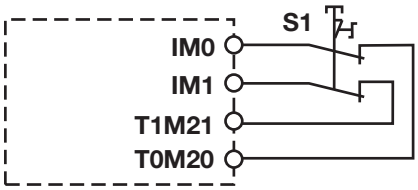
Procedure:

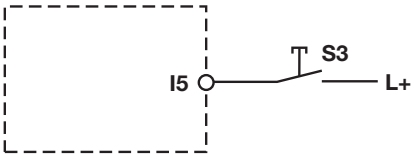
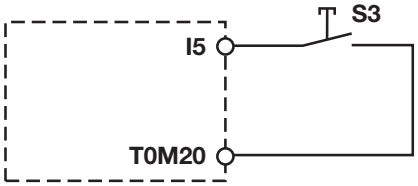
- Insert a chip card into the card slot on the base unit.
- Connect the computer containing the PNOZmulti Configurator to the base unit via the USB port.
- Switch on the supply voltage.
- Download the project (see PNOZmulti Configurator's online help).

## Base units
PNOZ mm0.1p

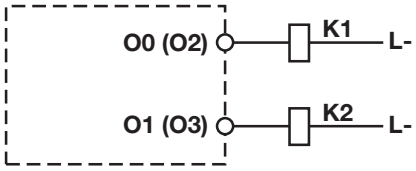
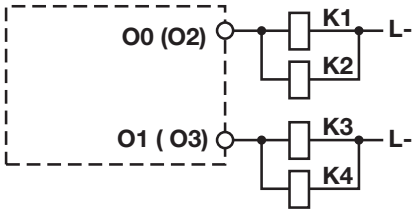
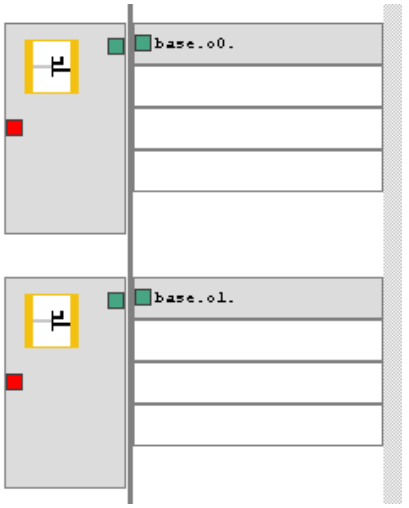
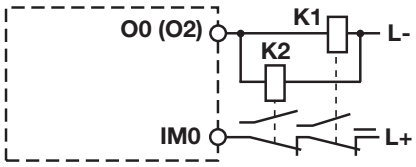
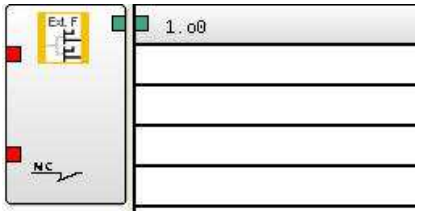
- Once the project has been successfully downloaded, the status of the inputs and outputs and the supply voltage will be shown on the display. The "RUN" LED will be lit.

| Supply voltage | AC | DC |
|---|---|---|
| For the safety system |  |  |
| For the semiconductor outputs Must always be present, even if the semiconductor outputs are not used |  |  |

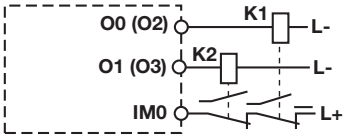
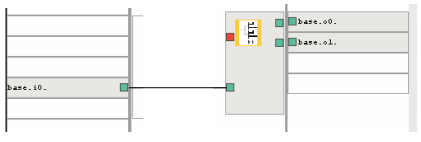
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

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

## Base units
PNOZ mm0.1p

| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |
| Single output with advanced fault detection* |  |  |

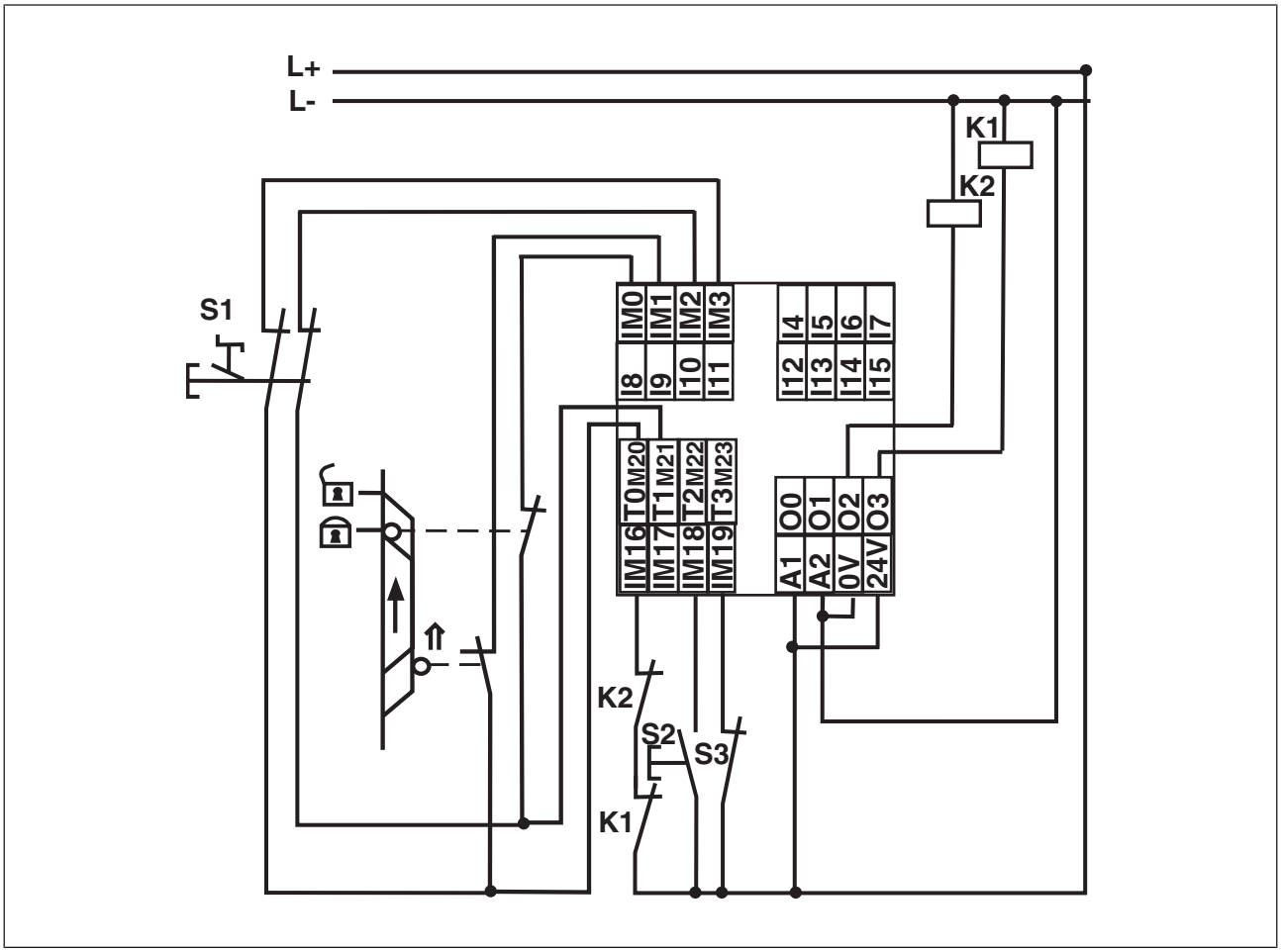
*Two loads may be connected to each safety output with advanced fault detection, even on applications in accordance with EN IEC 62061, SIL CL 3. Prerequisite: Feedback loop is connected, shorts across contacts and external power sources are excluded (e.g. through separate multicore cables). Please note that, in the event of an error in the feedback loop, the safety system switches to a safe condition and shuts down **all** the outputs.

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

## Base units
PNOZ mm0.1p

### Connection example

Dual-channel E-STOP and safety gate wiring, monitored start (IM18), feedback loop (IM16)



# Base units
PNOZ mm0.1p

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), KCC, TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Supply to the system** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **35,0 W** |
| Output of external power supply (DC) at no load | **8,0 W** |
| Residual ripple DC | **5 %** |
| Supply voltage | |
| for | **Supply to the SC outputs** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **192,0 W** |
| Status indicator | **Display, LED** |
| **Configurable inputs/outputs (inputs or auxiliary outputs)** | |
| Number | **8** |
| Galvanic isolation | **No** |
| Configurable inputs | |
| Input voltage in accordance with EN 61131-2 Type 1 | **24,0 V** |
| Input current at rated voltage | **5 mA** |
| Min. pulse duration | **16 ms** |
| Pulse suppression | **0,6 ms** |
| Signal level at "1" | **15 ... 30 V DC** |
| Signal level at "0" | **-3 ... +5 V DC** |
| Maximum input delay | **4,0 ms** |
| Configurable auxiliary outputs | |
| Voltage | **24,0 V** |
| Output current | **75 mA** |
| Power | **1,8 W** |
| Short circuit-proof | **yes** |
| Residual current at "0" | **0,5 mA** |
| Voltage at "1" | **UB - 2 V at 0.1 A** |

## Base units
PNOZ mm0.1p

| | |
|---|---|
| **Inputs** | |
| Number | **12** |
| Signal level at "0" | **-3 - +5 V DC** |
| Signal level at "1" | **15 - 30 V DC** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** |
| Input current at rated voltage | **5 mA** |
| Min. pulse duration | **16 ms** |
| Pulse suppression | **0,6 ms** |
| Maximum input delay | **4 ms** |
| Potential isolation | **No** |
| **Semiconductor outputs** | |
| Number | **4** |
| Switching capability | |
| Voltage | **24 V** |
| Current | **2,0 A** |
| Power | **48 W** |
| Signal level at "1" | **UB - 0.5 VDC at 2 A** |
| Residual current at "0" | **0,5 mA** |
| Max. capacitive load | **1 µF** |
| Max. duration of off time during self test | **330 µs** |
| Switch-off delay | **30 ms** |
| Potential isolation | **yes** |
| Short circuit-proof | **yes** |
| **Test pulse outputs** | |
| Number of test pulse outputs | **4** |
| Voltage | **24 V** |
| Current | **0,1 A** |
| Max. duration of off time during self test | **5 ms** |
| Short circuit-proof | **yes** |
| Potential isolation | **No** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| Simultaneity, channel 1 and 2 max. | **3 s** |
| Simultaneity in the two-hand circuit | **0,5 s** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |

# Base units
## PNOZ mm0.1p

| | |
|---|---|
| **Environmental data** | |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Rated impulse withstand voltage | **2,50 kV** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **SC output and system voltage** |
| Type of potential isolation | **Basic insulation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **1,0 km** |
| Sum of individual cable lengths at the test pulse output | **2 km** |

# Base units
PNOZ mm0.1p

| Mechanical data | |
|---|---|
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **45,0 mm** |
| Depth | **120,0 mm** |
| Weight | **231 g** |

Where standards are undated, the 2010-08 latest editions shall apply.

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **1,54E-09** | **20** |
| Expansion right | – | **PL e** | **Cat. 4** | **SIL CL 3** | **2,13E-10** | **20** |
| Expansion left | – | **PL e** | **Cat. 4** | **SIL CL 3** | **2,38E-10** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **3,95E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,61E-10** | **20** |
| SC inputs | **Short circuit-forming safety mats** | **PL d** | **Cat. 3** | **SIL CL 2** | **1,86E-09** | **20** |

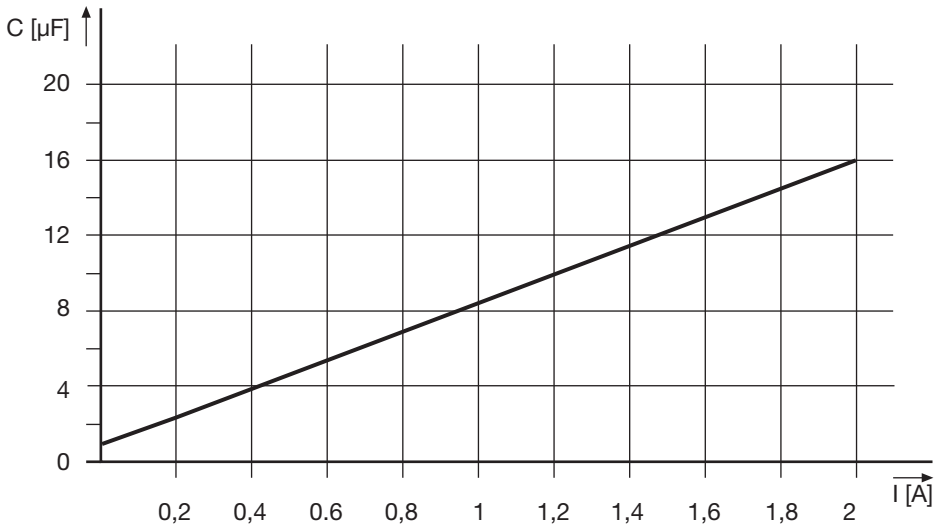
# Base units
PNOZ mm0.1p

| | | | | | | |
|---|---|---|---|---|---|---|
| **Input** | | | | | | |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **3,95E-10** | **20** |
| **Output** | | | | | | |
| SC outputs | **1-channel with advanced fault detection** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,65E-10** | **20** |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **8,90E-10** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,86E-10** | **20** |

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

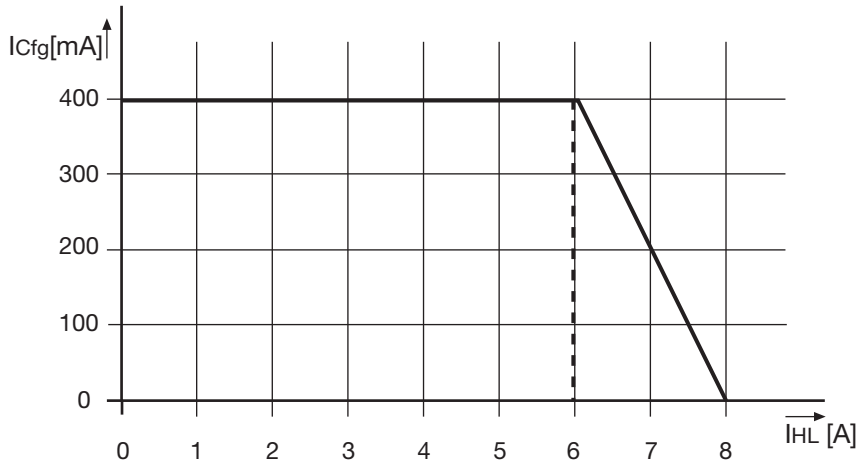
## Supplementary data

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



# Base units
PNOZ mm0.1p

### Maximum permitted total current of the semiconductor outputs




$I_{Cfg}$: Total current of the configurable semiconductor outputs (auxiliary outputs)

$I_{HL}$: Total current: Semiconductor outputs (safety outputs)

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.1p | Base unit | 772 001 |

### Accessories

#### Terminator

| Product type | Features | Order No. |
|---|---|---|
| PNOZ s terminator plug | Right terminator, yellow, x10 | 750 010 |
| PNOZ mm0.xp terminator left | Left terminator, black/yellow, x1 | 779 261 |

#### Cable

| Product type | Features | Order no. |
|---|---|---|
| PSSu A USB-CAB03 | Mini USB cable, 3 m | 312 992 |
| PSSu A USB-CAB05 | Mini USB cable, 5 m | 312 993 |

## Base units
PNOZ mm0.1p

**Terminals**

| Product type | Features | Order no. |
|---|---|---|
| PNOZ s Set1 spring loaded terminals | 1 set of spring-loaded terminals | 751 008 |
| PNOZ s Set1 screw terminals | 1 set of screw terminals | 750 008 |

# Base units
PNOZ mm0.2p

## Overview

### Unit features

Using the product PNOZ mm0.2p:

PNOZmulti Mini base unit

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:

  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- 12 inputs for connecting, for example:
  - E-STOP pushbuttons
  - Two-hand button
  - Safety gate limit switches
  - Start buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN
  - Operating mode selector switches
  - Safety mats
- 8 configurable inputs/outputs

  Can be configured as:
  - Inputs (see above for connection options)

  or
  - Outputs for standard applications

## Base units
PNOZ mm0.2p

- 4 configurable outputs
  Can be configured as:
  - Outputs for standard applications

  or
  - Test pulse outputs
- LED indicator for:
  - Error messages
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Display for:
  - Error messages
  - State of supply voltage
  - State of the inputs and outputs
  - Status information
  - Unit information
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals:
  Either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Rotary knob for menu control
- Expansion modules can be connected
  (please refer to the document "PNOZmulti System Expansion" for details of the type and number that can be connected)
- Integrated interface (RJ45 socket) for safe connection of two configurable control systems:
  - Connection options:
    - Two PNOZmulti Mini base units
    or
    - One PNOZmulti Mini base unit with one PNOZmulti base unit
    (both the units to be connected need either an integrated interface or a link module)
  - Point-to-point connection via 4-core shielded, twisted-pair cable
  - 32 virtual inputs and 32 virtual outputs for data transfer

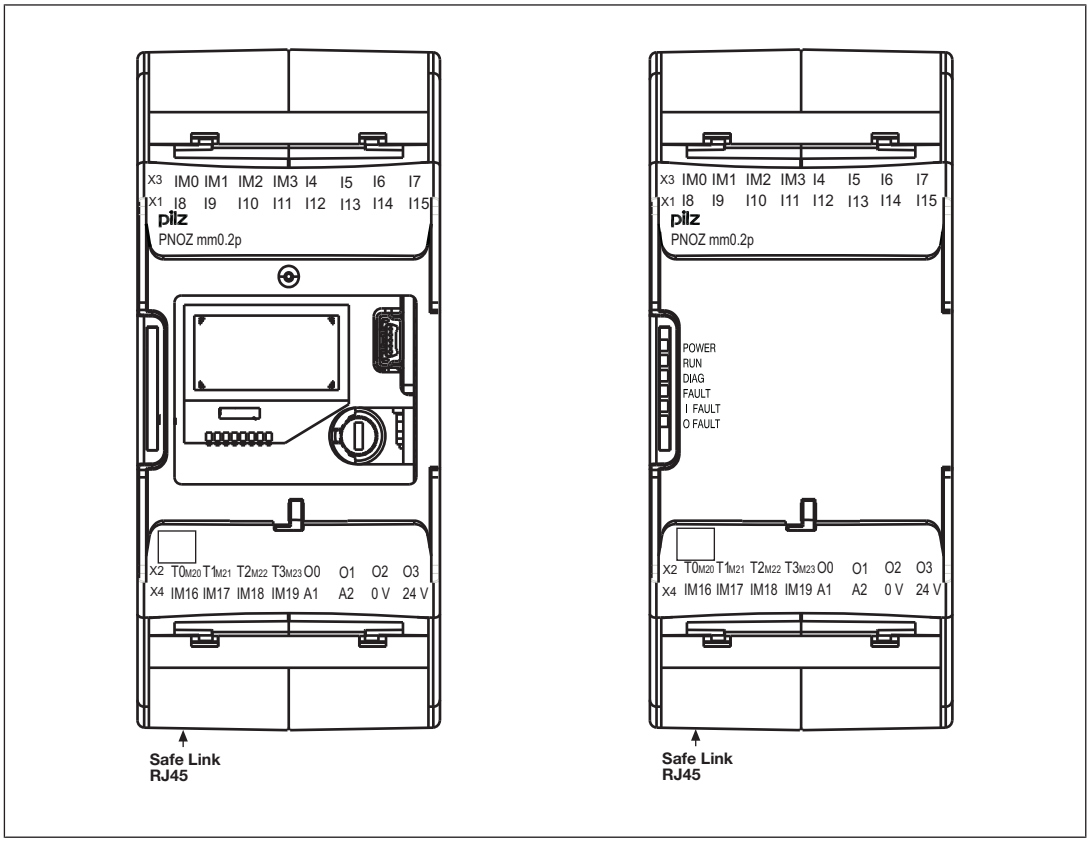
# Base units
PNOZ mm0.2p

## Chip card

To be able to use the product you will need a 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 Technical Catalogue: Accessories chapter).

## Front view




Front view with and without cover

### Legend

| | |
|---|---|
| X1: | Inputs I8 ... I15 |
| X1: | Configurable test pulse/auxiliary outputs T0M20 ... T3M23 |
| | Semiconductor outputs O0 ... O3 |
| X3: | Configurable inputs/outputs IM0 – IM3 |
| | Inputs I4 ... I7 |
| X4: | Configurable inputs/outputs IM16 – IM19 |
| | Supply connections |

# Base units
PNOZ mm0.2p

LEDs: PWR
RUN
DIAG
FAULT
I FAULT
O FAULT

- Safe Link RJ45
  RJ45 socket for connection of 2 base units

## Function description

### Functions

The function of the inputs and outputs on the control 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 LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [📖 30]".

### Connection of two base units

The integrated interface for connection of 2 base units is used to safely transfer the input information from 32 virtual inputs and 32 virtual outputs between two PNOZmulti systems.

Each base unit needs either an integrated interface or a link module for the connection.

**Data exchange:**

- Data is exchanged cyclically.
- At the end of the PNOZmulti cycle, each base unit sends its output data to the other base unit or to the link module on the other base unit.
- At the same time the base unit reads the input data from the other base unit.

# Base units
PNOZ mm0.2p

**Connection of multiple base units:**

Any number of base units can be connected via link modules or via the integrated interface. Each base unit needs a link module or an integrated interface for the connection between two base units.
However, only a maximum of 4 link 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**

This 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

- On semiconductor outputs:

  $tS_{UM} = t_{ON} + (n * t_{BUS}) + t_{COND}$

- On relay outputs:

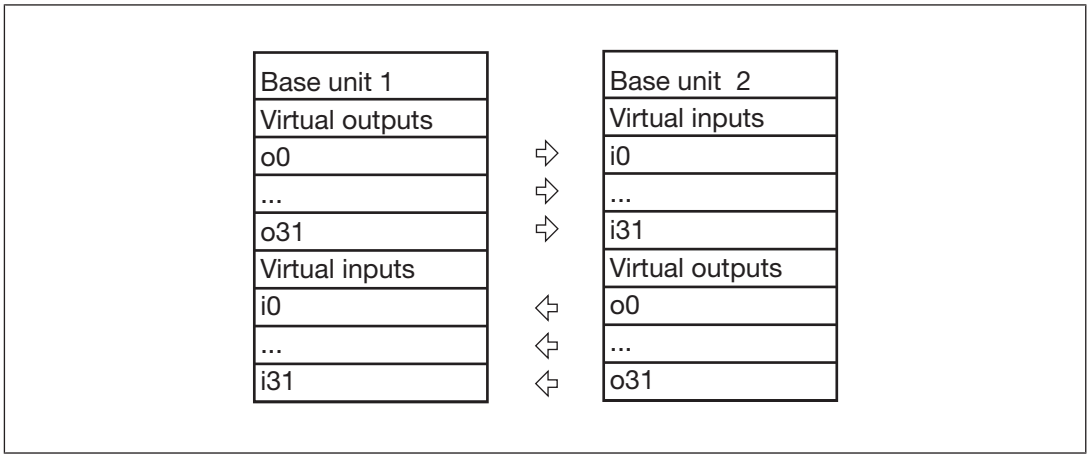
  $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{REL}$

- Input delay and switch-off delay are only included once in the reaction time. The data transmission time is multiplied by the number of connections.
- Please refer to the connection examples under "Preparing for operation".

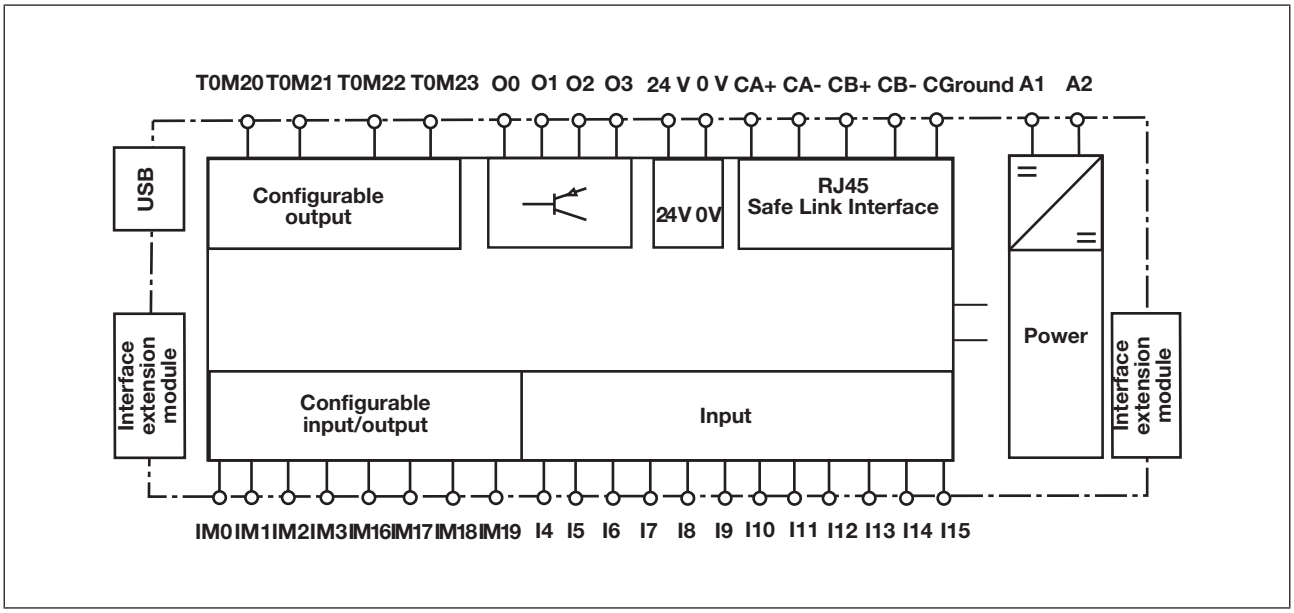
**Virtual inputs and outputs:**

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.

## Base units
PNOZ mm0.2p




### Block diagram

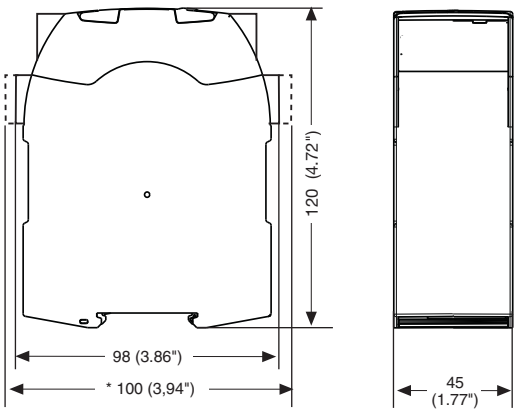


# Base units
PNOZ mm0.2p

## Installation

### Dimensions

*with spring-loaded terminals




## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 560] must be followed.
- Outputs O0 to O3 are semiconductor outputs
- Use copper wiring with a temperature stability of 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation.
- 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.
  Test pulses that are used for the safety mat may not be reused for other purposes.

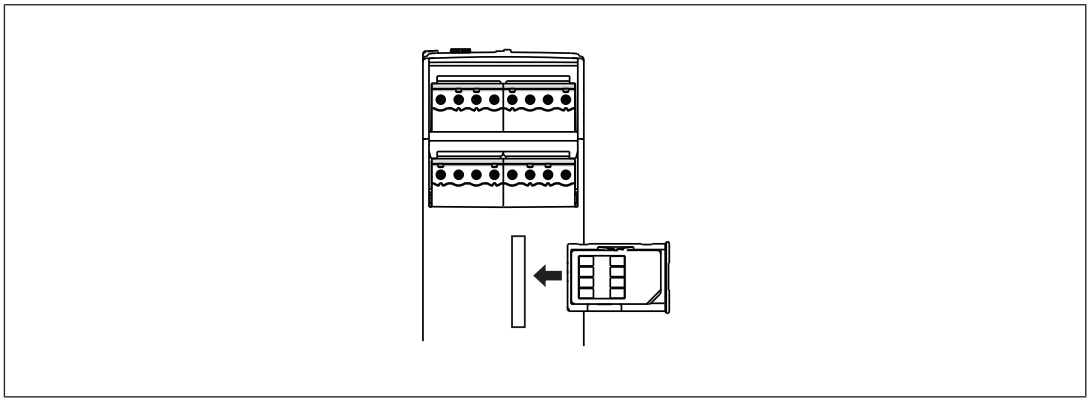
# Base units
PNOZ mm0.2p

When connecting two base units via the integrated interface please note:

- The max. cable length between two base units on a connection with
  - one link module PNOZ ml1p <V2.0: 100 m
  - one link module PNOZ ml1p from V2.0, PNOZ mml1p or one base unit PNOZ mm0.2p: 1000 m
- Connect the inputs and outputs via the two interfaces using 4-core shielded cable. The cables must be twisted in pairs (see "Preparing for operation").
- Note the crossover cabling, e.g. CA+ with CB+.
- The cables must be classified into a minimum of Category 5 in accordance with ISO/IEC 11801.

## Preparing for operation

Make sure that you do not bend the chip card as you insert it into the chip card slot.



Procedure:

- Wire the inputs and outputs on the base unit in accordance with the circuit diagram.
- Connect the supply voltage:
  - Supply voltage for the control system:
  - Terminal A1: + 24 VDC
  - Terminal A2: 0 V
  - Supply voltage for the semiconductor outputs:
  - 24 V terminal: + 24 VDC
  - 0V terminal: 0 V

Please note: The supply voltage for the semiconductor outputs must always be present, even if you are not using the semiconductor outputs.

Procedure:

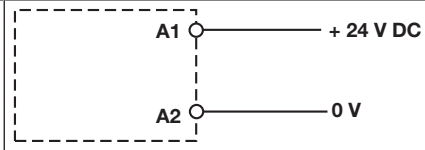
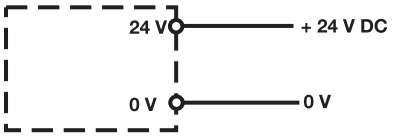
- Insert the chip card containing the current project into the card slot on the base unit.
- Switch on the supply voltage. The LC display shows the project name, CRC sum and the date the project was created. Please check this information.

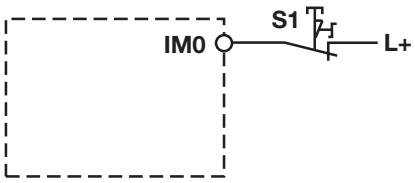
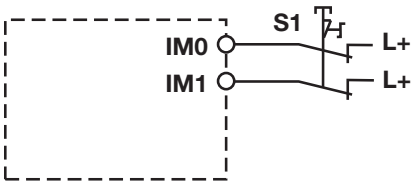
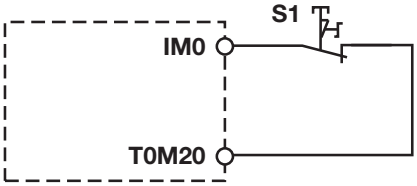
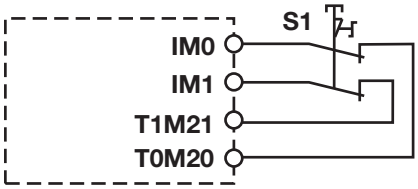
## Base units
PNOZ mm0.2p

- Load the project by pressing the rotary knob. For the project to be downloaded, the rotary knob must be held down for between 3 and 8 seconds. Once the project has been successfully downloaded, the status of the inputs and outputs will be shown on the display.

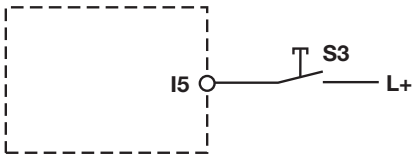
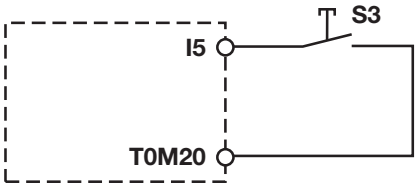
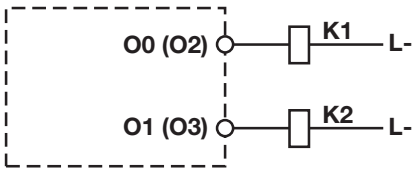
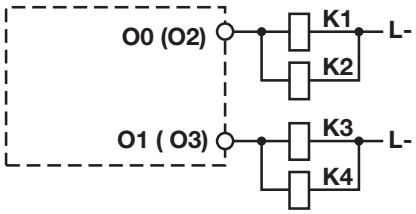
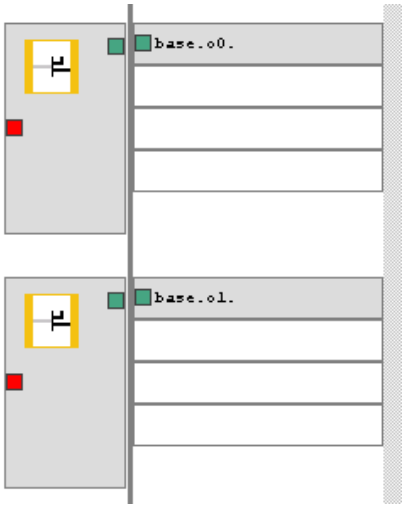
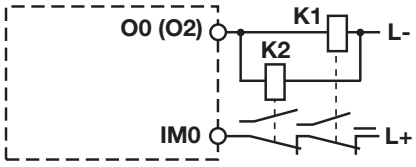
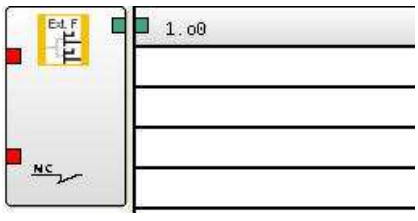
Procedure:

- Insert a chip card into the card slot on the base unit.
- Connect the computer containing the PNOZmulti Configurator to the base unit via the USB port.
- Switch on the supply voltage.
- Download the project (see PNOZmulti Configurator's online help).
- Once the project has been successfully downloaded, the status of the inputs and outputs and the supply voltage will be shown on the display. The "RUN" LED will be lit.

| Supply voltage | AC | DC |
|---|---|---|
| For the safety system | |  |
| For the semiconductor outputs Must always be present, even if the semiconductor outputs are not used | |  |

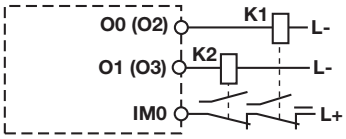
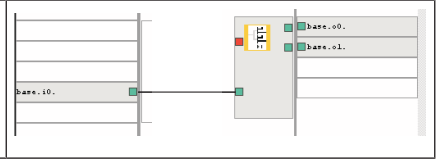
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

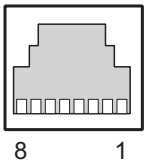
## Base units
PNOZ mm0.2p

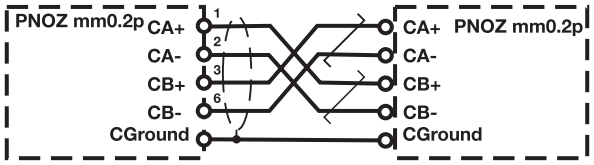
| Start circuit | Input circuit without detection of shorts across contacts | Input circuit with detection of shorts across contacts |
|---|---|---|
| |  |  |
| Redundant output |  |  |
| Single output |  |  |
| Single output with advanced fault detection* |  |  |

*Two loads may be connected to each safety output with advanced fault detection, even on applications in accordance with EN IEC 62061, SIL CL 3. Prerequisite: Feedback loop is connected, shorts across contacts and external power sources are excluded (e.g. through separate multicore cables). Please note that, in the event of an error in the feedback loop, the safety system switches to a safe condition and shuts down **all** the outputs.

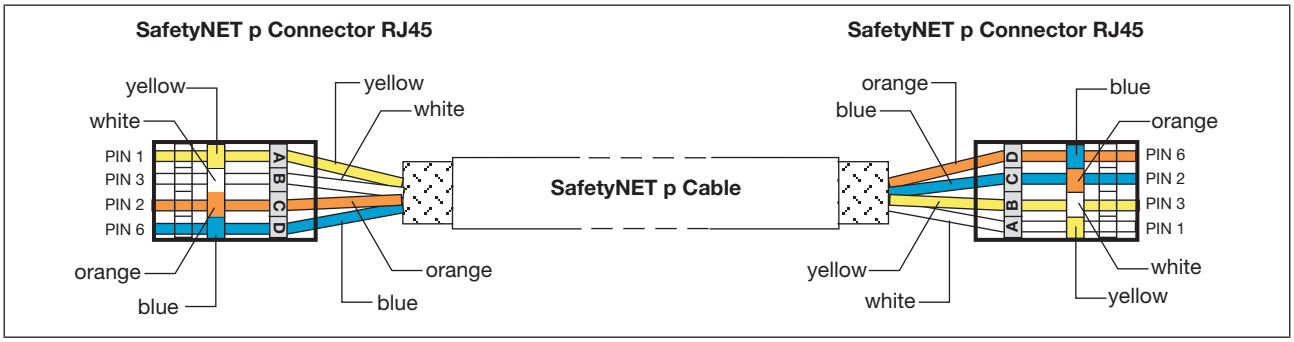
## Base units
PNOZ mm0.2p

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

| RJ45 socket<br>8-pin | PIN | Layout |
|---|---|---|
|  | 1 | CA+ |
| | 2 | CA- |
| | 3 | CB+ |
| | 4 | n.c. |
| | 5 | n.c. |
| | 6 | CB- |
| | 7 | n.c. |
| | 8 | n.c. |
| | Shield | CGround |




Connection of two base units PNOZmulti Mini via the integrated interface

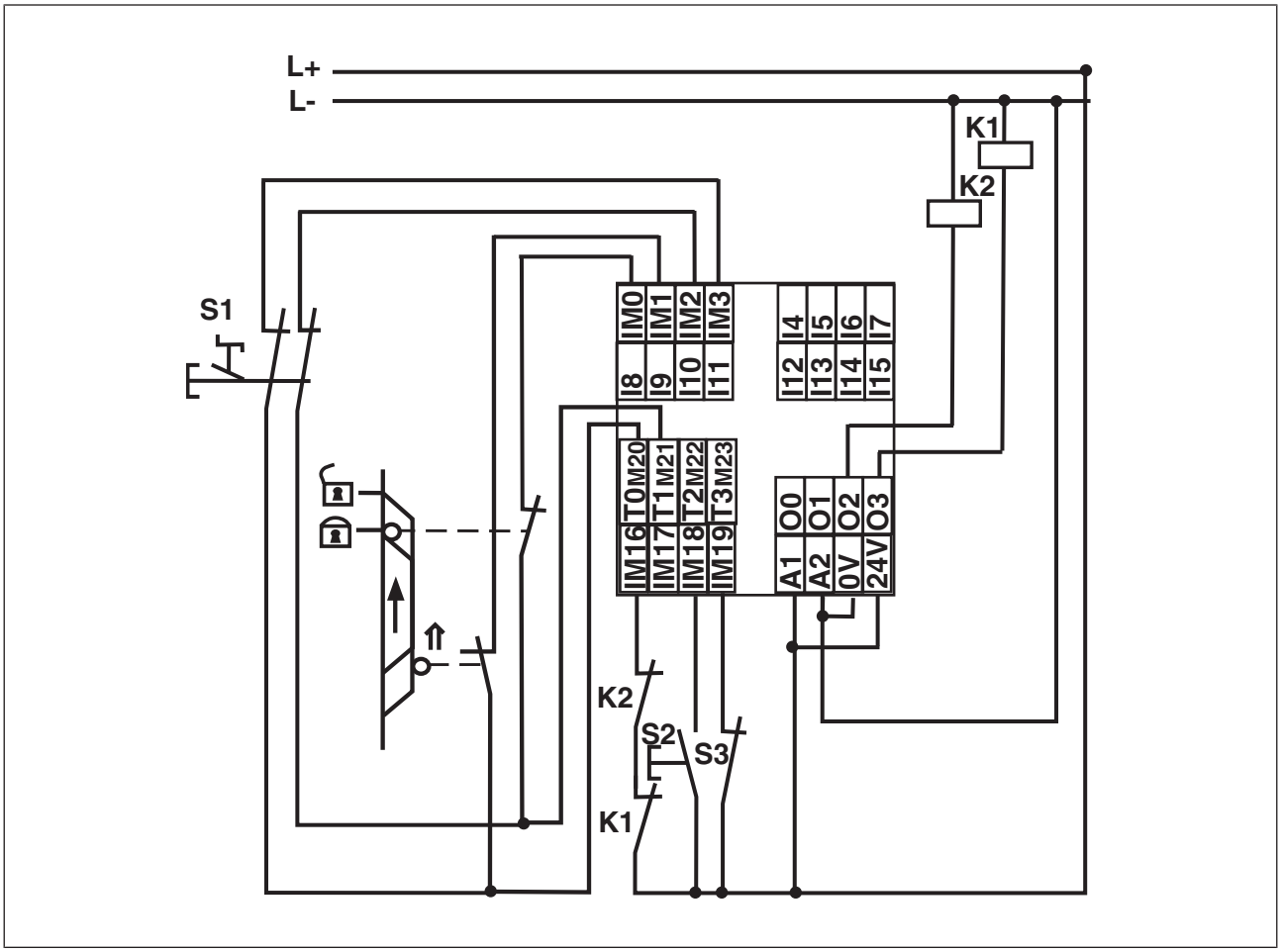



Connection cable configuration when using:
- 2 plug-in connectors "SafetyNET p Connector RJ45"
- 1 connection cable "SafetyNET p Cable"
(available as accessory, see order reference)

# Base units
PNOZ mm0.2p

## Connection examples

Dual-channel E-STOP and safety gate wiring, monitored start (IM18), feedback loop (IM16)




Reaction time $t_{SUM}$ between base unit Base 1 and Base 2:
Input delay $t_{ON}$ at I4 and I6 + data transmission time1 * $t_{BUS}$ through link module/interface + switch-off delay $t_{COND}$ of the semiconductor output at O0

$t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$

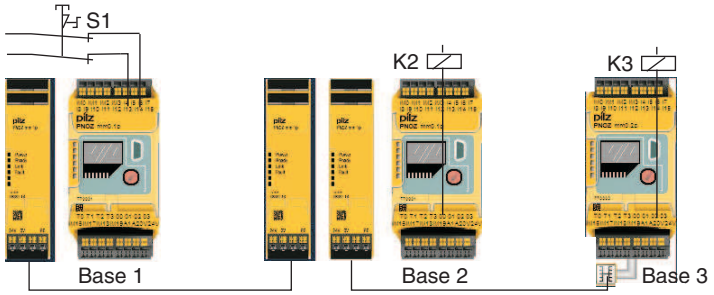
$t_{SUM}$ = 4 ms + (1 * 35 ms ) + 30 ms = 69 ms

Reaction time $t_{SUM}$ between base unit Base 1 and Base 3:
Input delay $t_{ON}$ at I4 und I6 + data transmission time 2 * $t_{BUS}$ through link modules/interfaces + switch-off delay $t_{COND}$ of the semiconductor output at O1

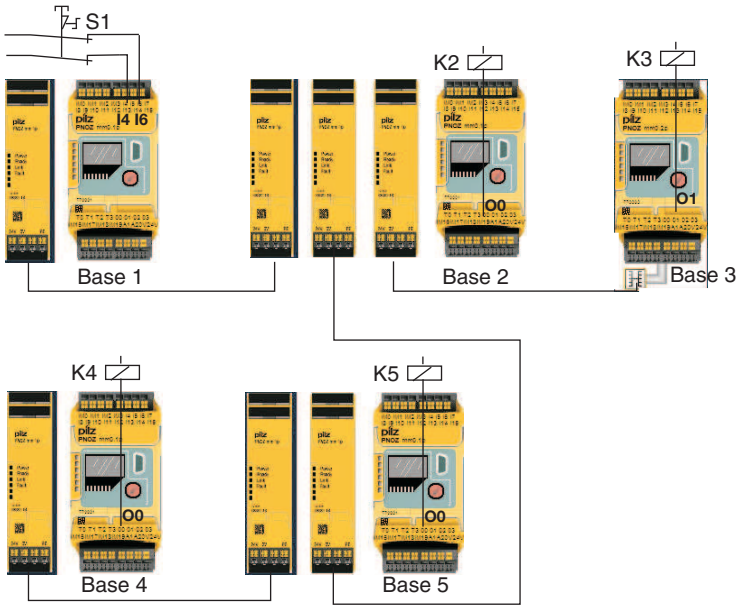
$t_{SUM} = t_{ON} + (n * t_{BUS} ) + t_{COND}$

$t_{SUM}$ = 4 ms + (2 * 35 ms ) + 30 ms = 104 ms

## Base units
PNOZ mm0.2p




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 2: 69 ms
O1 on Base 3: 104 ms
O0 on Base 4: 139 ms
O0 on Base 5: 104 ms



# Base units
PNOZ mm0.2p

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), KCC, TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Supply to the system** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **35,0 W** |
| Output of external power supply (DC) at no load | **8,0 W** |
| Residual ripple DC | **5 %** |
| Supply voltage | |
| for | **Supply to the SC outputs** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **192,0 W** |
| Status indicator | **Display, LED** |
| **Configurable inputs/outputs (inputs or auxiliary outputs)** | |
| Number | **8** |
| Galvanic isolation | **No** |
| Configurable inputs | |
| Input voltage in accordance with EN 61131-2 Type 1 | **24,0 V** |
| Input current at rated voltage | **5 mA** |
| Min. pulse duration | **16 ms** |
| Pulse suppression | **0,6 ms** |
| Signal level at "1" | **15 ... 30 V DC** |
| Signal level at "0" | **-3 ... +5 V DC** |
| Maximum input delay | **4,0 ms** |
| Configurable auxiliary outputs | |
| Voltage | **24,0 V** |
| Output current | **75 mA** |
| Power | **1,8 W** |
| Short circuit-proof | **yes** |
| Residual current at "0" | **0,5 mA** |
| Voltage at "1" | **UB - 2 V at 0.1 A** |

## Base units
PNOZ mm0.2p

| | |
|---|---|
| **Virtual inputs** | |
| Number of virtual inputs | **32** |
| **Inputs** | |
| Number | **12** |
| Signal level at "0" | **-3 - +5 V DC** |
| Signal level at "1" | **15 - 30 V DC** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** |
| Input current at rated voltage | **5 mA** |
| Min. pulse duration | **16 ms** |
| Pulse suppression | **0,6 ms** |
| Maximum input delay | **4 ms** |
| Potential isolation | **No** |
| **Virtual outputs** | |
| Number of virtual outputs | **32** |
| **Semiconductor outputs** | |
| Number | **4** |
| Switching capability | |
| Voltage | **24 V** |
| Current | **2,0 A** |
| Power | **48 W** |
| Signal level at "1" | **UB - 0.5 VDC at 2 A** |
| Residual current at "0" | **0,5 mA** |
| Max. capacitive load | **1 µF** |
| Max. duration of off time during self test | **330 µs** |
| Switch-off delay | **30 ms** |
| Potential isolation | **yes** |
| Short circuit-proof | **yes** |
| **Test pulse outputs** | |
| Number of test pulse outputs | **4** |
| Voltage | **24 V** |
| Current | **0,1 A** |
| Max. duration of off time during self test | **5 ms** |
| Short circuit-proof | **yes** |
| Potential isolation | **No** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| Simultaneity, channel 1 and 2 max. | **3 s** |
| Simultaneity in the two-hand circuit | **0,5 s** |
| Max. data transmission time | **35 ms** |

# Base units
## PNOZ mm0.2p

| | |
|---|---|
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| Max. operating height above sea level | **2000 m** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1 g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15 g** |
| Duration | **11 ms** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Rated impulse withstand voltage | **2,50 kV** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **SC output and system voltage** |
| Type of potential isolation | **Basic insulation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |

# Base units
PNOZ mm0.2p

| Mechanical data | |
|---|---|
| Max. cable length | |
| Max. cable length per input | **1,0 km** |
| Sum of individual cable lengths at the test pulse output | **2 km** |
| Max. cable length between two link modules | **1 km** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9,0 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **45,0 mm** |
| Depth | **120,0 mm** |
| Weight | **236 g** |

Where standards are undated, the 2011-01 latest editions shall apply.

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **1,54E-09** | **20** |
| Expansion right | – | **PL e** | **Cat. 4** | **SIL CL 3** | **2,13E-10** | **20** |
| Expansion left | – | **PL e** | **Cat. 4** | **SIL CL 3** | **2,38E-10** | **20** |
| Link interface | – | **PL e** | **Cat. 4** | **SIL CL 3** | **6,53E-10** | **20** |

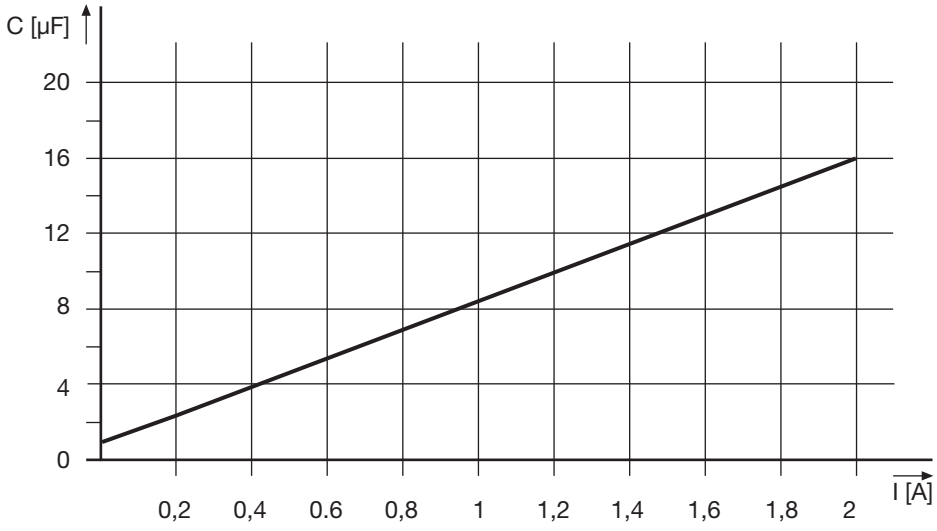
## Base units
PNOZ mm0.2p

| | | | | | | |
|---|---|---|---|---|---|---|
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **3,95E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,61E-10** | **20** |
| SC inputs | **Short circuit-forming safety mats** | **PL d** | **Cat. 3** | **SIL CL 2** | **1,86E-09** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **3,95E-10** | **20** |
| **Output** | | | | | | |
| SC outputs | **1-channel with advanced fault detection** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,65E-10** | **20** |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **8,90E-10** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,86E-10** | **20** |

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

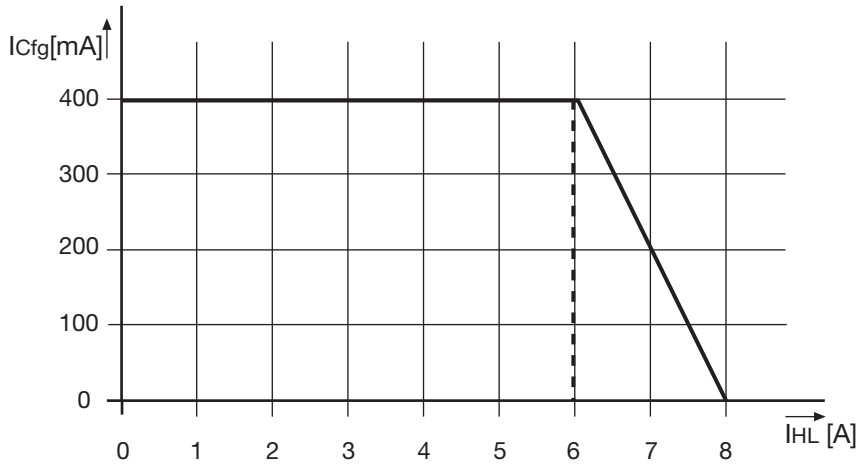
## Supplementary data

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



# Base units
PNOZ mm0.2p

### Maximum permitted total current of the semiconductor outputs




$I_{Cfg}$: Total current of the configurable semiconductor outputs (auxiliary outputs)

$I_{HL}$: Total current: Semiconductor outputs (safety outputs)

## Order reference

| Order reference | | |
|---|---|---|
| | | |

| Product Type | Features | Order no. |
|---|---|---|
| PNOZ mm0.2p | Base unit | 772 002 |

**Terminals**

| Product type | Features | Order no. |
|---|---|---|
| PNOZ s Set1 spring loaded terminals | 1 set of spring-loaded terminals | 751 008 |
| PNOZ s Set1 screw terminals | 1 set of screw terminals | 750 008 |

**Terminator**

| Product type | Features | Order No. |
|---|---|---|
| PNOZ s terminator plug | Right terminator, yellow, x10 | 750 010 |
| PNOZ mm0.xp terminator left | Left terminator, black/yellow, x1 | 779 261 |

## Base units
PNOZ mm0.2p

| Order reference: Cable | | |
|---|---|---|
| | | |

| Product Type | Features | Order no. |
|---|---|---|
| PSSu A USB-CAB03 | Mini USB cable, 3 m | 312 992 |
| PSSu A USB-CAB05 | Mini USB cable, 5 m | 312 993 |
| SafetyNET p Connector RJ45 | RJ45 plug-in connector | 380 400 |
| SafetyNET p Cable | SafetyNET p cable, 1 - 500 m | 380 000 |

# Link modules
PNOZ mml1p

## Overview

### Unit features

Using the product PNOZ mml1p:

Link module to safely connect two configurable control systems PNOZmulti Mini.

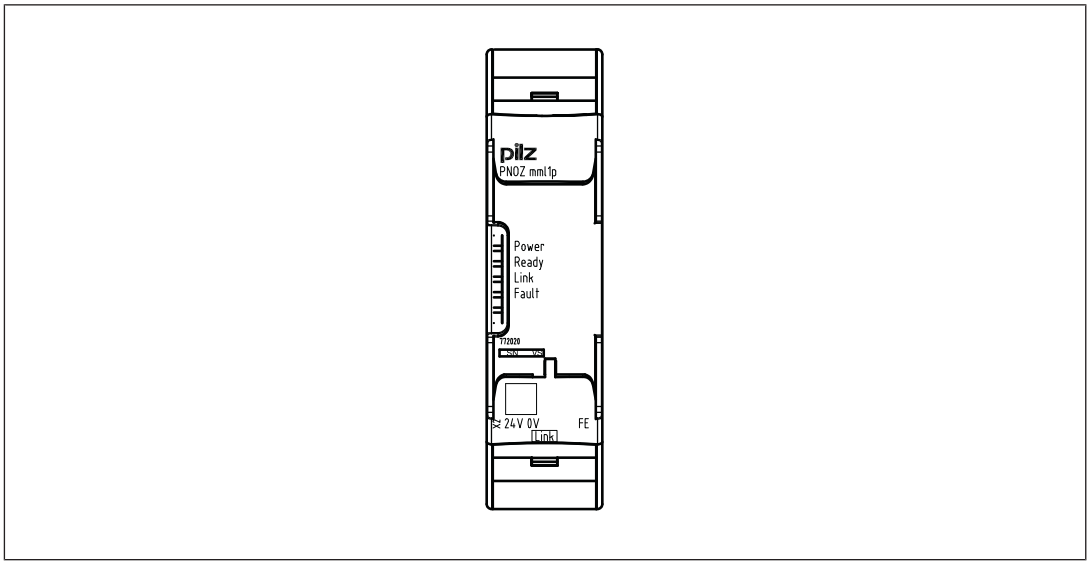
The product has the following features:

- Connection options:
  - Two PNOZmulti Mini base units

    or
  - One PNOZmulti Mini base unit with one PNOZmulti base unit
- Can be configured in the PNOZmulti Configurator
- Point-to-point connection via 4-core shielded and twisted-pair cable
- 32 virtual inputs and 32 virtual outputs
- Status indicators
- LED indicators for
  - Operating status
  - Error
  - Connection status
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

# Link modules
PNOZ mml1p

### Front view




Key:

- X2:
  - 0 V, 24 V:Supply connections
  - FE: Functional earth
- Link:
  Connection
- LEDs:
  - Power
  - Ready
  - Link
  - Fault

## Function Description

### Functions

The link module PNOZ mml1p is used to safely transfer the input information from 32 virtual inputs and 32 virtual outputs between two PNOZmulti systems. One link module is assigned to each base unit. Data is exchanged cyclically.

The function of the inputs and outputs on the control 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.

# Link modules
PNOZ mml1p

The LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the control 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 link module. This output data is immediately sent to the link module on the other base unit.
- At the same time, the base unit reads the input data from the link module.

**Connection of multiple base units:**

Any number of base units can be connected via link modules. Two link modules are required for a connection between two base units. However, only a maximum of 4 link 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**

This 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

- On semiconductor outputs:

  $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$
- On 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 link modules is multiplied by the number of connections.
- Please refer to the connection examples under "Preparing for operation".

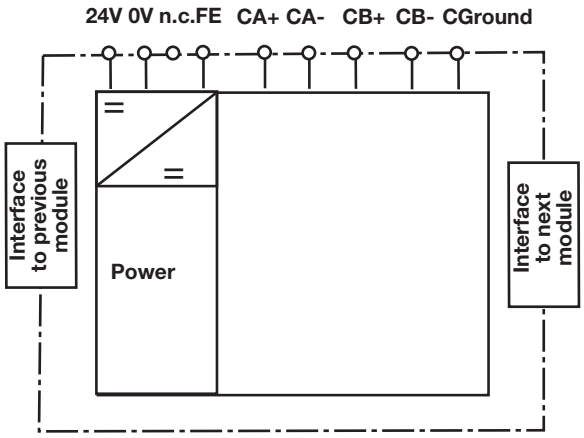
# Link modules
PNOZ mml1p

**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.

| Base unit 1 | | Base unit 2 |
|---|---|---|
| Virtual outputs | | Virtual inputs |
| o0 | ⇨ | i0 |
| ... | ⇨ | ... |
| o31 | ⇨ | i31 |
| Virtual inputs | | Virtual outputs |
| i0 | ⇦ | o0 |
| ... | ⇦ | ... |
| i31 | ⇦ | o31 |

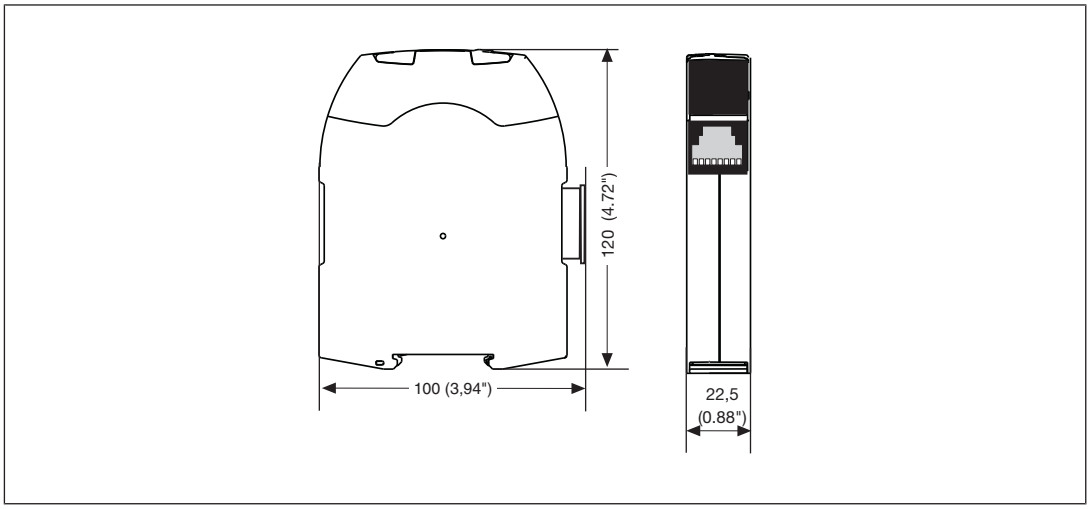
## Block diagram



# Link modules
PNOZ mml1p

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

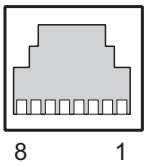
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

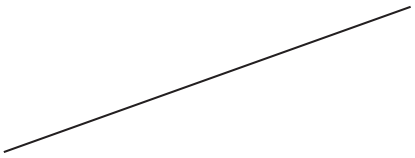
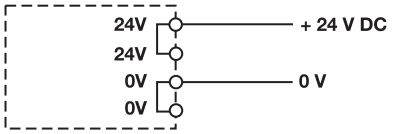
Please note:

- Information given in the Technical details [📖 574] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- The power supply must meet the regulations for extra low voltages with protective separation.
- 2 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. The current at each terminal may not exceed 3 A.
- The max. cable length between two link modules on a connection with one link module
  - PNOZ ml1p <V2.0: 100 m
  - PNOZ ml1p from V2.0, PNOZ mml1p: 1000 m
- Connect the inputs and outputs from two link modules with 4-core shielded cable. The cables must be twisted in pairs.
- Note the crossover cabling, e.g. CA+ with CB+.
- The cables must be classified into a minimum of Category 5 in accordance with ISO/IEC 11801.

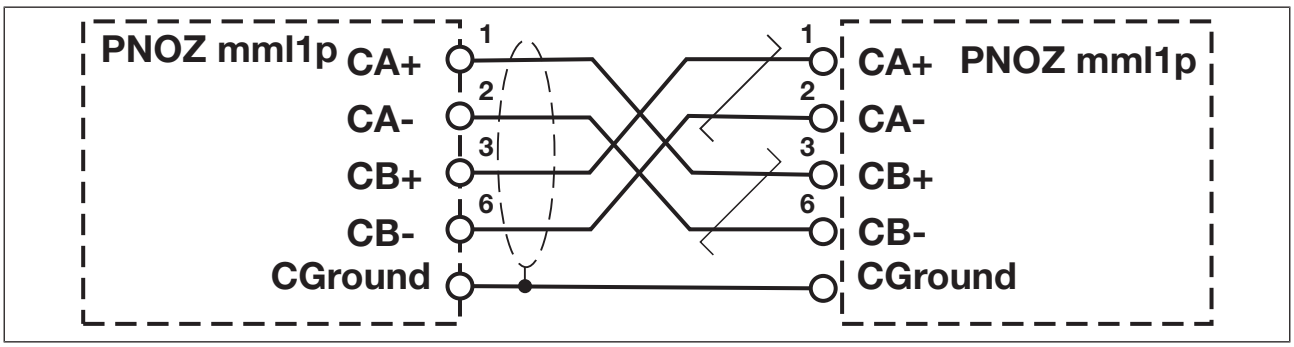
# Link modules
PNOZ mml1p

## Connection

| RJ45 socket<br>8-pin | PIN | Layout |
|---|---|---|
|  | 1 | CA+ |
| | 2 | CA- |
| | 3 | CB+ |
| | 4 | n.c. |
| | 5 | n.c. |
| | 6 | CB- |
| | 7 | n.c. |
| | 8 | n.c. |
| | Shield | CGround |

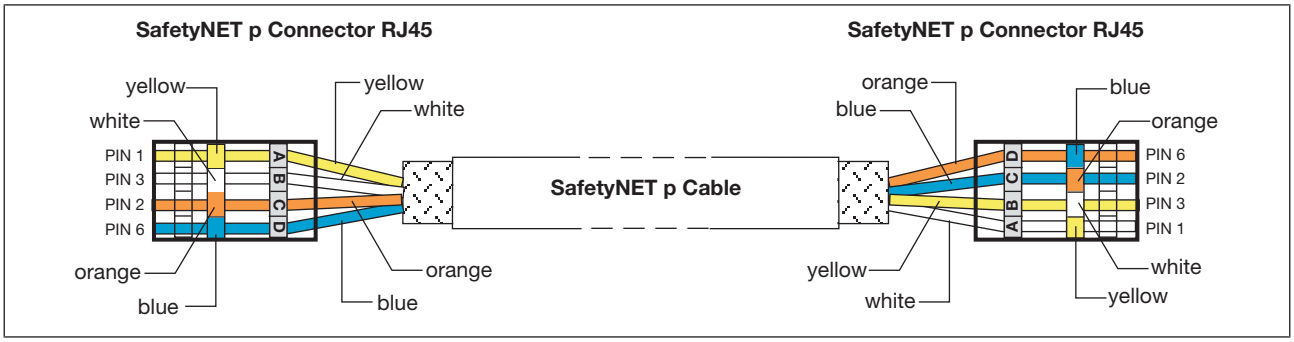
| Supply voltage | AC | DC |
|---|---|---|
| |  |  |

Supply voltage




Connection of two base units PNOZmulti Mini via PNOZ mml1p

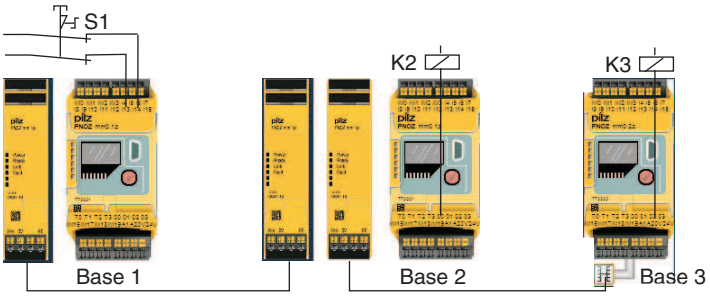
## Link modules
PNOZ mml1p




Connection cable configuration when using:
- 2 plug-in connectors "SafetyNET p Connector RJ45"
- 1 connection cable "SafetyNET p Cable"
(available as accessory, see order reference)

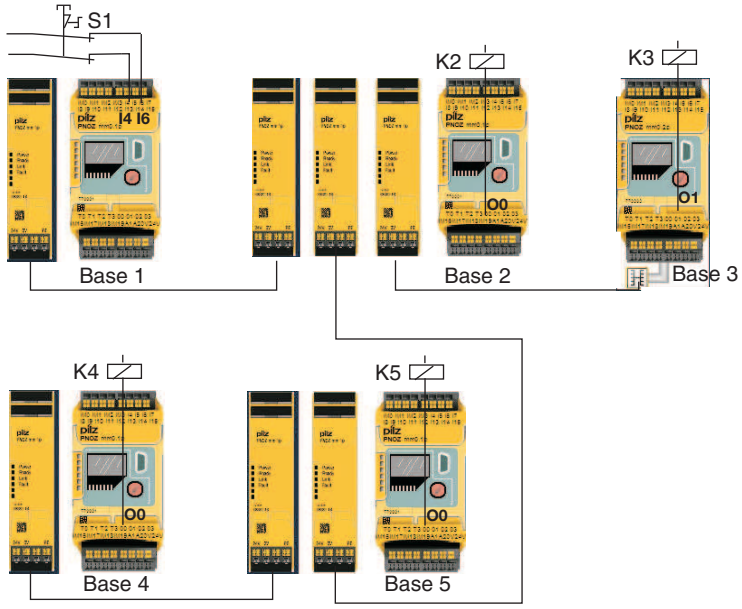
### Connection examples

Reaction time $t_{SUM}$ between base unit Base 1 and Base 2:
Input delay $t_{ON}$ at I4 and I6 + data transmission time1 * $t_{BUS}$ through link module/interface + switch-off delay $t_{COND}$ of the 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 I4 und I6 + data transmission time 2 * $t_{BUS}$ through link modules/interfaces + switch-off delay $t_{COND}$ of the semiconductor output at O1
$t_{SUM} = t_{ON} + (n * t_{BUS} ) + t_{COND}$
$t_{SUM}$ = 4 ms + (2 * 35 ms ) + 30 ms = 104 ms



## Link modules
PNOZ mml1p

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 2: 69 ms
O1 on Base 3: 104 ms
O0 on Base 4: 139 ms
O0 on Base 5: 104 ms




# Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **5,0 W** |
| Residual ripple DC | **5 %** |
| Status indicator | **LED** |
| **Virtual inputs** | |
| Number of virtual inputs | **32** |

# Link modules
PNOZ mml1p

| | |
|---|---|
| **Virtual outputs** | |
| Number of virtual outputs | **32** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| Max. data transmission time | **35 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Rated impulse withstand voltage | **2,50 kV** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |

# Link modules
PNOZ mml1p

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length between two link modules | **1 km** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **22,5 mm** |
| Depth | **120,0 mm** |
| Weight | **95 g** |

Where standards are undated, the 2011-01 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mml1p | Expansion module | 772 020 |

# Link modules
PNOZ mml1p

## Accessories

### Cable

| Product type | Features | Order no. |
|---|---|---|
| SafetyNET p Connector | RJ45 plug-in connector | 380 400 |
| SafetyNET p Cable | SafetyNET p cable, 1 - 500 m | 380 000 |

### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals PNOZ mmc2p, mml1p 1 pc. | Spring-loaded terminals, 1 pieces | 783 538 |
| Spring terminals PNOZ mmc2p,mml1p 10 pcs | Spring-loaded terminals, 10 pieces | 783 539 |
| Screw terminals PNOZ mmc2p, mml1p 1 pc. | Screw terminals, 1 piece | 793 538 |
| Screw terminals PNOZ mmc2p,mml1p 10 pcs. | Screw terminals, 10 piece | 793 539 |

### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Link modules
PNOZ mml2p

## Overview

### Unit features

Using the product PNOZ mml2p:

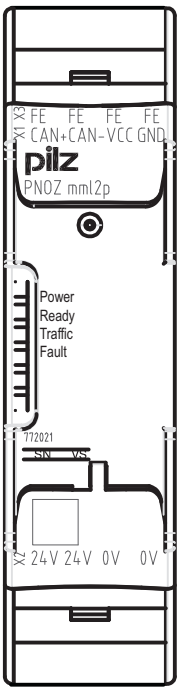
Link module to safely connect decentralised input/output modules to a configurable control system PNOZmulti Mini.

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Max. 4 PNOZ mml2p can be connected to the base unit
- Max. 4 decentralised modules can be connected to the link module PNOZ mml2p
- LEDs for
  - Operating state
  - Error
  - Connection status
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

# Link modules
PNOZ mml2p

### Front view




Key:

- 0 V, 24 V:
  Supply connections
- CAN+, CAN-, VCC, GND:
  Connection for decentralised modules
- FE:
  Functional earth

## Function description

### Operation

The link module PNOZ mml2p is used to safely transfer the input information from decentralised modules to the safety system PNOZmulti.

The function of the inputs and outputs on the control 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 LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

# Link modules
PNOZ mml2p

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

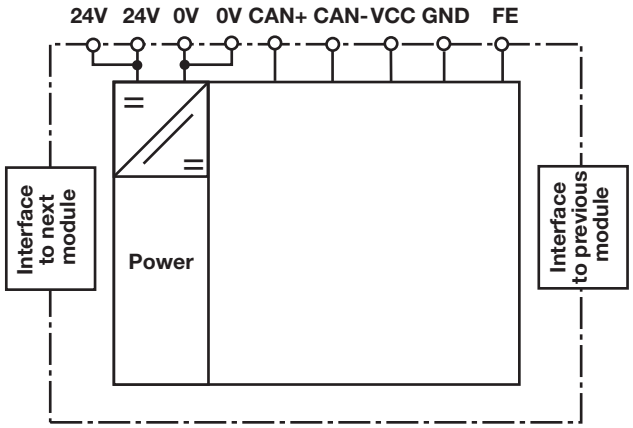
**Data exchange:**

- Communication with the decentralised modules is via a safe data link.
- The link module PNOZ mml2p reads the input information from the decentralised modules as part of each cycle and then forwards it to the base unit.
- At the end of a PNOZmulti cycle, the base unit sends its output data to its link module. This output data is immediately sent to the decentralised modules.

**Linking several decentralised modules:**

- A maximum of 4 link modules can be connected to a base unit PNOZmulti Mini.
- A maximum of 4 decentralised modules can be connected to a link module PNOZ mml2p.
- If a decentralised module receives data intended for a different decentralised module that is connected, the data is forwarded without being processed.

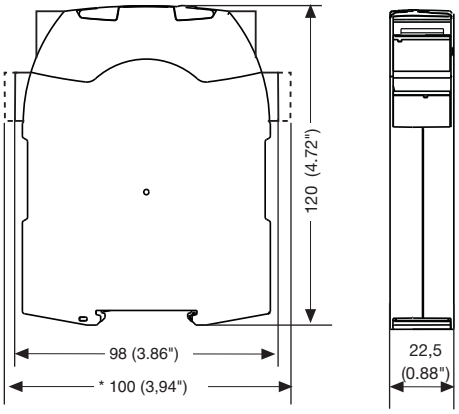
## Block diagram



# Link modules
PNOZ mml2p

## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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

Please note:

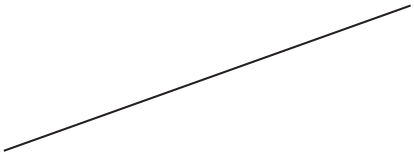
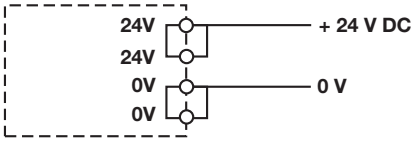
- Information given in the Technical details [📖 585] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- External measures must be used to connect the FE terminal to the function earth (e.g. mounting rail).
- The power supply must meet the regulations for extra low voltages with protective 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. When the supply voltage is looped, the current at each terminal may not exceed 3 A.
- Please refer to the technical details for information on the maximum cable length. Please also read the section entitled Voltage drop [📖 583].
- Shielded cable must be used from a cable length of 30 m.
- Pilz pre-assembled cable can be used to connect the decentralised modules (see Order references [📖 587]).

# Link modules
PNOZ mml2p

- The plug-in connection terminals are either designed as cage clamp terminals or screw terminals (see Order references [📖 587]).

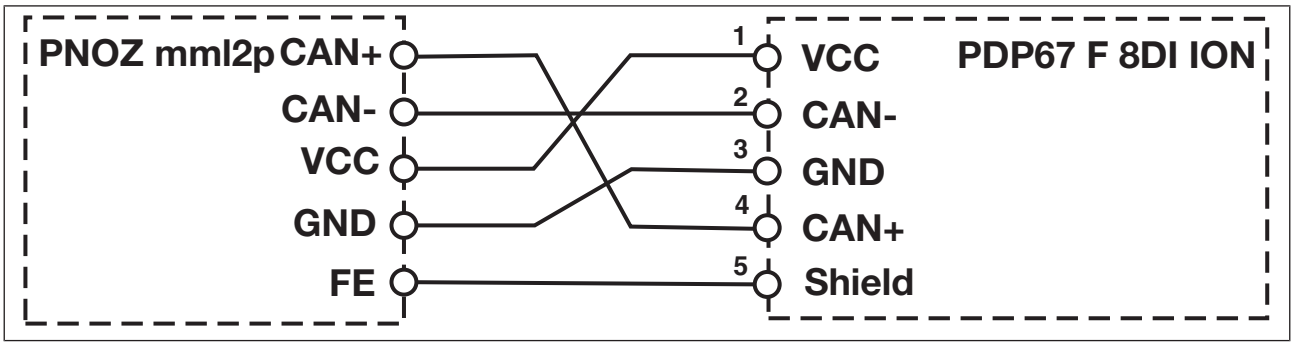
The product PNOZ mml2p is connected to functional earth ⏚ via protection elements on the supply voltage. Insulation voltage tests are only possible with voltages up to ca. 42 V.

## Connection

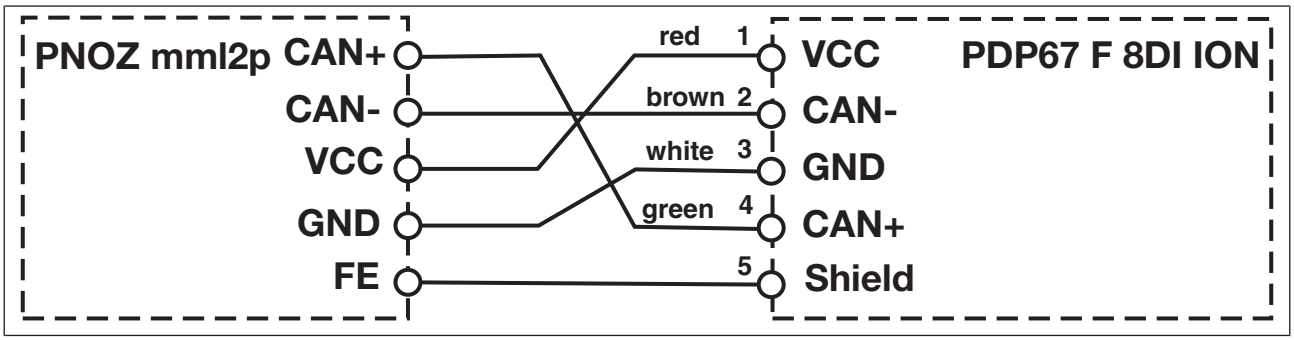
| Supply voltage | AC | DC |
|---|---|---|
| |  |  |



Supply voltage




Connection to a decentralised input module PDP67

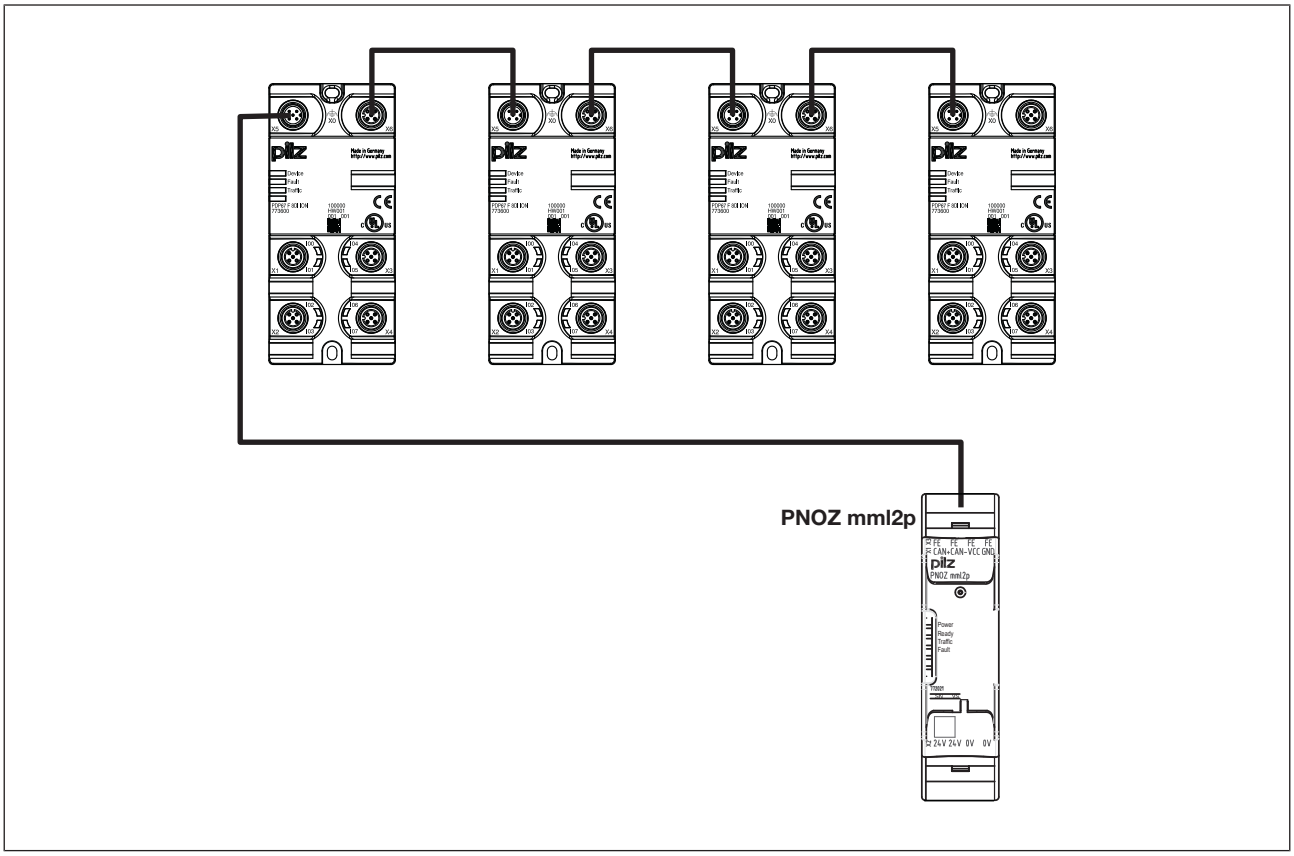



Connection when using the PSS SB BUSCABLE LC in conjunction with a Pilz self-assembly "PSS67 M12 connector" (see order reference in the Technical Catalogue)

# Link modules
PNOZ mml2p

### Series connection of 4 decentralised modules

You can connect up to 4 decentralised modules in series to a PNOZmulti link module.




### Voltage drop

The max. cable length depends on the voltage drop in the supply voltage cables. The level of voltage drop is determined by the:

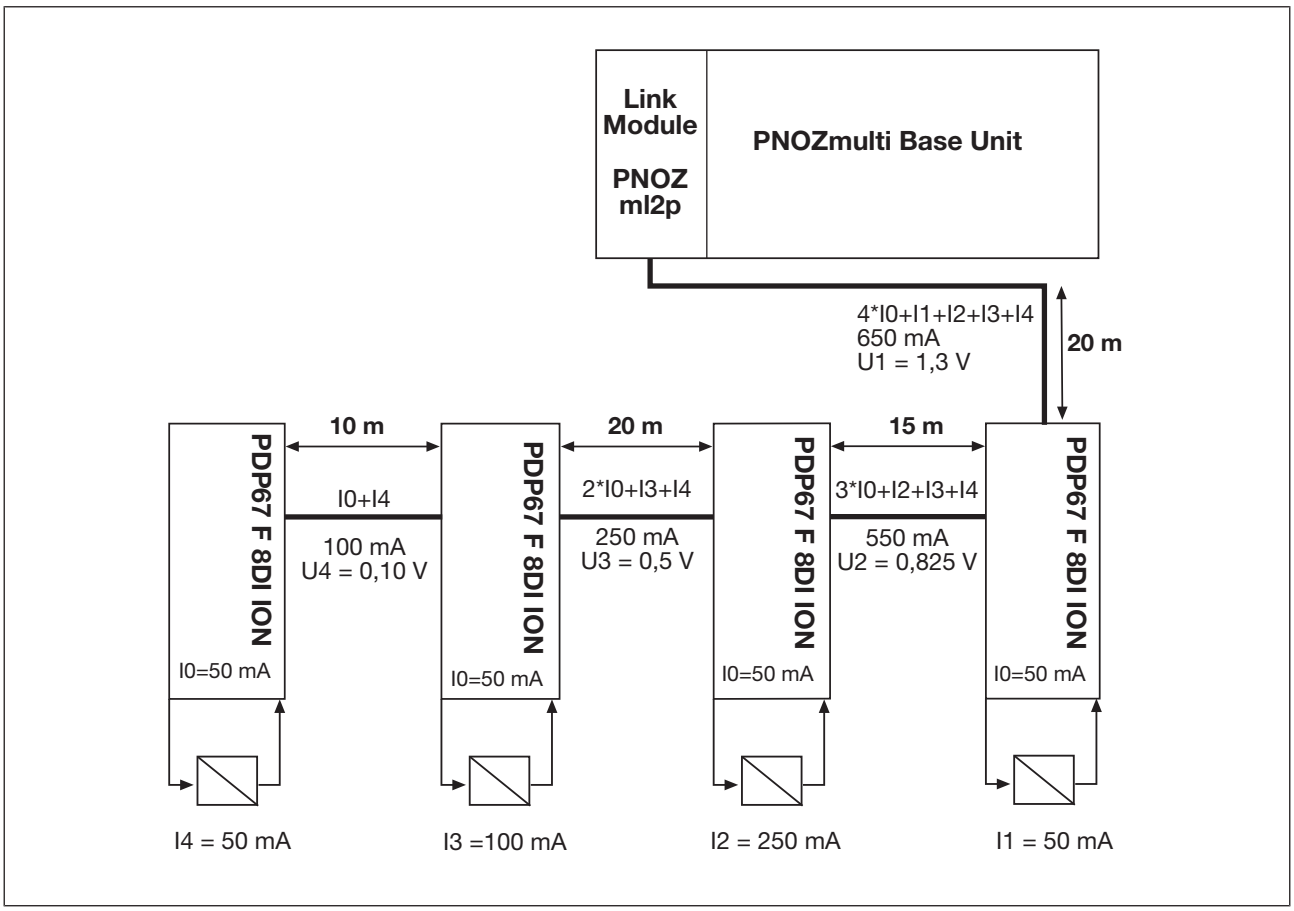
- Cable resistance on the supply voltage cables
- Operating current of the modules
- Load on the modules

To increase the max. cable length, the input voltage can be permanently increased by the voltage tolerance (see Technical Details).

| Cable type | Voltage drop per 10 m and per 100 mA |
|---|---|
| PSS SB BUSCABLE LC | 0.1 V |
| Sensor cable 0.25 $mm^2$ | 0.15 V |
| Sensor cable 0.34 $mm^2$ | 0.11 V |
| Sensor cable 0.5 $mm^2$ | 0.07 V |

## Link modules
PNOZ mml2p

- The PSS SB BUSCABLE LC is used in accordance with the pin assignment in section 6.2.2.
  Voltage drop per 10 m and per 100 mA: 0.1 V




Key:

- I0: Module's consumption.
- I1 ... I5: Load current taken from the module
- U1 … U4: Voltage drop on the respective connection path

Total voltage drop from the link module PNOZ mml2p to the final PDP67 F 8DI ION:
$U_{total} = U_1 + U_2 + U_3 + U_4$
$U_{total}$ = 1.3 V + 0.825 V + 0.5 V + 0.10 V = 2.725 V

# Link modules
PNOZ mml2p

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **101,0 W** |
| Output of external power supply (DC) at no load | **5,0 W** |
| Residual ripple DC | **5 %** |
| Status indicator | **LED** |
| **Inputs** | |
| Maximum input delay | **15 ms** |
| **Semiconductor outputs** | |
| Switch-off delay | **35 ms** |
| **Test pulse outputs** | |
| Maximum output current, decentralised module supply | **4 A** |
| Short circuit protection of decentralised module supply | **yes** |
| **Times** | |
| Switch-on delay | **5,00 s** |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |

# Link modules
PNOZ mml2p

| | |
|---|---|
| **Environmental data** | |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Number of shocks | **3** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| In accordance with the standard | **EN 60068-2-27** |
| Number of shocks | **500** |
| Acceleration | **25g** |
| Duration | **6 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Rated impulse withstand voltage | **0,50 kV** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length unshielded | **30 m** |
| Max. cable length shielded | **100 m** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |

# Link modules
PNOZ mml2p

| Mechanical data | |
|---|---|
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **22,5 mm** |
| Depth | **120,0 mm** |
| Weight | **98 g** |

Where standards are undated, the 2011-01 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mml2p | Link Module | 772 021 |

### Accessories

#### Adapter

| Product type | Features | Order No. |
|---|---|---|
| PSEN ma adapter | Adapter for connection to safety switch PSENmag | 380 300 |
| PSEN cs adapter | Adapter for connection to safety switch PSENcode | 380 301 |
| PSEN sl adapter | Adapter for connection to safety switch PSENslock | 380 325 |

#### Cable

| Product type | Features | Order No. |
|---|---|---|
| PSS SB BUSCABLE LC | Cable, shielded, 1 - 100 m | 311074 |
| PSS67 I/O Cable | Cable, 1 - 30 m | 380 320 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 3 m | 380 200 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 5 m | 380 201 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 10 m | 380 202 |

## Link modules
PNOZ mml2p

| Product type | Features | Order No. |
|---|---|---|
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 30 m | 380 203 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 3m | 380 204 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 5 m | 380 205 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 10 m | 380 206 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 30 m | 380 207 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 3m | 380 208 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 5 m | 380 209 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 10 m | 380 210 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 20 m | 380 220 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 30 m | 380 211 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 3m | 380 212 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 5 m | 380 213 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 10 m | 380 214 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 30 m | 380 215 |
| PSEN op cable axial M12 5-pole 3m | Cable, straight, M12, 5-pin, open-ended socket, 3 m | 630310 |
| PSEN op cable axial M12 5-pole 5m | Cable, straight, M12, 5-pin, open-ended socket, 5 m | 630311 |
| PSEN op cable axial M12 5-pole 10m | Cable, straight, M12, 5-pin, open-ended socket, 10 m | 630312 |
| PSEN op cable axial M12 5-pole 20m | Cable, straight, M12, 5-pin, open-ended socket, 20 m | 630298 |
| PSEN op cable axial M12 5-pole 30m | Cable, straight, M12, 5-pin, open-ended socket, 30 m | 630297 |

# Link modules
PNOZ mml2p

### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Spring terminals PNOZ mml2p 1 pc. | Spring-loaded terminals, 1 pieces | 783 540 |
| Spring terminals PNOZ mml2p 10 pcs. | Spring-loaded terminals, 10 pieces | 783 541 |
| Screw terminals PNOZ mml2p 1 pc. | Screw terminals, 1 piece | 793 540 |
| Screw terminals PNOZ mml2p 10 pcs. | Screw terminals, 10 pieces | 793 541 |

### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

### Connector

| Product type | Features | Order No. |
|---|---|---|
| PSS67 M12 connector | Connector, M12, straight, 5-pin, A-coded | 380 308 |
| PSS67 M12 connector | Socket, M12, straight, 5-pin, A-coded | 380 309 |
| PSS67 M12 connector | Connector, M12, angled, 5-pin, A-coded | 380 310 |
| PSS67 M12 connector | Socket, M12, angled, 5-pin, A-coded | 380 311 |
| PSS67 M8 connector | Connector, M8, straight, 4-pin | 380 316 |
| PSS67 M8 connector | Socket, M8, straight, 4-pin | 380 317 |
| PSS67 M8 connector | Connector, M8, angled, 4-pin | 380 318 |
| PSS67 M8 connector | Socket, M8, angled, 4-pin | 380 319 |

# Communication modules
PNOZ mmc1p

## Overview

### Unit features

Using the product PNOZ mmc1p:

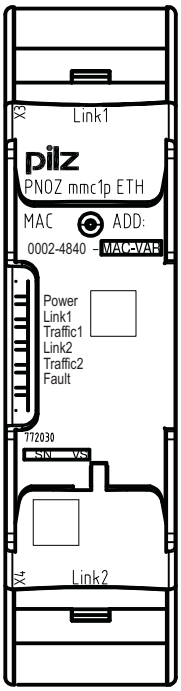
Communication module for connection to a base unit from the configurable control systems PNOZmultiMini.

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- 2 Ethernet interfaces
- Status indicators for supply voltage, communication and errors
- Max. 1 communication module can be connected to the left of the base unit PNOZmulti Mini

# Communication modules
PNOZ mmc1p

### Front view




**Legend:**

- Link1, Link2:
  Ethernet interfaces
- LEDs:
  - Power
  - Link1
  - Traffic1
  - Link2
  - Traffic2
  - Fault

## Function description

### Unit properties

The product PNOZ mmc1p has two Ethernet interfaces to

- Download the project
- Read the diagnostic data

# Communication modules
PNOZ mmc1p

- Set virtual inputs for standard functions
- Read virtual outputs for standard functions

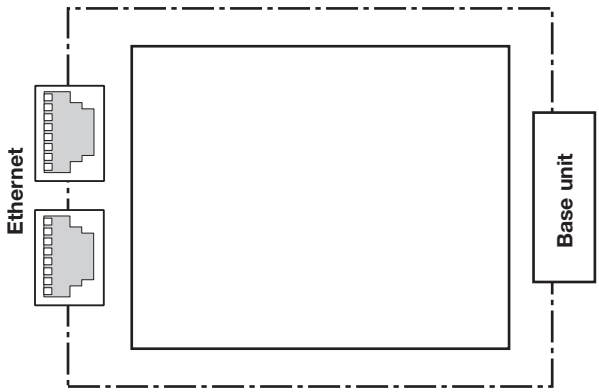
via Ethernet (TCP/IP, Modbus/TCP).

Information on diagnostics via the Ethernet interfaces can be found in the document entitled " PNOZmulti Mini communication interfaces".

The connection to Ethernet is made via the two 8-pin RJ45 sockets.

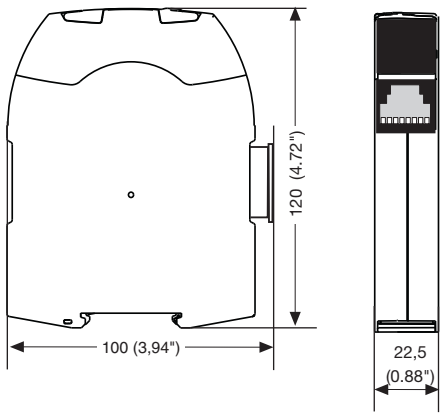
The Ethernet interface is configured in the PNOZmulti Configurator and is described in the online help for the PNOZmulti Configurator.

### Block diagram




## Installation

### Dimensions



# Communication modules
PNOZ mmc1p

## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [596] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.

### Preparing for operation

Detection and activation of the Ethernet interface, depending on the USB interface on the base unit:

- **USB interface on the base unit not connected**

  If the USB interface on the base unit is not connected, the Ethernet interface will be detected and activated by the base unit as soon as the communication module has been connected to the base unit.

- **USB interface on the base unit connected**

  If the USB interface on the base unit is already connected, the "Ethernet" interface will first need to be selected on the base unit display to enable the Ethernet interface on the base unit to be detected and activated (see operating manual for the base unit for details of the setting).

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

### Ethernet interfaces

Two free switch ports are provided as Ethernet interfaces via an internal autosensing switch. The autosensing switch automatically detects whether data transfer is occurring at 10 Mbit/s or 100 Mbit/s.

The switch's automatic crossover function means there is no need to distinguish on the connection cable between patch cable (uncrossed data line connection) and crossover cable (crossover data line connection). The switch automatically creates the correct data line connection internally. Patch cable can therefore be used as the connection cable for end devices as well as cascading.

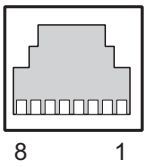
Both Ethernet interfaces use RJ45 technology.

The following minimum requirements must be met:

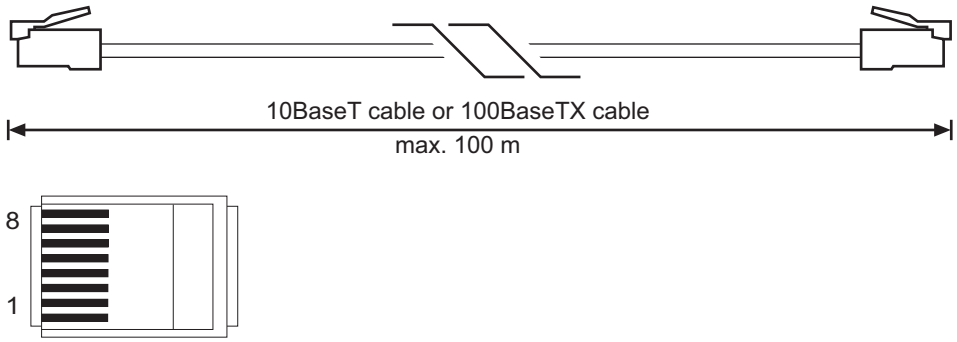
- Ethernet standards (min. Category 5) 10BaseT or 100BaseTX
- Double-shielded twisted pair cable for industrial Ethernet use

## Communication modules
PNOZ mmc1p

- Shielded RJ45 connectors (industrial connectors)

| RJ45 socket<br>8-pin | PIN | Standard | Crossover |
|---|---|---|---|
|  | 1 | TD+ (Transmit+) | RD+ (Receive+) |
| | 2 | TD- (Transmit-) | RD- (Receive-) |
| | 3 | RD+ (Receive+) | TD+ (Transmit+) |
| | 4 | n.c. | n.c. |
| | 5 | n.c. | n.c. |
| | 6 | RD- (Receive-) | TD- (Transmit-) |
| | 7 | n.c. | n.c. |
| | 8 | n.c. | n.c. |

**RJ45 connector**
**8-pin**




The RJ45 interfaces on the internal autosensing switch enable process data to be exchanged with other Ethernet subscribers within a network.

The product PNOZ mmc1p can also be connected to Ethernet via a hub (hub or switch).

## Communication modules
PNOZ mmc1p

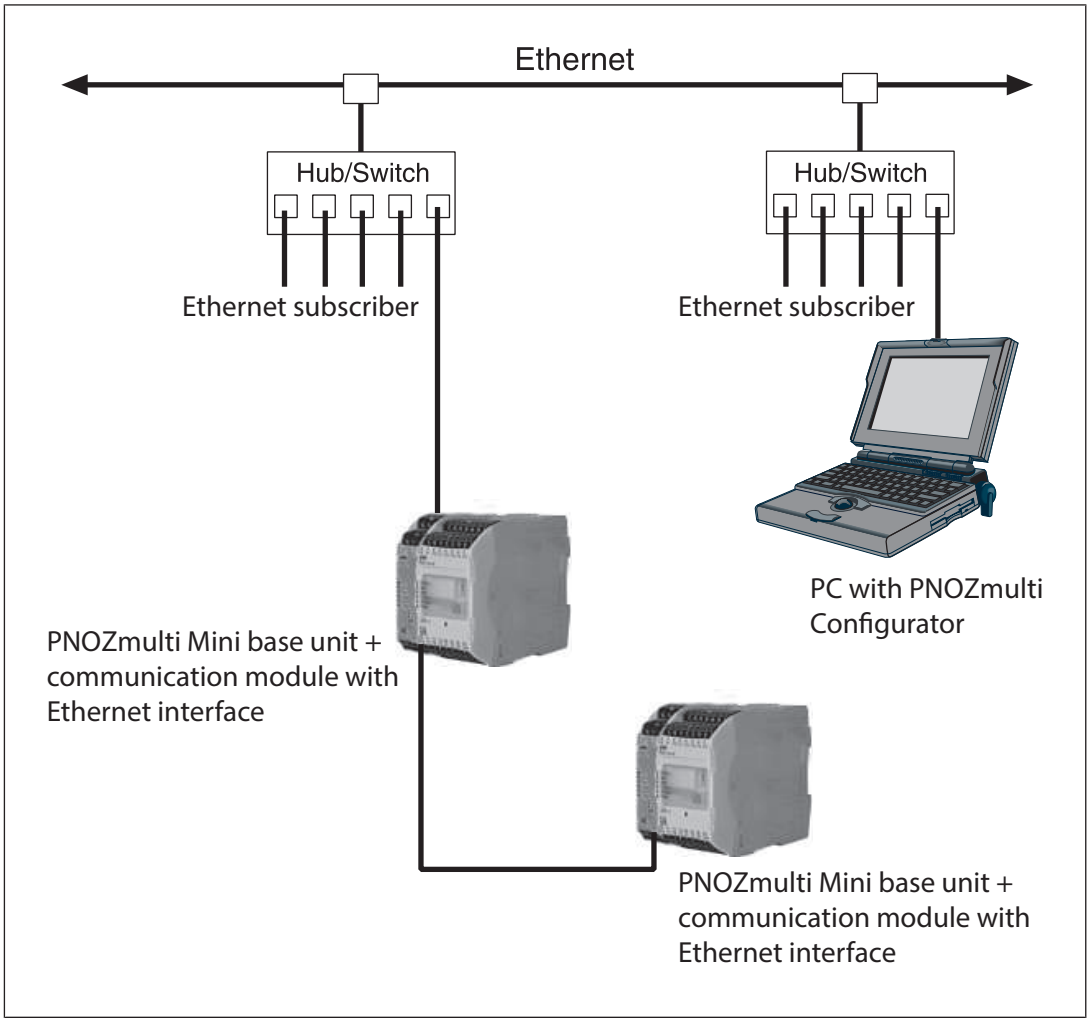



Fig.: PNOZmulti as Ethernet subscriber - possible topologies

## Communication modules
PNOZ mmc1p

# Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), KCC, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **3,3 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **1,0 W** |
| Status indicator | **LED** |
| **Ethernet interface** | |
| Number | **2** |
| **Fieldbus interface** | |
| Fieldbus interface | **Modbus TCP** |
| Device type | **Slave** |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |

# Communication modules
PNOZ mmc1p

| Environmental data | |
|---|---|
| Airgap creepage | |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **0,1 km** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **22,5 mm** |
| Depth | **120,0 mm** |
| Weight | **100 g** |

Where standards are undated, the 07/2010 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mmc1p ETH | Expansion module | 772 030 |

# Communication modules
PNOZ mmc1p

## Accessories

### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ s terminator plug | Terminator, yellow, 10 pieces | 750 010 |
| PNOZ s connector | Jumper, 10 pieces | 750 020 |

# Communication modules
PNOZ mmc2p

## Overview

### Unit features

Using the product PNOZ mmc2p:

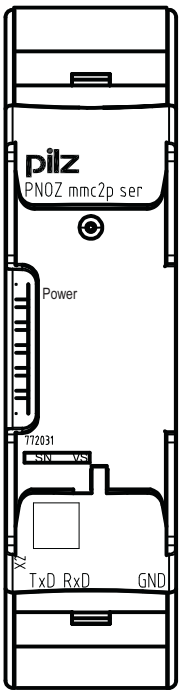
Communication module for connection to a base unit from the configurable control systems PNOZmultiMini.

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- 1 serial interface RS232
- Status indicator for supply voltage
- Max. 1 communication module can be connected to the left of the base unit PNOZmulti Mini
- Plug-in connection terminals (either cage clamp terminals or screw terminals)

# Communication modules
PNOZ mmc2p

### Front view




**Legend:**

- X2: Serial interface RS232
- LED:
  - Power

## Function description

### Functions

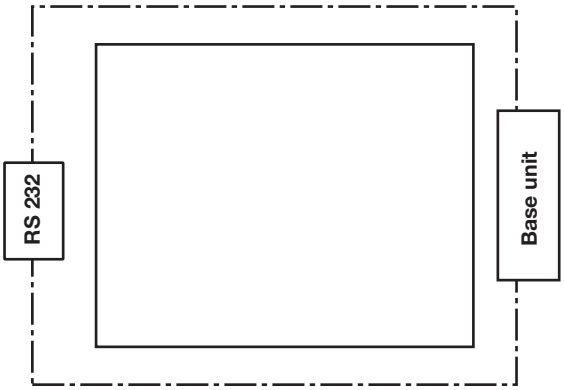
The product PNOZ mmc2p has a serial interface RS232 interface to

- Download the project
- Read the diagnostic data
- Set virtual inputs for standard functions
- Read virtual outputs for standard functions.

Information on diagnostics can be found in the document "Communication Interfaces".

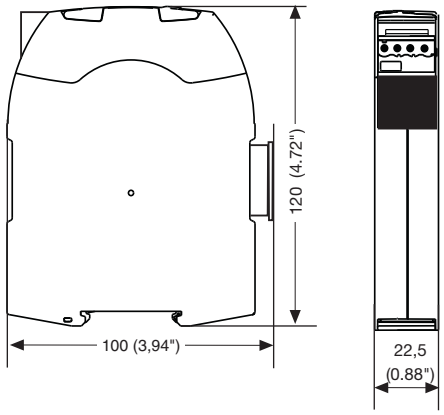
# Communication modules
PNOZ mmc2p

### Block diagram




## Installation

### Dimensions




## Commissioning

### General wiring guidelines

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

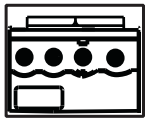
Please note:

- Information given in the Technical details [📖 602] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.

## Communication modules
PNOZ mmc2p

- Use copper wire that can withstand 75° C.

### Interface configuration

| Serial interface<br>RS232 | Standard |
|---|---|
|  <br>TxD RxD GND | TxD (Transmit) |
| | RxD (Receive) |
| | GND (Ground) |

### Preparing for operation

The serial interface RS 232 is activated and detected depending on the USB interface on the base unit:

- **USB interface on the base unit not connected**

  In this case, the serial interface RS 232 will be detected and activated by the base unit as soon as the communication module has been connected to the base unit.

- **USB interface on the base unit connected**

  If the USB interface on the base unit is already connected, the "External" interface will first need to be selected on the base unit display to enable the serial interface RS 232 on the base unit to be detected and activated (see operating manual for the base unit for details of the setting).

# Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), KCC, cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **3,3 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Power consumption | **30,0 mW** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Galvanic isolation | **No** |
| **Serial interface** | |
| Number of RS232 interfaces | **1** |

## Communication modules
PNOZ mmc2p

| | |
|---|---|
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **22,0 m** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |

# Communication modules
PNOZ mmc2p

| Mechanical data | |
|---|---|
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,50 - 1,50 mm², 22 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **22,5 mm** |
| Depth | **120,0 mm** |
| Weight | **85 g** |

Where standards are undated, the 07/2010 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mmc2p serial | Expansion module | 772 031 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals PNOZ mmc2p, mml1p 1 pc. | Spring-loaded terminals, 1 pieces | 783 538 |
| Spring terminals PNOZ mmc2p,mml1p 10 pcs | Spring-loaded terminals, 10 pieces | 783 539 |
| Screw terminals PNOZ mmc2p, mml1p 1 pc. | Screw terminals, 1 piece | 793 538 |
| Screw terminals PNOZ mmc2p,mml1p 10 pcs. | Screw terminals, 10 piece | 793 539 |

## Communication modules
PNOZ mmc2p

**Terminator, jumper**

| Product type | Features | Order No. |
|---|---|---|
| PNOZ s terminator plug | Terminator, yellow, 10 pieces | 750 010 |
| PNOZ s connector | Jumper, 10 pieces | 750 020 |

# Fieldbus modules
PNOZ mmc3p

## Overview

### Unit features

Using the product PNOZ mmc3p:

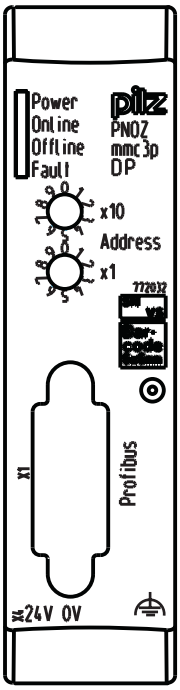
Expansion module for connection to a base unit from the configurable control system PNOZmulti Mini

The product has the following 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
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus PROFIBUS-DP . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mmc3p can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- For details of the PNOZmulti Mini base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
PNOZ mmc3p

### Front view




**Legend:**

- 0 V, 24 V:
  Supply connections
- X1: PROFIBUS-DP interface (female 9-pin D-Sub connector)
- ⏚: Functional earth
- LED:
  - Power
  - Online
  - Offline
  - Fault

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via PROFIBUS are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ mmc3p are connected via a jumper.

# Fieldbus modules
PNOZ mmc3p

The station address is set via rotary switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module PNOZ mmc3p is configured and started automatically.

LEDs indicate the status of the expansion module on PROFIBUS.

The configuration is described in detail in the PNOZmulti Configurator's online help.

## Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

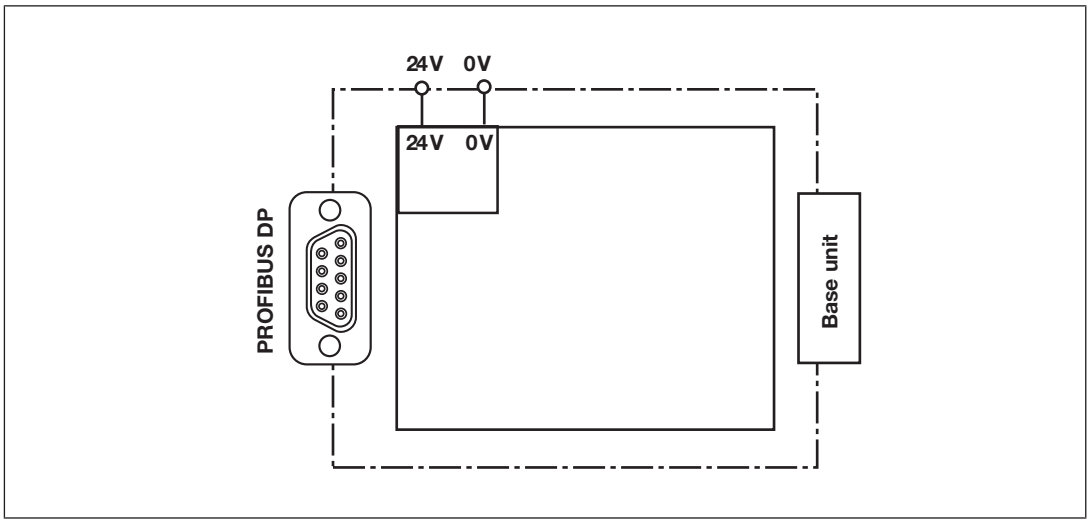
## Assigning the inputs/outputs in the PNOZmulti Configurator to the PROFIBUS-DP inputs/outputs

| | | | |
|---|---|---|---|
| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
| Input data PROFIBUS-DP | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data PROFIBUS-DP | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

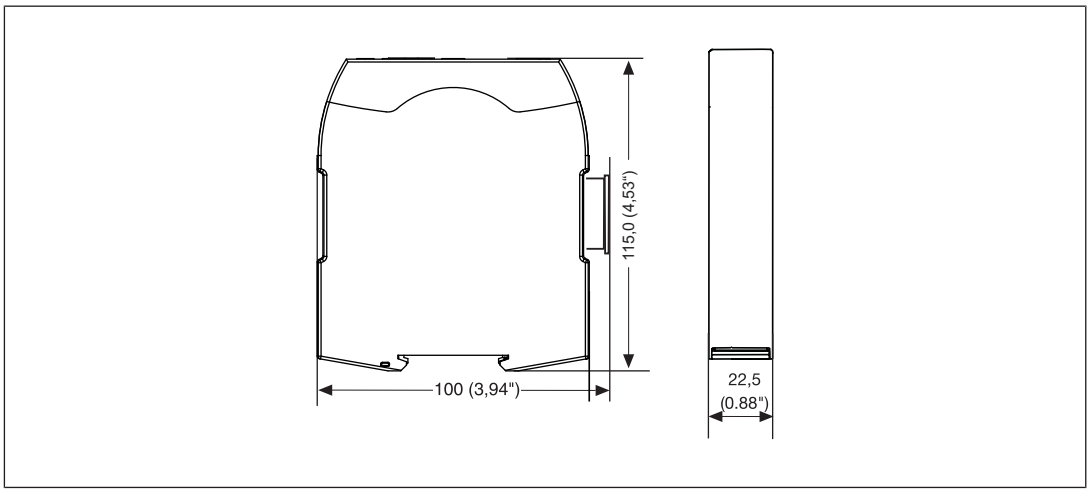
# Fieldbus modules
PNOZ mmc3p

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 622] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.

# Fieldbus modules
PNOZ mmc3p

- Use copper wire that can withstand 75° C.
- External measures must be used to connect the ⏚ terminal to the function earth (e.g. mounting rail).
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

## Connecting the supply voltage

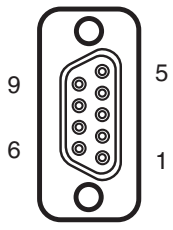
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

## PROFIBUS DP interface

It is possible to define which outputs on the control system will communicate with PROFIBUS-DP. The connection to PROFIBUS-DP is made via a female 9-pin D-Sub connector in accordance with the guidelines of the PROFIBUS User Group (PNO).




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

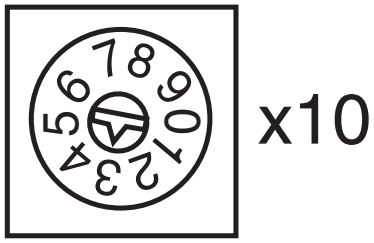
Please note the following when connecting to PROFIBUS-DP:

- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces

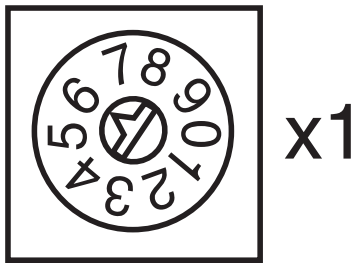
# Fieldbus modules
PNOZ mmc3p

## Setting the station address

The station address of the expansion module PNOZ mmc3p is set between 0 ... 99 (decimal) via two rotary switches x1 and x10.




- On the upper rotary switch x10, use a small screwdriver to set the tens digit for the address (“3” in the example).




- On the lower rotary switch x1, set the ones digit for the address (“6” in the example).

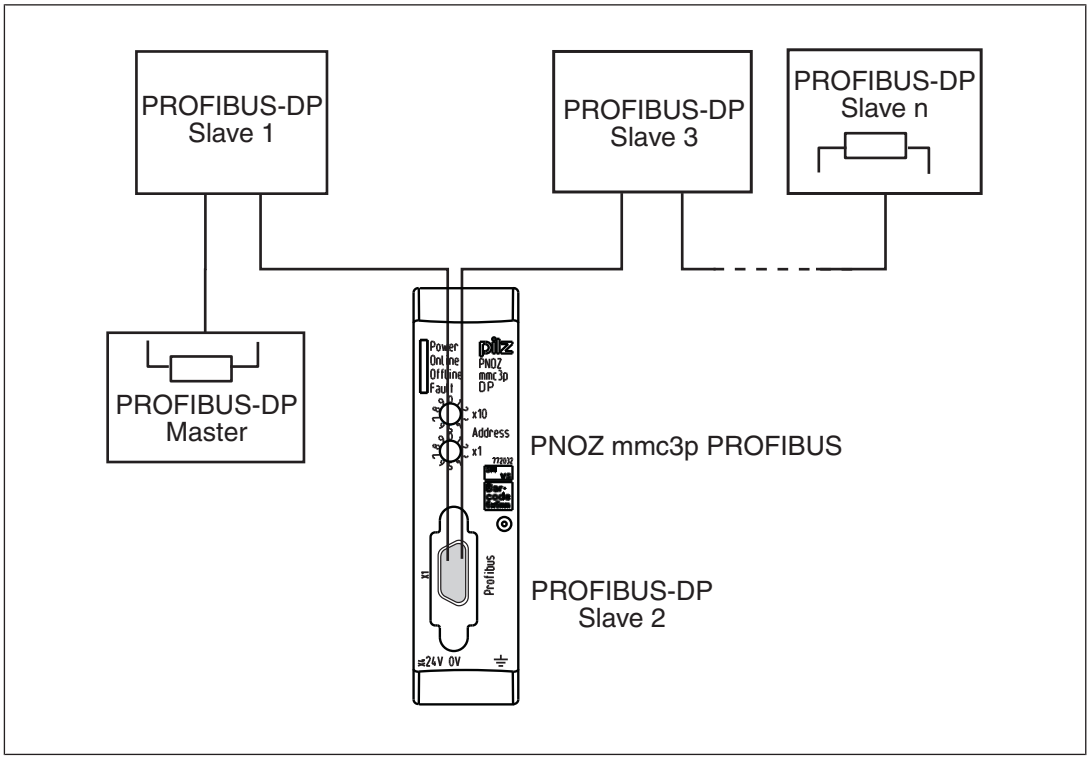
Station address 36 is set in the diagrams as an example.

## Download modified project to the control system PNOZmulti

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

## Fieldbus modules
PNOZ mmc3p

### Connection example




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Output of external power supply (DC) | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **PROFIBUS DP** |
| Device type | **Slave DPV0** |
| Station address | **0 - 99d** |
| Transmission rate | **9,6 kBit/s - 12 MBit/s** |
| Connection | **9-pin D-Sub female connector** |
| Galvanic isolation | **yes** |

## Fieldbus modules
PNOZ mmc3p

| | |
|---|---|
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |

# Fieldbus modules
PNOZ mmc3p

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible with crimp connectors, no plastic sleeve | **0,20 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **22,5 mm** |
| Depth | **115,0 mm** |
| Weight | **95 g** |

Where standards are undated, the 2011-09 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mmc3p | Fieldbus module, PROFIBUS-DP | 772 032 |

# Fieldbus modules
PNOZ mmc3p

## Accessories

### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ s terminator plug | Terminator, yellow, 10 pieces | 750 010 |
| PNOZ s connector | Jumper, 10 pieces | 750 020 |

# Fieldbus modules
PNOZ mmc4p

## Overview

### Unit features

Using the product PNOZ mmc4p:

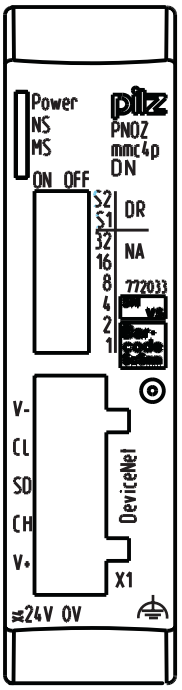
Expansion module for connection to a base unit from the configurable control system PNOZmulti Mini .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for DeviceNet
- Station addresses from 0 ... 63 can be selected via DIP switches
- Status indicators for communication with DeviceNet and for errors
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus DeviceNet . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mmc4p can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- For details of the PNOZmulti Mini base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
PNOZ mmc4p

### Front view




**Legend:**

- 0 V, 24 V:
  Supply connections
- X1: DeviceNet interface (5-pin screw connector)
- ⏚: Functional earth
- LED:
  - Power
  - NS
  - MS

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via DeviceNet are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ mmc4p are connected via a jumper.

# Fieldbus modules
## PNOZ mmc4p

The station address and the transmission rate are set using DIP switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module PNOZ mmc4p is configured and started automatically.

LEDs indicate the status of the expansion module on DeviceNet.

The configuration is described in detail in the PNOZmulti Configurator's online help.

### Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

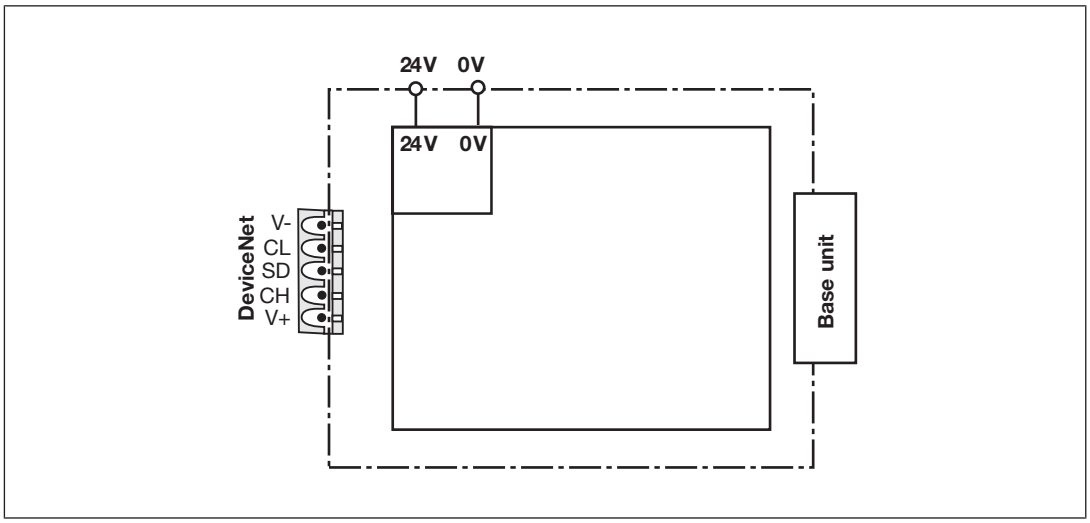
### Assigning the inputs/outputs in the PNOZmulti Configurator to the DeviceNet inputs/outputs

| | | | |
|---|---|---|---|
| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
| Input data DeviceNet | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data DeviceNet | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

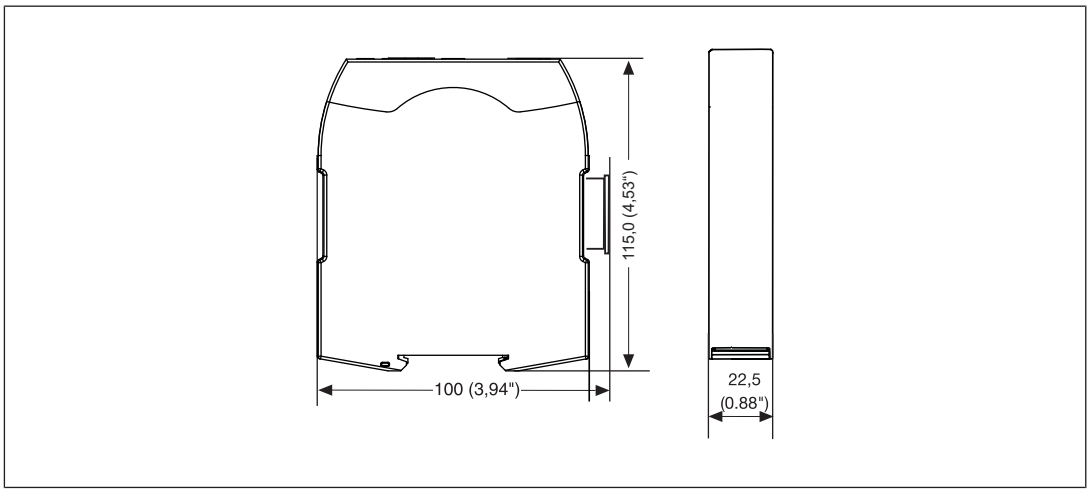
# Fieldbus modules
PNOZ mmc4p

### Block diagram




## Installation

### Dimensions in mm



# Fieldbus modules
PNOZ mmc4p

## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [622] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- External measures must be used to connect the ⏚ terminal to the function earth (e.g. mounting rail).
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

### Connecting the supply voltage

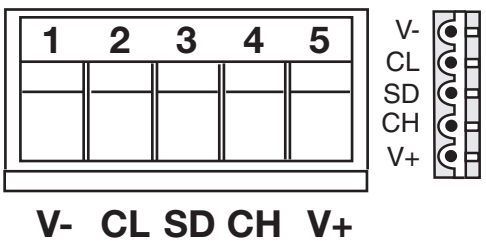
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

### DeviceNet interface

It is possible to define which outputs on the control system will communicate with DeviceNet. The connection to DeviceNet is made via a 5-pin screw connector.




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

# Fieldbus modules
PNOZ mmc4p

**Termination DeviceNet**

To minimise cable reflection and to guarantee a defined rest signal on the transmission line, DeviceNetmust be terminated at both ends.

## Setting the transmission rate

Set the transmission rate using DIP switches S1 and S2 (DR).

| Transmission rate | DIP switch | |
|---|---|---|
| | S1 | S2 |
| 125 kBit/s | Off | Off |
| 250 kBit/s | On | Off |
| 500 kBit/s | Off | On |
| --- | On | On |

## Setting the station address

The station address of the expansion module PNOZ mmc4p is set from 0 ... 63 (binary) using DIP switches 1 to 32.

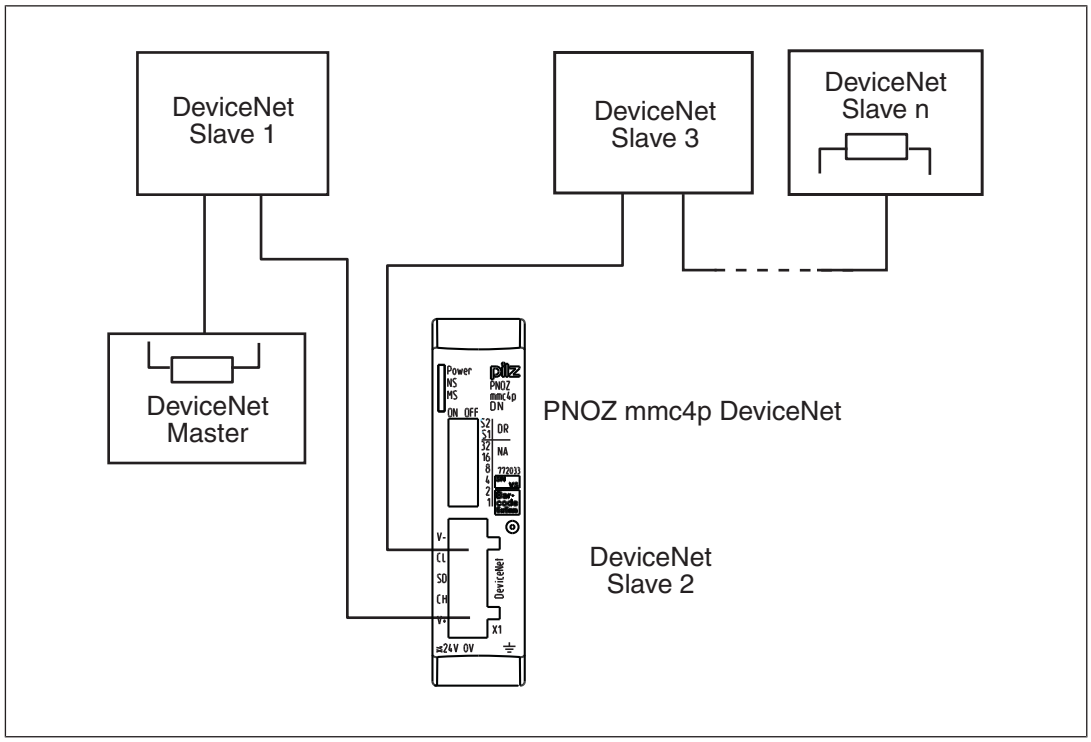
| **Station address** | **DIP switch** | | | | | |
|---|---|---|---|---|---|---|
| | **32** | **16** | **8** | **4** | **2** | **1** |
| 0 | Off | Off | Off | Off | Off | Off |
| 1 | Off | Off | Off | Off | Off | On |
| 2 | Off | Off | Off | Off | On | Off |
| 3 | Off | Off | Off | Off | On | On |
| ... | ... | ... | ... | ... | ... | ... |
| 62 | On | On | On | On | On | Off |
| 63 | On | On | On | On | On | On |

## Download modified project to the PNOZmulti safety system

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

# Fieldbus modules
PNOZ mmc4p

### Connection example




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Output of external power supply (DC) | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **DeviceNet** |
| External supply (DC) | **24 V** |
| Power consumption | **0,75 W** |
| Device type | **Slave** |
| Station address | **0 ... 63d** |
| Transmission rates | **125 kBit/s, 250 kBit/s, 500 kBit/s** |
| Connection | **5-pin Combicon plug-in connector** |

# Fieldbus modules
## PNOZ mmc4p

| | |
|---|---|
| **Fieldbus interface** | |
| Galvanic isolation | **yes** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |

# Fieldbus modules
PNOZ mmc4p

| Mechanical data | |
|---|---|
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible with crimp connectors, no plastic sleeve | **0,20 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **22,5 mm** |
| Depth | **110,0 mm** |
| Weight | **95 g** |

Where standards are undated, the 2011-09 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mmc4p | Fieldbus module, DeviceNet | 772 033 |

# Fieldbus modules
PNOZ mmc4p

## Accessories

### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ s terminator plug | Terminator, yellow, 10 pieces | 750 010 |
| PNOZ s connector | Jumper, 10 pieces | 750 020 |

# Fieldbus modules
PNOZ mmc6p

## Overview

### Unit features

Using the product PNOZ mmc6p:

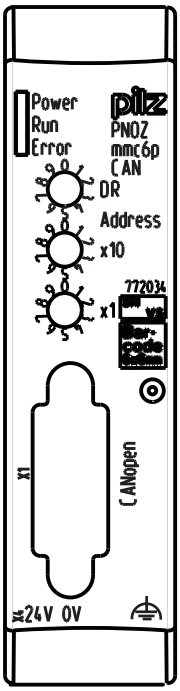
Expansion module for connection to a base unit from the configurable control system PNOZmulti Mini

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for CANopen
- Station addresses from 0 ... 99, selected via rotary switch
- Transmission rate selected via rotary switch (1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s)
- Status indicators for communication with CANopen and for errors
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus CANopen . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mmc6p can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- For details of the PNOZmulti Mini base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
PNOZ mmc6p

### Front view




**Legend:**

- X4: 0 V, 24 V:
  Supply connections
- X1: CANopen interface (male 9-pin D-Sub connector)
- ⏚: Functional earth
- LED:
  - Power
  - Run
  - Error

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via CANopen are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ mmc6p are connected via a jumper. The station address and the transmission rate are set using rotary switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module PNOZ mmc6p is configured and started automatically.

# Fieldbus modules
PNOZ mmc6p

LEDs indicate the status of the expansion module on CANopen.

The configuration is described in detail in the PNOZmulti Configurator's online help.

## Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

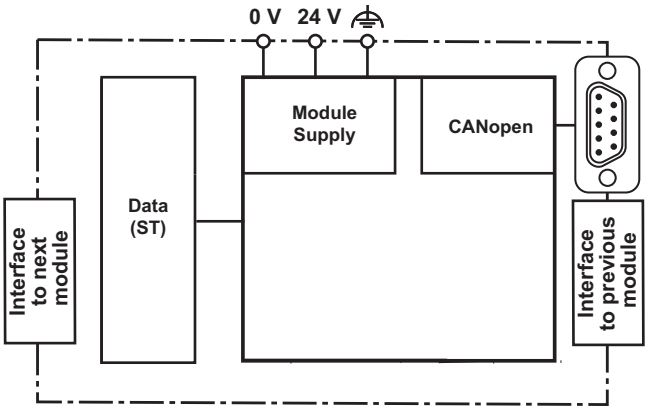
## Assigning the inputs/outputs in the PNOZmulti Configurator to the CANopen inputs/outputs

| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
|---|---|---|---|
| Input data CANopen | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data CANopen | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

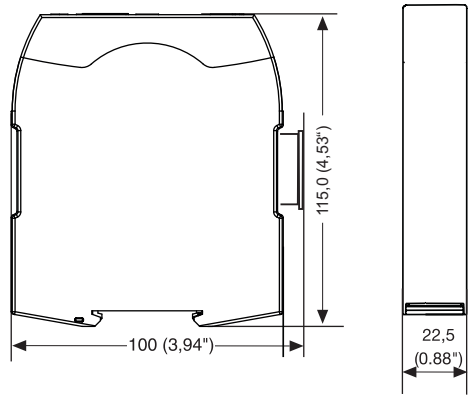
# Fieldbus modules
PNOZ mmc6p

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 632] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.

# Fieldbus modules
PNOZ mmc6p

- Use copper wire that can withstand 75° C.
- External measures must be used to connect the ⏚ terminal to the function earth (e.g. mounting rail).
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

## Connecting the supply voltage

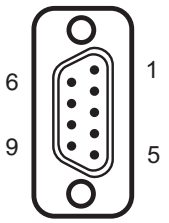
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

## CANopen interface

The connection to CANopen is made via a male 9-pin D-Sub connector.




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

n.c. = not connected

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

To minimise cable reflection and to guarantee a defined rest signal on the transmission line, CANopen must be terminated at both ends.

# Fieldbus modules
PNOZ mmc6p

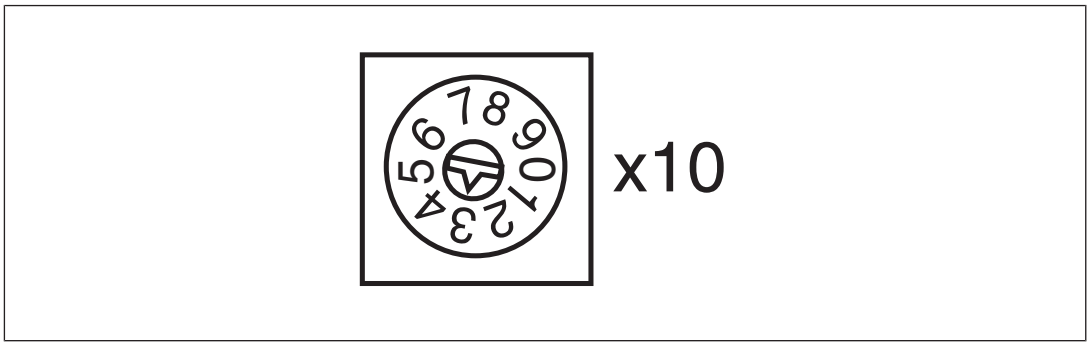
## Setting the transmission rate


- On the upper rotary switch DR, use a small screwdriver to set the transmission rate (in the example, "3" corresponds to 50 kBit/s).

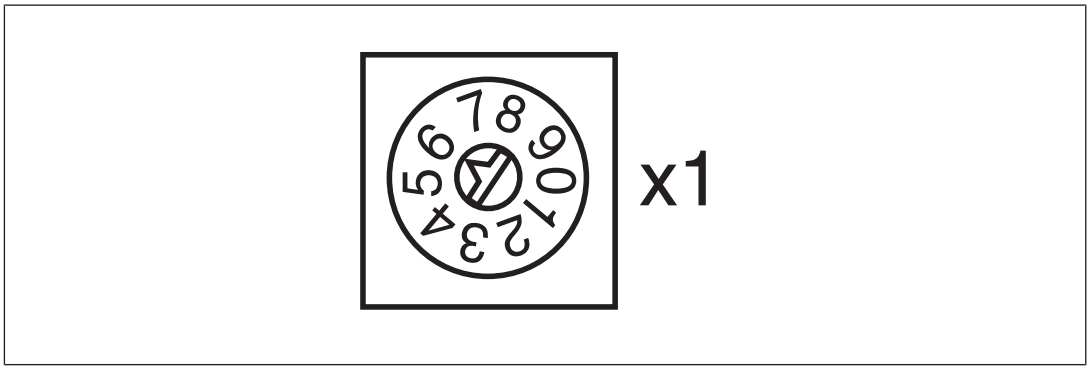
| Switch setting | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Transmission rate | - | 10 kBit/s | 20 kBit/s | 50 kBit/s | 125 kBit/s | 250 kBit/s | 500 kBit/s | 800 kBit/s | 1 MBit/s | - |

## Setting the station address

The station address of the expansion module PNOZ mmc6p is set between 0 ... 99 (decimal) via two rotary switches x1 and x10.




- On the middle rotary switch x10, use a small screwdriver to set the tens digit for the address (“3” in the example).



## Fieldbus modules
PNOZ mmc6p

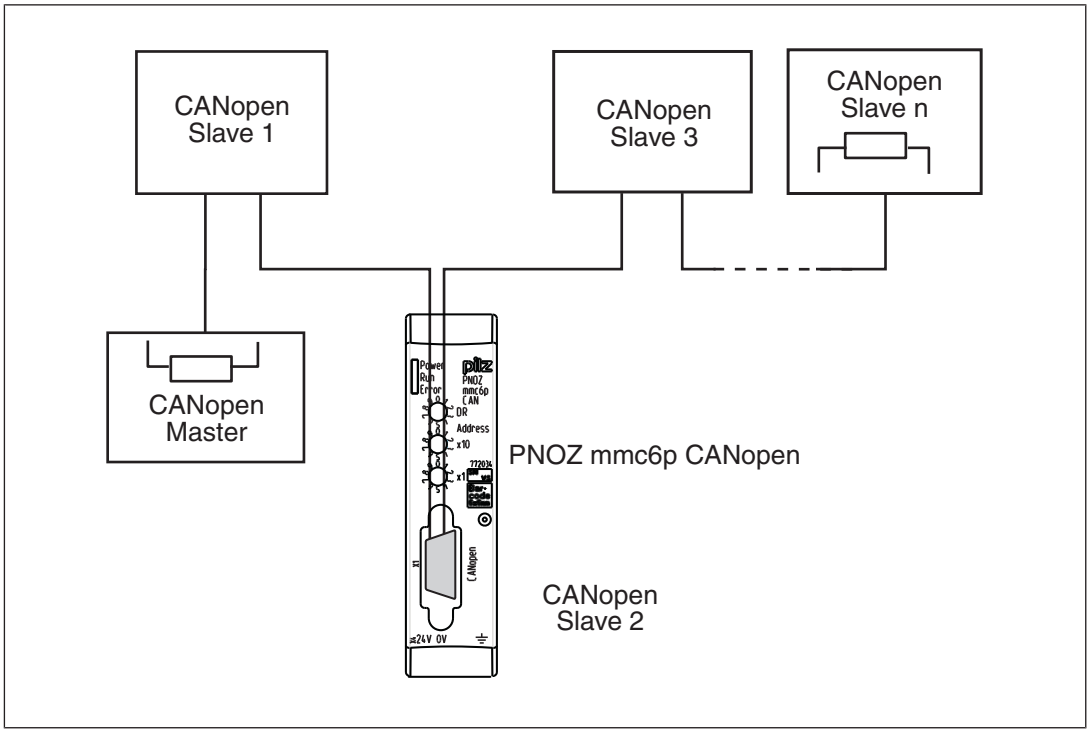
- On the lower rotary switch x1, set the ones digit for the address (“6” in the example).

Station address 36 is set in the diagrams as an example.

### Download modified project to the PNOZmulti safety system

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

### Connection example




# Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Output of external power supply (DC) | **1,5 W** |

# Fieldbus modules
PNOZ mmc6p

| | |
|---|---|
| **Electrical data** | |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **CANopen** |
| Device type | **Slave** |
| Log | **CiA 301 V4.2.0** |
| Station address | **0 - 99d** |
| Transmission rates | **1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s** |
| Connection | **9-pin D-Sub male connector** |
| Galvanic isolation | **yes** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |

# Fieldbus modules
## PNOZ mmc6p

| | |
|---|---|
| **Environmental data** | |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible with crimp connectors, no plastic sleeve | **0,20 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **22,5 mm** |
| Depth | **115,0 mm** |
| Weight | **95 g** |

Where standards are undated, the 2011-09 latest editions shall apply.

# Fieldbus modules
PNOZ mmc6p

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mmc6p | Fieldbus module, CANopen | 772 034 |

### Accessories

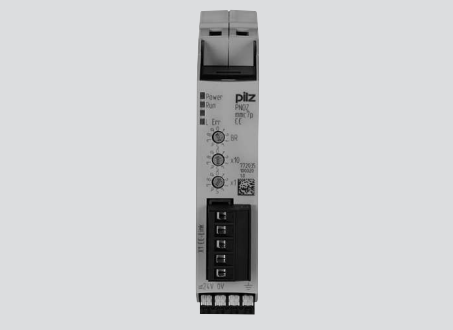
#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ s terminator plug | Terminator, yellow, 10 pieces | 750 010 |
| PNOZ s connector | Jumper, 10 pieces | 750 020 |

# Fieldbus modules
PNOZ mmc7p CC



## Overview

### Unit features

Using the product PNOZ mmc7p CC:

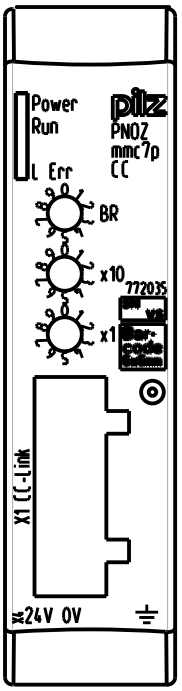
Expansion module for connection to a base unit from the configurable control system PNOZmulti Mini .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for CC-Link
- Station addresses from 1 ... 63, selected via rotary switch
- Station type: Remote Device
- Occupied stations: 2
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus CC-Link . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mmc7p CC can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Fieldbus modules
PNOZ mmc7p CC

### Front view




**Legend:**

- X1: CC-Link interface
- 0 V, 24 V: Supply connections
- LEDs:
  - Power
  - Run
  - L Err

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via the fieldbus CC-Link are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ mmc7p CC are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the fieldbus module PNOZ mmc7p CC is configured and started automatically.

LEDs indicate the status of the fieldbus module CC-Link.

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
PNOZ mmc7p CC

## Input and output data

The data is structured as follows:

- Input area
  - Inputs on PNOZmulti Configurator: i00 … i23
  - Input data CC-Link: RY0n, RY1n with n = 0 … F

    Example: i23 -> RY17

| n | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RY0n** | i15 | i14 | i13 | i12 | i11 | i10 | i09 | i08 | i07 | i06 | i05 | i04 | i03 | i02 | i01 | i00 |
| **RY1n** | - | - | - | - | - | - | - | - | i23 | i22 | i21 | i20 | i19 | i18 | i17 | i16 |

- Output range
  - Outputs on PNOZmulti Configurator: o00 … o23
  - Output data CC-Link: RXn, RX1n with n = 0 … F

    Example: o22 -> Rx16

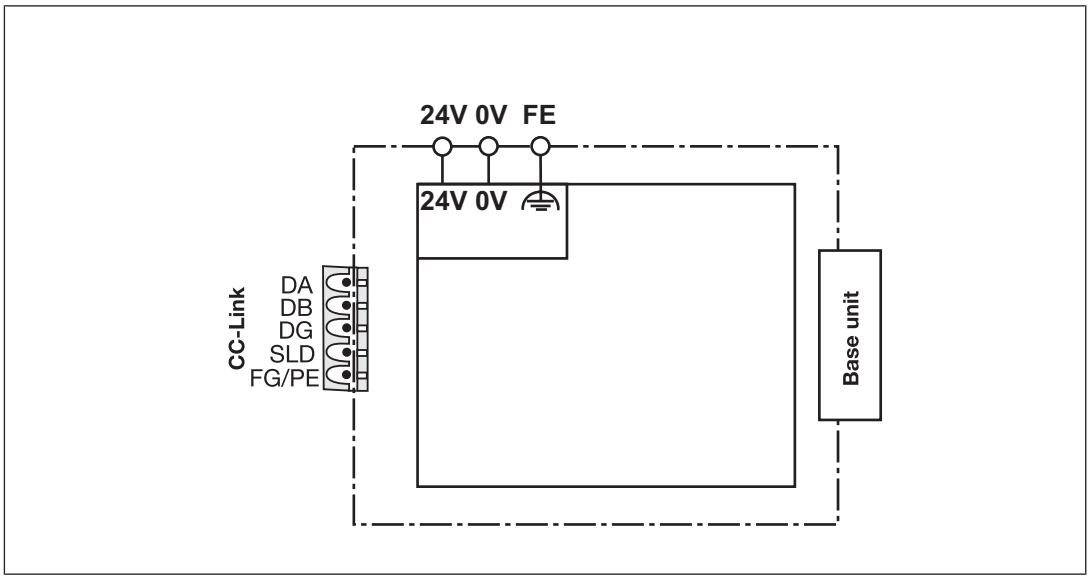
| n | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RX 0n** | o15 | o14 | o13 | o12 | o11 | o10 | o09 | o08 | o07 | o06 | o05 | o04 | o03 | o02 | o01 | o00 |
| **RX 1n** | - | - | - | - | - | - | - | - | o23 | o22 | o21 | o20 | o19 | o18 | o17 | o16 |

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

Detailed information on data exchange is available in the document "Communication Interfaces PNOZmulti 2" in the section entitled "Fieldbus modules".

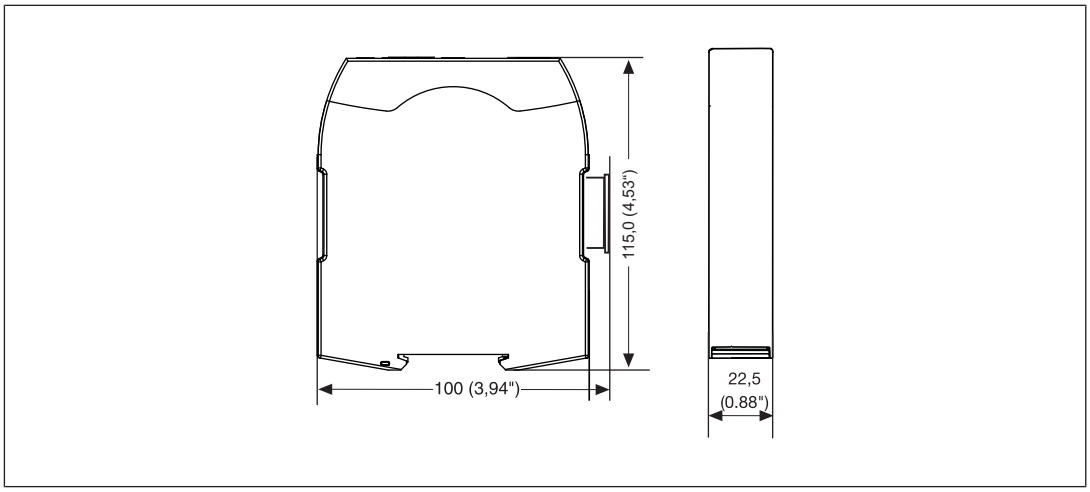
# Fieldbus modules
PNOZ mmc7p CC

### Block diagram




## Installation

### Dimensions in mm



# Fieldbus modules
PNOZ mmc7p CC

## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 641] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

### Connecting the supply voltage

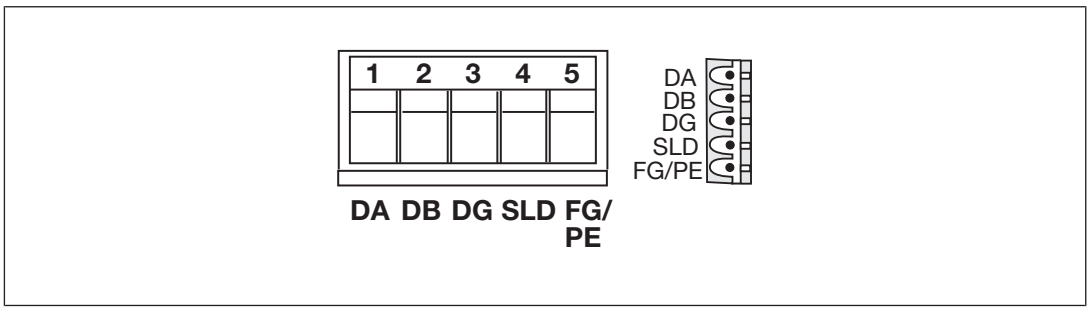
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

### Interface assignment

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.




1: DA (Channel A)

2: DB (Channel B)

3: DG (Earth)

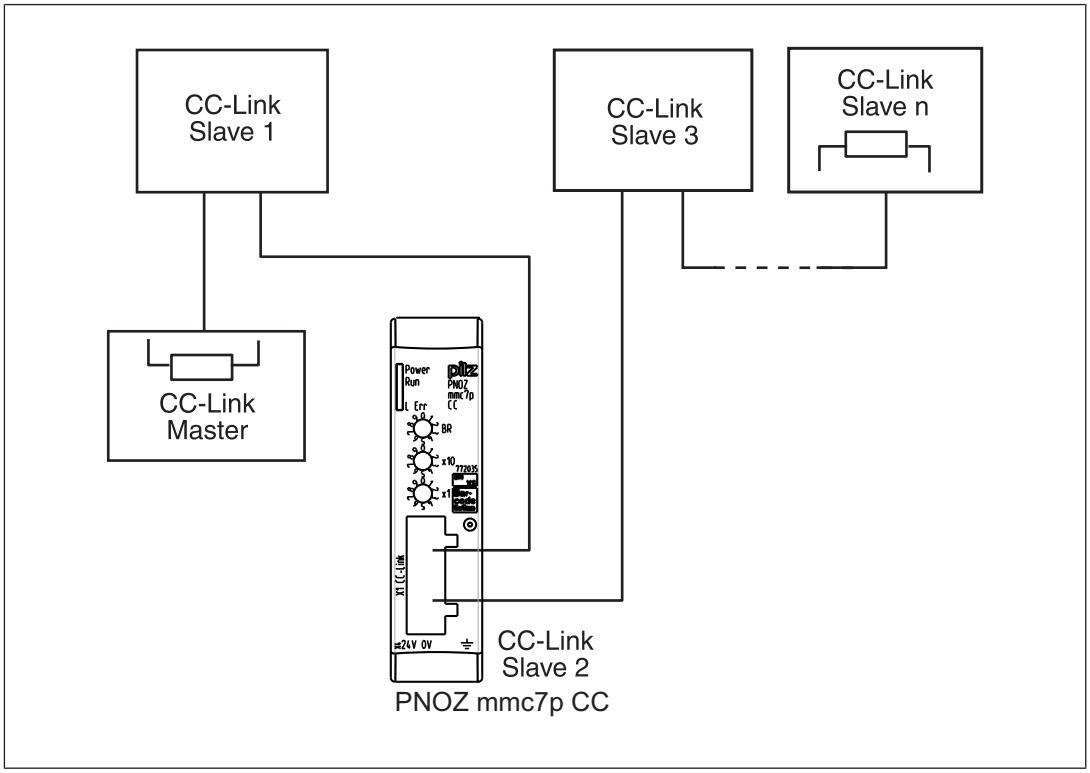
4: SLD (Cable shield)

5: FG/PE (Functional earth)

### Download modified project to the PNOZmulti safety system

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

### Connection example




## Technical Details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, GOST** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Output of external power supply (DC) | **1,5 W** |

# Fieldbus modules
## PNOZ mmc7p CC

| | |
|---|---|
| **Electrical data** | |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **CC-Link V1.10** |
| Device type | **Slave** |
| Station address | **1 ... 63d** |
| Transmission rates | **10 MBit/s, 156 kbit/s, 2,5 MBit/s, 5 MBit/s, 625 kbit/s** |
| Connection | **5-pin Combicon plug-in connector** |
| Assigned stations | **2** |
| Galvanic isolation | **yes** |
| Test voltage | **500 V AC** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |

# Fieldbus modules
## PNOZ mmc7p CC

| | |
|---|---|
| **Environmental data** | |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible with crimp connectors, no plastic sleeve | **0,20 - 1,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Rigid single-core, flexible multi-core or multi-core with crimp connector | **0,5 - 1,5 mm²** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **22,5 mm** |
| Depth | **110,0 mm** |
| Weight | **90 g** |

Where standards are undated, the 2011-09 latest editions shall apply.

# Fieldbus modules
PNOZ mmc7p CC

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mmc7p CC | Fieldbus module, CC-Link | 772035 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ s terminator plug | Terminator, yellow, 10 pieces | 750 010 |
| PNOZ s connector | Jumper, 10 pieces | 750 020 |

# Fieldbus modules
PNOZ mmc11p

## Overview

### Unit features

Using the product PNOZ mmc11p:

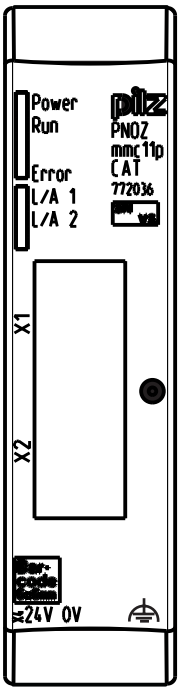
Expansion module for connection to a base unit from the configurable control system PNOZmulti Mini .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Network protocols: EtherCAT
- Supports CANopen over EtherCAT (DS301 V4.02 compliant)
- Status indicators for communication with EtherCAT and for errors
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus EtherCAT . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mmc11p can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- For details of the PNOZmulti Mini base units that can be connected, please refer to the document "PNOZmulti System Expansion".

## Fieldbus modules
PNOZ mmc11p

### Front view




**Legend:**

- X1: EtherCAT IN
- X2: EtherCAT OUT
- X4: 0 V, 24 V:
  Supply connections
- ⏚: Functional earth
- LEDs:
  - Power
  - Run
  - Error
  - L/A 1
  - L/A 2

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

# Fieldbus modules
PNOZ mmc11p

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via EtherCAT are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ mmc11p are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module PNOZ mmc11p is configured and started automatically.

The connection to EtherCAT is made via the two RJ45 sockets.

LEDs indicate the status of the expansion module on EtherCAT.

The configuration is described in detail in the PNOZmulti Configurator's online help.

### Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- Output range only: Byte 3

  Bits 0 … 4: Status of LEDs on the PNOZmulti

  – Bit 0: OFAULT
  – Bit 1: IFAULT
  – Bit 2: FAULT
  – Bit 3: DIAG
  – Bit 4: RUN

  Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

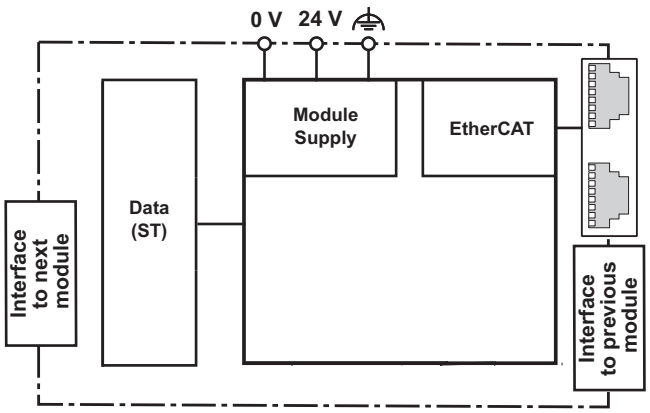
# Fieldbus modules
PNOZ mmc11p

### Assigning the inputs/outputs in the PNOZmulti Configurator to the EtherCAT inputs/outputs

| | | | |
|---|---|---|---|
| Virtual inputs on PNOZmulti Configurator | i0 ... I7 | i8 ... i15 | i16 ... i23 |
| Input data EtherCAT | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |
| Virtual outputs on PNOZmulti Configurator | o0 ... o7 | o8 ... o15 | o16 ... o23 |
| Output data EtherCAT | Byte 0: Bits 0 … 7 | Byte 1: Bits 0 … 7 | Byte 2: Bits 0 … 7 |

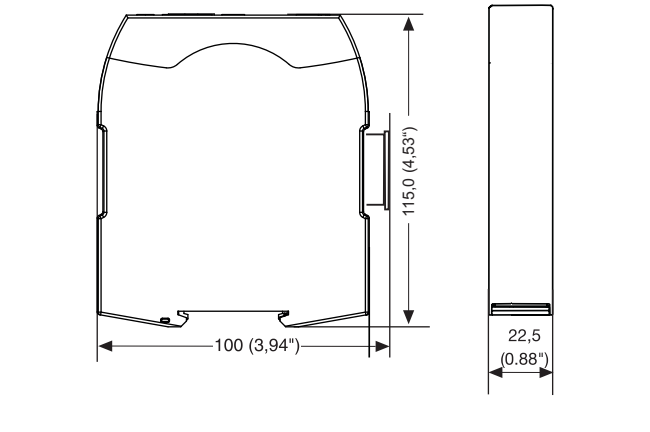
The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

### Block diagram




## Installation

### Dimensions in mm



# Fieldbus modules
PNOZ mmc11p

## Commissioning

### General wiring guidelines

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 EtherCAT.

Please note:

- Information given in the "Technical details" must be followed.
- Use copper wire that can withstand 75 °C.
- External measures must be used to connect the ⏚ terminal to the function earth (e.g. mounting rail).

Please note the following when connecting to EtherCAT:

- 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 EtherCAT are met, as stated in the Installation Manual published by the User Group.

### Connecting the supply voltage

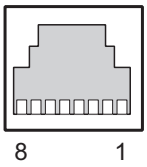
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

# Fieldbus modules
PNOZ mmc11p

## Interface assignment

| RJ45 socket<br>8-pin | 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

## Download modified project to the PNOZmulti safety system

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

## Preparing for operation

- Install Device Description File

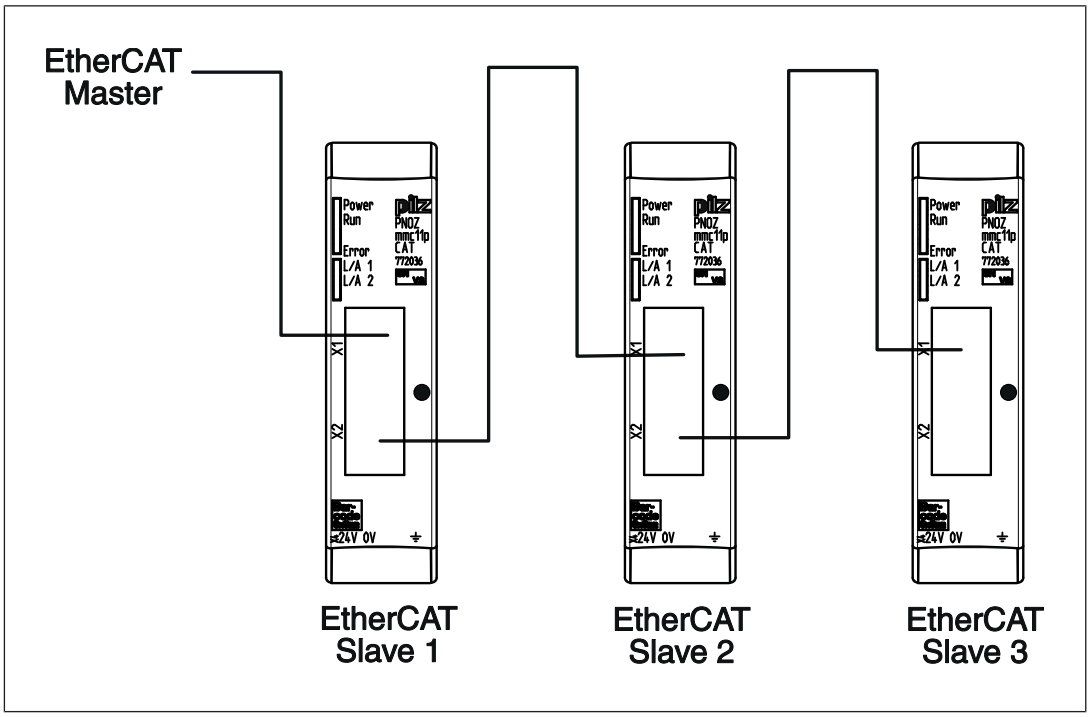
  Install the *Device Description File* in your configuration software. You can only then use the PNOZ mmc11p.
- Connect the supply voltage to the base unit:

  Terminals **24 V** and **A1 (+)**: + 24 VDC

  Terminals **0 V** and **A2 (-)** : 0 V

## Fieldbus modules
PNOZ mmc11p

### Connection example




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Output of external power supply (DC) | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **EtherCAT** |
| Device type | **Slave** |
| Log | **CANopen over EtherCAT** |
| Transmission rates | **100 MBit/s** |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |

## Fieldbus modules
PNOZ mmc11p

| | |
|---|---|
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |

# Fieldbus modules
PNOZ mmc11p

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible with crimp connectors, no plastic sleeve | **0,20 - 2,50 mm², 24 - 16 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100,0 mm** |
| Width | **22,5 mm** |
| Depth | **115,0 mm** |
| Weight | **95 g** |

Where standards are undated, the 2012-10 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mmc11p | Fieldbus module, EtherCAT | 772 036 |

# Fieldbus modules
PNOZ mmc11p

## Accessories

### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ s terminator plug | Terminator, yellow, 10 pieces | 750 010 |
| PNOZ s connector | Jumper, 10 pieces | 750 020 |

# Fieldbus modules
PNOZ mmc12p

## Overview

### Unit features

Using the product PNOZ mmc12p:

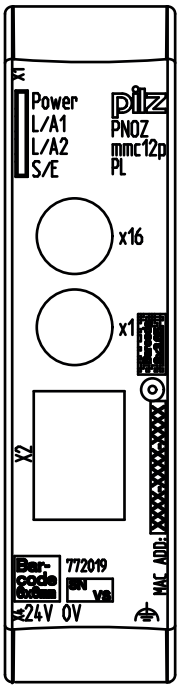
Expansion module for connection to a base unit from the configurable control system PNOZmulti Mini .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for Ethernet POWERLINK (Ethernet POWERLINK V 2 protocol)
- Station addresses from 1 ... 239, selected via rotary switch
- The minimum cycle time for an application of 20 Byte Output and 20 Byte Input is 250µs. The minimum cycle time is 450 µs at the maximum PDO size of 254 Byte Input and 20 Byte Output (the inputs and outputs in this case are viewed from the Managing Node).
- 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus Ethernet POWERLINK . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- Max. 1 PNOZ mmc12p can be connected to the base unit
- For details of the PNOZmulti Mini base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
PNOZ mmc12p

### Front view




**Legend:**

- X1, X2: Ethernet POWERLINK interfaces
- 0 V, 24 V: Supply connections
- ⏚: Functional earth
- LED:
  - Power
  - L/A1
  - L/A2
  - S/E (Status/Error)

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via the fieldbus Ethernet POWERLINK are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ mmc12p are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the fieldbus module PNOZ mmc12p is configured and started automatically.

# Fieldbus modules
PNOZ mmc12p

LEDs indicate the status of the fieldbus module Ethernet POWERLINK.

The configuration is described in detail in the PNOZmulti Configurator's online help.

## Input and output data

The data is structured as follows:

- Input area

  The inputs are defined in the Managing Node and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of SDO 2100:02 has the number i12.

| | | | |
|---|---|---|---|
| Virtual inputs<br>PNOZmulti Configurator | I0 … I7 | I8 … I15 | I16 … I23 |
| Ethernet POWERLINK | SDO 2100:01:<br>Bit 0 … 7 | SDO 2100:02:<br>Bit 0 … 7 | SDO 2100:03:<br>Bit 0 … 7 |

- Output range

  The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The state of output o0 is stored in Bit 0 of SDO 2000:01.

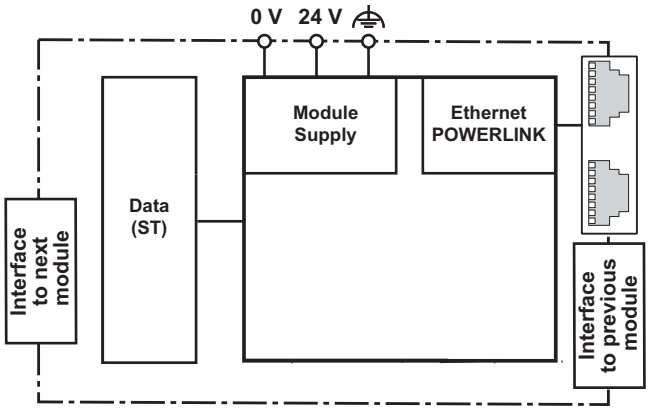
| | | | |
|---|---|---|---|
| Virtual outputs<br>PNOZmulti Configurator | O0 … O7 | O8 … O15 | O16 … O23 |
| Ethernet POWERLINK | SDO 2000:01:<br>Bit 0 … 7 | SDO 2000:02:<br>Bit 0 … 7 | SDO 2000:03:<br>Bit 0 … 7 |

Detailed information on data exchange is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

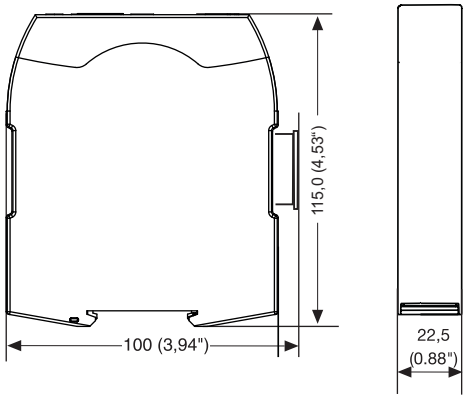
# Fieldbus modules
PNOZ mmc12p

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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 POWERLINK.

Please note:

- Information given in the "Technical details [📖 661]" must be followed.
- Use copper wiring with a temperature stability of 75 °C.

# Fieldbus modules
PNOZ mmc12p

Please note the following when connecting to Ethernet POWERLINK:

- 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 Ethernet POWERLINK are met, as stated in the Installation Manual published by the User Group.
- External measures must be used to connect the ⏚ terminal to the function earth (e.g. mounting rail).
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

## Connecting the supply voltage

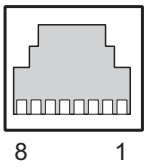
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

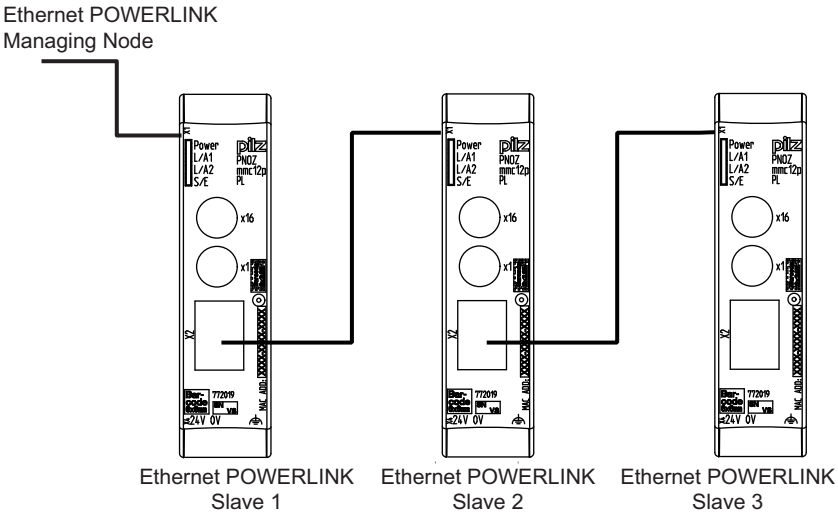
# Fieldbus modules
PNOZ mmc12p

## Interface assignment

| RJ45 socket<br>8-pin | 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

## Connection example



# Fieldbus modules
PNOZ mmc12p

## Technical Details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian)** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Output of external power supply (DC) | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **Ethernet POWERLINK V2** |
| Device type | **Controlled Node** |
| Transmission rates | **100 MBit/s** |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |
| **Times** | |
| Supply interruption before de-energisation | **20 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |

# Fieldbus modules
## PNOZ mmc12p

| | |
|---|---|
| **Environmental data** | |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **100 mm** |
| Width | **22,5 mm** |
| Depth | **110,4 mm** |
| Weight | **90 g** |

Where standards are undated, the 2015-08 latest editions shall apply.

# Fieldbus modules
PNOZ mmc12p

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mmc12p | Fieldbus module, Ethernet POWERLINK | 772 019 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

| Contents | Page |
|---|---|

# Base units
PNOZ m B0

## Overview

### Unit features

Using the product PNOZ m B0:

Base unit of the configurable control system PNOZmulti 2

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:

  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- 12 inputs for connecting, for example:
  - Emergency stop pushbuttons
  - Two-hand pushbuttons
  - Safety gate limit switches
  - Reset buttons
  - Light beam devices
  - Scanners
  - Enabling switches
  - PSEN
  - Operating mode selector switches
- 8 configurable inputs/outputs

  Can be configured as:
  - Inputs (see above for connection options)

  or
  - Auxiliary outputs

# Base units
PNOZ m B0

- 4 configurable outputs
  Can be configured as:
  - Auxiliary outputs

  or
  - Test pulse outputs
- LED for:
  - Error messages
  - Diagnostics
  - Supply voltage
  - Fault at the outputs
  - Fault at the inputs
- Backlit display for:
  - Error messages
  - State of supply voltage
  - State of inputs/outputs
  - Status information
  - Device information
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals:
  Either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Rotary knob for menu control
- Expansion modules can be connected
  (please refer to the document "PNOZmulti System Expansion" for details of the type and number that can be connected)

## Chip card

To be able to use the product you will need a 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 Technical Catalogue: Accessories chapter).

# Base units
PNOZ m B0

## Front view

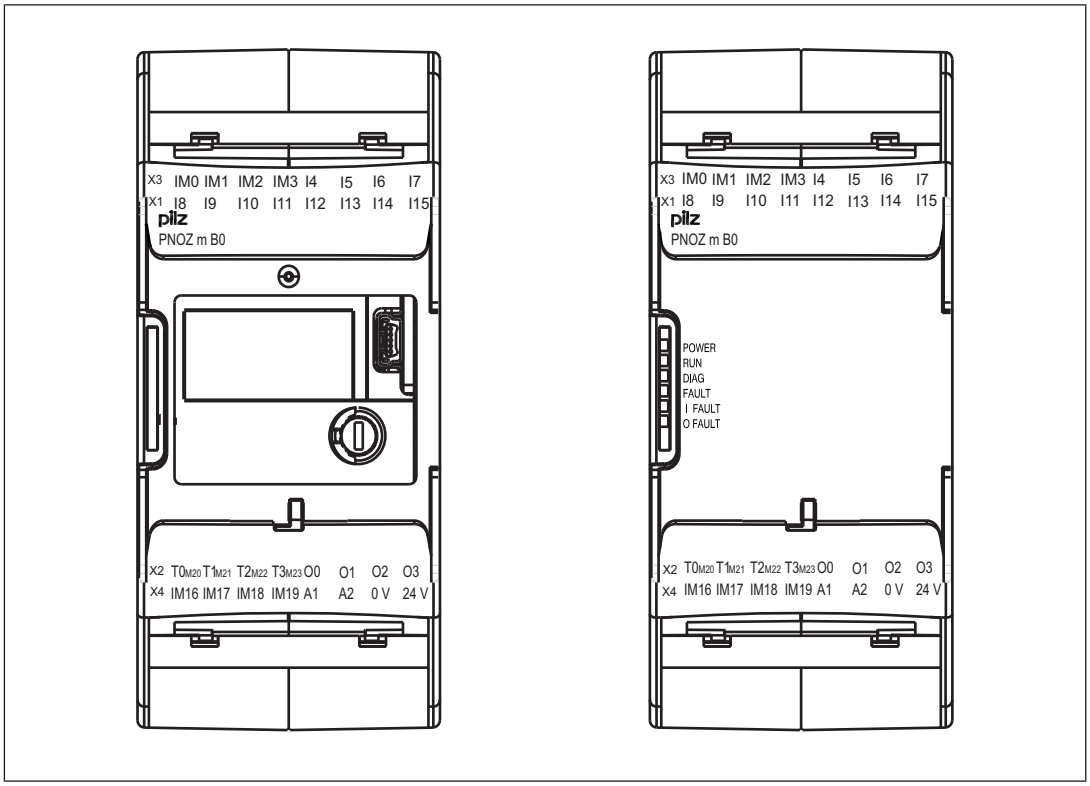



Fig.: Front view with and without cover

### Legend

| | |
|---|---|
| X1: | Inputs I8 ... I15 |
| X1: | Configurable test pulse/auxiliary outputs T0M20 ... T3M23 |
| | Semiconductor outputs O0 ... O3 |
| X3: | Configurable inputs/outputs IM0 – IM3 |
| | Inputs I4 ... I7 |
| X4: | Configurable inputs/outputs IM16 – IM19 |
| | Supply connections |
| LEDs: | PWR |
| | RUN |
| | DIAG |
| | FAULT |
| | I FAULT |
| | O FAULT |

# Base units
PNOZ m B0

## Function description

### Functions

The function of the inputs and outputs on the control 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.

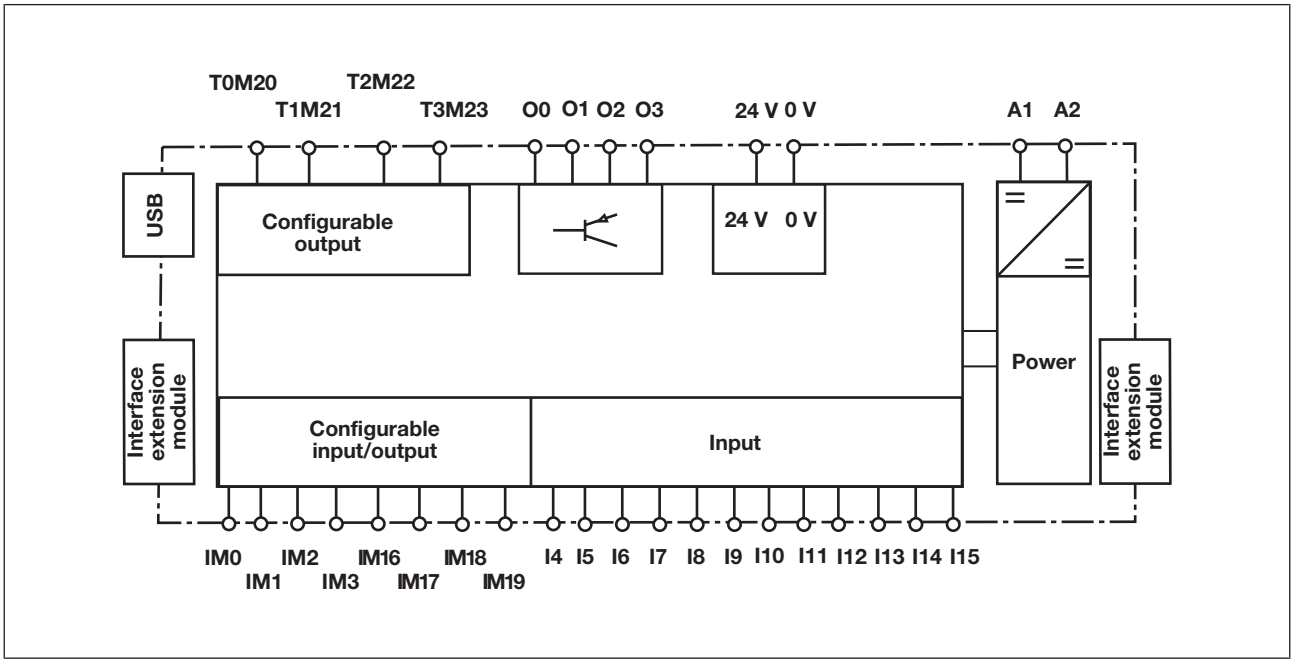
The LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

### Block diagram

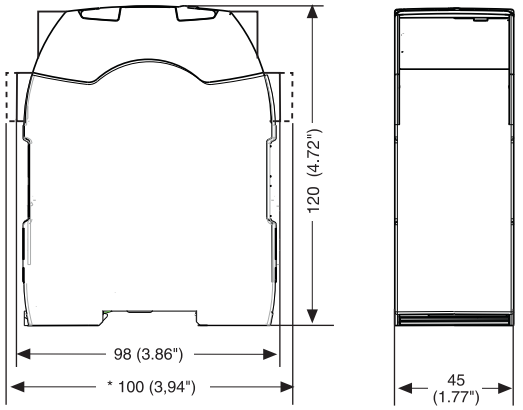


# Base units
PNOZ m B0

## Installation

### Dimensions in mm

*with spring-loaded terminals




## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 676] must be followed.
- Outputs O0 to O3 are semiconductor outputs
- Use copper wiring with a temperature stability of 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation.
- 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.

# Base units
PNOZ m B0

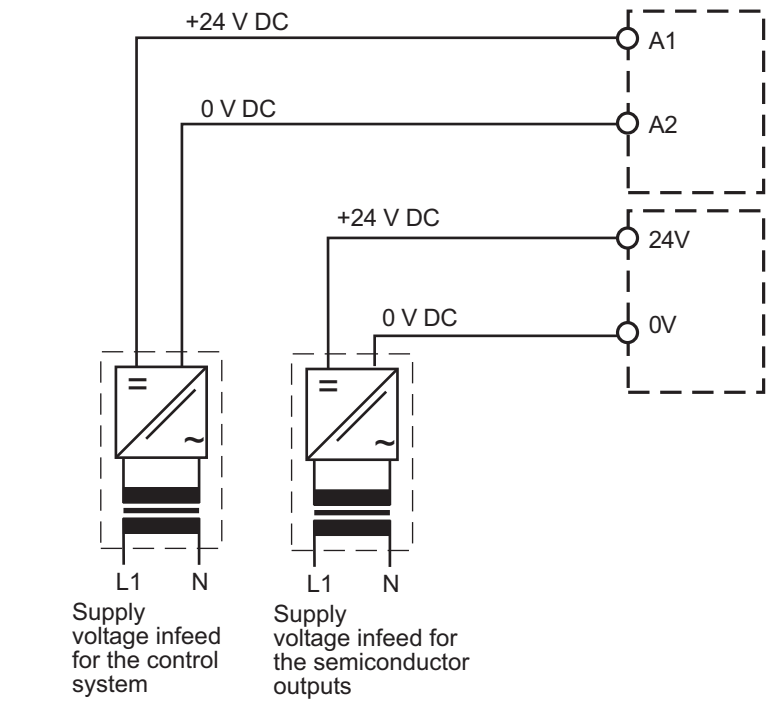
## Commissioning the control system

Procedure:

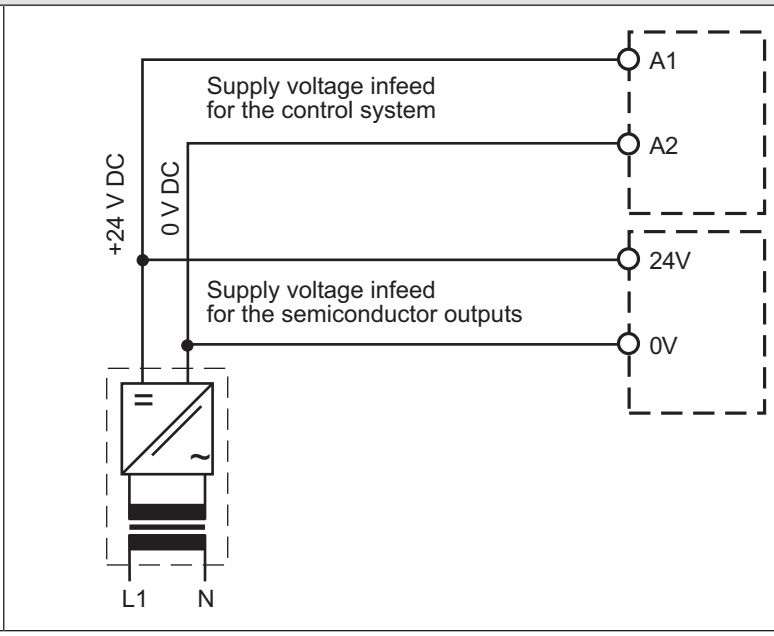
- Wire the inputs and outputs on the base unit in accordance with the circuit diagram.
- Connect the supply voltage:
  - Supply voltage for the control system:
  - Terminal A1: + 24 VDC
  - Terminal A2: 0 V
  - Supply voltage for the semiconductor outputs:
  - 24 V terminal: + 24 VDC
  - 0V terminal: 0 V

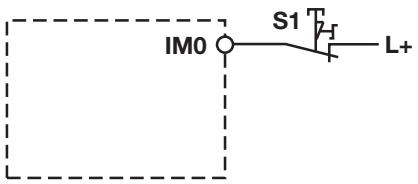
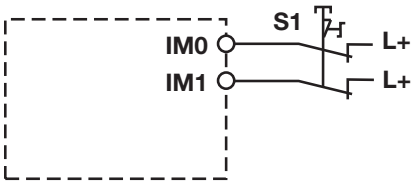
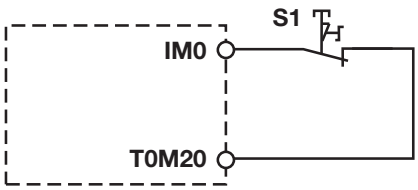
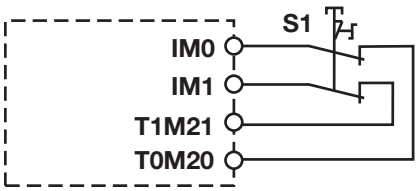
Please note: The supply voltage for the semiconductor outputs must always be present, even if you are not using the semiconductor outputs.

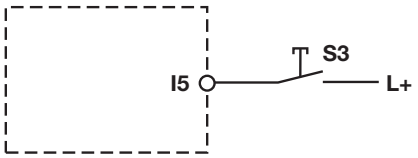
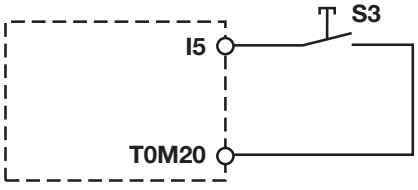
When the voltages are fed separately using two power supplies, the supply voltage for the control system and the supply voltage for the semiconductor outputs are galvanically isolated.

| Supply voltage | |
|---|---|
| Separate power supplies for the supply voltage to the control system and the supply voltage to the semiconductor outputs |  |

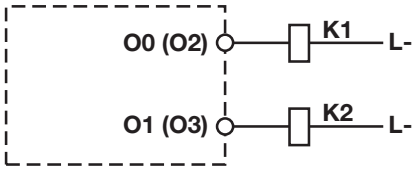
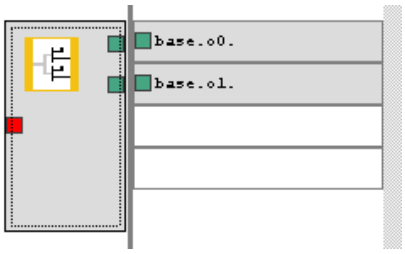
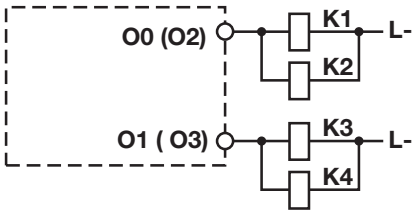
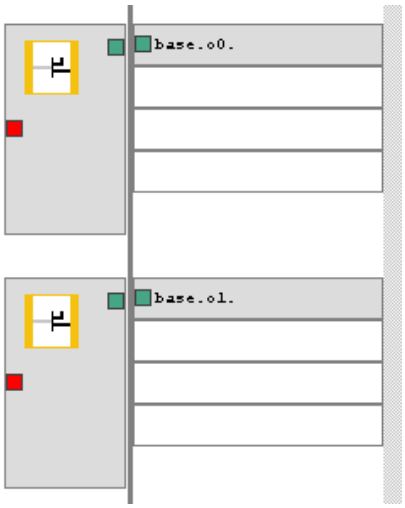
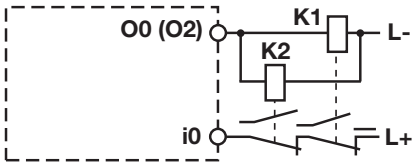
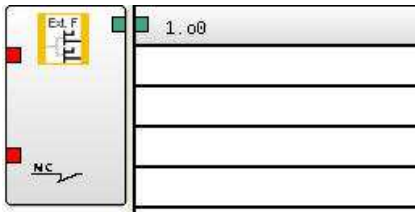
# Base units
PNOZ m B0

| Supply voltage | |
|---|---|
| Common power supply for the supply voltage to the control system and the supply voltage to the semiconductor outputs |  |

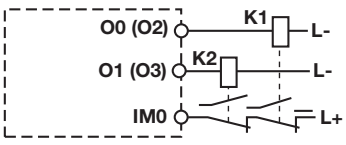
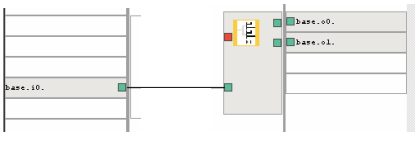
| Input circuit | Single-channel | Dual-channel |
|---|---|---|
| E-STOP<br>**without** detection of shorts across contacts |  |  |
| E-STOP<br>**with** detection of shorts across contacts |  |  |

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

# Base units
PNOZ m B0

| Semiconductor outputs | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |
| Single output with advanced fault detection* |  |  |

*Two loads may be connected to each safety output with advanced fault detection, even on applications in accordance with EN IEC 62061, SIL CL 3. Prerequisite: Feedback loop is connected, shorts across contacts and external power sources are excluded (e.g. through separate multicore cables). Please note that, in the event of an error in the feedback loop, the safety system switches to a safe condition and shuts down **all** the outputs.

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

Procedure:

- Insert the chip card containing the current project into the card slot on the base unit.

- Switch on the supply voltage. The LC display shows the project name, CRC sum and the date the project was created. Please check this information.
- Load the project by pressing the rotary knob. For the project to be downloaded, the rotary knob must be held down for between 3 and 8 seconds. Once the project has been successfully downloaded, the status of the inputs and outputs will be shown on the display.

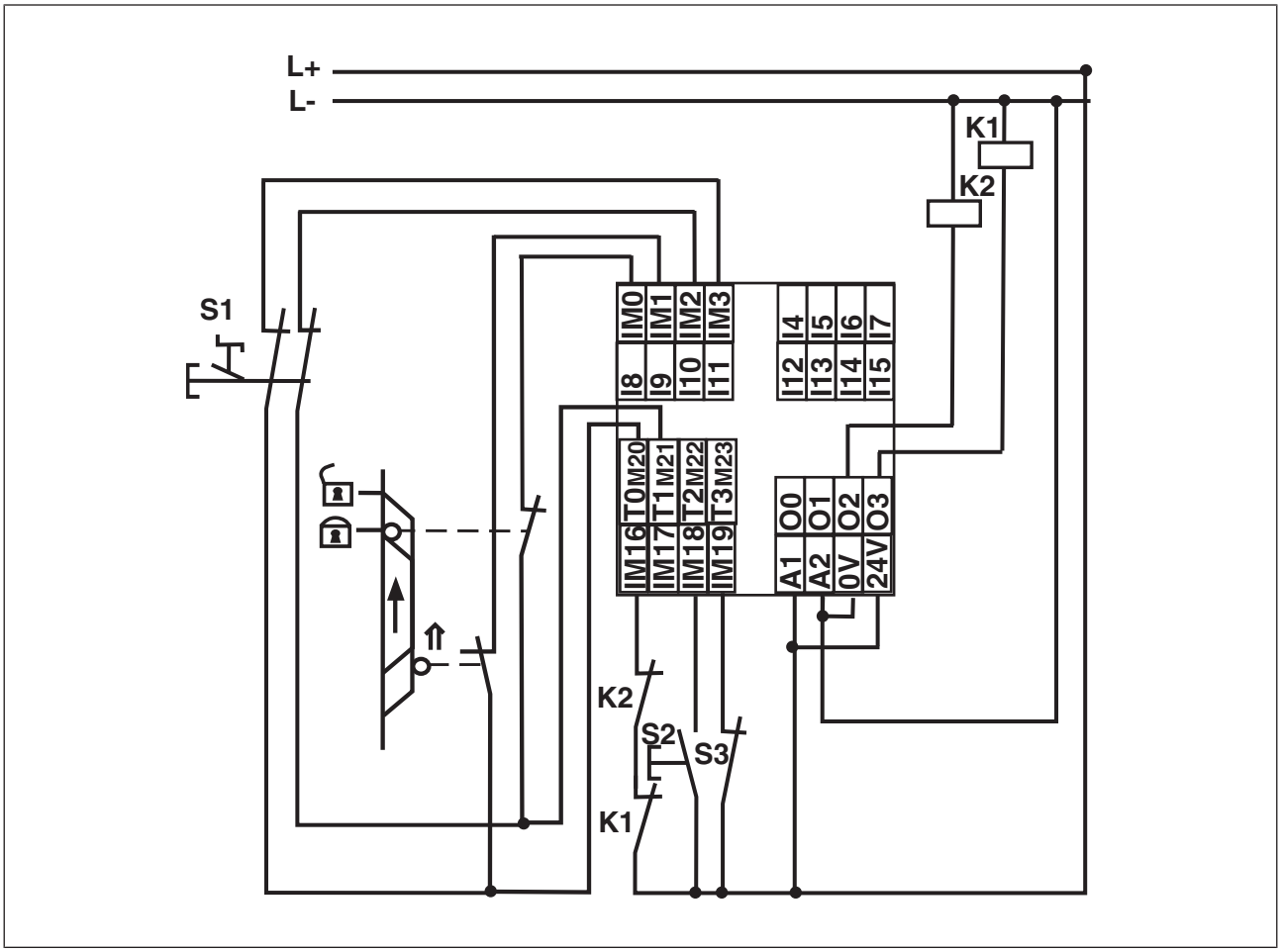
Procedure:

- Insert a chip card into the card slot on the base unit.
- Connect the computer containing the PNOZmulti Configurator to the base unit via the USB port.
- Switch on the supply voltage.
- Download the project (see PNOZmulti Configurator's online help).
- Once the project has been successfully downloaded, the status of the inputs and outputs and the supply voltage will be shown on the display. The "RUN" LED will be lit.

# Base units
PNOZ m B0

### Connection example

Dual-channel E-STOP and safety gate wiring, monitored start (IM18), feedback loop (IM16)



# Base units
PNOZ m B0

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| Application range | **Failsafe** |
| Module's device code | **0060h** |
| **Electrical data** | |
| Supply voltage | |
| for | **Supply to the system** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Max. continuous current that the external power supply must provide | **1,6 A** |
| Inrush current that the external power supply must provide | **3 A** |
| Output of external power supply (DC) at no load | **1,2 W** |
| Supply voltage | |
| for | **Supply to the SC outputs** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Max. continuous current that the external power supply must provide | **8 A** |
| Output of external power supply (DC) at no load | **0,8 W** |
| Potential isolation | **yes** |
| Max. power dissipation of module | **7,4 W** |
| Status indicator | **Display, LED** |
| Permitted loads | **inductive, capacitive, resistive** |
| **Configurable inputs/outputs (inputs or auxiliary outputs)** | |
| Number | **8** |
| Potential isolation | **No** |
| Configurable inputs | |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V** |
| Input current at rated voltage | **5 mA** |
| Input current range | **2,5 - 5,3 mA** |
| Pulse suppression | **0,5 ms** |
| Maximum input delay | **2 ms** |

# Base units
PNOZ m B0

| | |
|---|---|
| **Configurable inputs/outputs (inputs or auxiliary outputs)** | |
| Configurable auxiliary outputs | |
| Voltage | **24 V** |
| Output current | **75 mA** |
| Output current range | **0 - 100 mA** |
| Max. transient pulsed current | **500 mA** |
| Short circuit-proof | **yes** |
| Residual current at "0" | **0,5 mA** |
| Voltage at "1" | **UB - 2 V at 0.1 A** |
| **Inputs** | |
| Number | **12** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** |
| Input current at rated voltage | **5 mA** |
| Input current range | **2,5 - 5,3 mA** |
| Pulse suppression | **0,5 ms** |
| Maximum input delay | **2 ms** |
| Potential isolation | **No** |
| **Semiconductor outputs** | |
| Number of positive-switching single-pole semiconductor outputs | **4** |
| Switching capability | |
| Voltage | **24 V** |
| Current | **2 A** |
| Permitted current range | **0,000 - 2,500 A** |
| Residual current at "0" signal | **0,05 mA** |
| Max. transient pulsed current | **12 A** |
| Max. capacitive load | **1 µF** |
| Max. internal voltage drop | **500 mV** |
| Max. duration of off time during self test | **330 µs** |
| Switch-off delay | **1 ms** |
| Potential isolation | **yes** |
| Short circuit-proof | **yes** |
| **Test pulse outputs** | |
| Number of test pulse outputs | **4** |
| Voltage | **24 V** |
| Current | **0,1 A** |
| Max. duration of off time during self test | **5 ms** |
| Short circuit-proof | **yes** |
| Potential isolation | **No** |

# Base units
PNOZ m B0

| | |
|---|---|
| **Times** | |
| Simultaneity in the two-hand circuit | **0,5 s** |
| Processing time | **30 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| Max. operating height above sea level | **2000 m** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **SC output and system voltage** |
| Type of potential isolation | **Basic insulation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |

# Base units
PNOZ m B0

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **1 km** |
| Sum of individual cable lengths at the test pulse output | **2 km** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **45 mm** |
| Depth | **120 mm** |
| Weight | **235 g** |

Where standards are undated, the 2012-04 latest editions shall apply.

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,74E-10** | **20** |
| Expansion left | – | **PL e** | **Cat. 4** | **SIL CL 3** | **3,30E-11** | **20** |

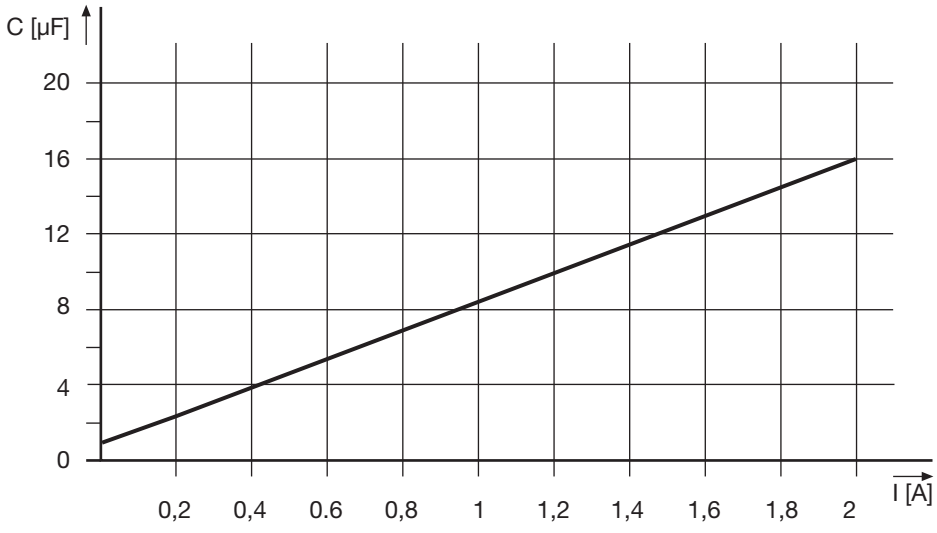
# Base units
PNOZ m B0

| | | | | | | |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| Expansion right | – | **PL e** | **Cat. 4** | **SIL CL 3** | **2,79E-11** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **3,85E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,95E-11** | **20** |
| SC inputs | **2-channel** | **PL d** | **Cat. 3** | **SIL CL 2** | **1,06E-09** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **3,85E-10** | **20** |
| **Output** | | | | | | |
| SC outputs | **1-channel with advanced fault detection** | **PL e** | **Cat. 4** | **SIL CL 3** | **1,66E-11** | **20** |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **1,57E-10** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **1,29E-10** | **20** |

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

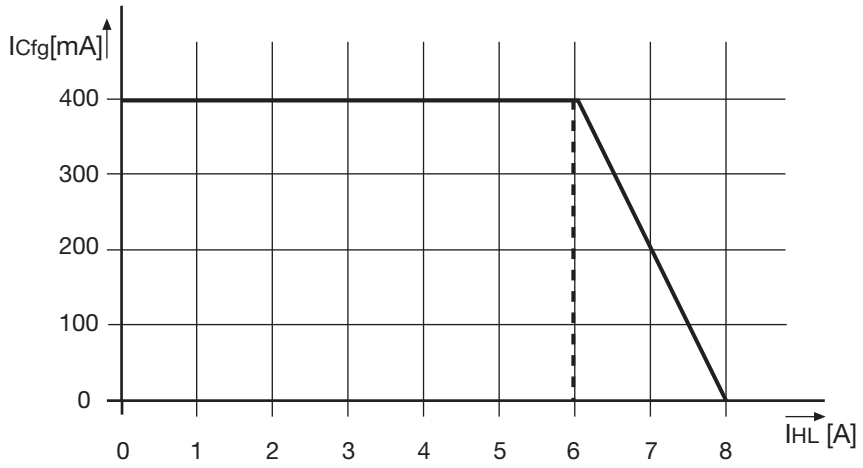
## Supplementary data

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



## Base units
PNOZ m B0

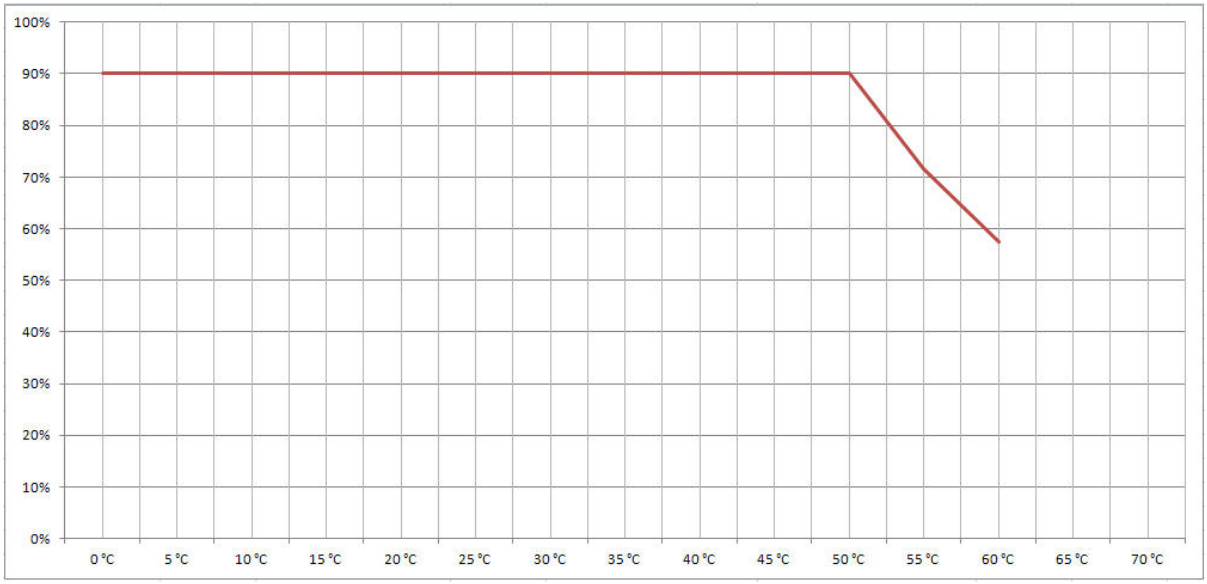
### Maximum permitted total current of the semiconductor outputs



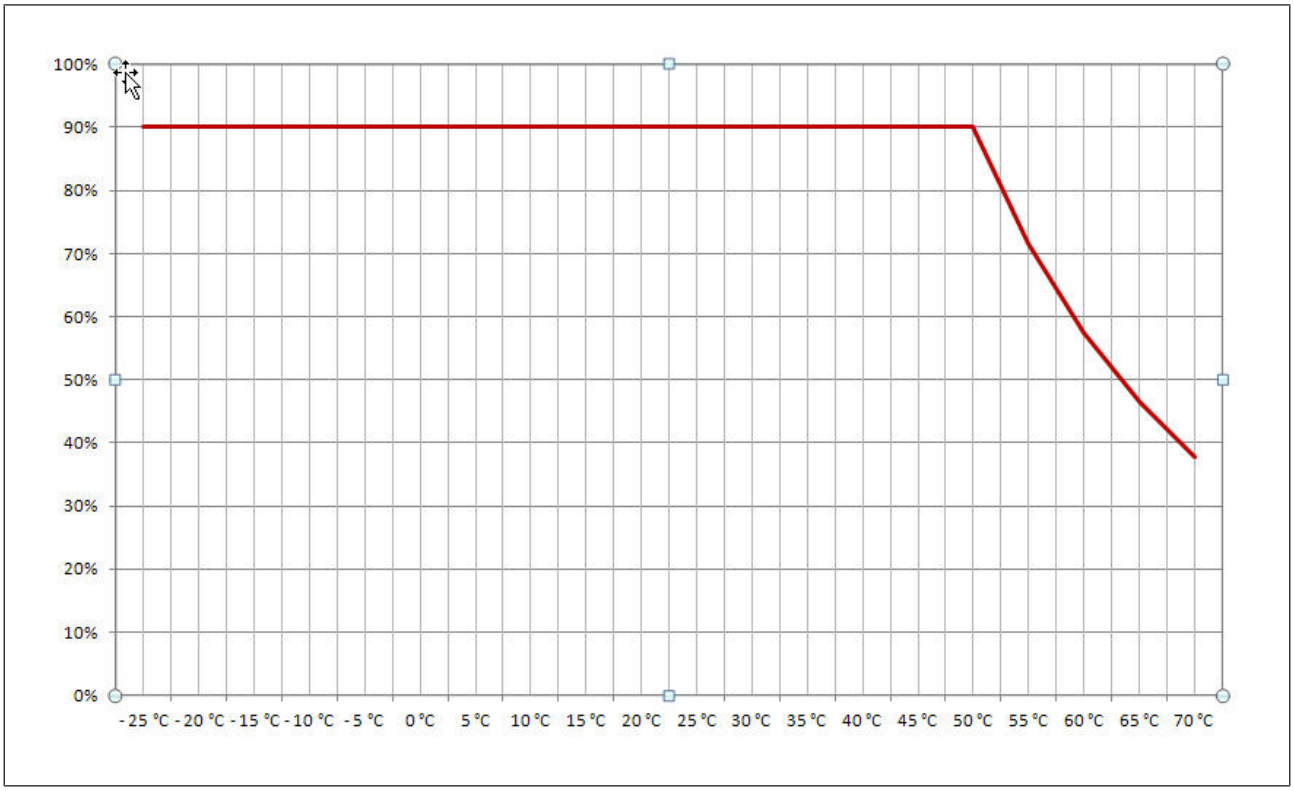

$I_{Cfg}$: Total current of the configurable semiconductor outputs (auxiliary outputs)

$I_{HL}$: Total current: Semiconductor outputs (safety outputs)

### Maximum permitted humidity



# Base units
PNOZ m B0




## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m B0 | Base unit | 772 100 |

### Accessories

#### Terminator

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mm0.xp terminator left | Terminator, black/yellow, x1 | 779 261 |

#### Cable

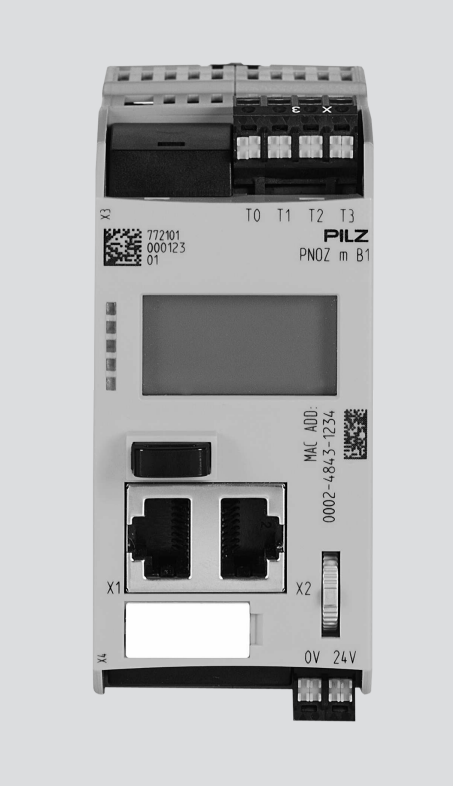
| Product type | Features | Order no. |
|---|---|---|
| PSSu A USB-CAB03 | Mini USB cable, 3 m | 312 992 |
| PSSu A USB-CAB05 | Mini USB cable, 5 m | 312 993 |

# Base units
PNOZ m B0

**Terminals**

| Product type | Features | Order no. |
|---|---|---|
| PNOZ s Set1 spring loaded terminals | 1 set of spring-loaded terminals | 751 008 |
| PNOZ s Set1 screw terminals | 1 set of screw terminals | 750 008 |

# Base units
PNOZ m B1




## Overview

### Unit features

Using the product PNOZ m B1:

Base unit of the configurable control system PNOZmulti 2

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Support for module programs
- 4 test pulse outputs to detect shorts between the inputs
- Backlit display for:
  - Status information
  - Device information
  - Diagnostics
  - Activate project
  - Ethernet settings
  - System's date and time
  - Stop and start device

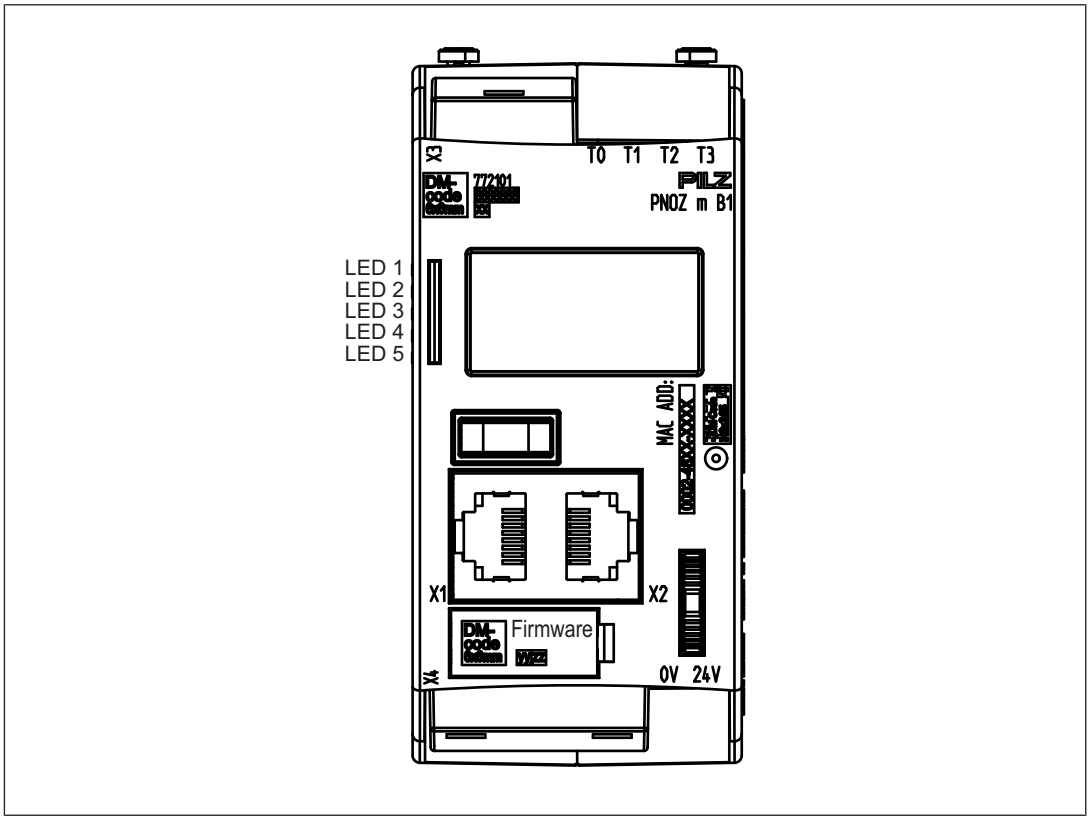
# Base units
PNOZ m B1

- Multifunction switch for menu control
- Ethernet interface with switch
- LED indicator for:
  - Operating status
  - Error messages
  - Diagnostics
  - Supply voltage
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Expansion modules can be connected
  (please refer to the document "PNOZmulti System Expansion" for details of the type and number that can be connected)

## USB memory

To save and transfer projects you need the Pilz USB memory that is supplied with the device (plugged into the device).

## Front view



# Base units
PNOZ m B1

**Legend**

| | |
|---|---|
| X1/X2: | Ethernet interface |
| X3: | Test pulse outputs T0 - T3 |
| X4: | Labelling clip for firmware version |
| LED 1: | Supply voltage |
| LED 2 | FS (Initialise/Run/Stop) |
| LED 3 | ST (Initialise/Run/Stop) |
| LED 4 | Diag (Project reset/Identify project) |
| LED 5 | FAULT (IFault/OFault) |

**To determine the version of the device, please note:**

The firmware version number is on the labelling clip. This is also the version number that must be selected in the PNOZmulti Configurator under ***Version*** during the hardware configuration.

## Function description

### Functions

The function of the inputs and outputs on the control system depends on the safety circuit created using the PNOZmulti Configurator. A USB memory stick 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 expansion modules accordingly.

The LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

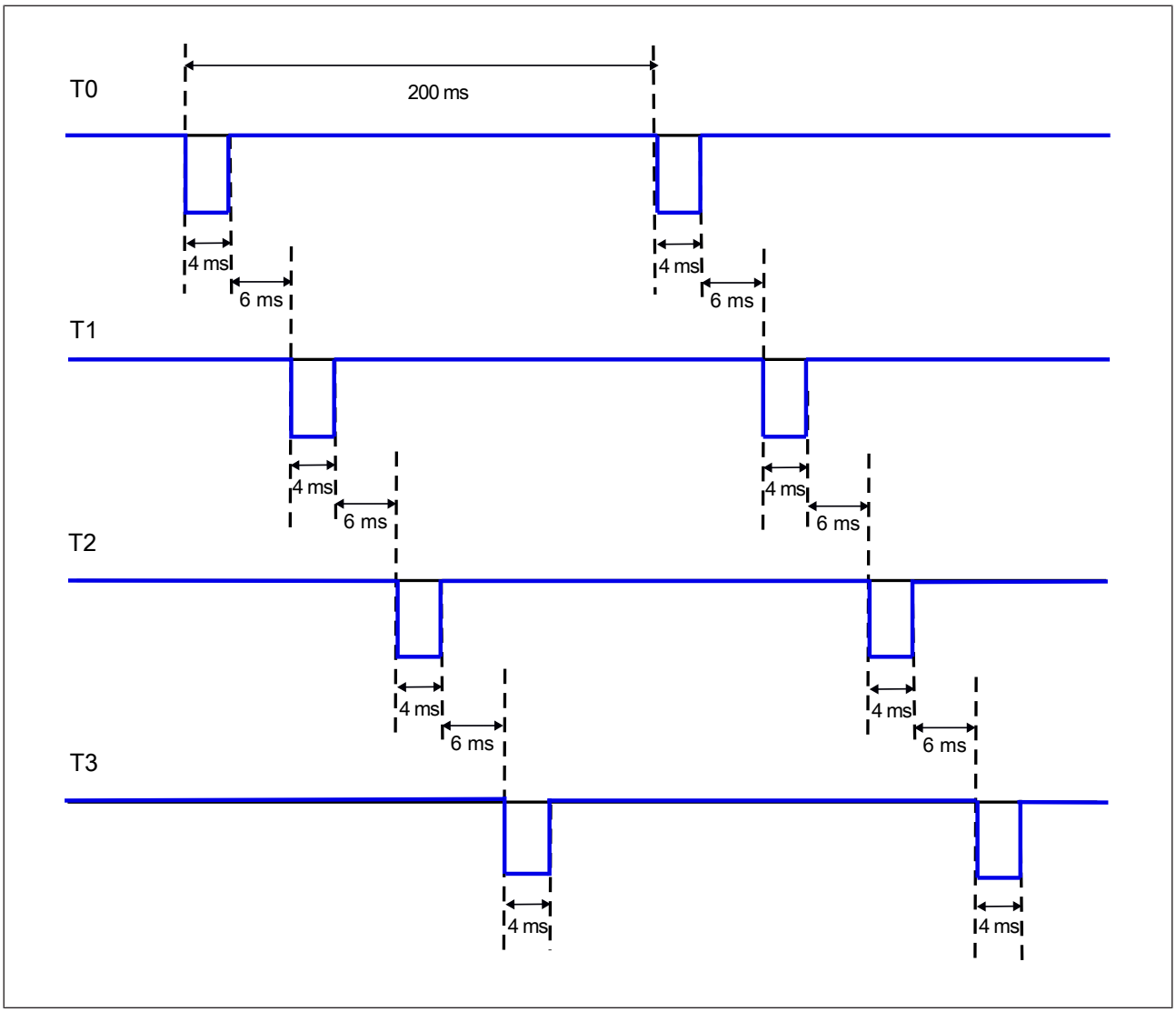
# Base units
PNOZ m B1

## Detection of shorts across contacts

4 test pulse outputs that use different test pulses (test pulse 0 (T0) ... test pulse 3 (T3)) are available for detecting shorts between the inputs.

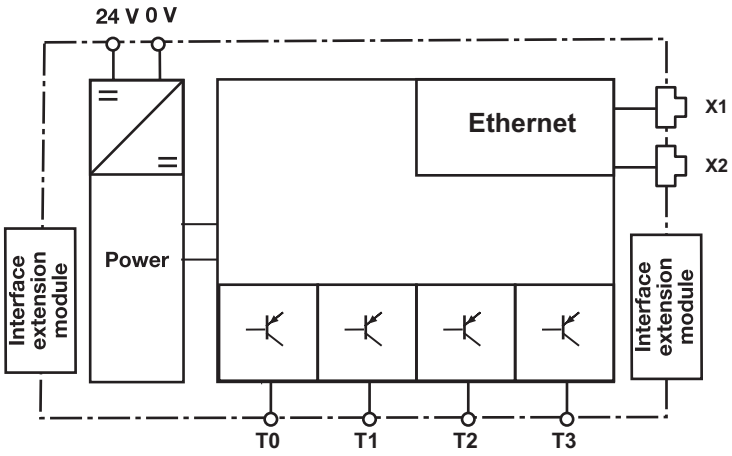
Shorts between inputs are detected if the inputs are connected to different test pulses (test pulse 0 ... test pulse 3).

**Pulsing of test pulse outputs T0 ... T3 (typical times):**



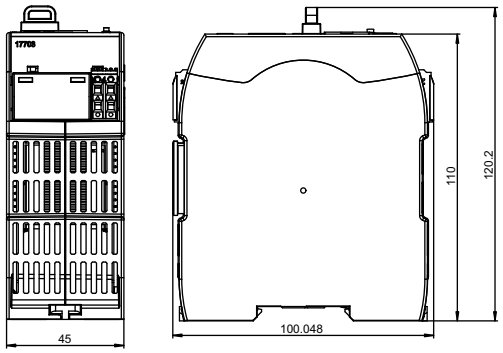
# Base units
PNOZ m B1

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 700] must be followed.
- Use copper wiring with a temperature stability of 75 °C.

- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with protective separation (SELV, PELV).
- Test pulse outputs are used to detect shorts between the inputs. Shorts between inputs are detected if the inputs are connected to different test pulses (test pulse 0 ... test pulse 3). Shorts between inputs of the same module with the same test pulses will not be detected.
- Test pulse outputs must exclusively be used to activate 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.
- The maximum permitted total current of the test pulse outputs is 640 mA.

### Connection

Procedure:

- Connect the supply voltage for the control system:
  - Terminal 24 V: + 24 VDC
  - Terminal 0 V: 0 V,
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

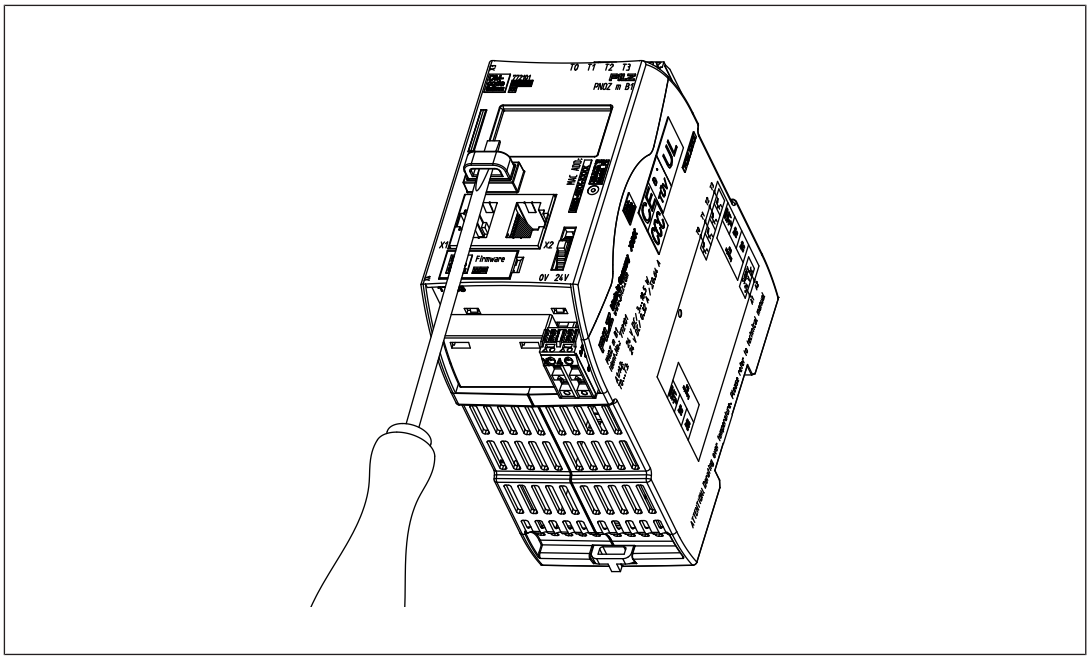
# Base units
PNOZ m B1

## Use USB memory

Multiple projects can be stored on the USB memory that is plugged into the device. One of these can be activated and executed on the base unit.

Please note the following when using the USB memory:

- The USB memory must always be plugged in during operation.
- In order to copy projects, for example, the USB memory can be removed and plugged into the PC or into another base unit PNOZ m B1.
- Only Pilz USB memories may be used!
- Due to mechanical requirements, the USB memory is plugged firmly into the device and so may be difficult to remove.
  If this is the case, use an appropriate tool, such as a screwdriver, to carefully extract the USB memory (see illustration).
- To use the USB memory, insert the USB memory into the slot, applying light pressure. Make sure that the USB memory is inserted right up to the plastic handle (see illustration).



## Load project from PNOZmulti Configurator

Projects can be transferred from the PNOZmulti Confgurator to the USB memory. Several projects may be stored on the USB memory, A project can be activated directly. This can be performed in the Project Manager of the PNOZmulti Configurator (see online help for the PNOZmulti Configurator).

Procedure:

- Connect the computer containing the PNOZmulti Configurator to the base unit PNOZ m B1 via the Ethernet interface.

- Make sure that the USB memory is plugged into the base unit PNOZ m B1.
- Switch on the supply voltage.
- Transfer the required project to the USB memory and activate it on the base unit via the Project Manager on the PNOZmulti Configurator, as described in the online help for the PNOZmulti Configurator.
- As the project is loaded, the base unit must be stopped and then restarted.
- Once the project has been loaded successfully and the device has been restarted, the status of the supply voltage is shown on the display. The "RUN" LED is lit.

### Activate project via the display on the base unit

A project that is stored on the USB memory can be activated in the base unit via settings on the display.

Procedure:

- Make sure that the USB memory containing the current project is plugged into the base unit PNOZ m B1.
- Switch on the supply voltage.
- Stop the device via the multifunction switch on the display via the menu setting ***System mode*** -> ***Stop system*** (for details of how to navigate the display see the section entitled Display settings [📖 691])
- In the ***Project*** menu, navigate to the folder containing the required project and select the project file with the extension ***.mpnoz2***.
- Load the project by pressing the multifunction switch and restart via the menu setting ***System mode*** -> ***Restart system***.

### Display settings

Various settings can be made and information displayed via the menu on the device's display.

The menu settings are made on the device's display via a multifunction switch. You can switch between the menu levels by pressing or turning the multifunction switch.

#### Press multifunction switch

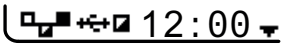
- Confirm selection/setting
- Switch to sub-menu
- Exit menu: **\..**

# Base units
PNOZ m B1

**Move multifunction switch up or down**

- Select menu

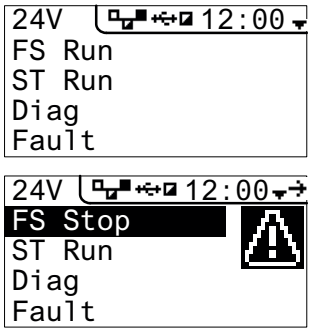
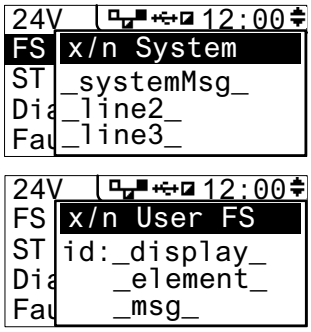
The LC display has five lines. Information is shown on the display and settings can be made.
The field at the top right of the display shows information about the connection and instructions for the menu settings:




**Legend:**

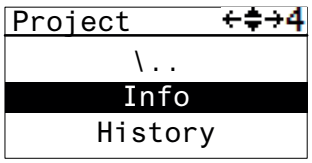
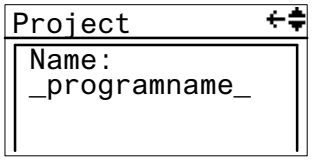
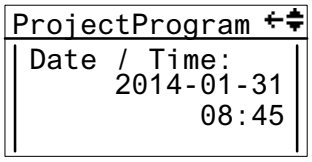
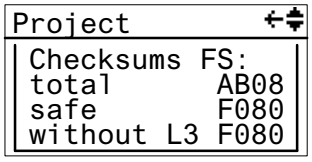
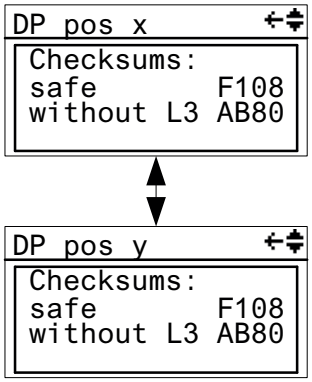
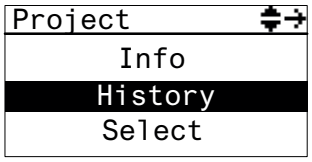
| | |
|---|---|
| | Network connection/traffic |
| | USB memory inserted |
| **12:00** | System time |
| | Press the multifunction switch to go back to the higher level menu |
| | Press the multifunction switch to access the sub-menu |
| 4 | Hold the multifunction switch down for 4 s to confirm the selection or perform the action |
| i | Press the multifunction switch to obtain information |
| | Press the multifunction switch to call up the system message |
| | Press the multifunction switch to call up the user message |

## Base units
PNOZ m B1

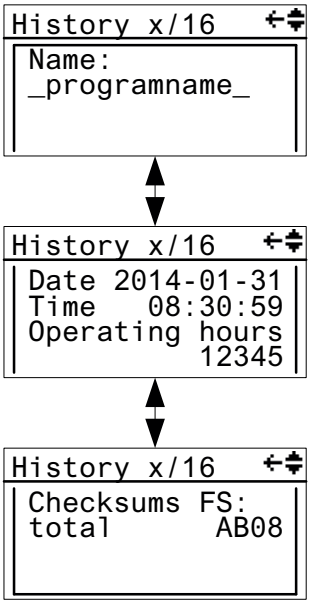
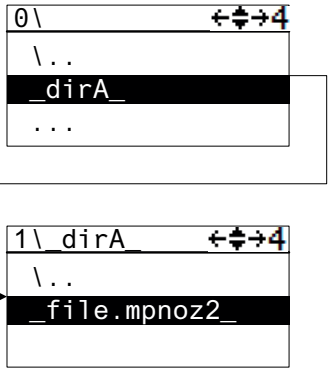
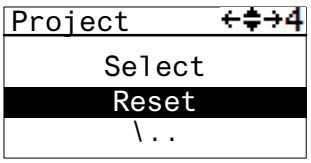
| Display | Display on device | Description |
|---|---|---|
| **Permanent display** |  | LED display<br>▸ A warning symbol shows that a message is present, which can be called up |
| **System / User...**<br>System or display messages |  | ⚠ System message is present<br>or<br>⚠ User message is present (user-specific messages that are created in the PNOZmulti Configurator) |

# Base units
PNOZ m B1

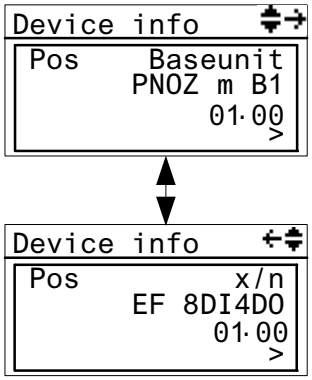
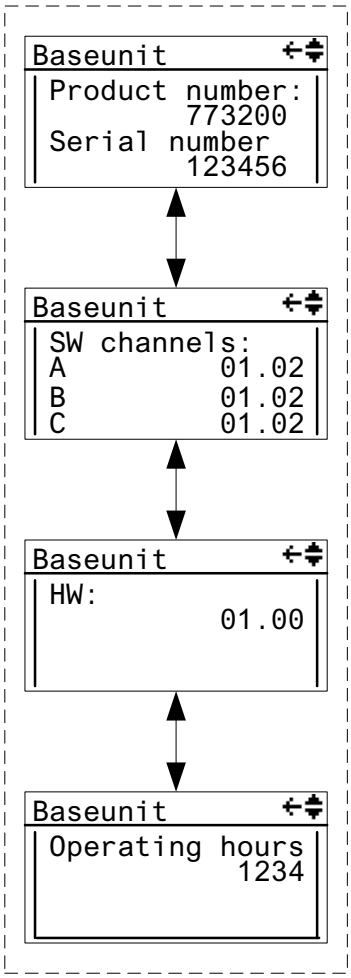
In the ***Project*** menu you can display information about the project that is activated on the device. You can also activate a different project from the USB memory on the device. See also Activate project via the display on the base unit [📖 691] and reset the project on the device.

| Display | Display on device | Description |
|---|---|---|
| **Info:** |  | Information is displayed about the project activated on the device |
| **Name**<br>Project name |  | Name of project |
| **Date / Time**<br>Creation data and time |  | Date and time that the project was created |
| **Check sums FS**<br>Overall check sum and check sums of main program |  | Display of check sums:<br>▸ Overall project check sum<br>▸ Check sum safe of main program<br>▸ Check sum safe of main program without level 3 |
| **Check sums DP pos x**<br>Check sums of module program |  | Display of check sums of module program<br>▸ Check sum safe<br>▸ Check sum safe without level 3 |
| | | |
| **History:**<br>Project history |  | Project information is displayed for one of the last 16 projects activated |

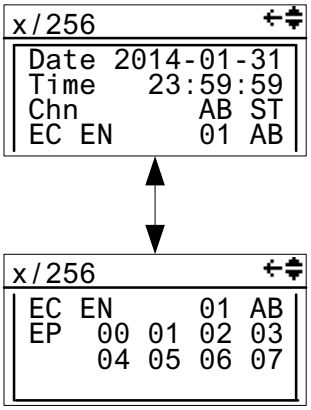
## Base units
PNOZ m B1

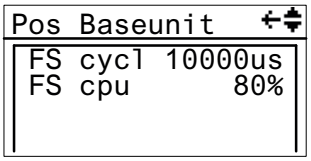
| Display | Display on device | Description |
|---|---|---|
| **Name**<br>**Date / Time**<br>**Check sum FS**<br>**Check sum DP pos x**<br>**...** |  | Display of project information for a selected project |
| | | |
| **Select:**<br>Activate project |  | Select project contained in the USB memory and activate it on the base unit<br>▸ Prerequisite: Device must be stopped<br>▸ Hold down multifunction switch for 4 s in order to activate the project |
| | | |
| **Reset:**<br>Reset or update project. |  | After a reset, the active project is reloaded from the USB memory<br>▸ Prerequisite: Device must be stopped<br>▸ Hold down multifunction switch for 4 s in order to reset |

## Base units
PNOZ m B1

| Display | Example | Description |
|---|---|---|
| **Device Info** |  | Information on the base unit and expansion modules. Overview:<br>▸ Position/slot<br>▸ Device type<br>▸ Firmware version |
| Device information for module |  | Show device information for a selected module:<br>▸ Order number<br>▸ Serial number<br>▸ Software versions<br>▸ Hardware version<br>▸ Operating hours |

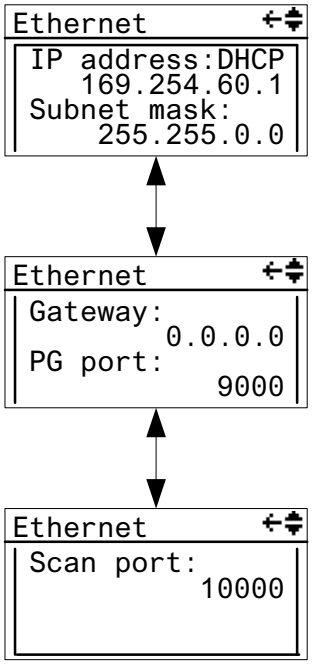
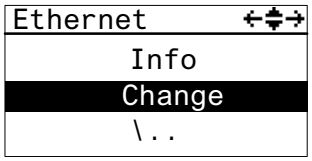
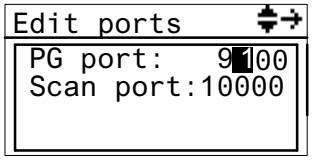
## Base units
PNOZ m B1

| Display | Example | Description |
|---|---|---|
| **Error stack** |  | Display of entries in the error stack (see also section entitled Show error stack on the display<br>To read the error stack entries please refer to the document ***PNOZmulti Error Messages*** |

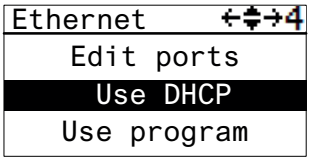
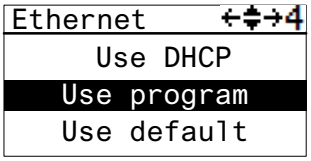
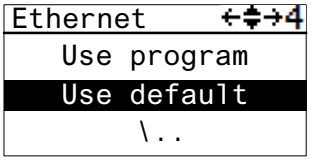
| Display | Example | Description |
|---|---|---|
| **Operating Info** |  | Display of specific operating parameters for the base unit and expansion modules.<br>e.g.: cycle time, operating temperature, frequencies |

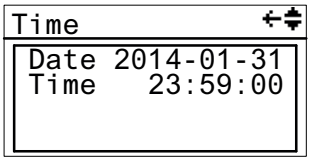
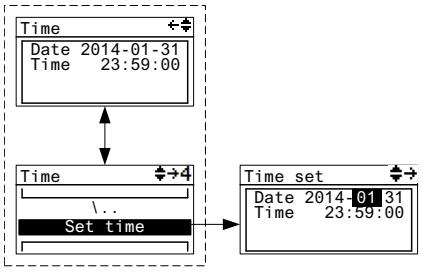
# Base units
PNOZ m B1

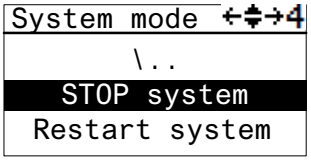
The Ethernet configuration can be displayed and changed in the ***Ethernet*** menu.

| Display | Example | Description |
|---|---|---|
| **About PNOZmulti Configurator** |  | Display of the current Ethernet configuration |
| **Change** |  | Change Ethernet configuration... |
| **Edit IP**<br>Change IP address |  | Adjust<br>▸ IP address<br>▸ Subnet mask<br>▸ Gateway<br>-> Hold down multifunction switch for 2 s in order to access change mode |
| **Edit ports**<br>Change IP address |  | Adjust PG port and scan port<br>-> Hold down multifunction switch for 2 s in order to access change mode |

## Base units
PNOZ m B1

| Display | Example | Description |
|---|---|---|
| **Use DHCP**<br>Change IP address |  | Obtain IP address automatically from the network (prerequisite: network has a DHCP Server Utility)<br>-> Hold down multifunction switch for 2 s in order to perform the action |
| **Use program**<br>Change IP address |  | Load Ethernet settings from the active PNOZmulti project<br>-> Hold down multifunction switch for 2 s in order to perform the action |
| **Use default**<br>Change IP address |  | Load default settings<br>IP address: 169.254.60.1<br>Subnet mask: 255.255.0.0<br>Gateway: 0.0.0.0<br>-> Hold down multifunction switch for 2 s in order to perform the action |

| Display | Example | Description |
|---|---|---|
| **Time**<br>Show date and time |  | Show system's date and time |
| **Set time**<br>Set date and time |  | Change date and time<br>-> Hold down multifunction switch for 2 s in order to access change mode |

| Display | Example | Description |
|---|---|---|
| **Stop system**<br>**Restart system** |  | Stop system<br>Restart system<br>-> Hold down multifunction switch for 4 s in order to perform the actions |

# Base units
PNOZ m B1

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CE** |
| Application range | **Failsafe** |
| **Electrical data** | |
| Supply voltage | |
| for | **Supply to the system** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Output of external power supply (DC) | **18,5 W** |
| Output of external power supply (DC) at no load | **3 W** |
| Max. power dissipation of module | **4,5 W** |
| Status indicator | **Display, LED** |
| **Test pulse outputs** | |
| Number of test pulse outputs | **4** |
| Voltage | **24 V** |
| Current | **0,32 A** |
| Max. duration of off time during self test | **4 ms** |
| Short circuit-proof | **yes** |
| Potential isolation | **No** |
| **Ethernet interface** | |
| Number | **2** |
| Transmission rate | **10 MBit/s, 100 MBit/s** |
| **Times** | |
| Simultaneity in the two-hand circuit | **0,5 s** |
| Processing time | **30 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Humidity | **93 % r. h. at 40 °C** |
| Condensation during operation | **Not permitted** |

# Base units
## PNOZ m B1

| | |
|---|---|
| **Environmental data** | |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Cage clamp terminal, screw terminal** |
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |

# Base units
PNOZ m B1

| Mechanical data | |
|---|---|
| Dimensions | |
| Height | **120,2 mm** |
| Width | **45 mm** |
| Depth | **98 mm** |
| Weight | **209 g** |

Where standards are undated, the 2013-05 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **4,19E-10** | **SIL 3** | **3,65E-05** | **20** |

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

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ m B1 | Base unit | 772 101 |

### Accessories

#### Terminator

| Product type | Features | Order no. |
|---|---|---|
| PNOZ mm0.xp terminator left | Terminator, black/yellow, x1 | 779 261 |

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set4 Spring Terminals | 1 set of spring-loaded terminals | 751 016 |
| Set4 Screw Terminals | 1 set of screw terminals | 750 016 |

## Base units
PNOZ m B1

### Jumper

| Product type | Features | Order No. |
|---|---|---|
| USB Memory 512MB | Pilz USB memory, 512 MB | 779 213 |

# Input module
PNOZ m EF 16DI

## Overview

### Unit features

Using the product PNOZ m EF 16DI:

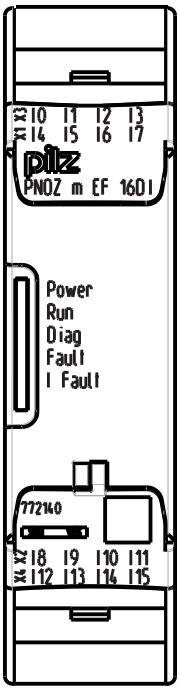
Expansion module for connection to a base unit from the configurable control system .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- 16 inputs for connecting, for example:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Start button
  - Light beam devices
  - Scanner
  - Enabling switch
  - PSEN
  - Operating mode selector switch
- LED for:
  - Error messages
  - Diagnostics
- Test pulse outputs used to monitor shorts across the inputs
- Plug-in connection terminals:
  Either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Input module
PNOZ m EF 16DI

### Front view




Legend:

- Inputs I0 – I15
- LEDs:
  - POWER
  - Run
  - Diag
  - Fault
  - I Fault

**To determine the version of the device, please note:**

The firmware version number is on the labelling clip. This is also the version number that must be selected in the PNOZmulti Configurator under ***Version*** during the hardware configuration.

# Input module
PNOZ m EF 16DI

## Function description

### Functions

The expansion module provides additional inputs.

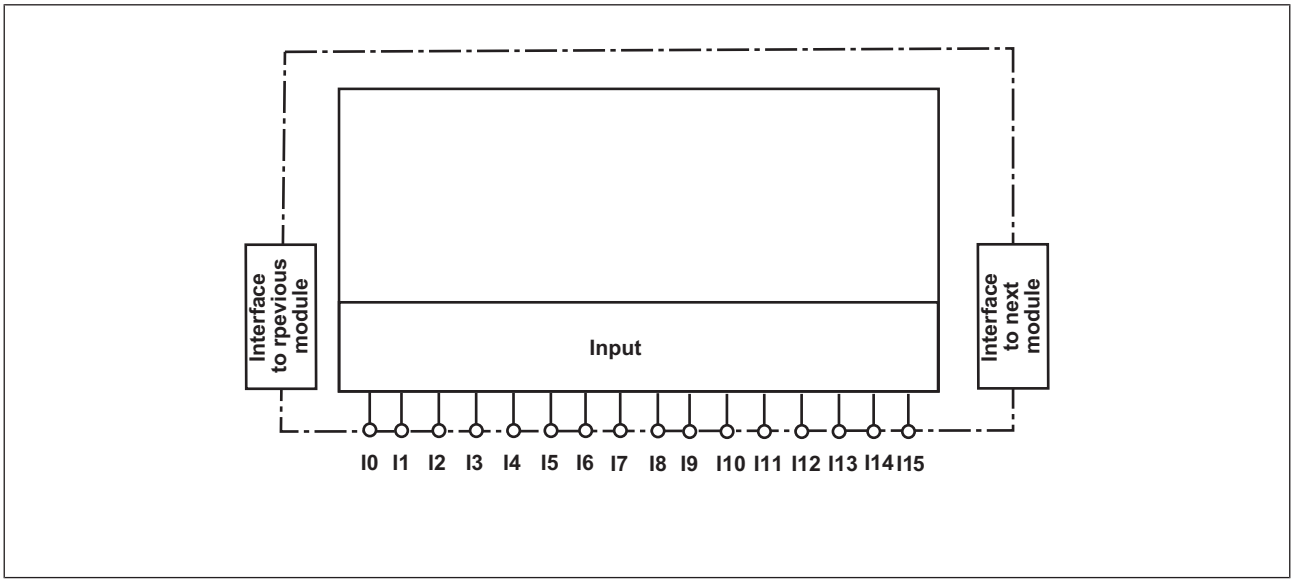
The function of the inputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit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

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

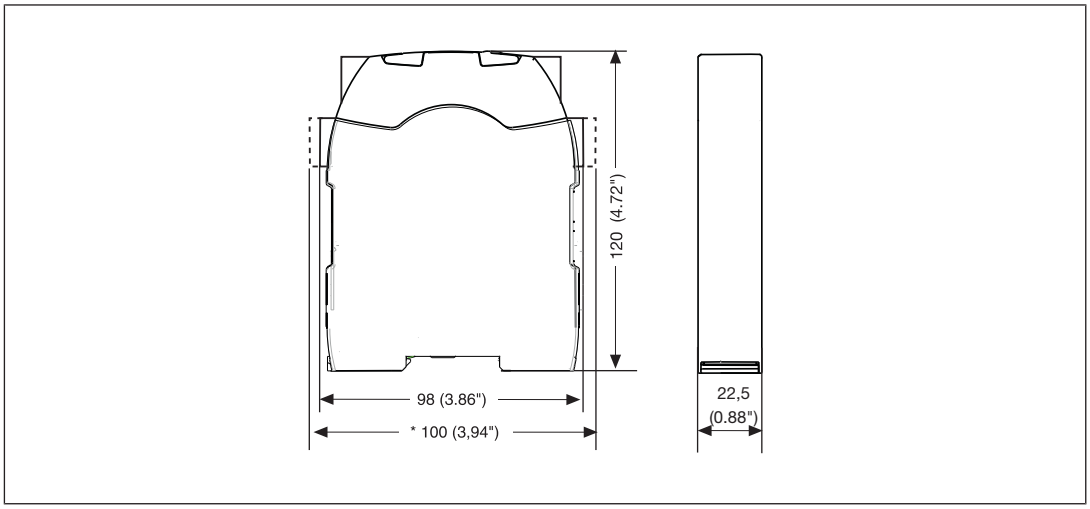
### Block diagram



# Input module
PNOZ m EF 16DI

## Installation

### Dimensions in mm




## Commissioning

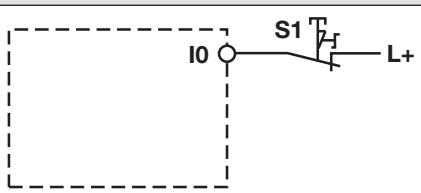
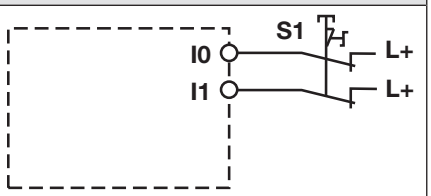
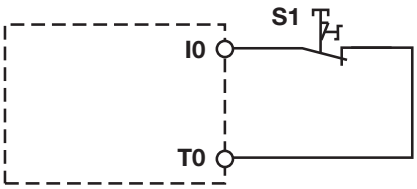
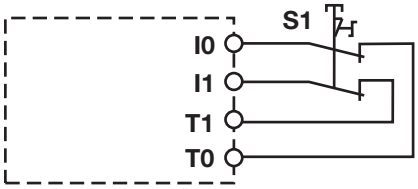
### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 708] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.

### Connection

| 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 |  |  |

# Input module
PNOZ m EF 16DI

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, GOST, TÜV, cULus Listed** |
| Application range | **Failsafe** |
| Module's device code | **00E2h** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Current consumption | **46 mA** |
| Power consumption | **1,1 W** |
| Max. power dissipation of module | **3,00 W** |
| Status indicator | **LED** |
| **Inputs** | |
| Number | **16** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** |
| Input current at rated voltage | **5 mA** |
| Input current range | **2,5 - 5,3 mA** |
| Pulse suppression | **0,5 ms** |
| Maximum input delay | **8 ms** |
| Potential isolation | **No** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5,0 - 150,0 Hz** |
| Acceleration | **1g** |

# Input module
PNOZ m EF 16DI

| | |
|---|---|
| **Environmental data** | |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **1,0 km** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |

# Input module
PNOZ m EF 16DI

| Mechanical data | |
|---|---|
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **120,0 mm** |
| Weight | **95 g** |

Where standards are undated, the 2012-08 latest editions shall apply.

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | – | **PL e** | **Cat. 4** | **SIL CL 3** | **2,84E-10** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **2,10E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,27E-11** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,10E-10** | **20** |

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

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ m EF 16DI | Expansion module | 772 140 |

### Accessories

#### Connection terminals

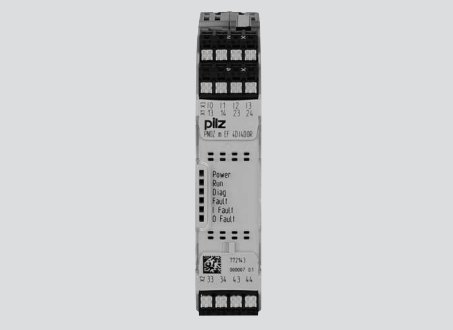
| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 751 004 |
| Set screw terminals | 1 set of screw terminals | 750 004 |

## Input module
PNOZ m EF 16DI

**Terminator, jumper**

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Input and output modules
PNOZ m EF 4DI4DOR



## Overview

### Unit features

Using the product PNOZ m EF 4DI4DOR:

Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

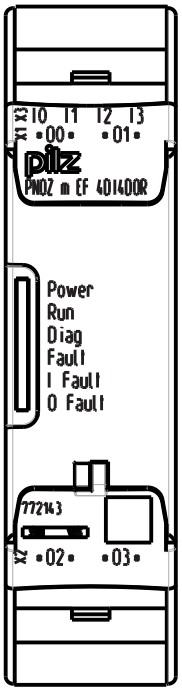
- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:

  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- 4 inputs for connecting, for example:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Start button
  - Light beam devices
  - Scanner
  - Enabling switch
  - PSEN
  - Operating mode selector switch
- LED for:
  - Error messages
  - Diagnostics
  - Supply voltage
  - Output circuits

## Input and output modules
PNOZ m EF 4DI4DOR

- Input circuits
- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals:
  Either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

### Front view




Legend:

- Inputs I0 – I3
- Outputs O0 – O3
- LEDs:
  - POWER
  - Run
  - Diag
  - Fault
  - I Fault

# Input and output modules
PNOZ m EF 4DI4DOR

– O Fault

## Function description

### Functions

The expansion module provides additional inputs and additional relay outputs.

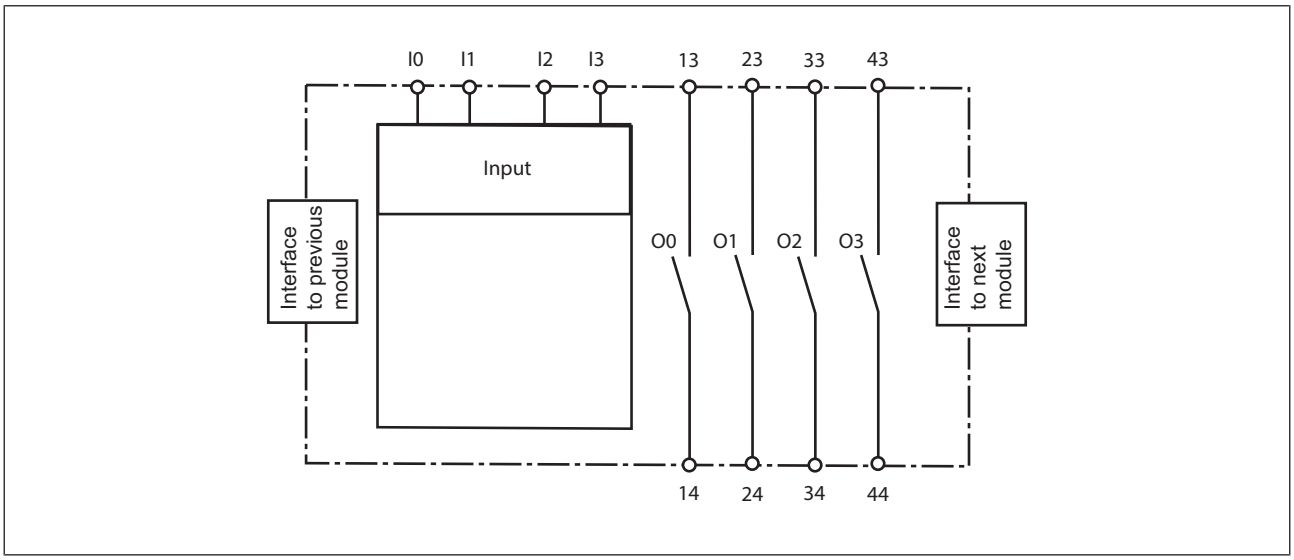
The function of the inputs and outputs on the control system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the 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 control system, plus connection examples.

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

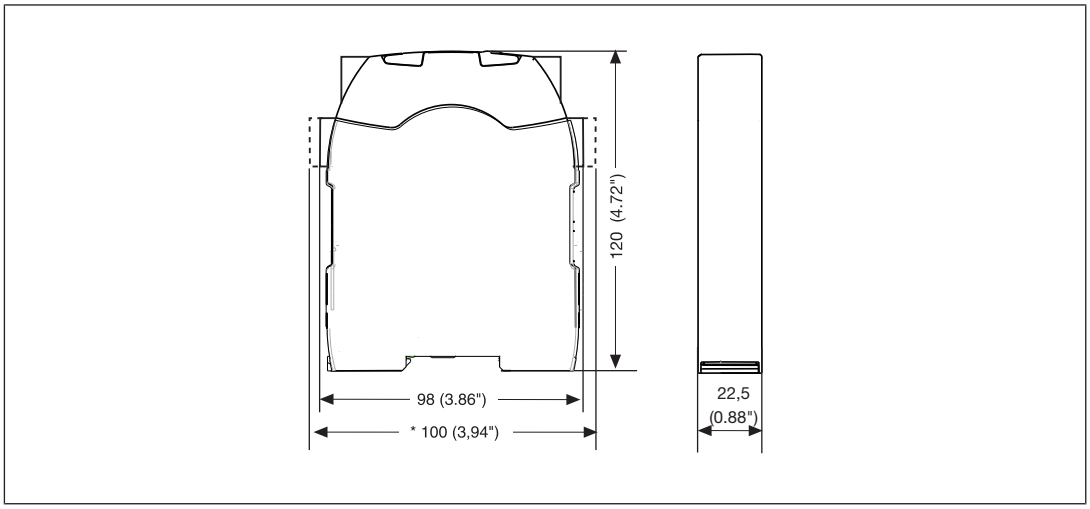
### Block diagram



# Input and output modules
PNOZ m EF 4DI4DOR

## Installation

### Dimensions in mm




## Commissioning

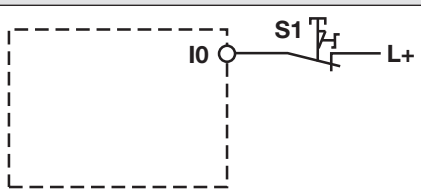
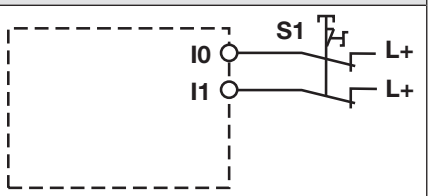
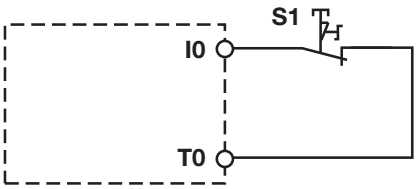
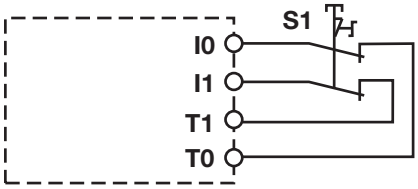
### General wiring guidelines

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

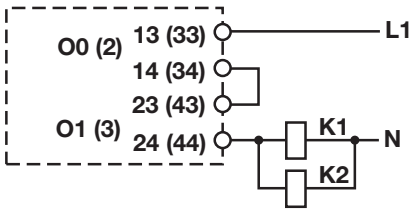
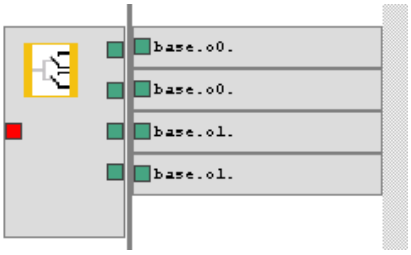
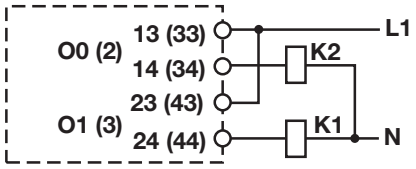
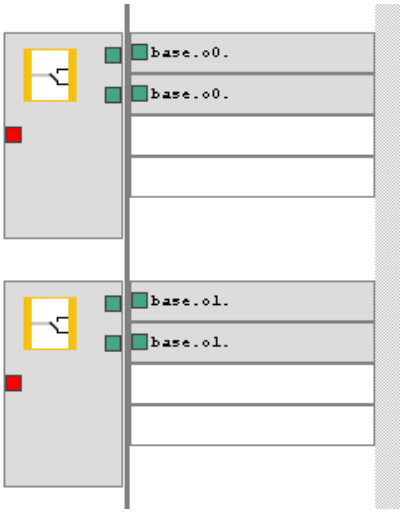
Please note:

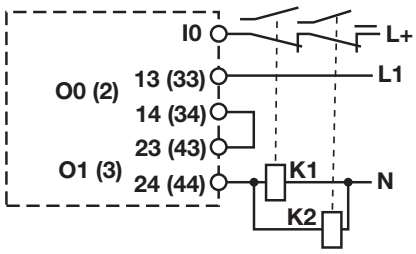
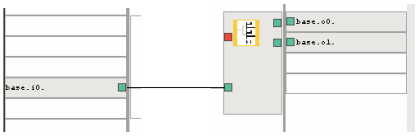
- Information given in the Technical details [📖 717] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.

### Connection

| 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 |  |  |

## Input and output modules
PNOZ m EF 4DI4DOR

| Relay outputs | | |
|---|---|---|
| Dual output |  |  |
| Single output |  |  |

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

# Input and output modules
PNOZ m EF 4DI4DOR

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, GOST, TÜV, cULus Listed** |
| Application range | **Failsafe** |
| Module's device code | **00E1h** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Current consumption | **122 mA** |
| Power consumption | **3,0 W** |
| Max. power dissipation of module | **6,50 W** |
| Status indicator | **LED** |
| Permitted loads | **inductive, resistive** |
| **Inputs** | |
| Number | **4** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** |
| Input current at rated voltage | **5 mA** |
| Input current range | **2,5 - 5,3 mA** |
| Pulse suppression | **0,5 ms** |
| Maximum input delay | **8 ms** |
| Potential isolation | **No** |
| **Relay outputs** | |
| Utilisation category | |
| In accordance with the standard | **EN 60947-4-1** |
| Utilisation category of safety contacts | |
| AC1 at | **250 V** |
| Min. current | **10,00 mA** |
| Max. current | **6,0 A** |
| Max. power | **1500 VA** |
| DC1 at | **24 V** |
| Min. current | **10,00 mA** |
| Max. current | **6,0 A** |
| Max. power | **144 W** |
| Utilisation category | |
| In accordance with the standard | **EN 60947-5-1** |

# Input and output modules
## PNOZ m EF 4DI4DOR

| | |
|---|---|
| **Relay outputs** | |
| Utilisation category of safety contacts | |
| AC15 at | **230 V** |
| Max. current | **3,0 A** |
| Max. power | **690 W** |
| DC13 (6 cycles/min) at | **24 V** |
| Max. current | **3,0 A** |
| Max. power | **72 W** |
| Utilisation category in accordance with UL | |
| Voltage | **240 V AC G.U. Resistive** |
| With current | **6,0 A** |
| Voltage | **24 V DC G. U. Resistive** |
| With current | **6,0 A** |
| Pilot Duty; R300 | **24 V DC** |
| With current | **3,0 A** |
| Pilot Duty; B300 | **230 V AC** |
| With current | **3,0 A** |
| Airgap creepage between | |
| Relay contacts | **3 mm** |
| Relay contacts and other circuits | **5,5 mm** |
| External contact fuse protection, safety contacts | |
| In accordance with the standard | **VDE 0660** |
| Blow-out fuse, quick | **10 A** |
| Blow-out fuse, slow | **6 A** |
| Switch-off delay | **22 ms** |
| Contact material | **AgCuNi + 0,2 µm Au** |
| Potential isolation | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |

# Input and output modules
## PNOZ m EF 4DI4DOR

| | |
|---|---|
| **Environmental data** | |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| Mechanical life | **10,000,000 cycles** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **1,0 km** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |

## Input and output modules
PNOZ m EF 4DI4DOR

| Mechanical data | |
|---|---|
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **120,0 mm** |
| Weight | **190 g** |

Where standards are undated, the 2012-04 latest editions shall apply.

## Safety characteristic data

| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | – | **PL e** | **Cat. 4** | **SIL CL 3** | **2,84E-10** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **2,10E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,27E-11** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,10E-10** | **20** |
| **Output** | | | | | | |
| Relay outputs | **1-channel** | **PL c** | **Cat. 1** | **-** | **3,75E-08** | **20** |
| Relay outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **7,52E-12** | **20** |

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

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

# Input and output modules
PNOZ m EF 4DI4DOR

## Supplementary data

### Service life graph for the relay contacts

The service life graphs indicate the number of cycles from which failures due to wear must be expected. The wear is mainly caused by the electrical load; the mechanical load is negligible.

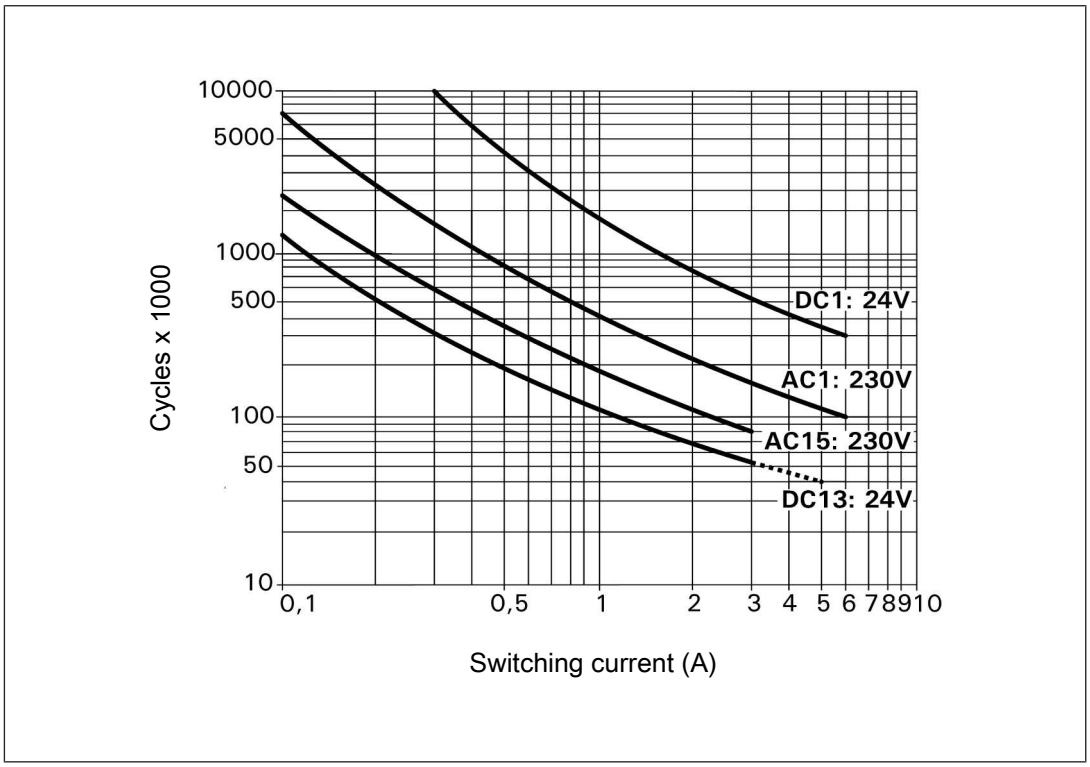



Fig.: Service life graphs at 24 VDC and 230 VAC

## Input and output modules
PNOZ m EF 4DI4DOR

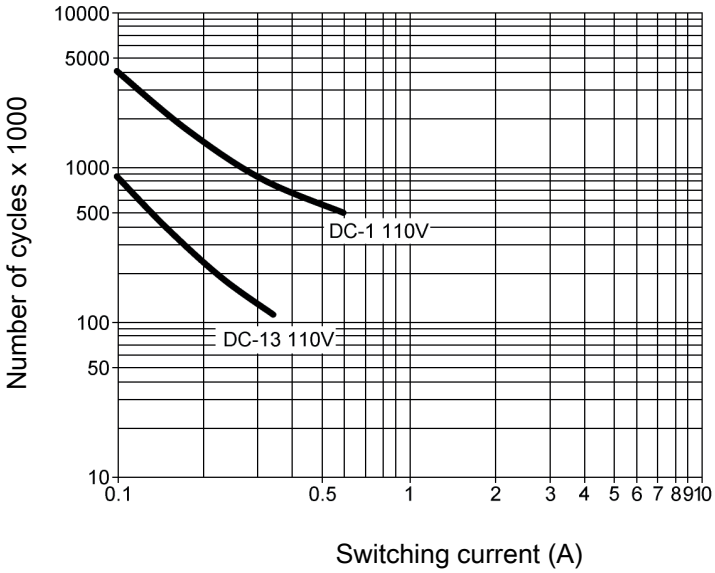



Fig.: Service life graphs at 110 VDC

**Example**

- Inductive load: 0.2 A
- Utilisation category: AC15
- Contact service life: 1 000 000 cycles

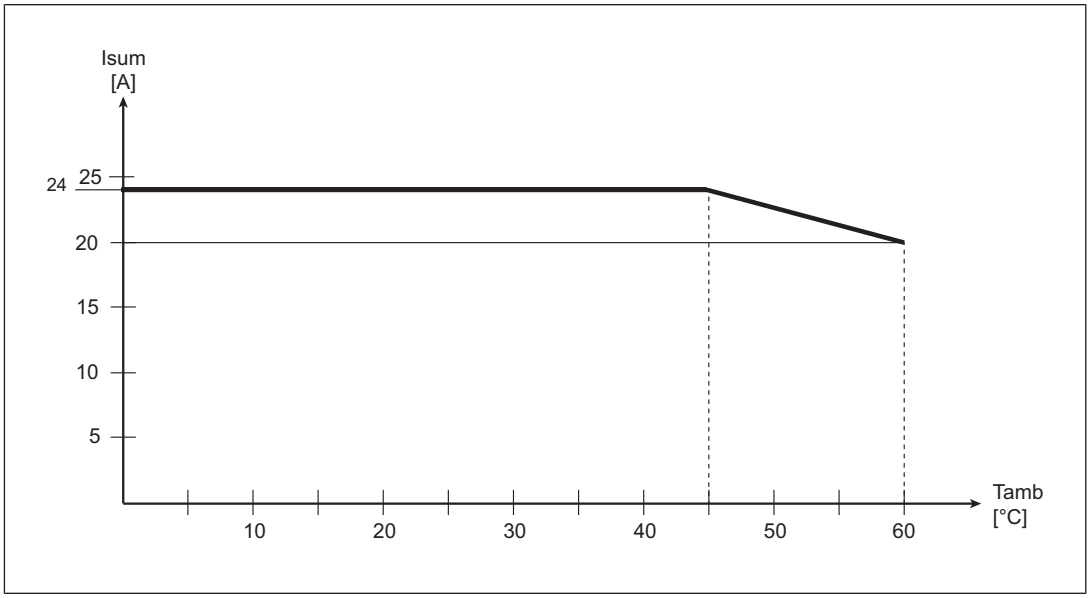
Provided the application to be implemented requires fewer than 1 000 000 cycles, the PFH value (see Technical details [📖 717]) can be used in the calculation.

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

We recommend you use semiconductor outputs to switch 24 VDC loads.

# Input and output modules
PNOZ m EF 4DI4DOR

### Permitted ambient temperature Tamb dependent on the total current Isum




Max. permitted total current of relay outputs at an ambient temperature of < 45 °C: 24 A

Max. permitted total current of relay outputs at an ambient temperature of = 60 °C: 20 A

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ m EF 4DI4DOR | Expansion module | 772 143 |

### Accessories

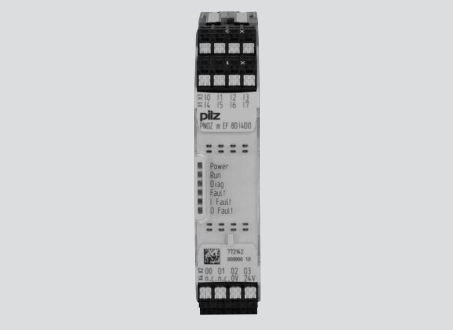
#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 751 004 |
| Set screw terminals | 1 set of screw terminals | 750 004 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Input and output modules
PNOZ m EF 8DI4DO



## Overview

### Unit features

Using the product PNOZ m EF 8DI4DO:

Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:

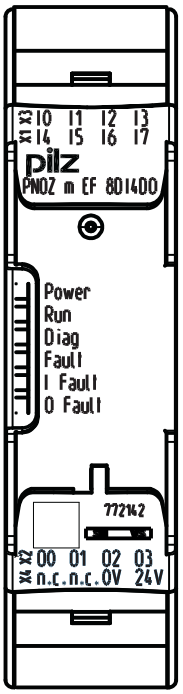
  4 safety outputs
  Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- 8 inputs for connecting, for example:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Start button
  - Light beam devices
  - Scanner
  - Enabling switch
  - PSEN
  - Operating mode selector switch
- LED for:
  - Error messages
  - Diagnostics
  - Supply voltage
  - Output circuits

## Input and output modules
PNOZ m EF 8DI4DO

- Input circuits

- Test pulse outputs used to monitor shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals:
  Either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

### Front view




Key:

- 0 V, 24 V: Supply connections
- Inputs I0 – I7
- Outputs O0 – O3
- LEDs:
  - POWER
  - Run
  - Diag
  - Fault

# Input and output modules
PNOZ m EF 8DI4DO

– I Fault
– O Fault

## Function description

### Functions

The expansion module provides additional inputs and additional semiconductor outputs.

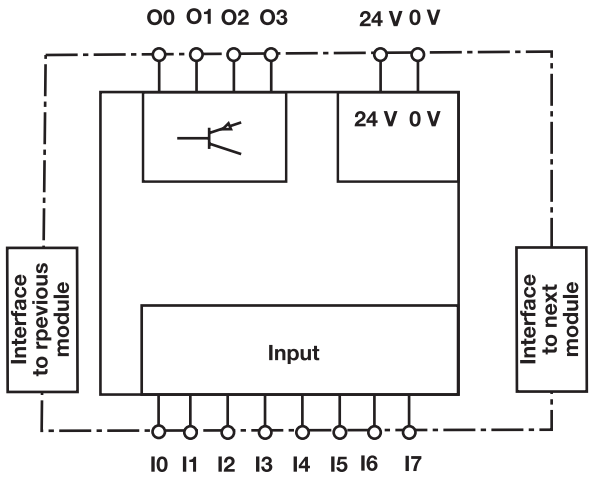
The function of the inputs and outputs on the control system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the 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 control system, plus connection examples.

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

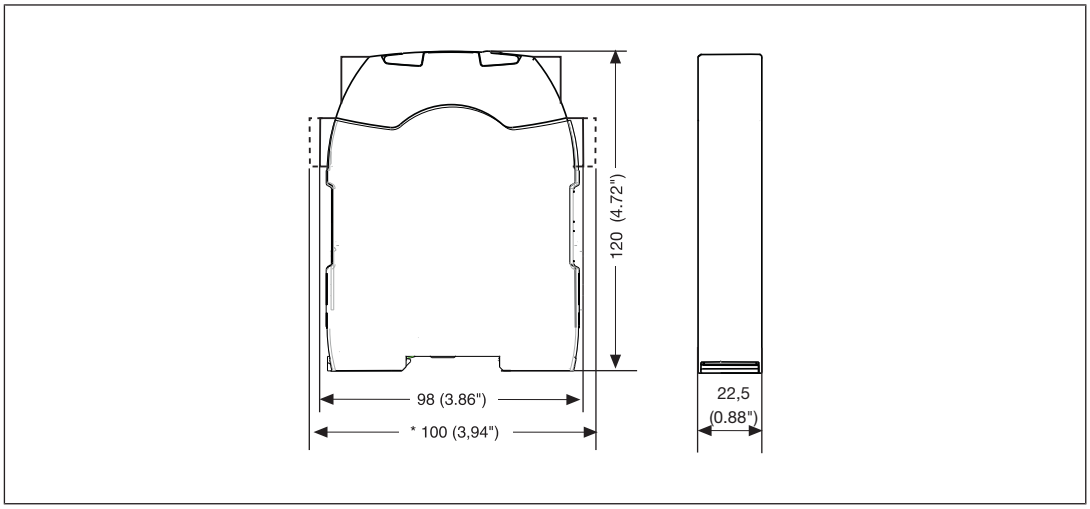
### Block diagram



# Input and output modules
PNOZ m EF 8DI4DO

## Installation

### Dimensions in mm




## Commissioning

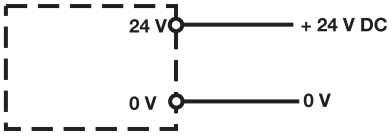
### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 729] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.

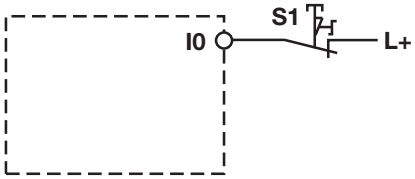
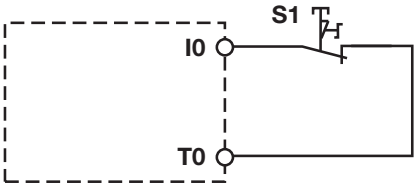
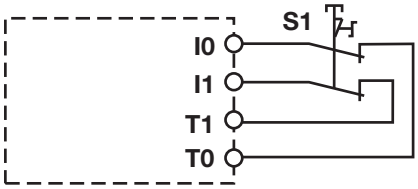
### Connection

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

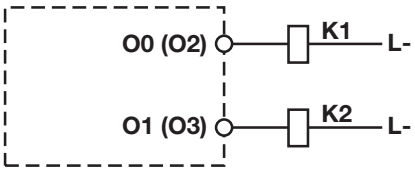
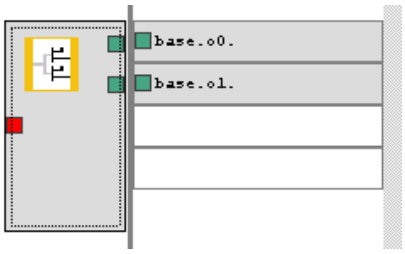
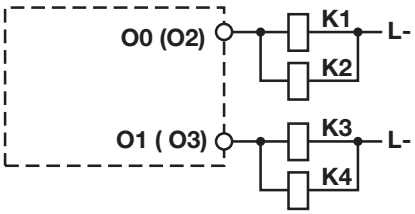
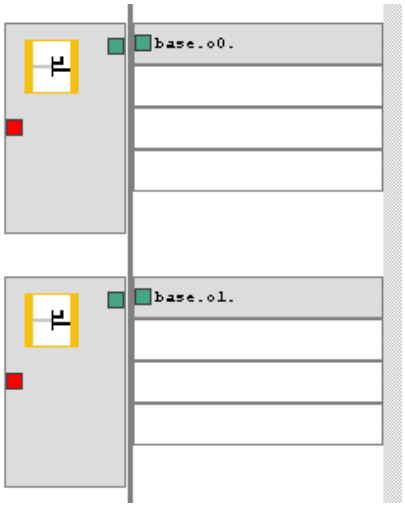
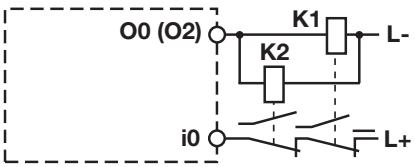
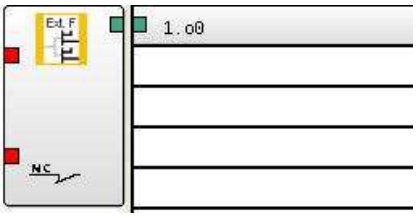


Supply voltage

## Input and output modules
PNOZ m EF 8DI4DO

| 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 |  |  |

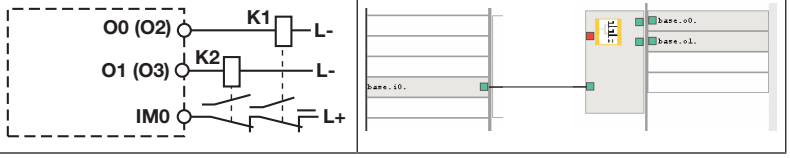
Connection examples for the input circuit

| | | |
|---|---|---|
| Redundant output |  |  |
| Single output |  |  |
| Single output with advanced fault detection* |  |  |

Connection examples for semiconductor outputs

# Input and output modules
PNOZ m EF 8DI4DO

*Two loads may be connected to each safety output with advanced fault detection, even on applications in accordance with EN IEC 62061, SIL CL 3. Prerequisite: Feedback loop is connected, shorts across contacts and external power sources are excluded (e.g. through separate multicore cables). Please note that, in the event of an error in the feedback loop, the safety system switches to a safe condition and shuts down **all** the outputs.

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



Connection examples for feedback loop

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, GOST, TÜV, cULus Listed** |
| Application range | **Failsafe** |
| Module's device code | **00E0h** |
| **Electrical data** | |
| Supply voltage | |
| for | **Supply to the SC outputs** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Current load capacity at UB | **8,0 A** |
| Potential isolation | **yes** |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Current consumption | **39 mA** |
| Power consumption | **1,0 W** |
| Max. power dissipation of module | **4,50 W** |
| Status indicator | **LED** |
| Permitted loads | **inductive, capacitive, resistive** |
| **Inputs** | |
| Number | **8** |
| Input voltage in accordance with EN 61131-2 Type 1 | **24 V DC** |
| Input current at rated voltage | **5 mA** |

# Input and output modules
## PNOZ m EF 8DI4DO

| | |
|---|---|
| **Inputs** | |
| Input current range | **2,5 - 5,3 mA** |
| Pulse suppression | **0,5 ms** |
| Maximum input delay | **8 ms** |
| Potential isolation | **No** |
| **Semiconductor outputs** | |
| Number of positive-switching single-pole semiconductor outputs | **4** |
| Switching capability | |
| Voltage | **24 V** |
| Typ. output current at "1" signal and rated voltage of semiconductor output | **2,00 A** |
| Permitted current range | **0,00 - 2,50 A** |
| Residual current at "0" signal | **0,05 mA** |
| Max. transient pulsed current | **12 A** |
| Max. capacitive load | **1 µF** |
| Max. internal voltage drop | **500 mV** |
| Max. duration of off time during self test | **330 µs** |
| Switch-off delay | **3 ms** |
| Potential isolation | **yes** |
| Short circuit-proof | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |

# Input and output modules
## PNOZ m EF 8DI4DO

| | |
|---|---|
| **Environmental data** | |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **SC output and system voltage** |
| Type of potential isolation | **Basic insulation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **1,0 km** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **120,0 mm** |

## Input and output modules
PNOZ m EF 8DI4DO

| Mechanical data | |
|---|---|
| Weight | **105 g** |

Where standards are undated, the 2012-04 latest editions shall apply.

## Safety characteristic data

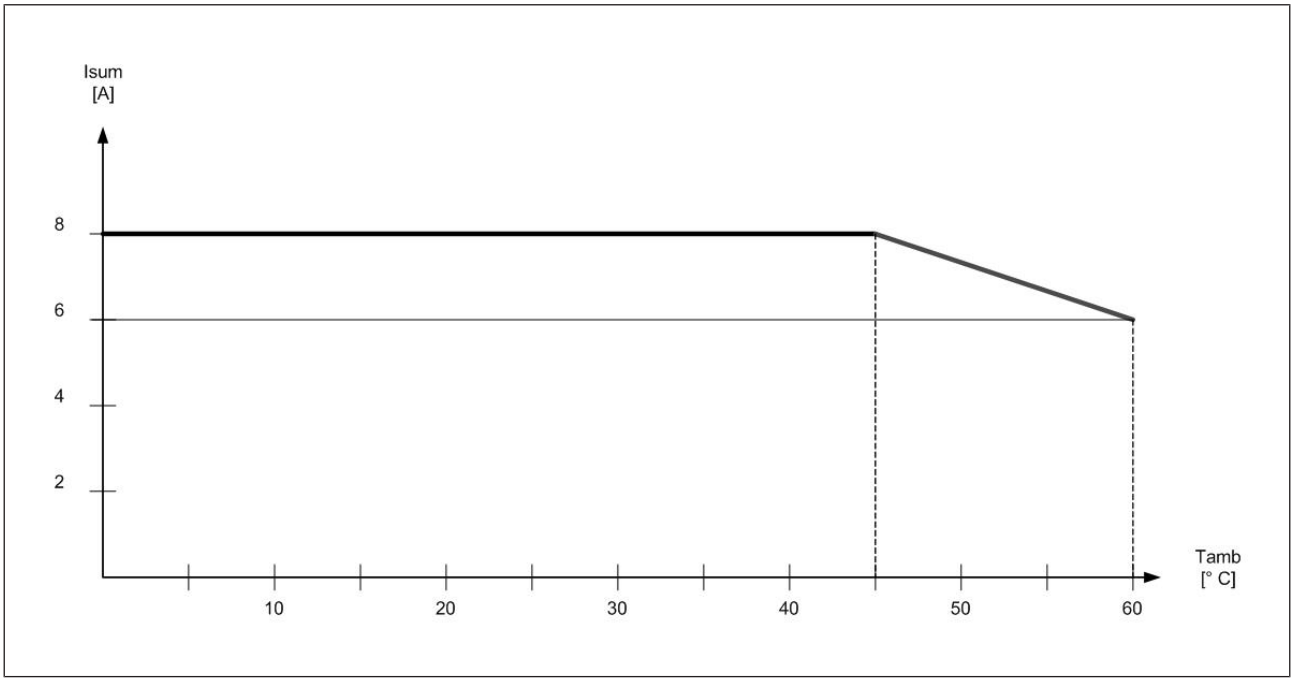
| Unit | Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|
| **Logic** | | | | | | |
| CPU | – | **PL e** | **Cat. 4** | **SIL CL 3** | **2,84E-10** | **20** |
| **Input** | | | | | | |
| SC inputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **2,10E-09** | **20** |
| SC inputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **4,27E-11** | **20** |
| SC inputs | **1-ch., pulsed light barrier** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,10E-10** | **20** |
| **Output** | | | | | | |
| SC outputs | **1-channel with advanced fault detection** | **PL e** | **Cat. 4** | **SIL CL 3** | **2,12E-11** | **20** |
| SC outputs | **1-channel** | **PL d** | **Cat. 2** | **SIL CL 2** | **2,29E-10** | **20** |
| SC outputs | **2-channel** | **PL e** | **Cat. 4** | **SIL CL 3** | **1,64E-10** | **20** |

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

# Input and output modules
PNOZ m EF 8DI4DO

## Supplementary data

### Permitted ambient temperature Tamb dependent on the total current Isum




## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ m EF 8DI4DO | Expansion module | 772 142 |

### Accessories

#### Connection terminals

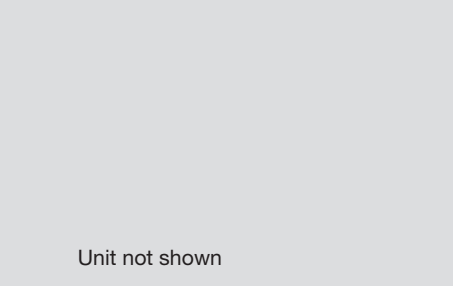
| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 751 004 |
| Set screw terminals | 1 set of screw terminals | 750 004 |

## Input and output modules
PNOZ m EF 8DI4DO

**Terminator, jumper**

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Output modules
PNOZ m ES 14DO




## Overview

### Unit features

Using the product PNOZ m ES 14DO:

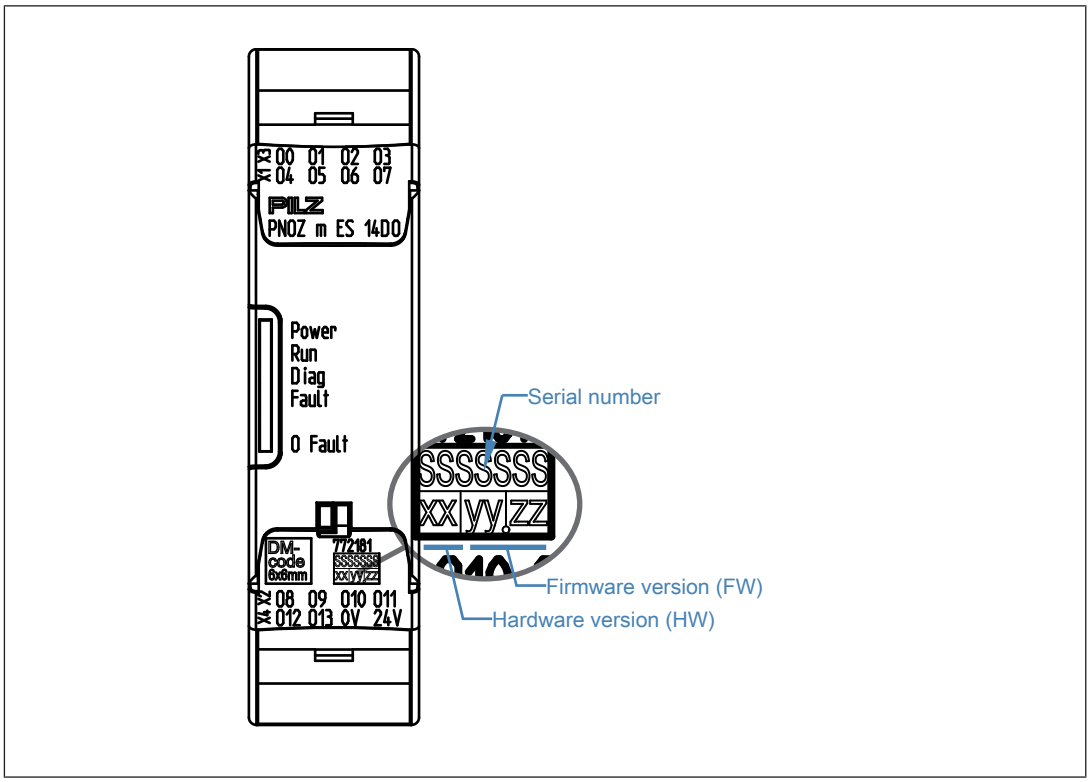
Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- 14 semiconductor outputs for standard applications
- LED display for:
  - Error messages
  - Diagnostics
  - Supply voltage
  - Output circuits
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- For details of the PNOZmulti 2 base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Output modules
PNOZ m ES 14DO

### Front view




Legend:

- 0 V, 24 V: Supply connections
- Outputs O0 – O13
- LEDs:
  - POWER
  - Run
  - Diag
  - Fault
  - O Fault

## Function description

### Functions

The expansion module provides additional semiconductor outputs for standard applications.

The function of the outputs depends on the user program created using the PNOZmulti Configurator. The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti system, plus connection examples.

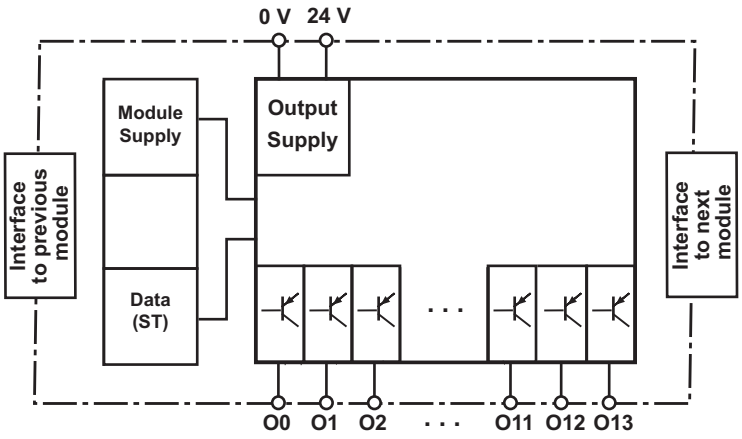
# Output modules
PNOZ m ES 14DO

To be able to switch higher loads, you can switch several outputs in parallel.
There are two groups:
Any of the outputs O0 to O7 can be connected in parallel, and any of the outputs O8 to O13 can be connected in parallel.

## System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

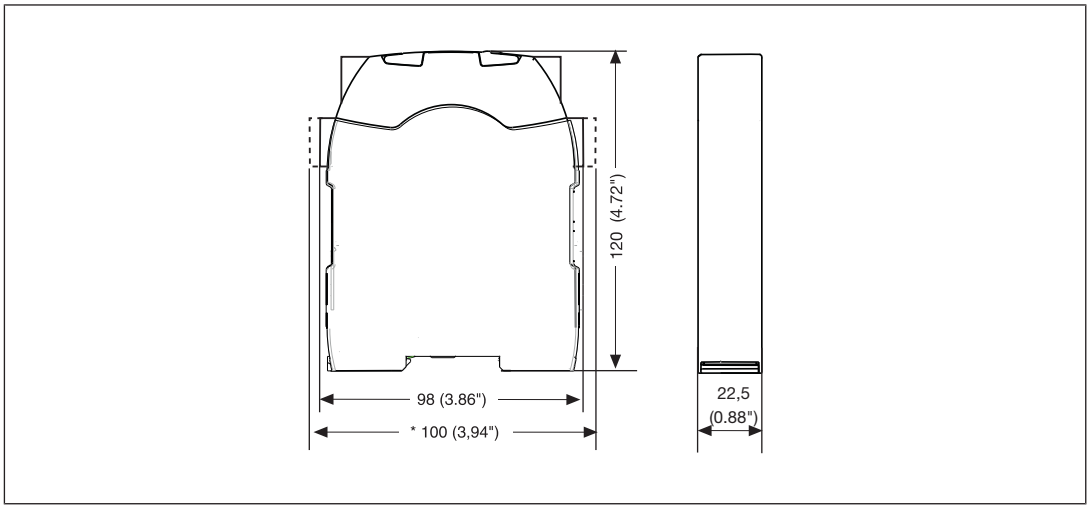
## Block diagram



# Output modules
PNOZ m ES 14DO

## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

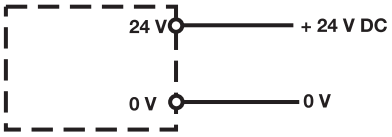
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Please note:

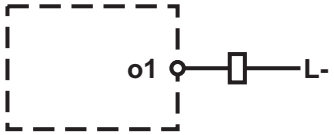
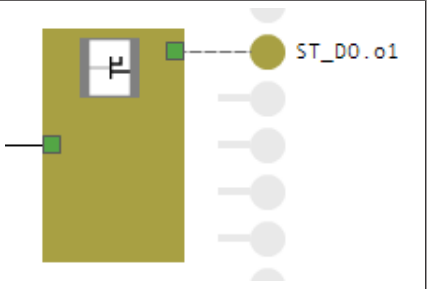
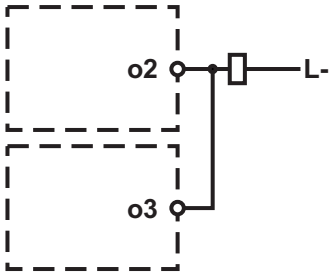
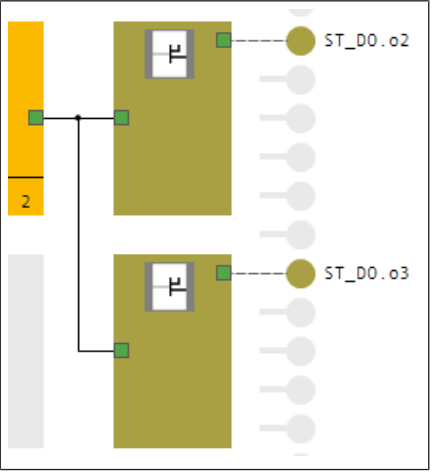
- Information given in the Technical details [📖 739] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- The supply voltage of the semiconductor outputs and the supply voltage of the system are galvanically isolated from each other.
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 10 A

    or
  - Blow-out fuse, slow, 10 A

### Connection

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

## Output modules
PNOZ m ES 14DO

| Connection example | | |
|---|---|---|
| Single output |  |  |
| Two outputs parallel |  |  |

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CE** |
| Application range | **Standard** |
| **Electrical data** | |
| Supply voltage | |
| for | **Supply to the SC outputs** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Max. continuous current that the external power supply must provide | **8,5 A** |
| Potential isolation | **yes** |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **24 V** |
| Kind | **DC** |
| Power consumption | **0,5 W** |

# Output modules
## PNOZ m ES 14DO

| | |
|---|---|
| **Electrical data** | |
| Max. power dissipation of module | **2,5 W** |
| Status indicator | **LED** |
| Permitted loads | **inductive, capacitive, resistive** |
| **Semiconductor outputs** | |
| Number of positive-switching single-pole semiconductor outputs | **14** |
| Switching capability | |
| Voltage | **24 V** |
| Typ. output current at "1" signal and rated voltage of semiconductor output | **0,5 A** |
| Permitted current range | **0,000 - 0,600 A** |
| Residual current at "0" signal | **0,5 mA** |
| Max. transient pulsed current | **1,4 A** |
| Max. internal voltage drop | **150 mV** |
| Switch-off delay | **1 ms** |
| Potential isolation | **yes** |
| Short circuit-proof | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| Max. operating height above sea level | **2000 m** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5 - 150 Hz** |
| Amplitude | **0,35 mm** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |

# Output modules
## PNOZ m ES 14DO

| | |
|---|---|
| **Environmental data** | |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **SC output and system voltage** |
| Type of potential isolation | **Basic insulation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **120 mm** |
| Weight | **100 g** |

Where standards are undated, the 2016-05 latest editions shall apply.

# Output modules
PNOZ m ES 14DO

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m ES 14DO | Expansion module | 772 181 |

### Accessories

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Set spring terminals | 1 set of spring-loaded terminals | 751 004 |
| Set screw terminals | 1 set of screw terminals | 750 004 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Motion monitoring modules
PNOZ m EF 1MM

## Overview

### Unit features

Using the product PNOZ m EF 1MM:

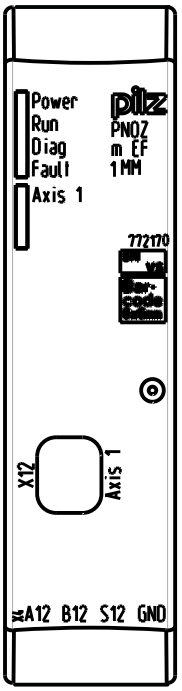
Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Monitoring of 1 axis
- Measured value recorded by proximity switch and encoder
- Monitoring functions
  - Safe speed monitoring (SSM)
  - Safe speed range monitoring (SSR-M)
  - Safe direction of movement monitoring (SDI-M)
  - Safe operating stop monitoring (SOS-M)
  - Safe stop 1 monitoring (SS1-M)
  - Safe stop 2 monitoring (SS2-M)
  - Analogue voltage (track S)
- LED indicator for:
  - Supply voltage
  - Diagnostics
  - Axis status
  - Error
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Motion monitoring modules
PNOZ m EF 1MM

## Front view




**Legend:**

- X4: Connection for proximity switch at axis 1
- X12: Mini IO socket for connecting encoder or proximity switch at axis 1.
- LEDs:
  - Power
  - Run
  - Diag
  - Fault
  - Axis 1

# Motion monitoring modules
PNOZ m EF 1MM

## Function description

### Operation

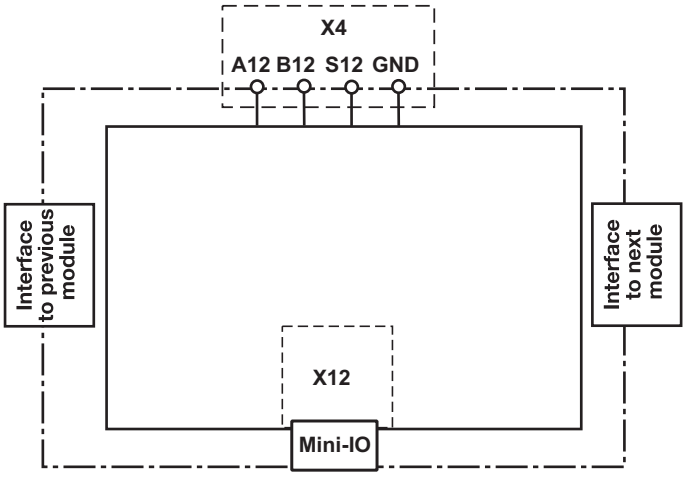
The motion monitoring module PNOZ m EF 1MM can monitor one axis. The motion monitoring module signals the status of the monitored values to the base unit. Depending on the implemented safety circuit, the values may be transferred from the base unit to an output on the control system. Proximity switches or encoders are used to record the values.

The configuration of the motion monitoring module is described in detail in the PNOZmulti Configurator's online help.

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




### Monitoring functions

The motion monitoring module PNOZ m EF 1MM supports the following monitoring functions.

Please note that the position monitoring functions SOS-M, SDI-M and SS2-M cannot be used in conjunction with 2 proximity switches, as no position can be detected.

# Motion monitoring modules
PNOZ m EF 1MM

### Safe speed monitoring

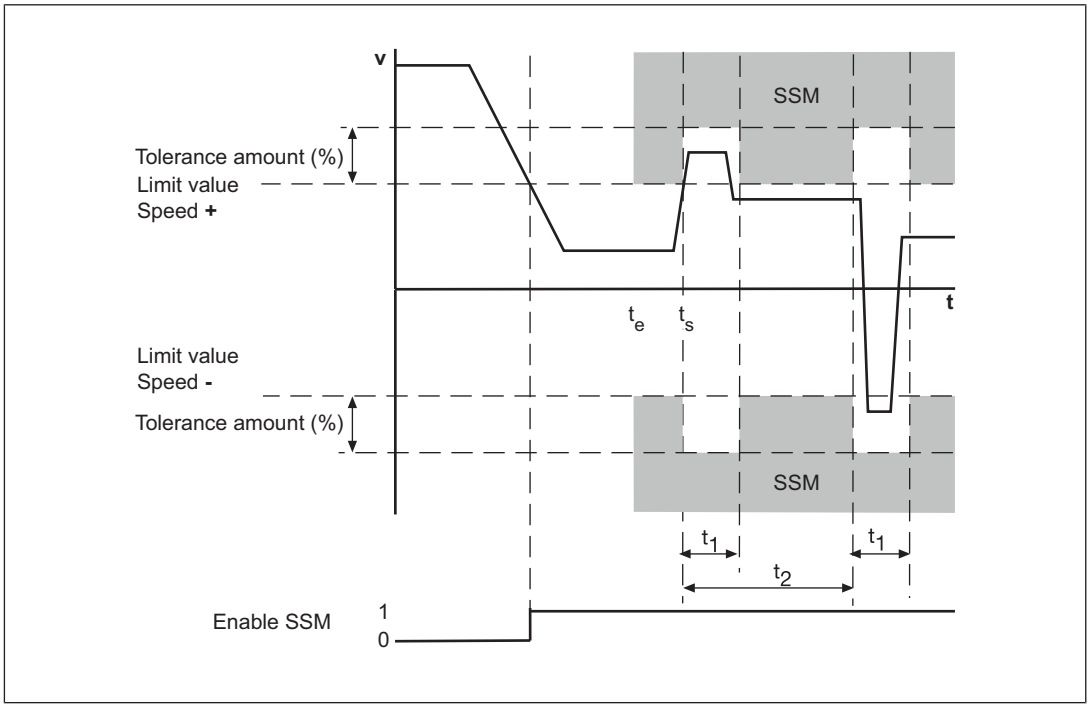
The ***Safe speed monitoring*** function (SSM) monitors the current speed to see if a limit value is exceeded.

If the configured limit value is exceeded, the output switches off. As soon as the value falls below the limit value (plus hysteresis), the output switches off again.
If a manual reset is configured, the output will not switch back on until the value is inside the limit value (plus hysteresis) and the reset input is activated.

12 limit values can be configured per axis in the PNOZmulti Configurator.

A tolerance range may also be set for the limit values used to monitor the speed. This tolerance range modifies the set limit values. As a result, one-off or periodic overshoots that exceed the limit values can be tolerated.
The following values can be configured for the tolerance range:

- Tolerance time (t1), which takes into account the length of the overshoots (maximum time for which the limit value may be exceeded). It must not be possible that the sum of all the overshoots exceeds the tolerance time (t1) within a tolerance period (t2).
- Tolerance period (t2), which takes into account the oscillation period (minimum time that must elapse between one limit value overshoot and the next)
- Tolerance amount (%), which takes into account the amplitude of the overshoots (maximum permitted percentage by which the configured limit values may be exceeded)




**Legend:**

- Enable SSM:
  - "1": Monitored limit value not exceeded

  - "0": Monitored limit value exceeded
- $t_s$: Speed v exceeds the limit value and activates the tolerance range (tolerance time, tolerance period, tolerance amount)
- $t_1$: Tolerance time
- $t_2$: Tolerance period
- Tolerance amount (%): Tolerance amount of limit value in both directions

**Safe speed range monitoring**

The ***Safe speed range monitoring*** function (SSR-M) monitors the current speed to ensure it stays within a maximum and minimum permitted limit value.

If the speed is outside the configured range, the output switches off. As soon as the speed returns within the configured range (plus hysteresis), the output switches back on.
If manual reset is configured, the output will not switch back on until the value is below the limit value (plus hysteresis) and the reset input is activated.

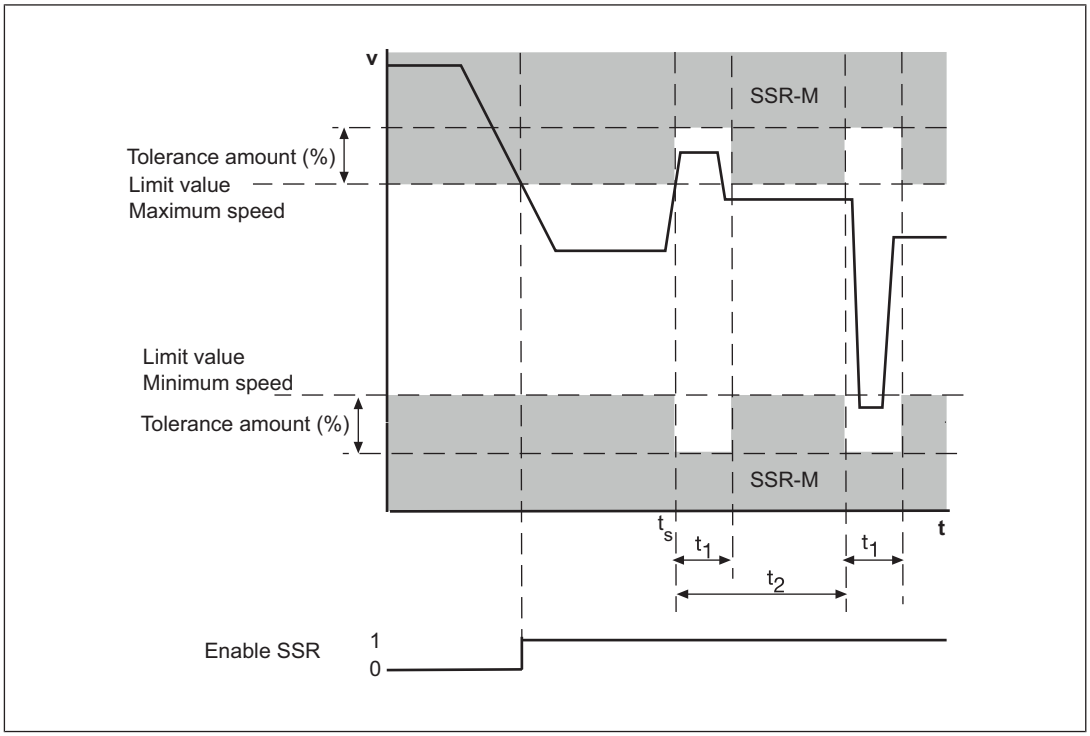
2 ranges can be configured per axis in the PNOZmulti Configurator.

A tolerance range may also be set for the limit values used to monitor the speed range. This tolerance range modifies the set limit values. As a result, one-off or periodic overshoots that exceed the range limits can be tolerated.

The following values can be configured for the tolerance range:

- Tolerance time (t1), which takes into account the length of the overshoots (maximum time for which the limit value may be exceeded). It must not be possible that the sum of all the overshoots exceeds the tolerance time (t1) within a tolerance period (t2).
- Tolerance period (t2), which takes into account the oscillation period (minimum time that must elapse between one limit value overshoot and the next)
- Tolerance amount as a %, which takes into account the amplitude of the overshoots (maximum permitted percentage by which the limit value may be exceeded)

## Motion monitoring modules
PNOZ m EF 1MM




**Legend:**

- Enable SSR:
  - "1": Speed is within the configured range
  - "0": Speed is outside the configured range
- $t_s$: Speed v exceeds the limit value and activates the tolerance range (tolerance time, tolerance period, tolerance amount)
- $t_1$: Tolerance time
- $t_2$: Tolerance period
- Tolerance amount (%): Tolerance amount of the two limit values, maximum and minimum speed

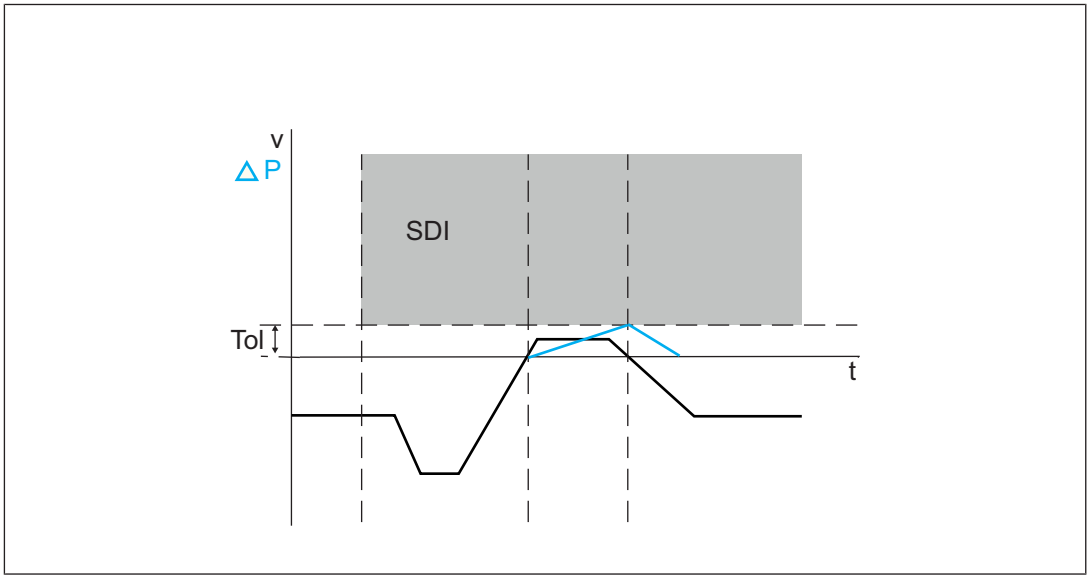
### Safe direction monitoring

The ***Safe direction monitoring*** function (SDI-M) monitors the direction of movement defined for the drive axis (positive or negative). Safe direction of movement monitoring is activated via the start input. It remains active until the configured tolerance is exceeded in the opposite direction. The function can be retriggered at any time by a rising edge at the start input. As a result, the current position can be used at any time as the start point for the monitoring function.

One SDI-M element can be configured per axis for each direction in the PNOZmulti Configurator.

## Motion monitoring modules
PNOZ m EF 1MM

Please note:
This monitoring function cannot be used in conjunction with 2 proximity switches because position detection is not possible.

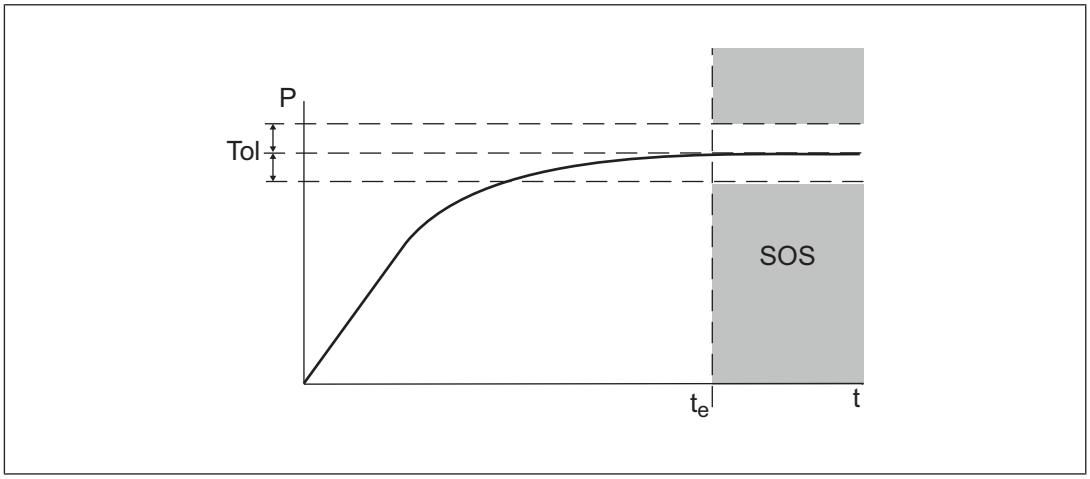



**Safe operating stop monitoring**

The ***Safe operating stop monitoring*** function (SOS-M) monitors whether the standstill position remains within a configured tolerance window. Safe operating stop monitoring is activated within a rising edge at the start input. It remains active until the value is outside the tolerance band. The function can be retriggered at any time by a rising edge at the start input. As a result, the current position can be used at any time as the start point for the monitoring function.

3 SOS-M elements can be configured per axis in the PNOZmulti Configurator.

Please note:
This monitoring function cannot be used in conjunction with 2 proximity switches because position detection is not possible.



# Motion monitoring modules
PNOZ m EF 1MM

**Legend:**

- $t_e$: Activation of the monitoring function SOS

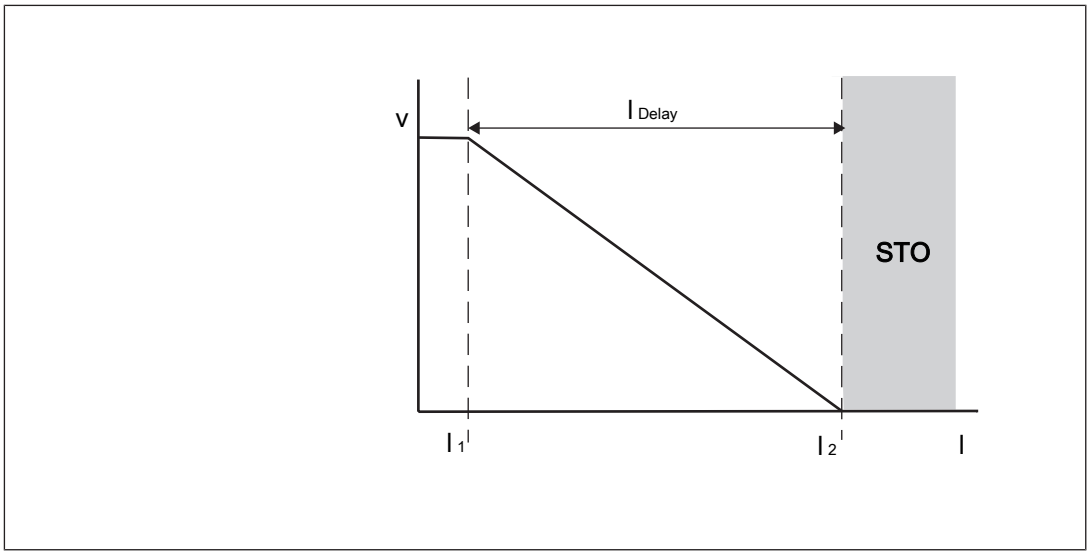
**Safe stop 1 monitoring**

The ***Safe stop 1 monitoring*** function (SS1-M) monitors whether the set delay time has elapsed (until controlled braking of the motor) or the value for standstill detection for automatic STO is below the limit value.

- If the monitoring function SS1-M is triggered, the ***Braking ramp*** output is switched off. The drive controller's braking ramp is activated.
- After the set delay time has elapsed or the value for the automatic STO is below the limit value, the output ***ST*** switches off. The safety function ***Safe torque off*** (STO) is activated.

A maximum of 1 SS1-M element can be configured per axis in the PNOZmulti Configurator.

Sequence without standstill detection limit value for automatic STO:

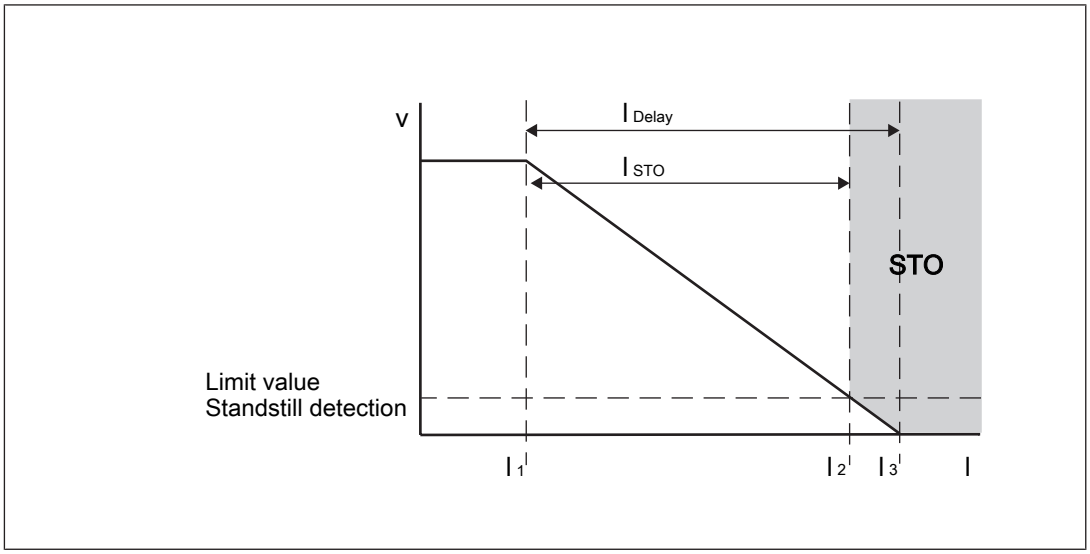



**Legend**

| | |
|---|---|
| $t_1$: | Monitoring function SS1-M is activated |
| $t_2$: | Delay time elapses, safety function "Safe torque off" (STO) is activated |
| $t_{Delay}$: | Set delay time for controlled braking of motor |

Sequence with standstill detection limit value for automatic STO:

## Motion monitoring modules
PNOZ m EF 1MM




**Legend**

| | |
|---|---|
| $t_1$: | Monitoring function SS1-M is activated |
| $t_2$: | Standstill detection limit value for automatic STO reached, safety function "Safe torque off" (STO) is activated |
| $t_3$: | Delay time elapses |
| $t_{Delay}$: | Set delay time for controlled braking of motor |
| $t_{STO}$: | Actual time from activation of monitoring function until STO is activated |

**Safe stop 2 monitoring**

The ***Safe stop 2 monitoring*** function (SS2-M) monitors

- Whether the set delay time has expired (to controlled braking of the motor) or the value for standstill detection for automatic SOS is below the limit value

  and

- Whether the standstill position ultimately remains within a configured tolerance window.

**Reaction:**

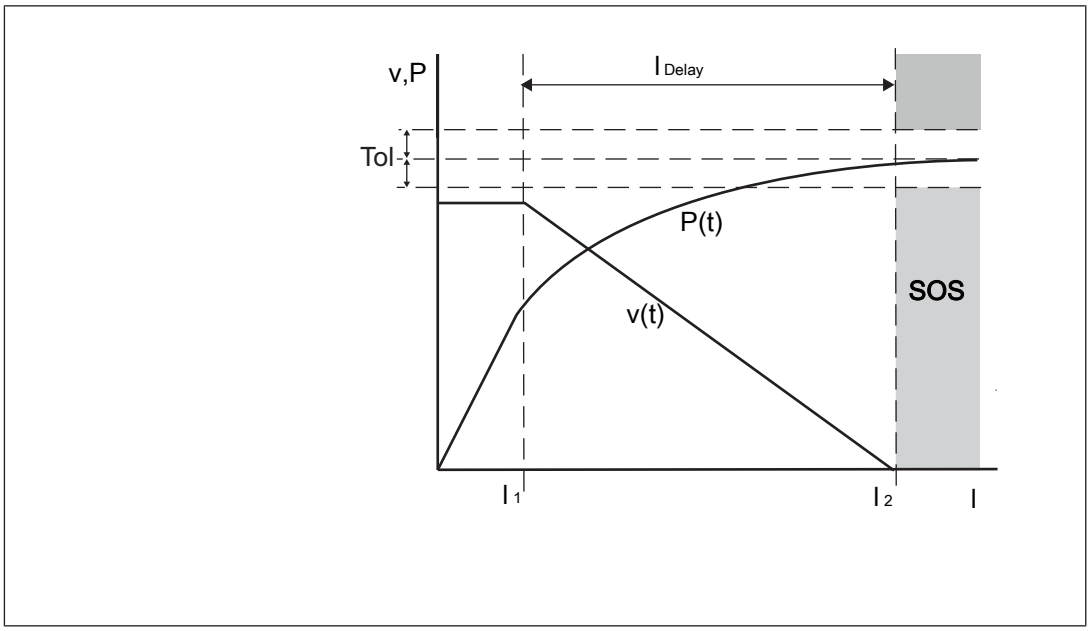
- If the monitoring function SS2-M is triggered, the "Braking ramp" output switches off. The drive controller's braking ramp is activated.
- If the set delay time has elapsed or the value for the automatic SOS is below the limit value, the standstill position is monitored, the ***Position monitoring*** output switches on. If the standstill position is outside the tolerance window, the ***Position monitoring*** and ***STO*** outputs switch off, the safety function ***Safe torque off*** (STO) is activated.

A maximum of 1 SS2-M element can be configured per axis in the PNOZmulti Configurator.

Please note:
This monitoring function cannot be used in conjunction with 2 proximity switches because position detection is not possible.

## Motion monitoring modules
PNOZ m EF 1MM

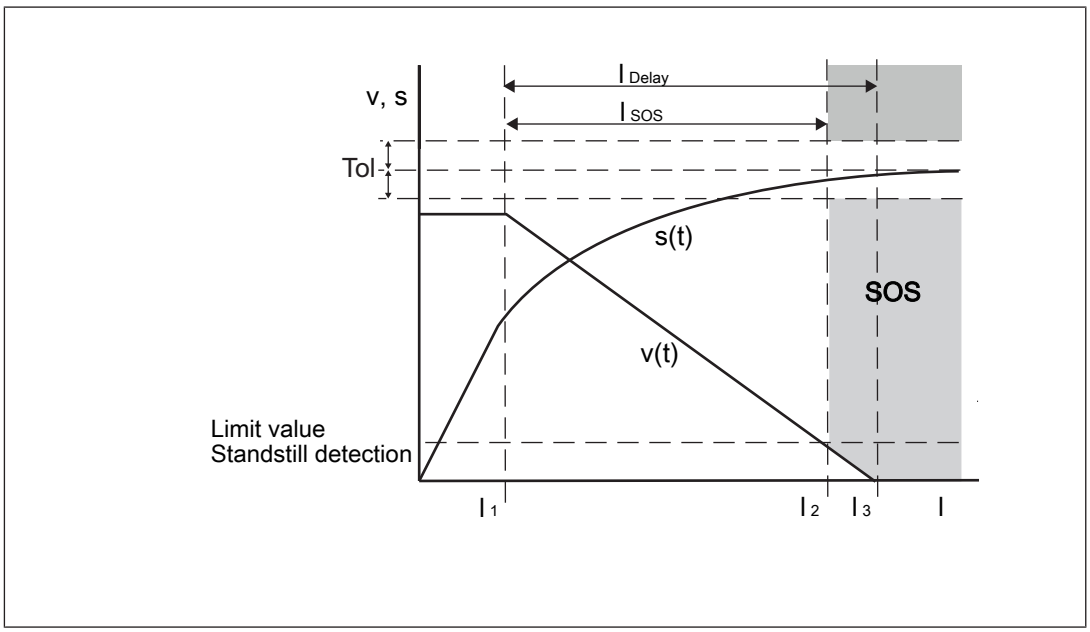
Sequence without standstill detection limit value for automatic SOS:




**Legend**

| | |
|---|---|
| $t_1$: | Activation of the monitoring function SS2-M |
| $t_2$: | Delay time elapses, monitoring of standstill position (SOS) is activated |
| $t_{Delay}$: | Set delay time for controlled braking of motor |

Sequence with standstill detection limit value for automatic SOS:



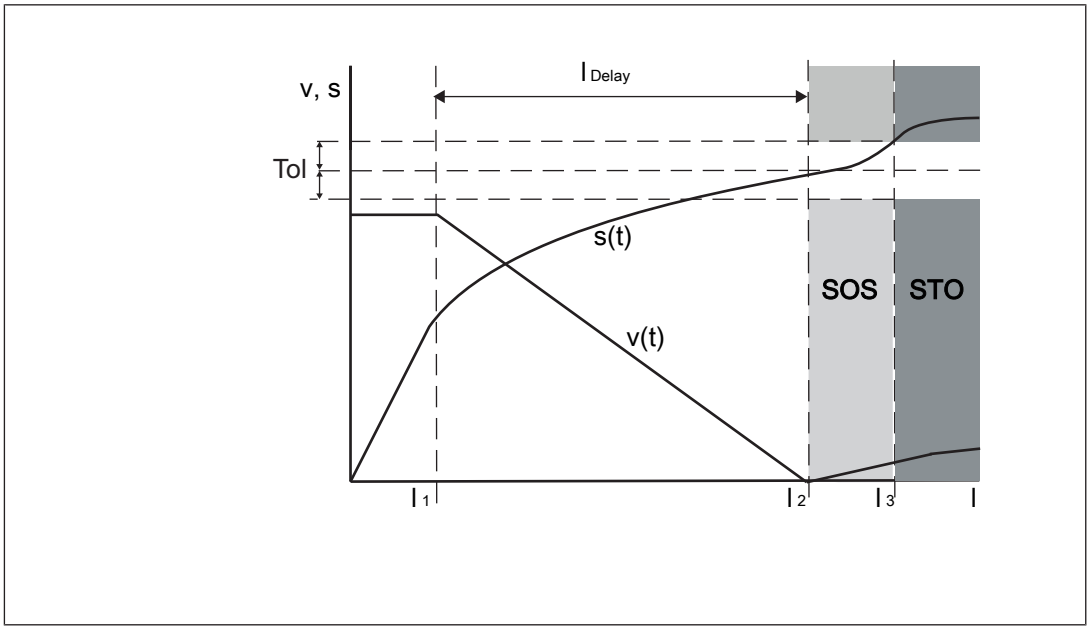

**Legend**

| | |
|---|---|
| $t_1$: | Activation of the monitoring function SS2-M |

## Motion monitoring modules
PNOZ m EF 1MM

| | |
|---|---|
| $t_2$: | Standstill detection limit value for automatic SOS reached, monitoring of standstill position (SOS) is activated |
| $t_3$: | Delay time elapses |
| $t_{Delay}$: | Set delay time for controlled braking of motor |
| $t_{STO}$: | Actual time from activation of monitoring function until STO is activated |

Sequence when standstill position is violated:




**Legend**

| | |
|---|---|
| $t_1$: | Activation of the monitoring function SS2-M |
| $t_2$: | Standstill detection limit value for automatic SOS reached, monitoring of standstill position (SOS) is activated |
| $t_3$: | Standstill position outside of tolerance window, safety function "Safe torque off" (STO) is activated |
| $t_{Delay}$: | Set delay time for controlled braking of motor |

**Hysteresis**

A hysteresis can be configured for the monitoring functions. This prevents the outputs from bouncing if there are fluctuations around the response value. The hysteresis takes effect when the output is switched on.

# Motion monitoring modules
PNOZ m EF 1MM

**Validation cut-off frequency**

As implausible signals may arise due to edge jitter on the sensors around the standstill position, a validation cut-off frequency must be configured for sensor types with proximity switches in the PNOZmulti Configurator (edge jitter is caused by the position control of the drive frequency converter or by external interference signals).

If the value of the validation cut-off frequency falls below the configured value, the feasibility check of the sensors will no longer be run.

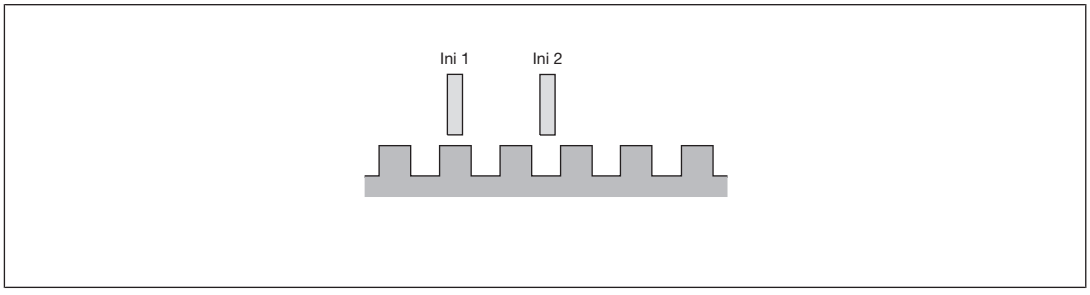
## System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [📖 30]".

## Proximity switches

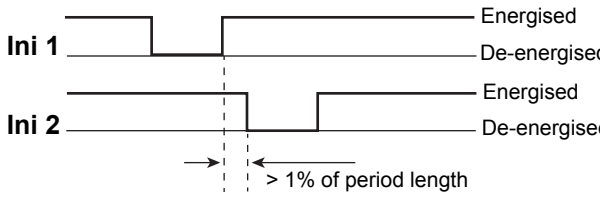
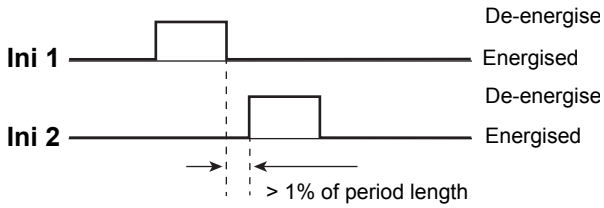
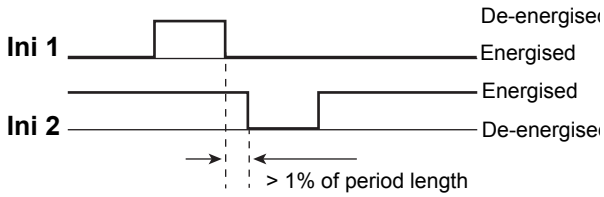
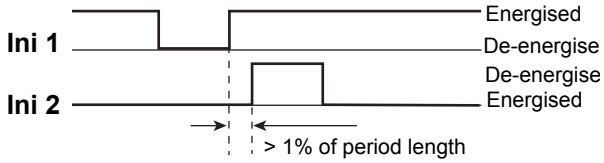
- The following proximity switches can be used with a pnp or npn output:
  - Inductive
  - Capacitive
- The proximity switches must be fitted so that at least one is always activated. In other words, the proximity switches must be fitted so that the recorded signals always overlap.
- The cable used to connect the proximity switches must be shielded (see connection diagrams in the chapter entitled "EMC-compliant wiring").
- A DC voltage in the range of 0 - 30 V can be monitored via track S. It should be used to monitor the supply voltage of the proximity switches.

**Proximity switch assembly:**



# Motion monitoring modules
PNOZ m EF 1MM

**Signal characteristics:**

| Proximity switch combinations | Signal image in an energised state |
|---|---|
| PNP / PNP |  |
| NPN / NPN |  |
| NPN / PNP |  |
| PNP / NPN |  |

- For a full configuration, the maximum frequency of the sensors you are using must be entered in the PNOZmulti Configurator (see sensor's data sheet).

## Encoder

- The following encoders can be used:
  - TTL, HTL (single-ended or differential signals)
  - Sin/Cos 1 Vss
  - Hiperface®
- The encoders can be connected with or without Z index (0 index).
- The cables used to connect the encoders must be shielded (see connection diagrams in the chapter entitled "EMC-compliant wiring").

- A proximity switch can also be connected to track Z to monitor for broken shearpins.
  **Please note:**
  Broken shearpin monitoring only becomes active when
  - The minimum speed is exceeded

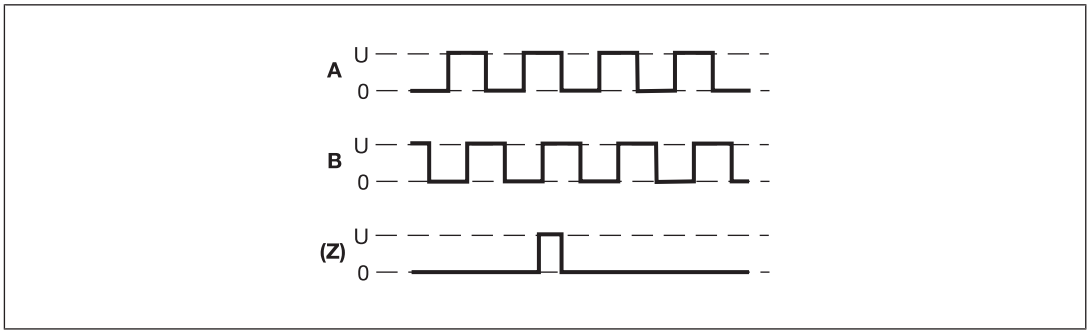
    and
  - The tolerance for detecting feasibility errors has elapsed.

  The minimum speed and tolerance depend on the ratio of the frequency on tracks AB "$f_{AB}$" to the frequency on track Z "$f_Z$" in your configuration (see PNOZmulti Configurator ***Motion Monitor Element***, ***Calculated Ratio AB/Z***).
  Minimum speed:
  - Calculated ratio AB/Z ≥ 1.0
    $f_Z$ = 10 mHz or $f_{AB}$ = ($f_{AB}/f_Z$) *x* 10 mHz
  - at $f_{AB}/f_Z$ ***Ratio*** < 1.0
    $f_{AB}$ = 10 mHz or $f_Z$ = 10 mHz/($f_{AB}/f_z$)

  Tolerance for detecting feasibility errors:
  - at $f_{AB}/f_Z$ ***Ratio*** ≥ 1.0
    7.5 Z pulses or 7.5 x ($f_{AB}/f_Z$ ) AB pulses
  - at $f_{AB}/f_Z$ ***Ratio*** **<** 1.0
    4.5 AB pulses or 4.5 x ($f_{AB}/f_Z$) Z pulses
- With Hiperface encoders, the Sin- Cos track is recorded and monitored via an adapter (see Adapters for encoders [📖 759]).
- Track S can be used:
  - To connect an encoder's error output.
  - To monitor voltages between 0 V and 30 V for a permitted upper and lower limit. For example, the encoder's supply voltage can be monitored.
- The maximum frequency of the used encoders must be entered for a complete configuration.
- Pay attention to the values in the technical details.

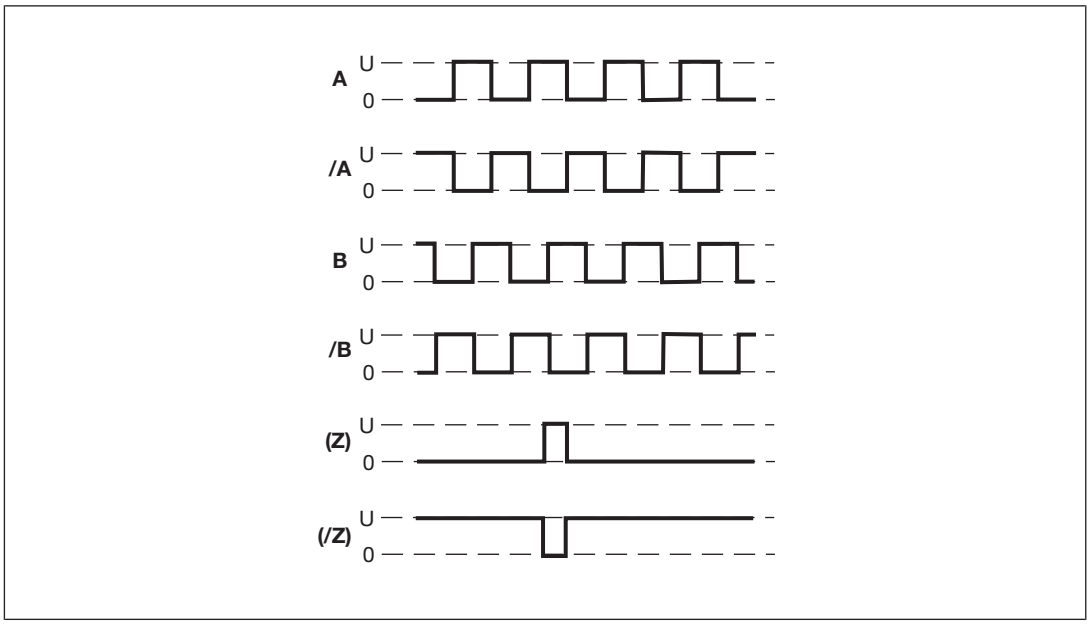
**Output signals TTL, HTL**

Single ended



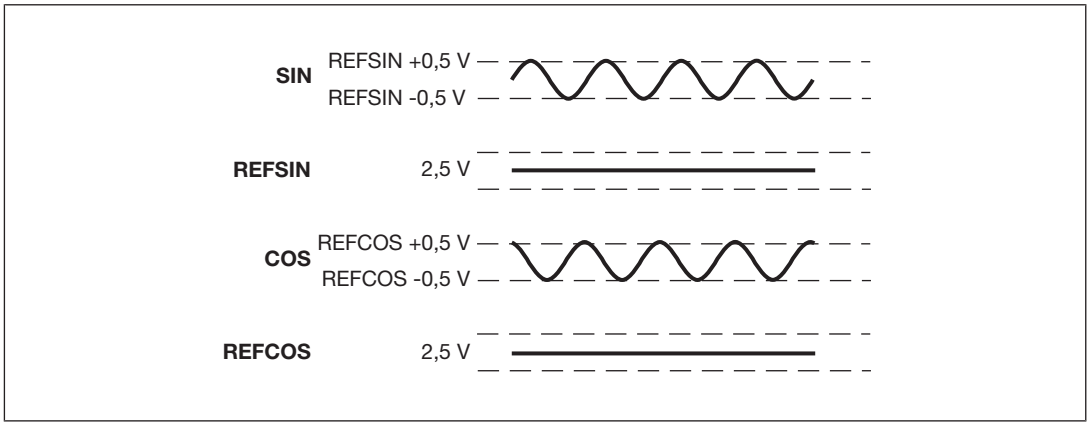
## Motion monitoring modules
PNOZ m EF 1MM

Differential



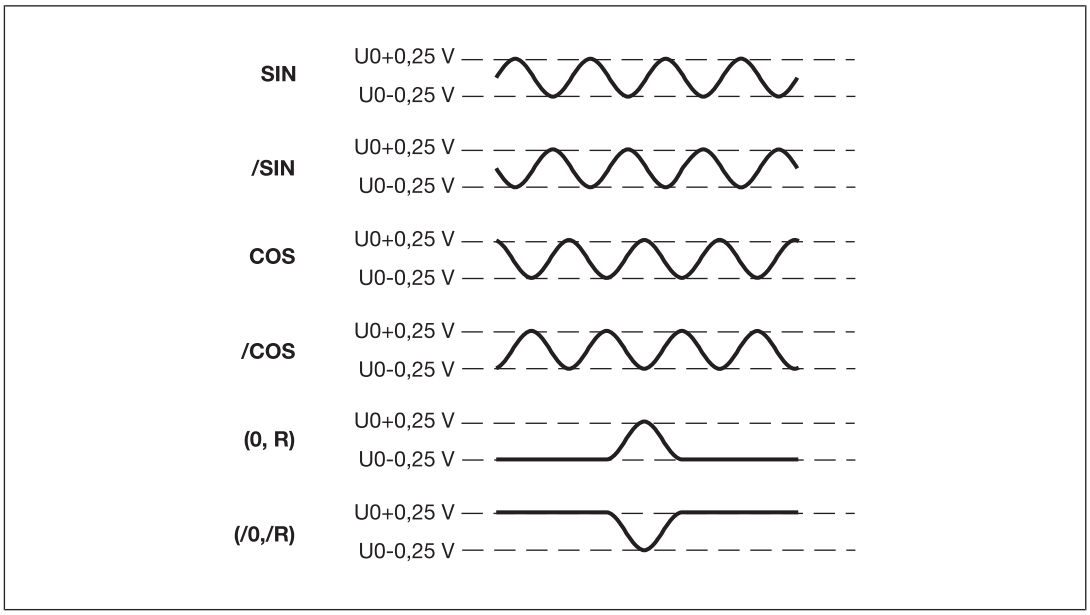

**Output signals Sin/Cos (1 Vss)**

Single ended with reference track (e.g. Hiperface ®)



## Motion monitoring modules
PNOZ m EF 1MM

Differential with/without Z index (e.g. Heidenhain 1 Vss)

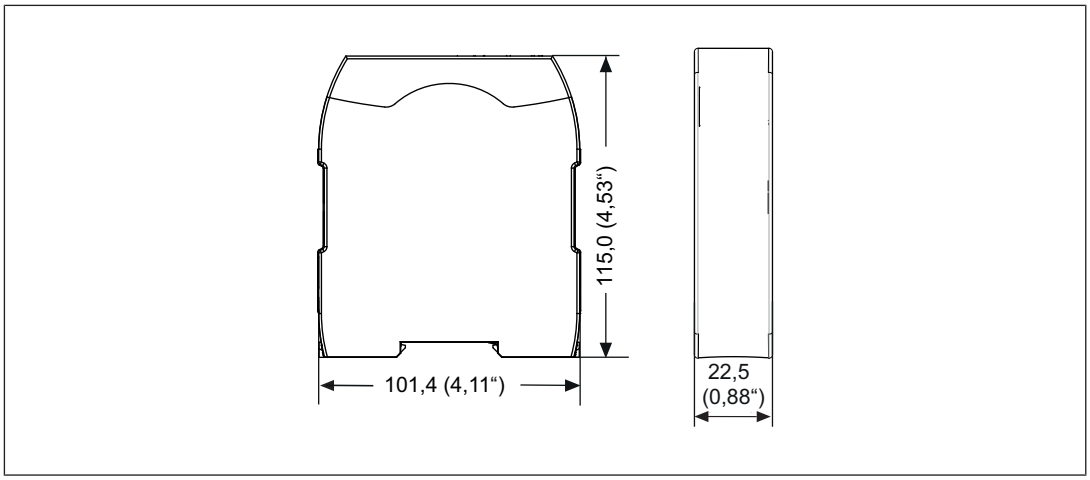



The adapter records the data between the encoder and the drive and makes it available to the PNOZ m EF 1MM via the Mini-IO socket.

Pilz supplies complete adapters as well as ready-made cable with Mini-IO connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

## Installation

### Dimensions in mm



# Motion monitoring modules
PNOZ m EF 1MM

## Commissioning

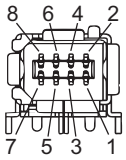
### Wiring

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

Please note:

- Information given in the Technical details [📖 771] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- The power supplies for the safety system and sensors must comply with the regulations for low voltages with safe isolation.
- The cable used to connect the encoders and proximity switches must be shielded (see connection diagrams in the chapter entitled "EMC-compliant wiring").
- The shield may only be connected to earth at a single point.
- Earth loops should be avoided.
- If possible, the connections for the various earth potentials (GND, A2 ) should not be connected on the PNOZ m EF 1MM but should be connected directly to the GNDs on the connected units, otherwise noise susceptibility may be increased significantly (conductor loops are not permitted).

### Pin assignment of Mini-IO socket

| Mini-IO socket<br>8-pin | PIN | Track |
|---|---|---|
|  | 1 | S |
| | 2 | GND |
| | 3 | Z |
| | 4 | A |
| | 5 | /A |
| | 6 | /Z |
| | 7 | B |
| | 8 | /B |

# Motion monitoring modules
PNOZ m EF 1MM

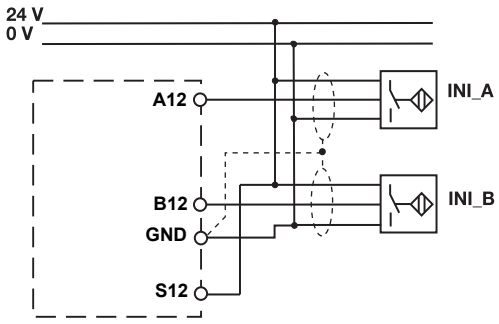
## Connection of proximity switches

The following proximity switch combinations can be connected:

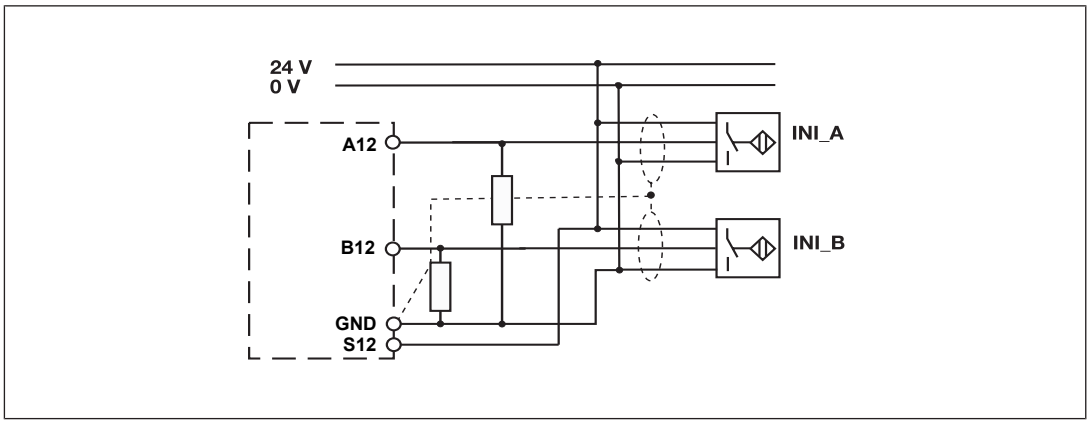
- A: pnp, B: pnp
- A: npn, B: npn
- A: pnp, B: npn
- A: npn, B: pnp

When connecting proximity switches please note:

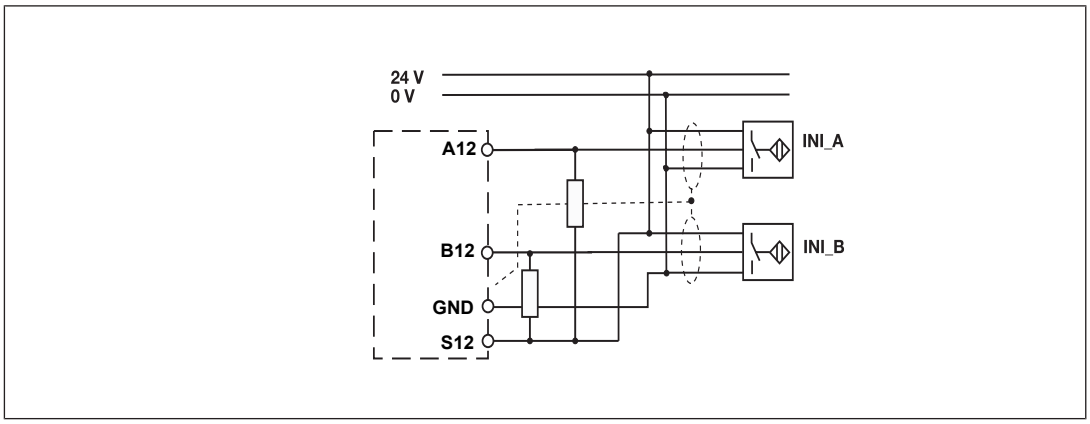
- Proximity switches can be connected to
  - terminals A12, B12, GND for axis 1
    or
  - tracks A, B and GND of the Mini-IO socket (X12 for axis 1).
- Track S (S12) should be used to monitor the supply voltage (see drawing). A permitted voltage range can be entered in the menu.
- Connect the proximity switch to 24 VDC of the power supply.
- When connecting the proximity switches, please refer to the chapter entitled "EMC-compliant wiring".
- Invalid signals may occur with long cable lengths. In this case we recommend that you connect a resistor between the signal lines, as shown in the diagrams.
- Connection of the proximity switches may only be performed in three-wire technology and not in two-wire technology.



pnp proximity switch with resistor R = 10 kOhm




npn proximity switch with resistor R = 47 kOhm




## Connection of an encoder

Proceed as follows when connecting the encoder:

- The encoder can be connected via an adapter (e.g. MM A Mini-IO-CAB99) or directly to the PNOZ m EF 1MM.
- Use only shielded cables for all connections. Please refer to the chapter entitled "EMC-compliant wiring".
- Always connect GND on the encoder to GND on the Mini-IO connector.
- If the encoder signals are not terminated with 120 Ohm in the frequency converter, the encoder signals must be terminated with $Z_0$ = 120 Ohm between A and /A, B and /B, Z and /Z.
- Please refer to the information provided by the encoder manufacturer with regard to the recommended max. cable length when taking into consideration
  - Output frequency
  - Supply voltage
  - Operating temperature

## Motion monitoring modules
PNOZ m EF 1MM

– Existing interference

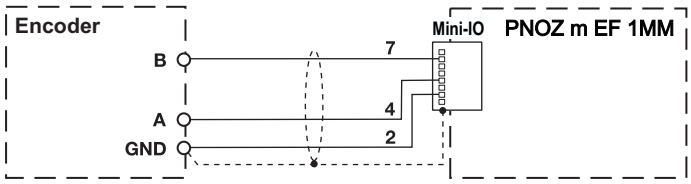
When calculating the maximum cable length, remember that the length of the adapter cable must also be taken into account.

Encoder types:

- TTL single ended
- HTL single ended

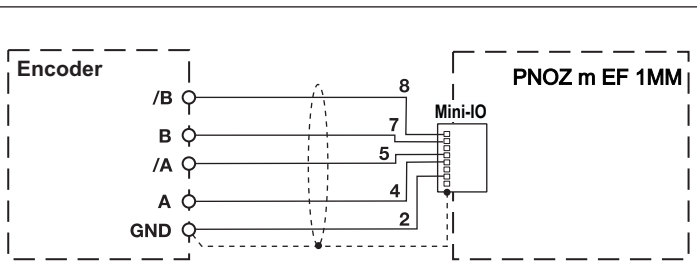
Please note:

- Tracks/A, /B, Z and /Z must remain free




Encoder types:

- TTL Differential
- HTL differential
- sin/cos 1 Vss
- Hiperface



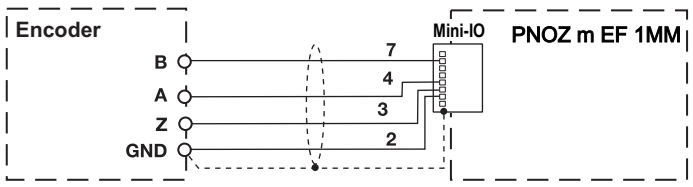

Encoder types:

- TTL single ended Z Index
- HTL single ended Z Index

Please note:

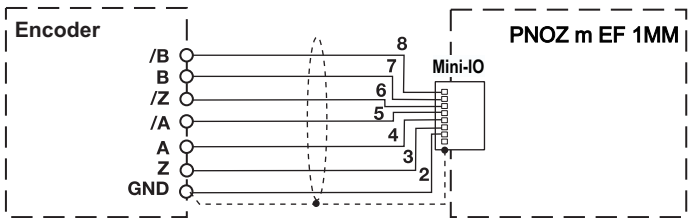
- Tracks /A, /B and /Z must remain free

## Motion monitoring modules
PNOZ m EF 1MM

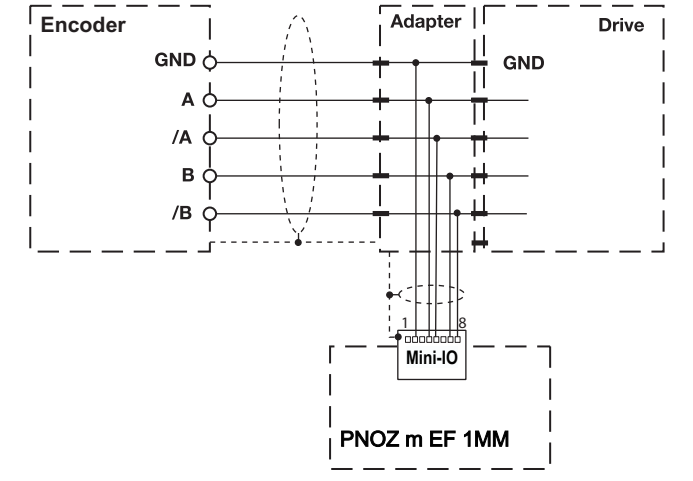



Encoder types:

- TTL differential + Z Index
- HTL differential + Z Index
- sin/cos 1 Vss Z Index




The adapter (see Accessories [📖 774]) is connected between the encoder and the drive. The output on the adapter is connected to the Mini-IO socket on the PNOZ m EF 1MM.



# Motion monitoring modules
PNOZ m EF 1MM

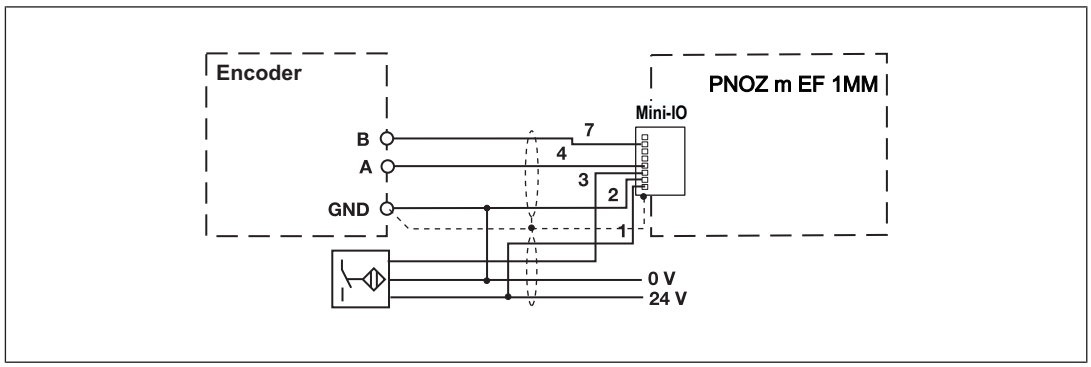
## Connection of proximity switch and encoder

When connecting the encoders and proximity switches, please refer to the chapter entitled "EMC-compliant wiring".

Sensor types:

- Configuration: HTL single Z Freq. Ini pnp
  - HTL single ended (A,B) + Ini pnp (Z)
  - HTL single ended (A,B) + HTL differential (A as Z)
  - HTL single ended (A,B) + HTL single ended (A as Z)
- Configuration: TTL single Z Freq. Ini pnp
  - TTL single ended (A,B) + Ini pnp (Z)
  - TTL single ended (A,B) + HTL differential (A as Z)
  - TTL single ended (A,B) + HTL single ended (A as Z)

Please note:
Tracks /A, /B and /Z must remain free.



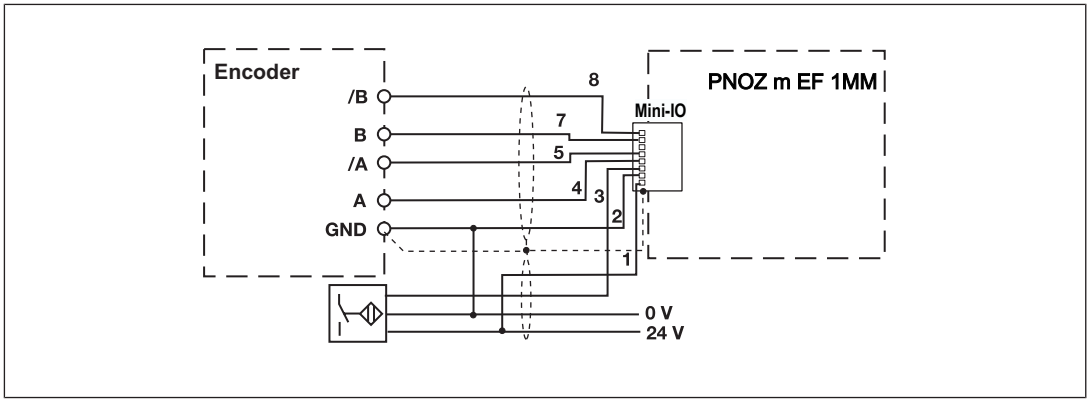

Sensor types:

- Configuration: TTL differential Z Freq. Ini pnp
  - TTL differential (A,/A,B,/B) + Ini pnp (Z)
  - TTL differential (A,/A,B,/B) + HTL differential (A as Z)
  - TTL differential (A,/A,B,/B) + HTL single ended (A as Z)
- Configuration: HTL differential Z Freq. Ini pnp
  - HTL differential (A,/A,B,/B) + Ini pnp (Z)
  - HTL differential (A,/A,B,/B) + HTL differential (A as Z)
  - HTL differential (A,/A,B,/B) + HTL single ended (A as Z)
- Configuration: sin/cos 1 Vss Z Freq. Ini pnp
  - sin/cos 1 Vss (A,/A,B,/B) + Ini pnp (Z)
  - sin/cos 1 Vss (A,/A,B,/B) + HTL differential (A as Z)
  - sin/cos 1 Vss (A,/A,B,/B) + HTL single ended (A as Z)

## Motion monitoring modules
PNOZ m EF 1MM

- Configuration: Hiperface Z Freq. Ini pnp
  - Hiperface (A,/A,B,/B) + Ini pnp (Z)
  - Hiperface (A,/A,B,/B) + HTL differential (A as Z)
  - Hiperface (A,/A,B,/B) + HTL single ended (A as Z)

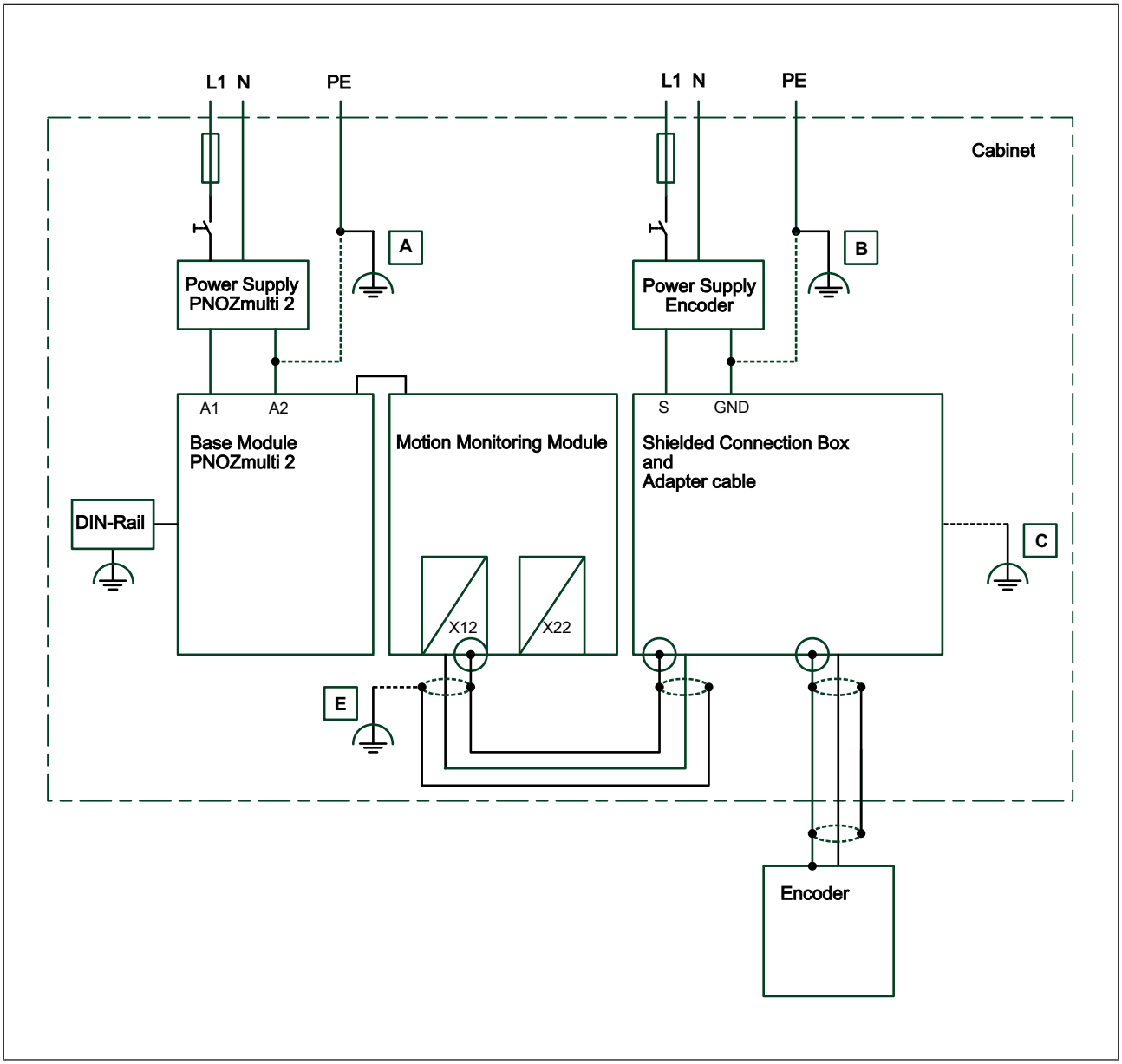
Please note:
Track /Z must remain free!!



# Motion monitoring modules
PNOZ m EF 1MM

## EMC-compliant wiring

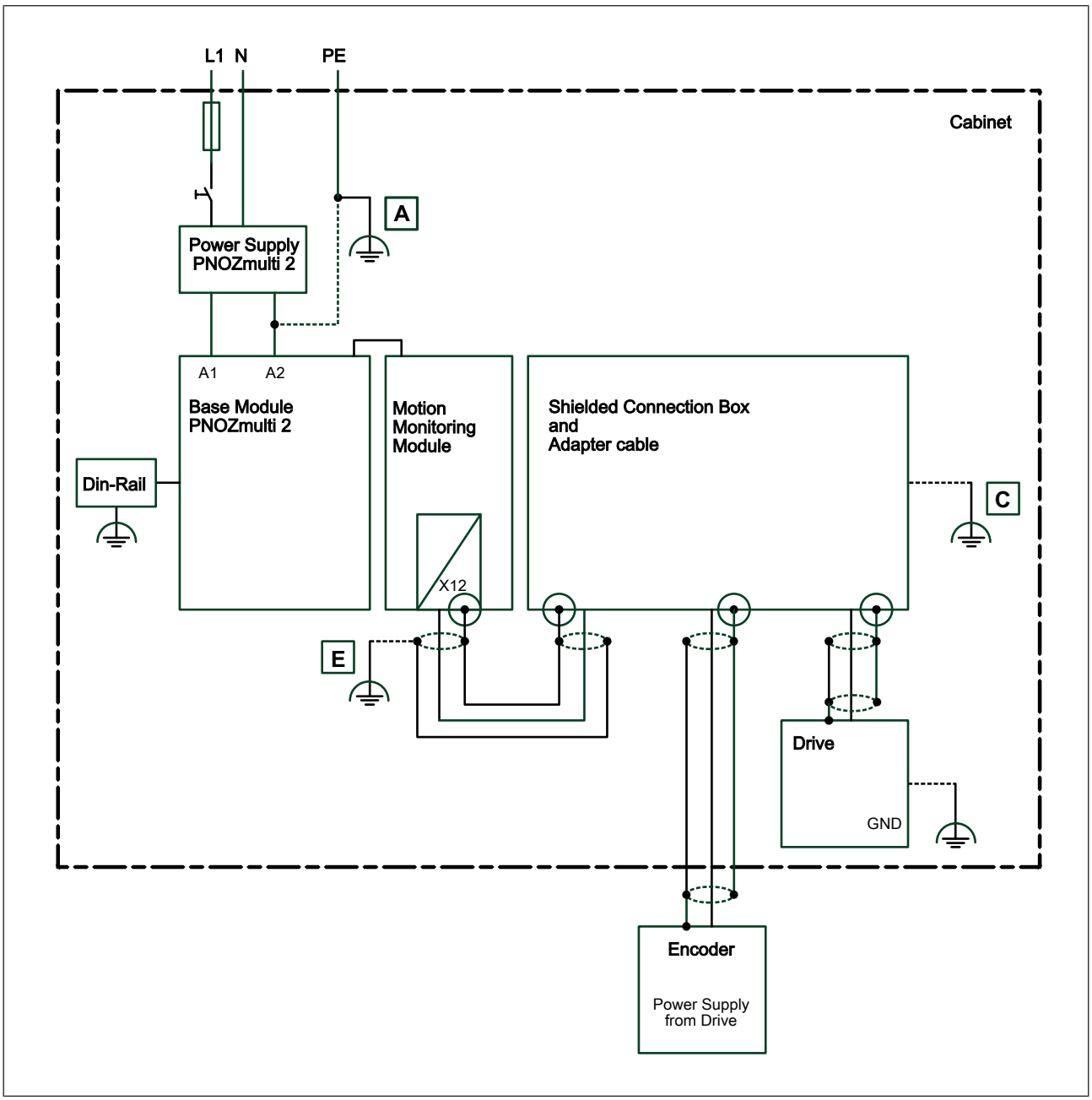
### EMC-compliant wiring for connecting an encoder




To avoid EMC interference we recommend that the shield on the sensor cable is connected to earth at **C** or **E**. However, depending on the application, it may be helpful to establish the connection to functional earth at another point (in this case **A** or **B**).
Conductor loops outside the shield must be avoided.
If a shielded junction box is not used, the shield must run continuously from the sensor to the evaluation device.

## Motion monitoring modules
PNOZ m EF 1MM

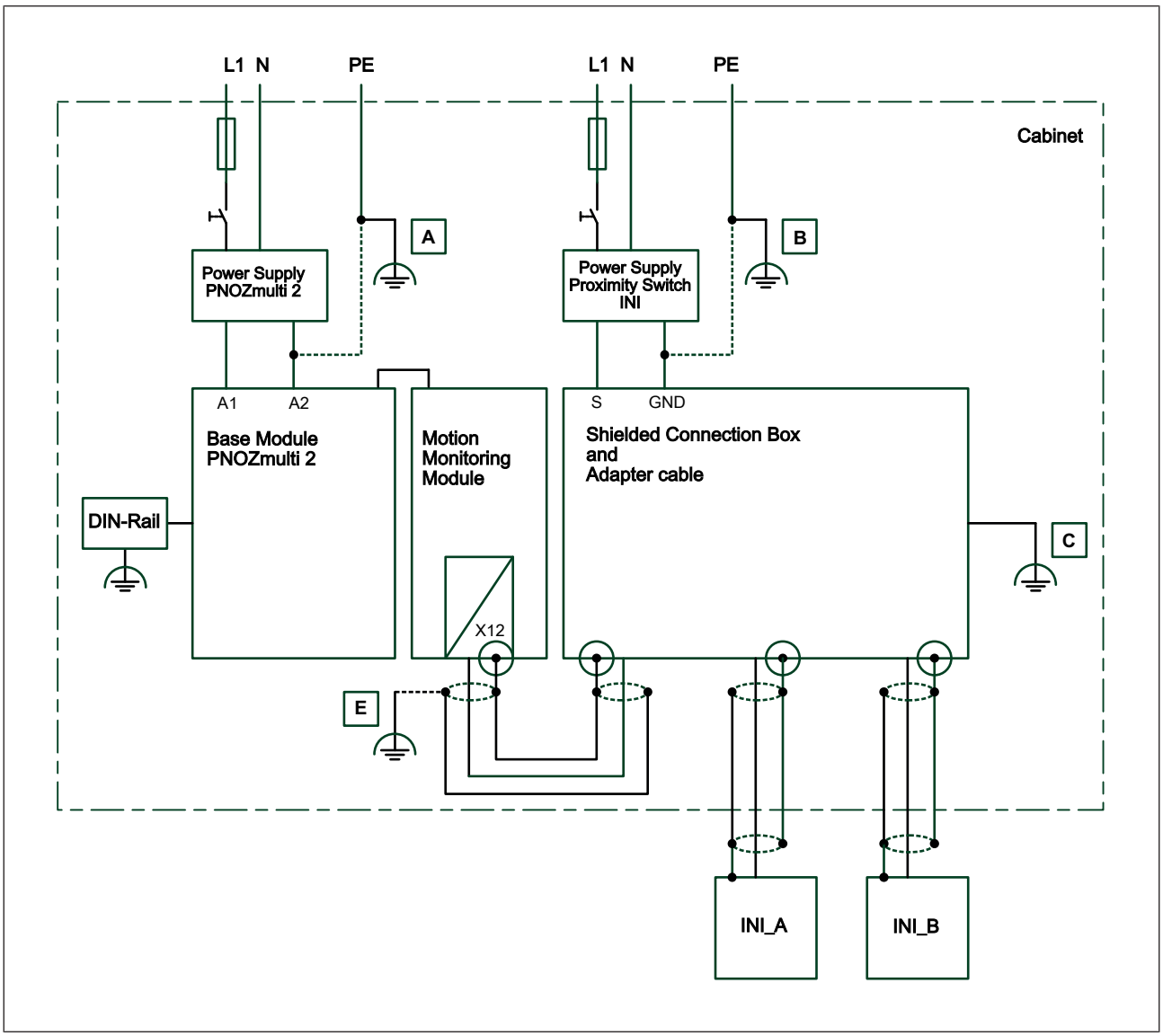
**EMC-compliant wiring for connecting an encoder with drive**




To avoid EMC interference we recommend that the shield on the sensor cable is connected to earth at **C** or **E**. However, depending on the application, it may be helpful to establish the connection to functional earth at another point (in this case **A**).
Conductor loops outside the shield must be avoided.
If a shielded junction box is not used, the shield must run continuously from the sensor to the evaluation device.

## Motion monitoring modules
PNOZ m EF 1MM

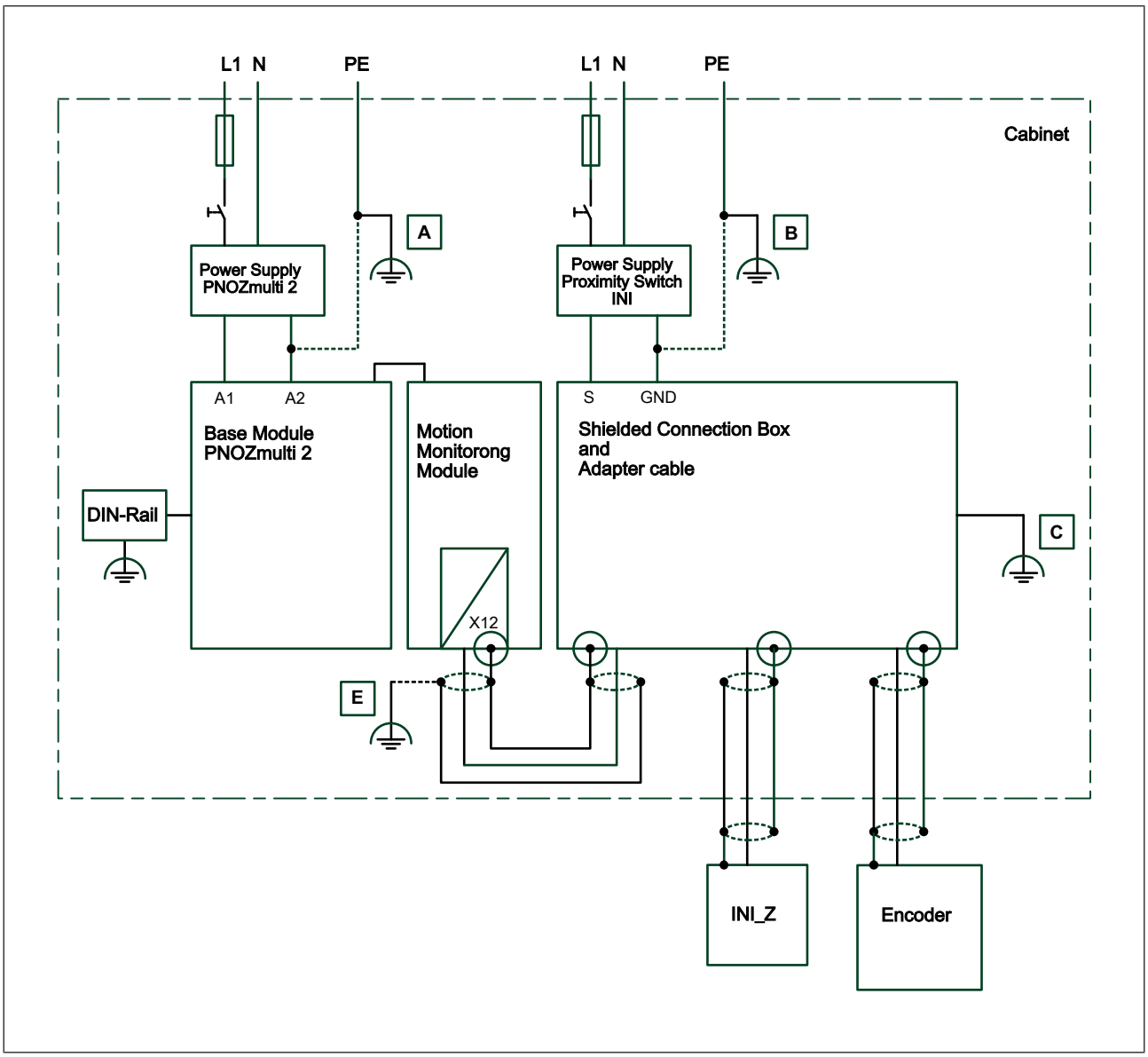
**EMC-compliant wiring for connecting 2 proximity switches**




To avoid EMC interference we recommend that the shield on the sensor cable is connected to earth at **C** or **E**. However, depending on the application, it may be helpful to establish the connection to functional earth at another point (in this case **A** or **B**).
Conductor loops outside the shield must be avoided.
If a shielded junction box is not used, the shield must run continuously from the sensor to the evaluation device.

## Motion monitoring modules
PNOZ m EF 1MM

**EMC-compliant wiring for connecting an encoder and a proximity switch**




To avoid EMC interference we recommend that the shield on the sensor cable is connected to earth at **C** or **E**. However, depending on the application, it may be helpful to establish the connection to functional earth at another point (in this case **A** or **B**).
Conductor loops outside the shield must be avoided.
If a shielded junction box is not used, the shield must run continuously from the sensor to the evaluation device.

# Motion monitoring modules
PNOZ m EF 1MM

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| Application range | **Failsafe** |
| Module's device code | **00E3h** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **24 V** |
| Kind | **DC** |
| Current consumption | **90 mA** |
| Power consumption | **2 W** |
| Max. power dissipation of module | **2,2 W** |
| Status indicator | **LED** |
| **Proximity switch input** | |
| Number of inputs | **2** |
| Input signal level | |
| Signal level at "1" | **11 - 30 V** |
| Signal level at "0" | **0 - 3 V** |
| Input resistance | **22 kOhm** |
| Input's frequency range | **0 - 5 kHz** |
| Configurable monitoring frequency | |
| Without hysteresis | **0.1 Hz - 5 kHz** |
| **Incremental encoder input** | |
| Number of inputs | **1** |
| Connection type | **Mini-IO female connector, 8-pin** |
| Input signal level | **0,5 - 30 Vss** |
| Phase position for the differential signals A, /A and B,/B | **90° ±30°** |
| Overload protection | **-50 - 65 V** |
| Input resistance | **20 kOhm** |
| Input's frequency range | **0 - 500 kHz** |
| Configurable monitoring frequency | |
| Without hysteresis | **0.1 Hz - 500 kHz** |
| **Inputs** | |
| Potential isolation | **yes** |
| **Times** | |
| Reaction time after limit value is exceeded | **1/f_ist + 16 ms** |

# Motion monitoring modules
PNOZ m EF 1MM

| | |
|---|---|
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Sensor and system voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |

# Motion monitoring modules
PNOZ m EF 1MM

| Mechanical data | |
|---|---|
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **111 mm** |
| Weight | **90 g** |

Where standards are undated, the 2013-01 latest editions shall apply.

## Safety characteristic data

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN IEC 62061 SIL CL | EN IEC 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| Monitoring 1 encoder | **PL d** | **Cat. 2** | **SIL CL 2** | **1,80E-08** | **SIL 2** | **1,58E-03** | **20** |
| Monitoring 2 encoder | **PL e** | **Cat. 3** | **SIL CL 3** | **1,01E-09** | **SIL 3** | **8,41E-05** | **20** |
| Monitoring safe encoder | **PL e** | **Cat. 4** | **SIL CL 3** | **2,35E-09** | **SIL 3** | **2,04E-04** | **20** |
| Logic | **PL e** | **Cat. 4** | **SIL CL 3** | **3,37E-10** | **SIL 3** | **2,88E-05** | **20** |

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

# Motion monitoring modules
PNOZ m EF 1MM

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m EF 1MM | Expansion module | 772 170 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

#### Adapter cable

| Product type | Features | Order No. |
|---|---|---|
| MM A MINI-IO CAB99 | 1.50 m | 772 200 |
| MM A MINI-IO CAB99 | 2.50 m | 772 201 |
| MM A MINI-IO CAB99 | 5.0 m | 772 202 |

| Product type | Features | Order No. |
|---|---|---|
| PNOZ msi b4 Box | Connection box | 773 845 |

# Motion monitoring modules
PNOZ m EF 2MM

## Overview

### Unit features

Using the product PNOZ m EF 2MM:

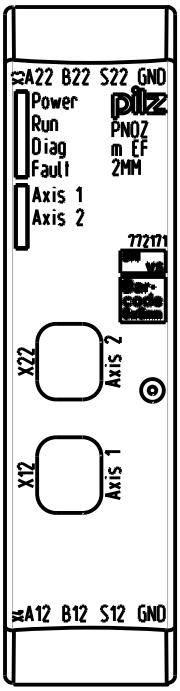
Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Monitoring of 2 independent axes
- Measured value recorded by proximity switch and encoder
- Monitoring functions
  - Safe speed monitoring (SSM)
  - Safe speed range monitoring (SSR-M)
  - Safe direction of movement monitoring (SDI-M)
  - Safe operating stop monitoring (SOS-M)
  - Safe stop 1 monitoring (SS1-M)
  - Safe stop 2 monitoring (SS2-M)
  - Analogue voltage (track S)
- LED indicator for:
  - Supply voltage
  - Diagnostics
  - Axis status
  - Error
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Motion monitoring modules
PNOZ m EF 2MM

## Front view




**Legend:**

- X4: Connection for proximity switch at axis 1
- X3: Connection for proximity switch at axis 2
- X12: Mini IO socket for connecting encoder or proximity switch at axis 1
- X22: Mini IO socket for connecting encoder or proximity switch at axis 2
- LEDs:
  - Power
  - Run
  - Diag
  - Fault
  - Axis 1
  - Axis 2

# Motion monitoring modules
PNOZ m EF 2MM

## Function description

### Operation

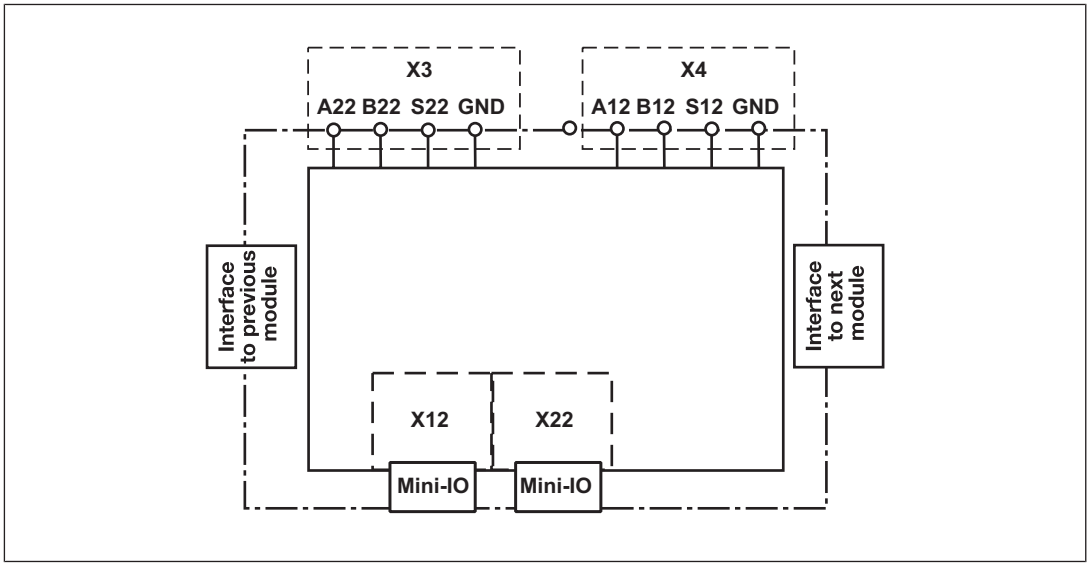
The motion monitoring module PNOZ m EF 2MM can monitor two axes independently. The motion monitoring module signals the status of the monitored values to the base unit. Depending on the implemented safety circuit, the values may be transferred from the base unit to an output on the control system. Proximity switches or encoders are used to record the values.

The configuration of the motion monitoring module is described in detail in the PNOZmulti Configurator's online help.

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




### Monitoring functions

The motion monitoring module PNOZ m EF 2MM supports the following monitoring functions.

Please note that the position monitoring functions SOS-M, SDI-M and SS2-M cannot be used in conjunction with 2 proximity switches, as no position can be detected.

# Motion monitoring modules
PNOZ m EF 2MM

### Safe speed monitoring

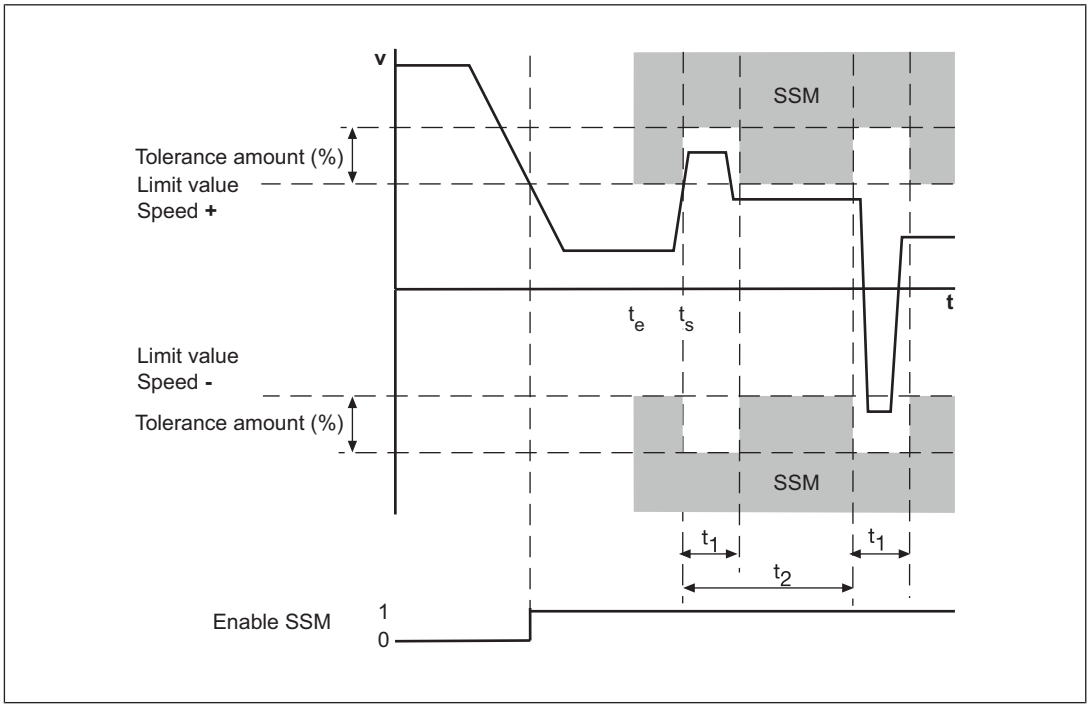
The ***Safe speed monitoring*** function (SSM) monitors the current speed to see if a limit value is exceeded.

If the configured limit value is exceeded, the output switches off. As soon as the value falls below the limit value (plus hysteresis), the output switches off again.
If a manual reset is configured, the output will not switch back on until the value is inside the limit value (plus hysteresis) and the reset input is activated.

12 limit values can be configured per axis in the PNOZmulti Configurator.

A tolerance range may also be set for the limit values used to monitor the speed. This tolerance range modifies the set limit values. As a result, one-off or periodic overshoots that exceed the limit values can be tolerated.
The following values can be configured for the tolerance range:

- Tolerance time (t1), which takes into account the length of the overshoots (maximum time for which the limit value may be exceeded). It must not be possible that the sum of all the overshoots exceeds the tolerance time (t1) within a tolerance period (t2).
- Tolerance period (t2), which takes into account the oscillation period (minimum time that must elapse between one limit value overshoot and the next)
- Tolerance amount (%), which takes into account the amplitude of the overshoots (maximum permitted percentage by which the configured limit values may be exceeded)



# Motion monitoring modules
PNOZ m EF 2MM

**Legend:**

- Enable SSM:
  - "1": Monitored limit value not exceeded
  - "0": Monitored limit value exceeded
- $t_s$: Speed v exceeds the limit value and activates the tolerance range (tolerance time, tolerance period, tolerance amount)
- $t_1$: Tolerance time
- $t_2$: Tolerance period
- Tolerance amount (%): Tolerance amount of limit value in both directions

**Safe speed range monitoring**

The ***Safe speed range monitoring*** function (SSR-M) monitors the current speed to ensure it stays within a maximum and minimum permitted limit value.

If the speed is outside the configured range, the output switches off. As soon as the speed returns within the configured range (plus hysteresis), the output switches back on.
If manual reset is configured, the output will not switch back on until the value is below the limit value (plus hysteresis) and the reset input is activated.

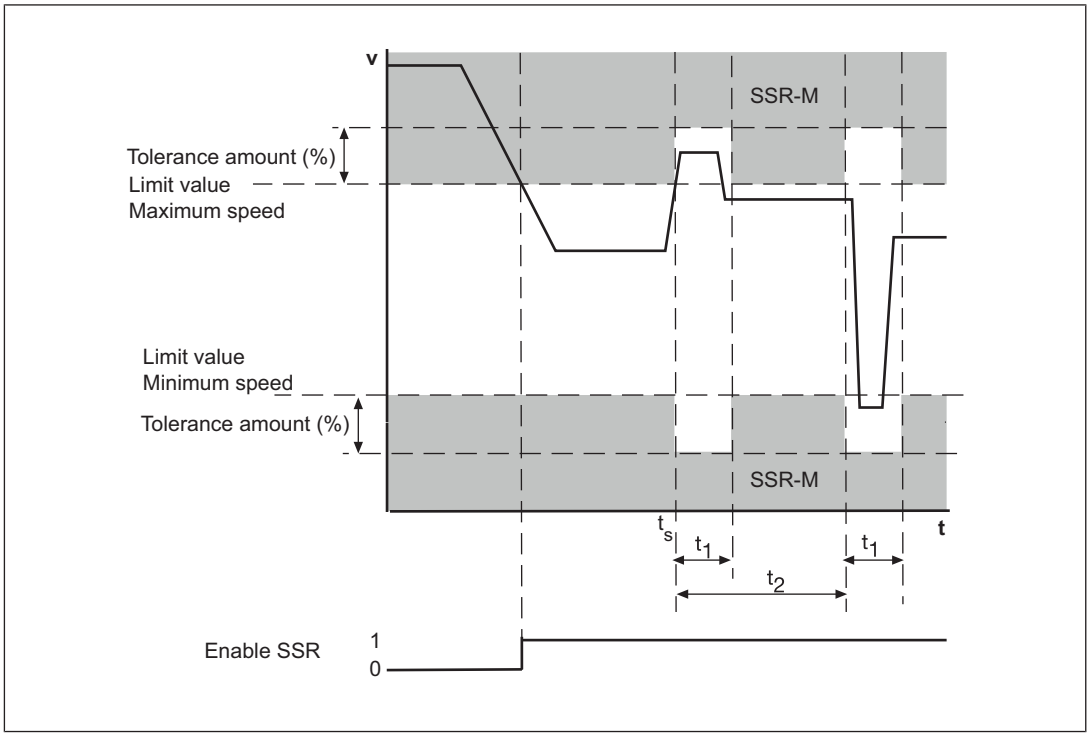
2 ranges can be configured per axis in the PNOZmulti Configurator.

A tolerance range may also be set for the limit values used to monitor the speed range. This tolerance range modifies the set limit values. As a result, one-off or periodic overshoots that exceed the range limits can be tolerated.

The following values can be configured for the tolerance range:

- Tolerance time (t1), which takes into account the length of the overshoots (maximum time for which the limit value may be exceeded). It must not be possible that the sum of all the overshoots exceeds the tolerance time (t1) within a tolerance period (t2).
- Tolerance period (t2), which takes into account the oscillation period (minimum time that must elapse between one limit value overshoot and the next)
- Tolerance amount as a %, which takes into account the amplitude of the overshoots (maximum permitted percentage by which the limit value may be exceeded)

## Motion monitoring modules
PNOZ m EF 2MM




**Legend:**

- Enable SSR:
  - "1": Speed is within the configured range
  - "0": Speed is outside the configured range
- $t_s$: Speed v exceeds the limit value and activates the tolerance range (tolerance time, tolerance period, tolerance amount)
- $t_1$: Tolerance time
- $t_2$: Tolerance period
- Tolerance amount (%): Tolerance amount of the two limit values, maximum and minimum speed

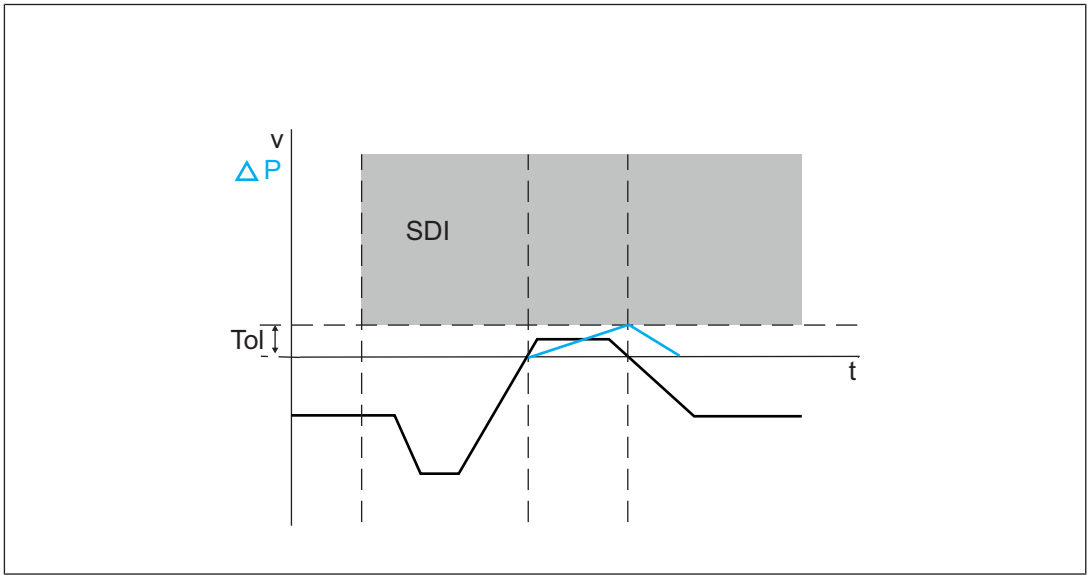
### Safe direction monitoring

The ***Safe direction monitoring*** function (SDI-M) monitors the direction of movement defined for the drive axis (positive or negative). Safe direction of movement monitoring is activated via the start input. It remains active until the configured tolerance is exceeded in the opposite direction. The function can be retriggered at any time by a rising edge at the start input. As a result, the current position can be used at any time as the start point for the monitoring function.

One SDI-M element can be configured per axis for each direction in the PNOZmulti Configurator.

## Motion monitoring modules
PNOZ m EF 2MM

Please note:
This monitoring function cannot be used in conjunction with 2 proximity switches because position detection is not possible.

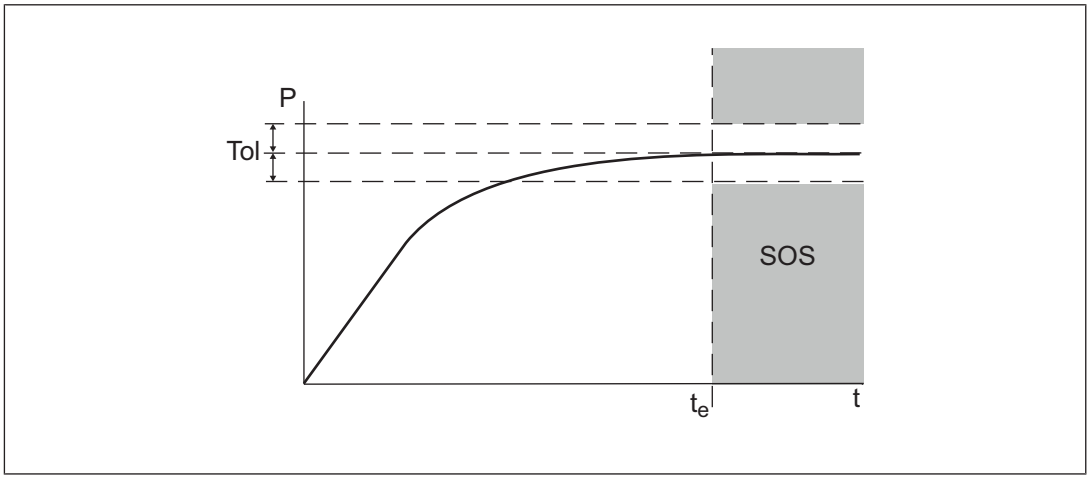



**Safe operating stop monitoring**

The ***Safe operating stop monitoring*** function (SOS-M) monitors whether the standstill position remains within a configured tolerance window. Safe operating stop monitoring is activated within a rising edge at the start input. It remains active until the value is outside the tolerance band. The function can be retriggered at any time by a rising edge at the start input. As a result, the current position can be used at any time as the start point for the monitoring function.

3 SOS-M elements can be configured per axis in the PNOZmulti Configurator.

Please note:
This monitoring function cannot be used in conjunction with 2 proximity switches because position detection is not possible.



# Motion monitoring modules
PNOZ m EF 2MM

**Legend:**

- $t_e$: Activation of the monitoring function SOS

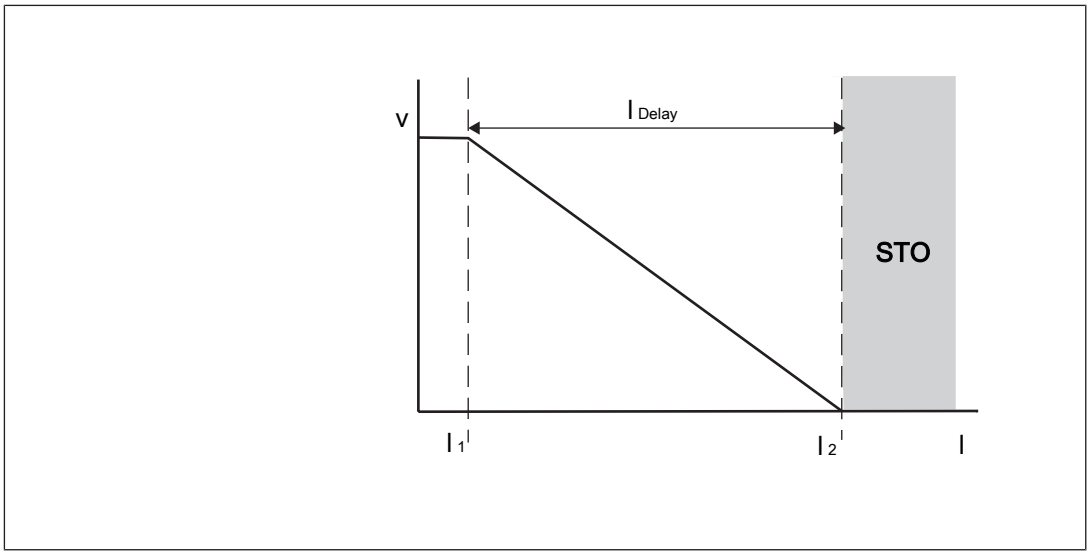
**Safe stop 1 monitoring**

The ***Safe stop 1 monitoring*** function (SS1-M) monitors whether the set delay time has elapsed (until controlled braking of the motor) or the value for standstill detection for automatic STO is below the limit value.

- If the monitoring function SS1-M is triggered, the ***Braking ramp*** output is switched off. The drive controller's braking ramp is activated.
- After the set delay time has elapsed or the value for the automatic STO is below the limit value, the output ***ST*** switches off. The safety function ***Safe torque off*** (STO) is activated.

A maximum of 1 SS1-M element can be configured per axis in the PNOZmulti Configurator.

Sequence without standstill detection limit value for automatic STO:

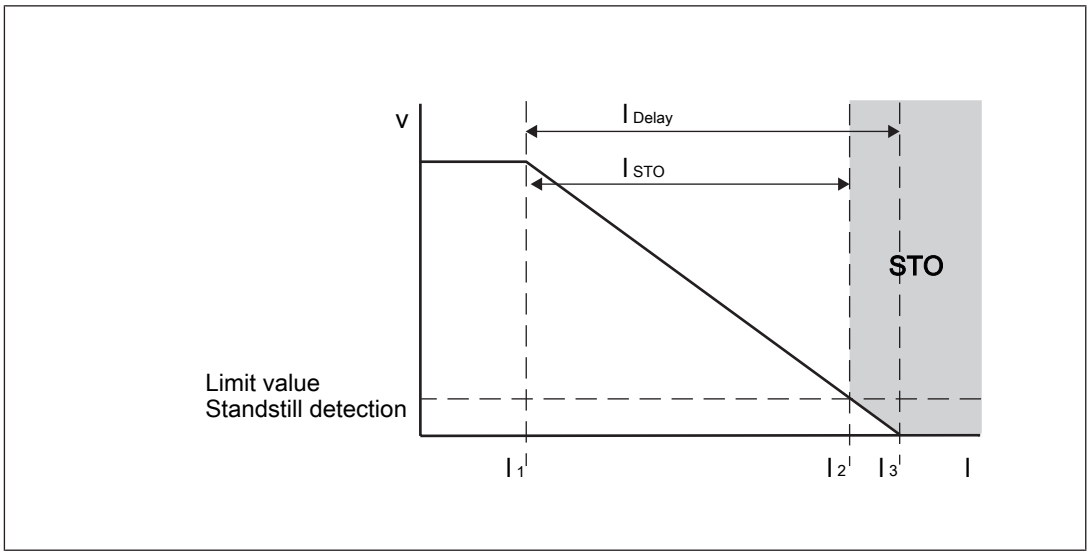



**Legend**

| | |
|---|---|
| $t_1$: | Monitoring function SS1-M is activated |
| $t_2$: | Delay time elapses, safety function "Safe torque off" (STO) is activated |
| $t_{Delay}$: | Set delay time for controlled braking of motor |

# Motion monitoring modules
PNOZ m EF 2MM

Sequence with standstill detection limit value for automatic STO:




**Legend**

| | |
|---|---|
| $t_1$: | Monitoring function SS1-M is activated |
| $t_2$: | Standstill detection limit value for automatic STO reached, safety function "Safe torque off" (STO) is activated |
| $t_3$: | Delay time elapses |
| $t_{Delay}$: | Set delay time for controlled braking of motor |
| $t_{STO}$: | Actual time from activation of monitoring function until STO is activated |

**Safe stop 2 monitoring**

The ***Safe stop 2 monitoring*** function (SS2-M) monitors

- Whether the set delay time has expired (to controlled braking of the motor) or the value for standstill detection for automatic SOS is below the limit value

  and

- Whether the standstill position ultimately remains within a configured tolerance window.

**Reaction:**

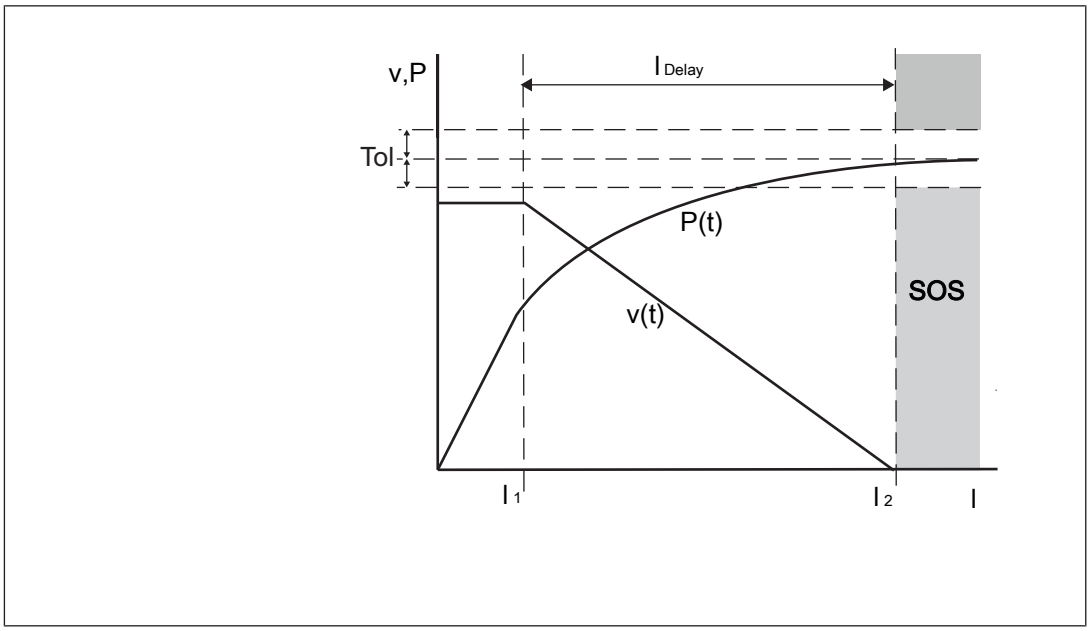
- If the monitoring function SS2-M is triggered, the "Braking ramp" output switches off. The drive controller's braking ramp is activated.
- If the set delay time has elapsed or the value for the automatic SOS is below the limit value, the standstill position is monitored, the ***Position monitoring*** output switches on. If the standstill position is outside the tolerance window, the ***Position monitoring*** and ***STO*** outputs switch off, the safety function ***Safe torque off*** (STO) is activated.

A maximum of 1 SS2-M element can be configured per axis in the PNOZmulti Configurator.

Please note:
This monitoring function cannot be used in conjunction with 2 proximity switches because position detection is not possible.

## Motion monitoring modules
PNOZ m EF 2MM

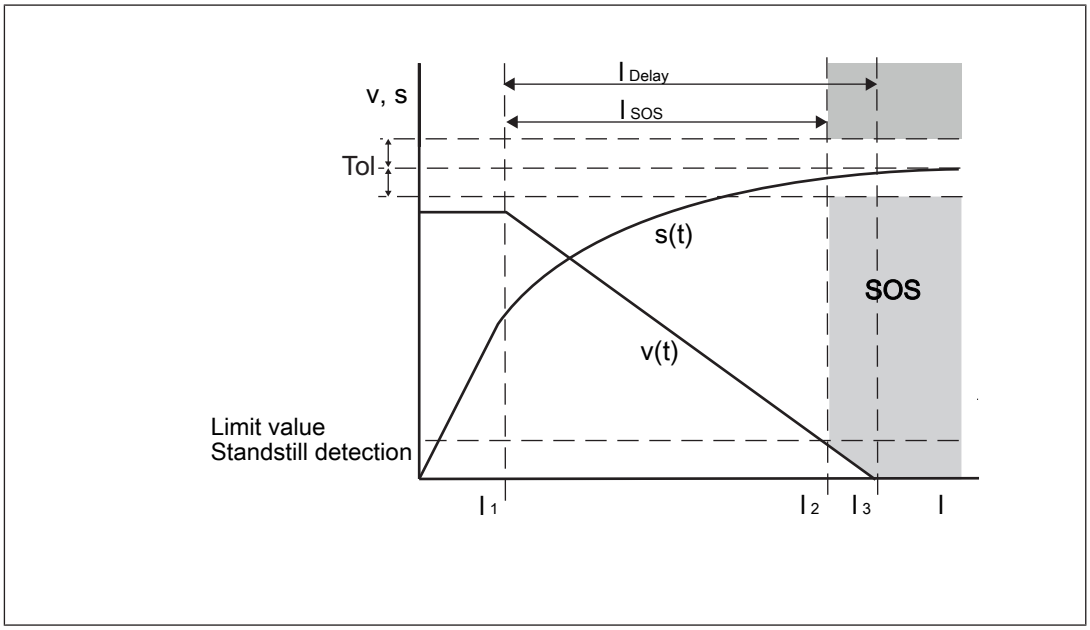
Sequence without standstill detection limit value for automatic SOS:




**Legend**

| | |
|---|---|
| $t_1$: | Activation of the monitoring function SS2-M |
| $t_2$: | Delay time elapses, monitoring of standstill position (SOS) is activated |
| $t_{Delay}$: | Set delay time for controlled braking of motor |

Sequence with standstill detection limit value for automatic SOS:

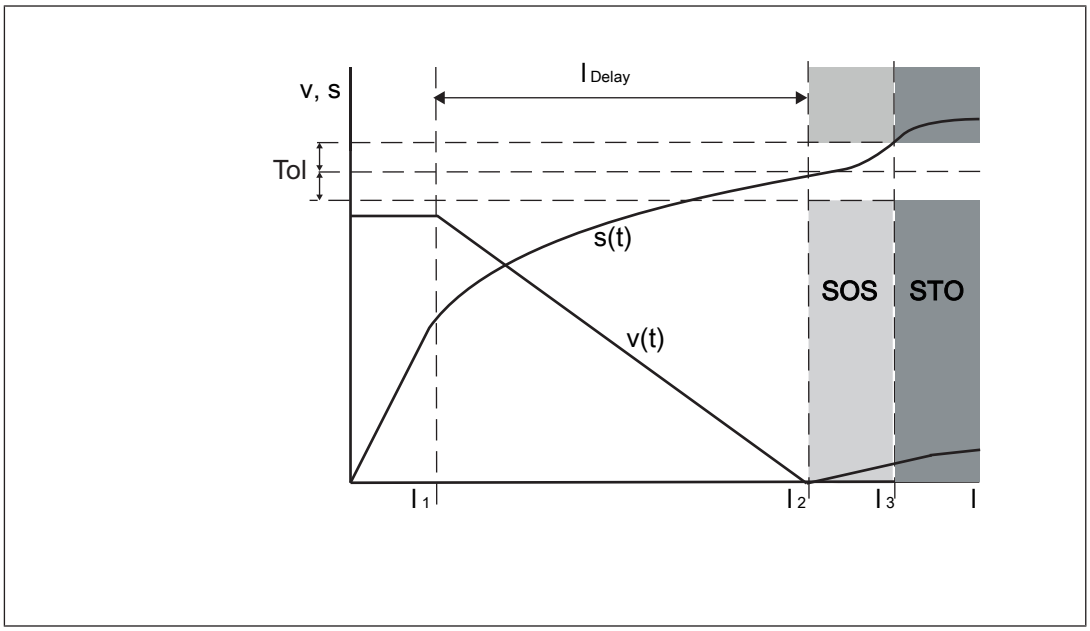


# Motion monitoring modules
PNOZ m EF 2MM

**Legend**

| | |
|---|---|
| $t_1$: | Activation of the monitoring function SS2-M |
| $t_2$: | Standstill detection limit value for automatic SOS reached, monitoring of standstill position (SOS) is activated |
| $t_3$: | Delay time elapses |
| $t_{Delay}$: | Set delay time for controlled braking of motor |
| $t_{STO}$: | Actual time from activation of monitoring function until STO is activated |

Sequence when standstill position is violated:




**Legend**

| | |
|---|---|
| $t_1$: | Activation of the monitoring function SS2-M |
| $t_2$: | Standstill detection limit value for automatic SOS reached, monitoring of standstill position (SOS) is activated |
| $t_3$: | Standstill position outside of tolerance window, safety function "Safe torque off" (STO) is activated |
| $t_{Delay}$: | Set delay time for controlled braking of motor |

### Hysteresis

A hysteresis can be configured for the monitoring functions. This prevents the outputs from bouncing if there are fluctuations around the response value. The hysteresis takes effect when the output is switched on.

### Validation cut-off frequency

As implausible signals may arise due to edge jitter on the sensors around the standstill position, a validation cut-off frequency must be configured for sensor types with proximity switches in the PNOZmulti Configurator (edge jitter is caused by the position control of the drive frequency converter or by external interference signals).

If the value of the validation cut-off frequency falls below the configured value, the feasibility check of the sensors will no longer be run.

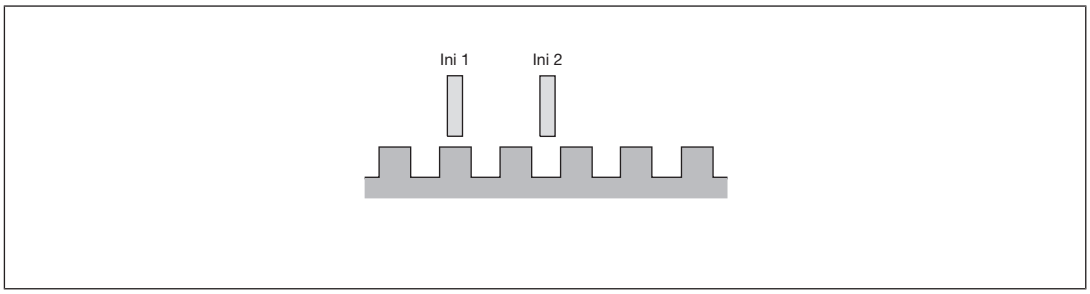
### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

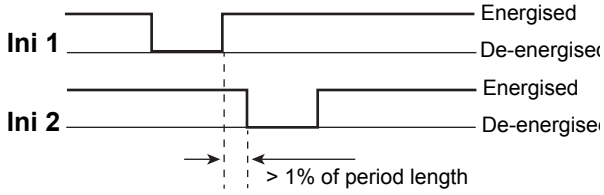
### Proximity switches

- The following proximity switches can be used with a pnp or npn output:
  - Inductive
  - Capacitive
- The proximity switches must be fitted so that at least one is always activated. In other words, the proximity switches must be fitted so that the recorded signals always overlap.
- The cable used to connect the proximity switches must be shielded (see connection diagrams in the chapter entitled "EMC-compliant wiring").
- A DC voltage in the range of 0 - 30 V can be monitored via track S. It should be used to monitor the supply voltage of the proximity switches.

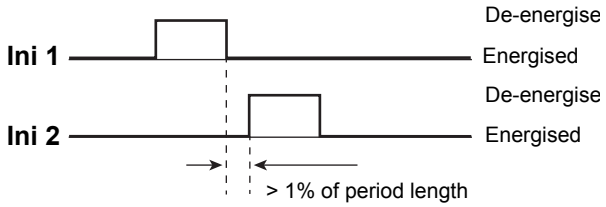
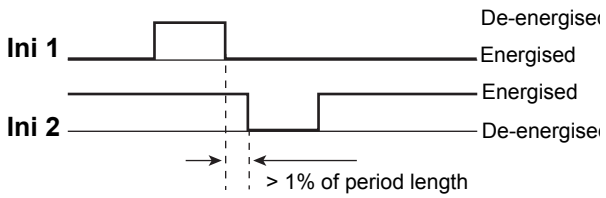
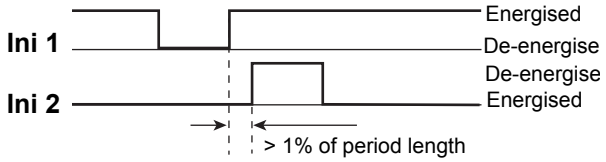
**Proximity switch assembly:**




**Signal characteristics:**

| Proximity switch combinations | Signal image in an energised state |
|---|---|
| PNP / PNP |  |

# Motion monitoring modules
PNOZ m EF 2MM

| Proximity switch combinations | Signal image in an energised state |
|---|---|
| NPN / NPN |  |
| NPN / PNP |  |
| PNP / NPN |  |

- For a full configuration, the maximum frequency of the sensors you are using must be entered in the PNOZmulti Configurator (see sensor's data sheet).

## Encoder

- The following encoders can be used:
  - TTL, HTL (single-ended or differential signals)
  - Sin/Cos 1 Vss
  - Hiperface®
- The encoders can be connected with or without Z index (0 index).
- The cables used to connect the encoders must be shielded (see connection diagrams in the chapter entitled "EMC-compliant wiring").
- A proximity switch can also be connected to track Z to monitor for broken shearpins.
  **Please note:**
  Broken shearpin monitoring only becomes active when
  - The minimum speed is exceeded

    and
  - The tolerance for detecting feasibility errors has elapsed.

## Motion monitoring modules
PNOZ m EF 2MM

The minimum speed and tolerance depend on the ratio of the frequency on tracks AB "$f_{AB}$" to the frequency on track Z "$f_Z$" in your configuration (see PNOZmulti Configurator ***Motion Monitor Element***, ***Calculated Ratio AB/Z***).
Minimum speed:

- Calculated ratio AB/Z ≥ 1.0
  $f_Z$ = 10 mHz or $f_{AB} = (f_{AB}/f_Z) \times 10$ mHz
- at $f_{AB}/f_Z$ ***Ratio*** < 1.0
  $f_{AB}$ = 10 mHz or $f_Z = 10\ \text{mHz}/(f_{AB}/f_z)$

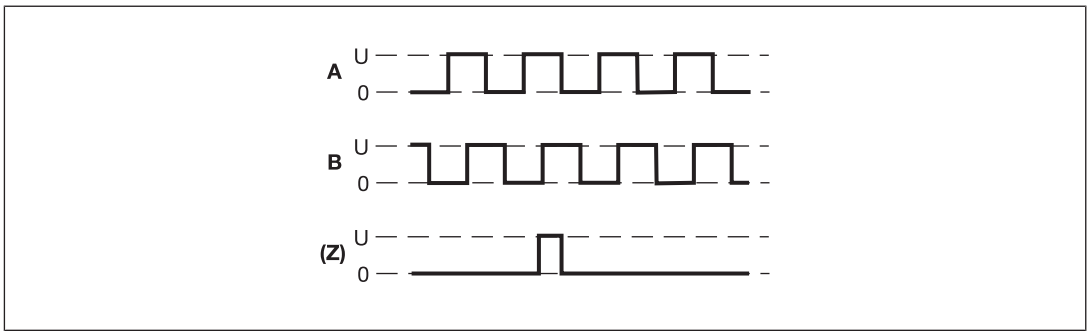
Tolerance for detecting feasibility errors:

- at $f_{AB}/f_Z$ ***Ratio*** ≥ 1.0
  7.5 Z pulses or 7.5 x ($f_{AB}/f_Z$ ) AB pulses
- at $f_{AB}/f_Z$ ***Ratio <*** 1.0
  4.5 AB pulses or 4.5 x ($f_{AB}/f_Z$) Z pulses

- With Hiperface encoders, the Sin- Cos track is recorded and monitored via an adapter (see Adapters for encoders [📖 790]).
- Track S can be used:
  - To connect an encoder's error output.
  - To monitor voltages between 0 V and 30 V for a permitted upper and lower limit. For example, the encoder's supply voltage can be monitored.
- The maximum frequency of the used encoders must be entered for a complete configuration.
- Pay attention to the values in the technical details.

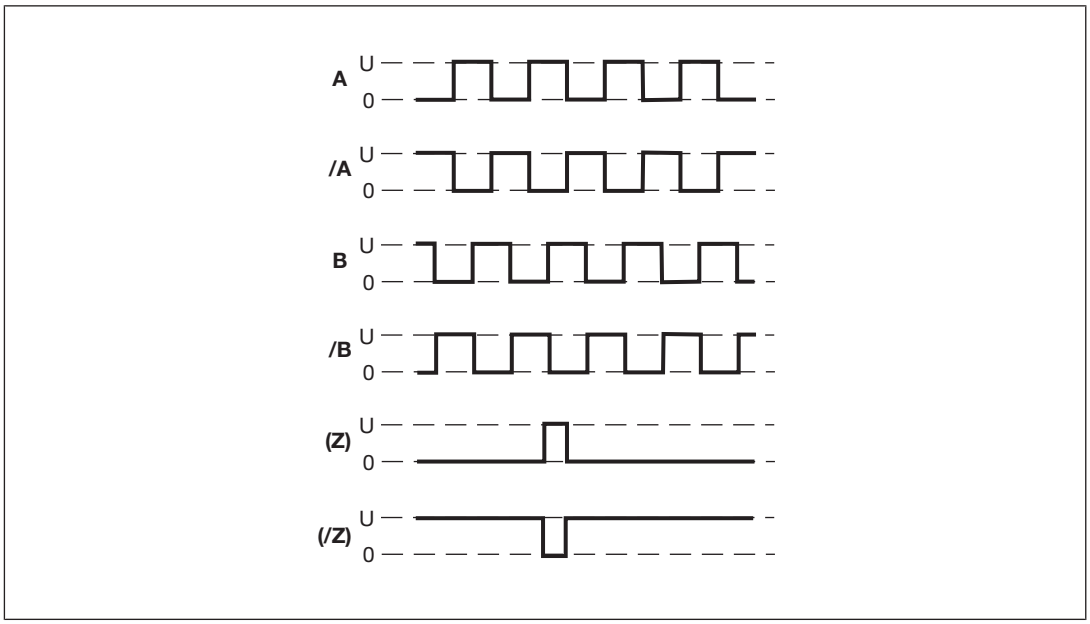
**Output signals TTL, HTL**

Single ended



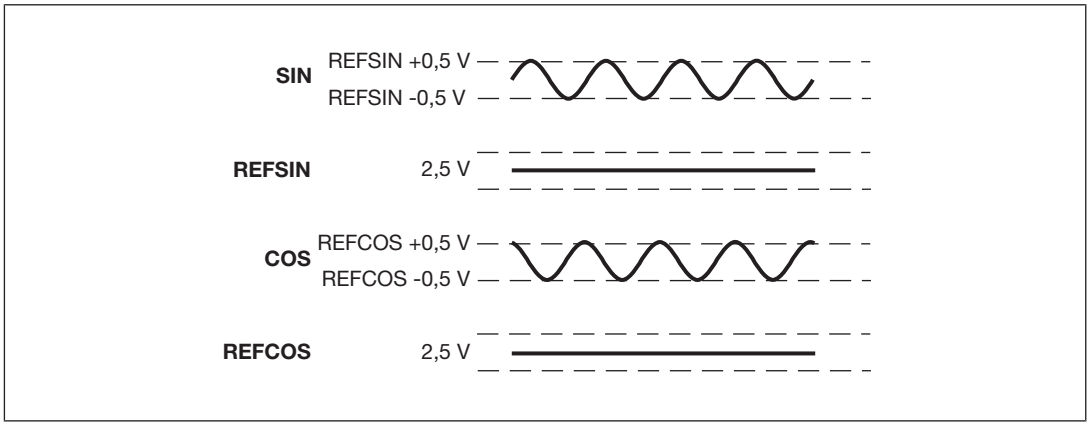
## Motion monitoring modules
PNOZ m EF 2MM

Differential



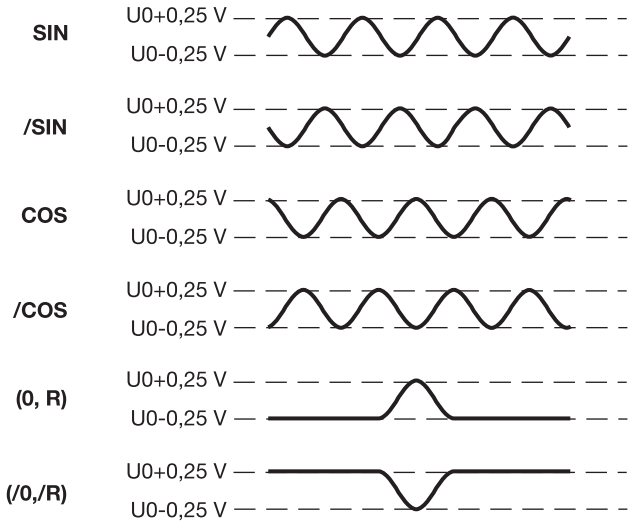

**Output signals Sin/Cos (1 Vss)**

Single ended with reference track (e.g. Hiperface ®)



# Motion monitoring modules
PNOZ m EF 2MM

Differential with/without Z index (e.g. Heidenhain 1 Vss)

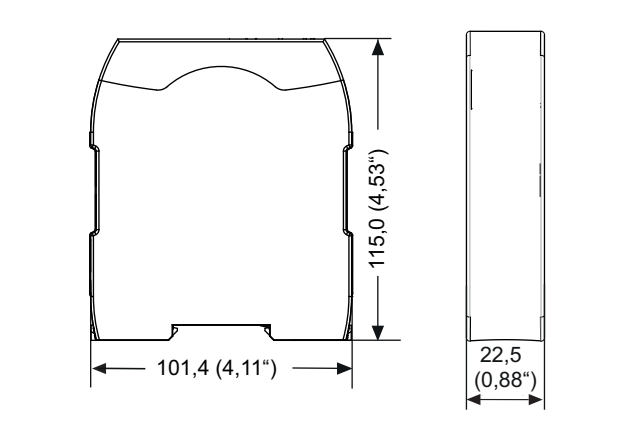



The adapter records the data between the encoder and the drive and makes it available to the PNOZ m EF 2MM via the Mini-IO socket.

Pilz supplies complete adapters as well as ready-made cable with Mini-IO connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

## Installation

### Dimensions in mm



# Motion monitoring modules
PNOZ m EF 2MM

## Commissioning

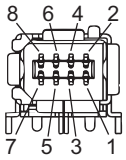
### Wiring

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

Please note:

- Information given in the Technical details [📖 802] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- The power supplies for the safety system and sensors must comply with the regulations for low voltages with safe isolation.
- The cable used to connect the encoders and proximity switches must be shielded (see connection diagrams in the chapter entitled "EMC-compliant wiring").
- The shield may only be connected to earth at a single point.
- Earth loops should be avoided.
- If possible, the connections for the various earth potentials (GND, A2 ) should not be connected on the PNOZ m EF 2MM but should be connected directly to the GNDs on the connected units, otherwise noise susceptibility may be increased significantly (conductor loops are not permitted).

### Pin assignment of Mini-IO socket

| Mini-IO socket<br>8-pin | PIN | Track |
|---|---|---|
|  | 1 | S |
| | 2 | GND |
| | 3 | Z |
| | 4 | A |
| | 5 | /A |
| | 6 | /Z |
| | 7 | B |
| | 8 | /B |

# Motion monitoring modules
PNOZ m EF 2MM

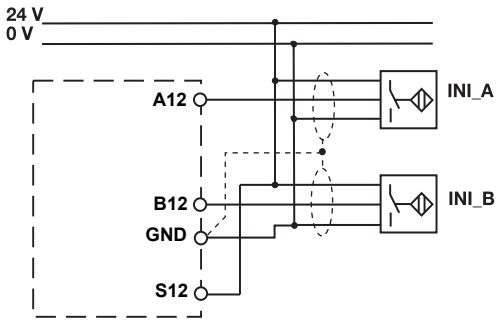
## Connection of proximity switches

The following proximity switch combinations can be connected:

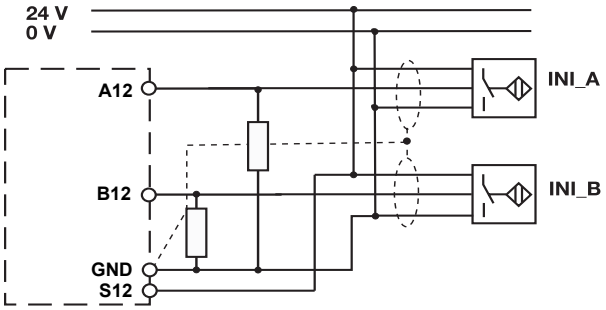
- A: pnp, B: pnp
- A: npn, B: npn
- A: pnp, B: npn
- A: npn, B: pnp

When connecting proximity switches please note:

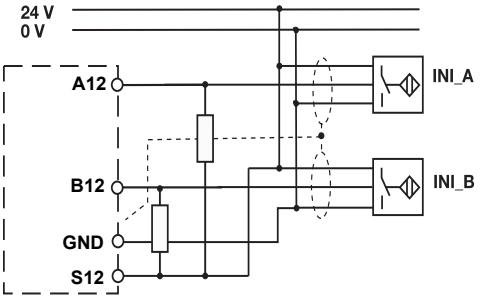
- Proximity switches can be connected to
  - terminals A12, B12, GND for axis 1 and A22, B22, GND for axis 2
    or
  - tracks A, B and GND of the Mini-IO socket (X12 for axis 1, X22 for axis 2).
- Track S (S12, S22) should be used to monitor the supply voltage (see drawing). A permitted voltage range can be entered in the menu.
- Connect the proximity switch to 24 VDC of the power supply.
- When connecting the proximity switches, please refer to the chapter entitled "EMC-compliant wiring".
- Invalid signals may occur with long cable lengths. In this case we recommend that you connect a resistor between the signal lines, as shown in the diagrams.
- Connection of the proximity switches may only be performed in three-wire technology and not in two-wire technology.



pnp proximity switch with resistor R = 10 kOhm




npn proximity switch with resistor R = 47 kOhm




## Connection of an encoder

Proceed as follows when connecting the encoder:

- The encoder can be connected via an adapter (e.g. MM A Mini-IO-CAB99) or directly to the PNOZ m EF 2MM.
- Use only shielded cables for all connections. Please refer to the chapter entitled "EMC-compliant wiring".
- Always connect GND on the encoder to GND on the Mini-IO connector.
- If the encoder signals are not terminated with 120 Ohm in the frequency converter, the encoder signals must be terminated with $Z_0$ = 120 Ohm between A and /A, B and /B, Z and /Z.
- Please refer to the information provided by the encoder manufacturer with regard to the recommended max. cable length when taking into consideration
  - Output frequency
  - Supply voltage
  - Operating temperature

## Motion monitoring modules
PNOZ m EF 2MM

– Existing interference

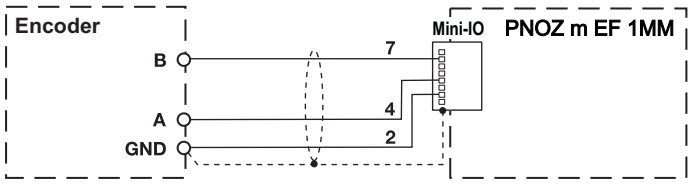
When calculating the maximum cable length, remember that the length of the adapter cable must also be taken into account.

Encoder types:

- TTL single ended
- HTL single ended

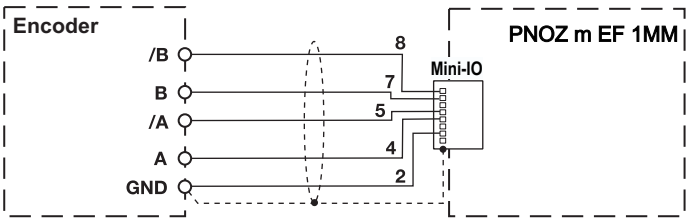
Please note:

- Tracks/A, /B, Z and /Z must remain free




Encoder types:

- TTL Differential
- HTL differential
- sin/cos 1 Vss
- Hiperface



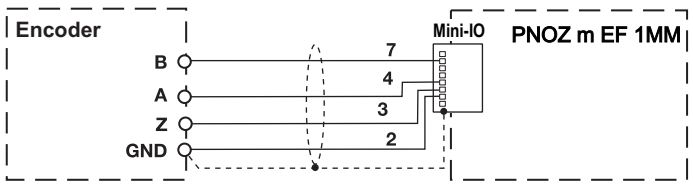

Encoder types:

- TTL single ended Z Index
- HTL single ended Z Index

Please note:

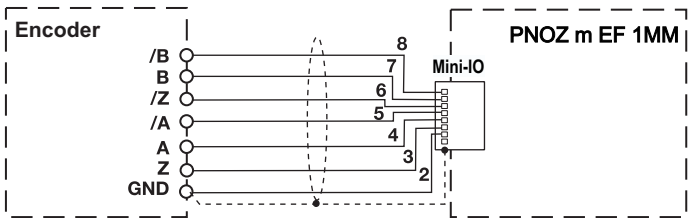
- Tracks /A, /B and /Z must remain free

## Motion monitoring modules
PNOZ m EF 2MM

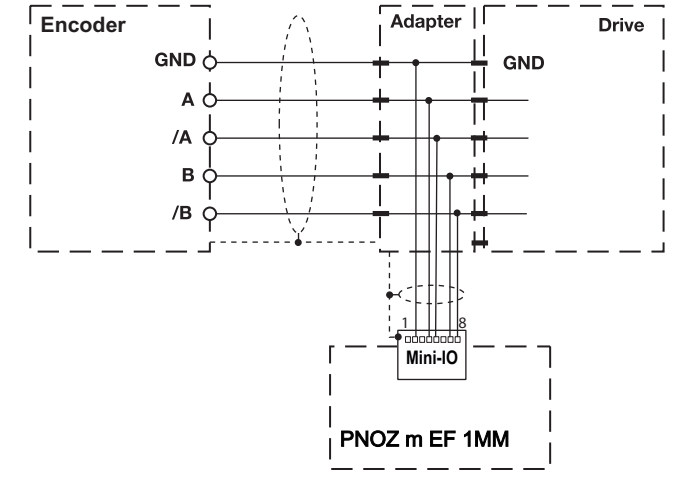



Encoder types:

- TTL differential + Z Index
- HTL differential + Z Index
- sin/cos 1 Vss Z Index




The adapter (see Accessories [📖 805]) is connected between the encoder and the drive. The output on the adapter is connected to the Mini-IO socket on the PNOZ m EF 2MM.



# Motion monitoring modules
PNOZ m EF 2MM

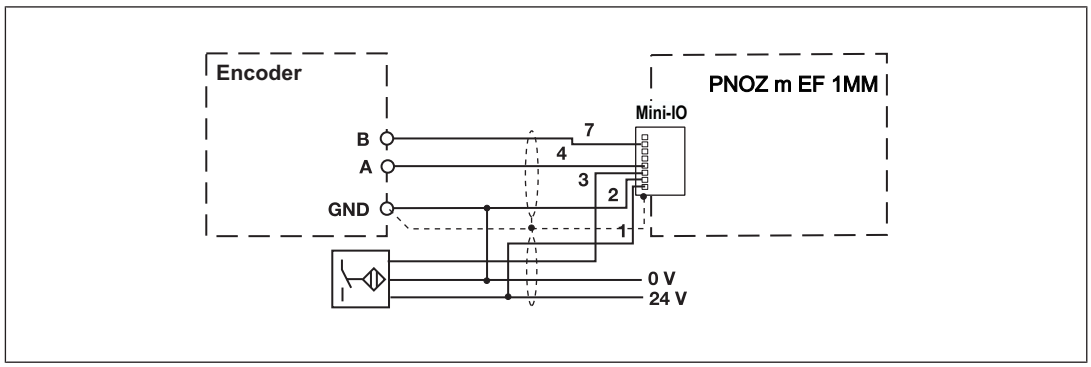
## Connection of proximity switch and encoder

When connecting the encoders and proximity switches, please refer to the chapter entitled "EMC-compliant wiring".

Sensor types:

- Configuration: HTL single Z Freq. Ini pnp
  - HTL single ended (A,B) + Ini pnp (Z)
  - HTL single ended (A,B) + HTL differential (A as Z)
  - HTL single ended (A,B) + HTL single ended (A as Z)
- Configuration: TTL single Z Freq. Ini pnp
  - TTL single ended (A,B) + Ini pnp (Z)
  - TTL single ended (A,B) + HTL differential (A as Z)
  - TTL single ended (A,B) + HTL single ended (A as Z)

Please note:
Tracks /A, /B and /Z must remain free.



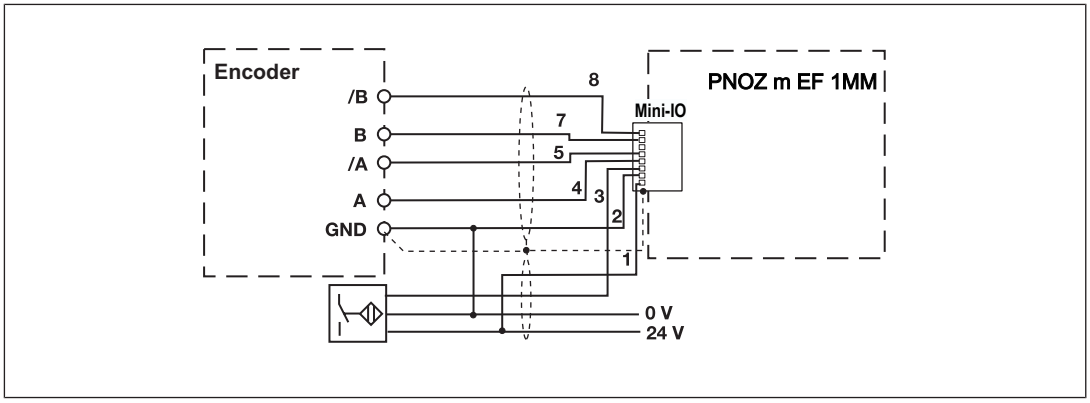

Sensor types:

- Configuration: TTL differential Z Freq. Ini pnp
  - TTL differential (A,/A,B,/B) + Ini pnp (Z)
  - TTL differential (A,/A,B,/B) + HTL differential (A as Z)
  - TTL differential (A,/A,B,/B) + HTL single ended (A as Z)
- Configuration: HTL differential Z Freq. Ini pnp
  - HTL differential (A,/A,B,/B) + Ini pnp (Z)
  - HTL differential (A,/A,B,/B) + HTL differential (A as Z)
  - HTL differential (A,/A,B,/B) + HTL single ended (A as Z)
- Configuration: sin/cos 1 Vss Z Freq. Ini pnp
  - sin/cos 1 Vss (A,/A,B,/B) + Ini pnp (Z)
  - sin/cos 1 Vss (A,/A,B,/B) + HTL differential (A as Z)
  - sin/cos 1 Vss (A,/A,B,/B) + HTL single ended (A as Z)

## Motion monitoring modules
PNOZ m EF 2MM

- Configuration: Hiperface Z Freq. Ini pnp
  - Hiperface (A,/A,B,/B) + Ini pnp (Z)
  - Hiperface (A,/A,B,/B) + HTL differential (A as Z)
  - Hiperface (A,/A,B,/B) + HTL single ended (A as Z)

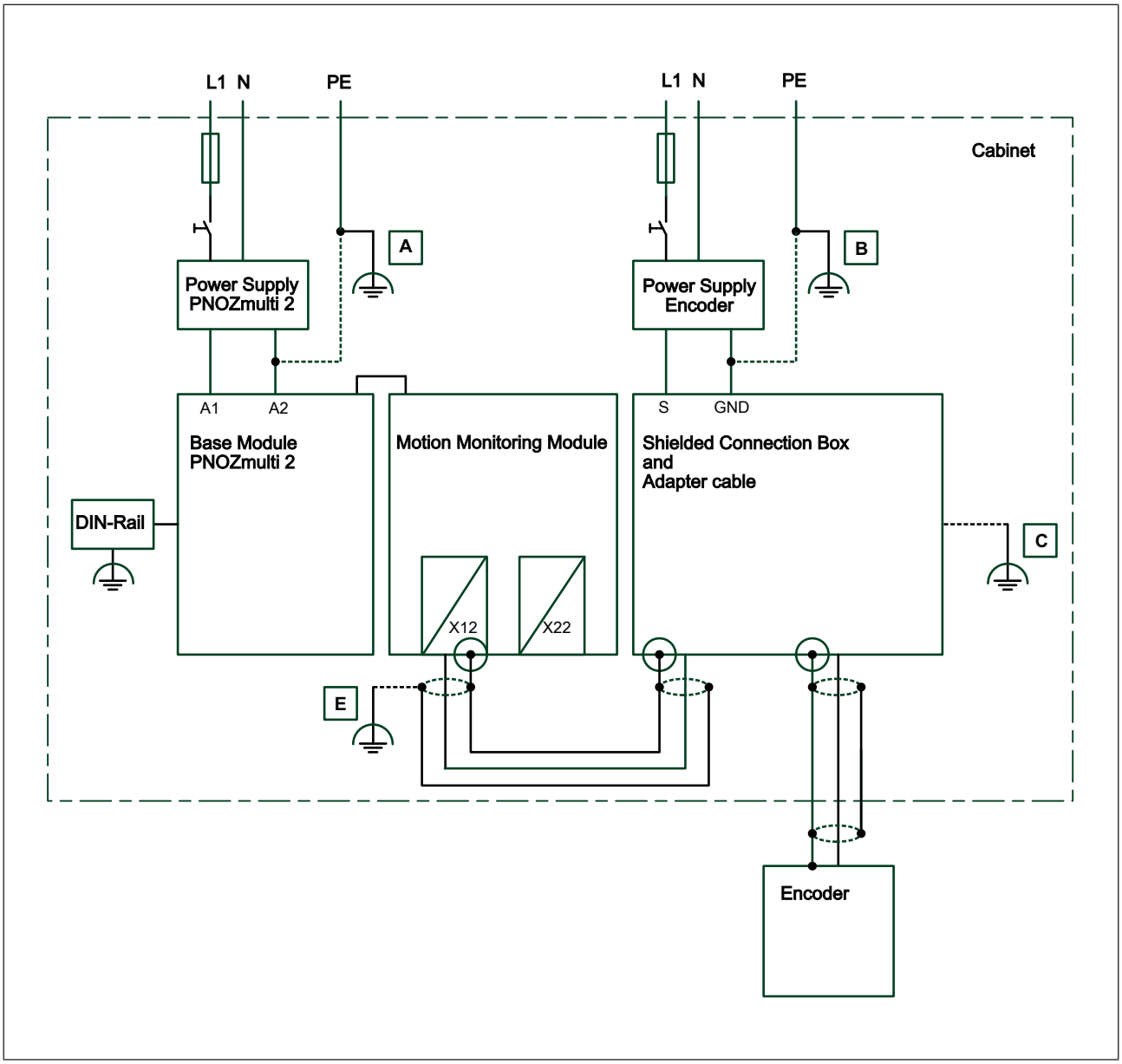
Please note:
Track /Z must remain free!!



# Motion monitoring modules
PNOZ m EF 2MM

## EMC-compliant wiring

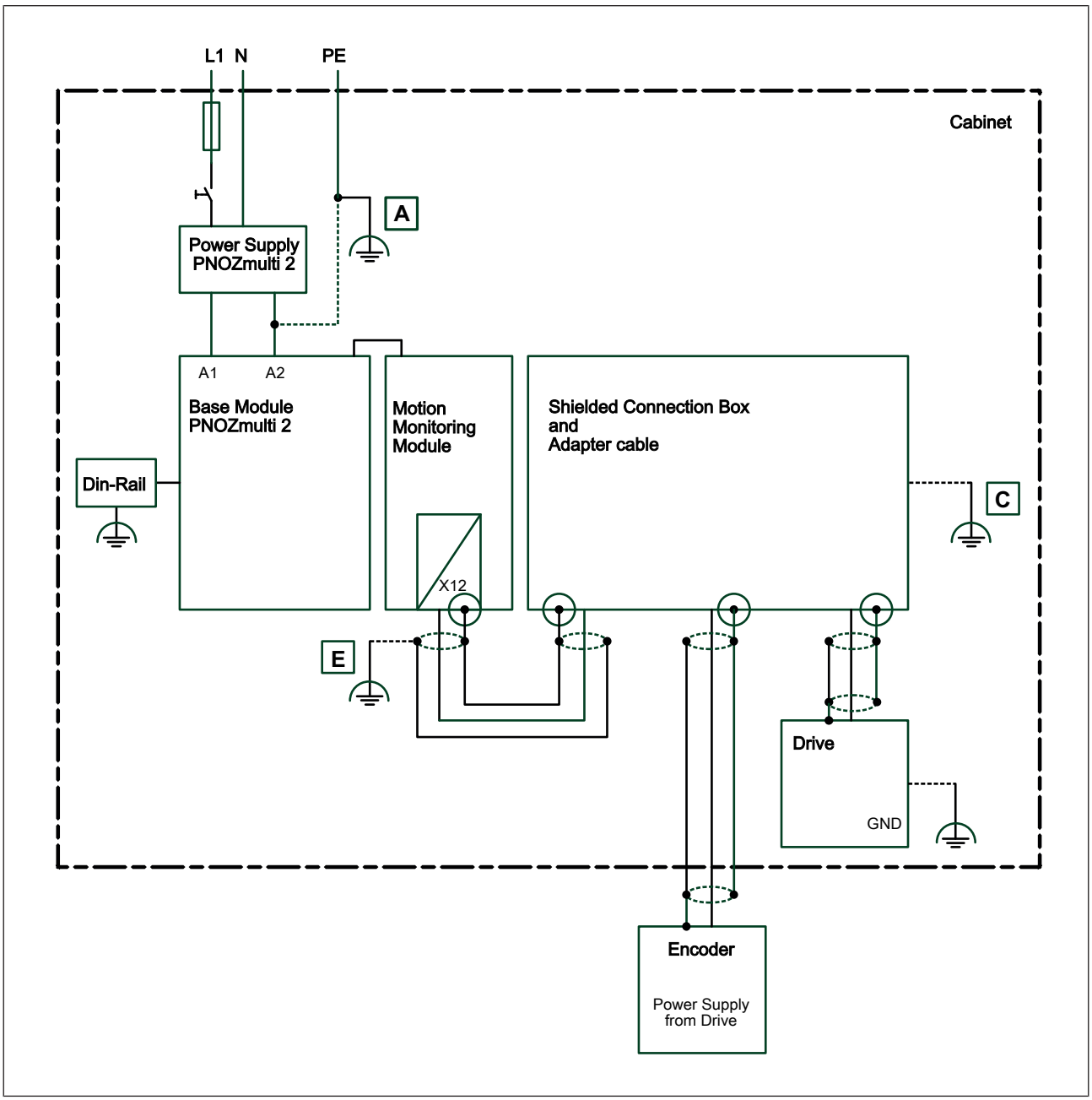
### EMC-compliant wiring for connecting an encoder




To avoid EMC interference we recommend that the shield on the sensor cable is connected to earth at **C** or **E**. However, depending on the application, it may be helpful to establish the connection to functional earth at another point (in this case **A** or **B**).
Conductor loops outside the shield must be avoided.
If a shielded junction box is not used, the shield must run continuously from the sensor to the evaluation device.

## Motion monitoring modules
PNOZ m EF 2MM

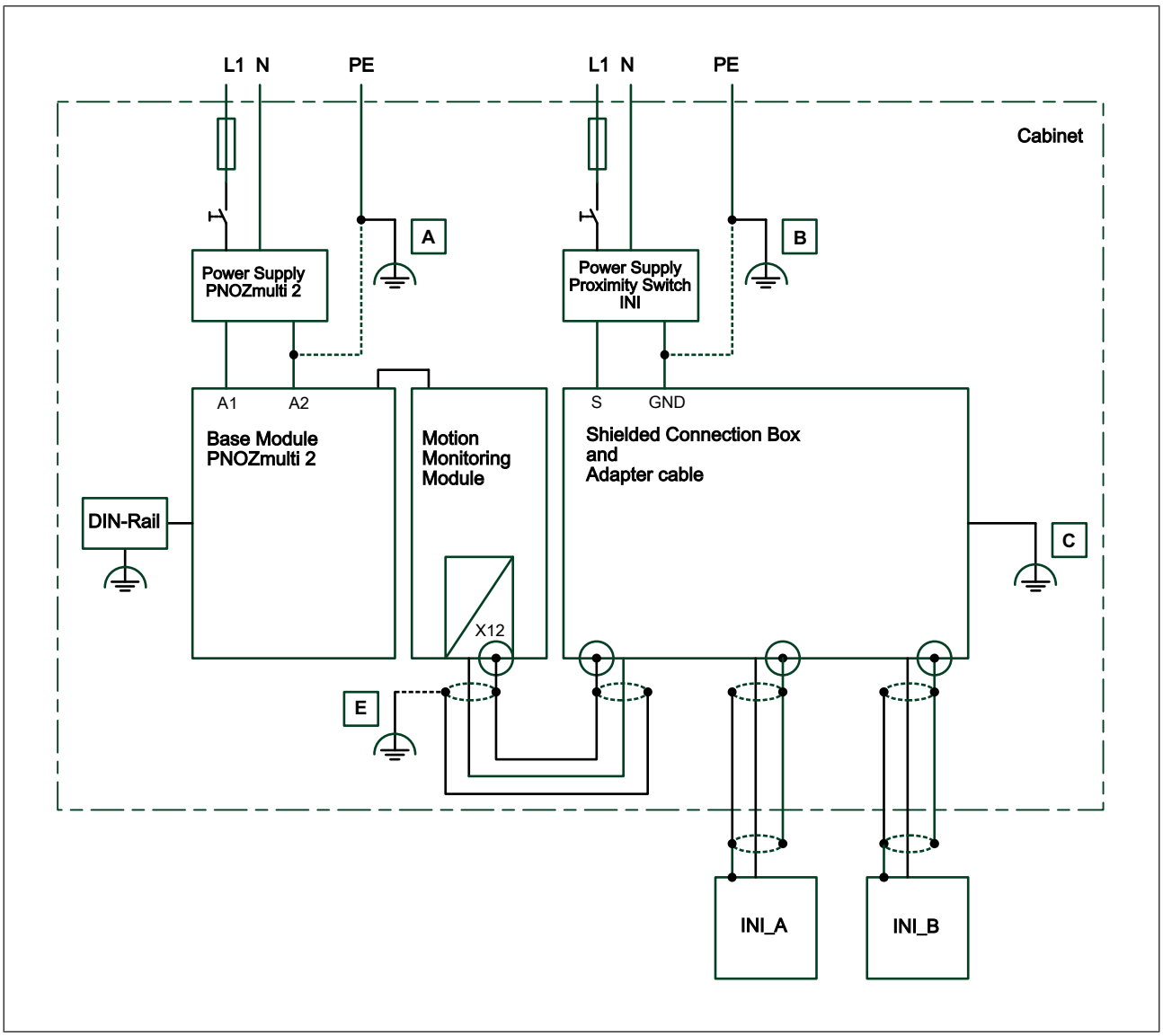
**EMC-compliant wiring for connecting an encoder with drive**




To avoid EMC interference we recommend that the shield on the sensor cable is connected to earth at **C** or **E**. However, depending on the application, it may be helpful to establish the connection to functional earth at another point (in this case **A**).
Conductor loops outside the shield must be avoided.
If a shielded junction box is not used, the shield must run continuously from the sensor to the evaluation device.

## Motion monitoring modules
PNOZ m EF 2MM

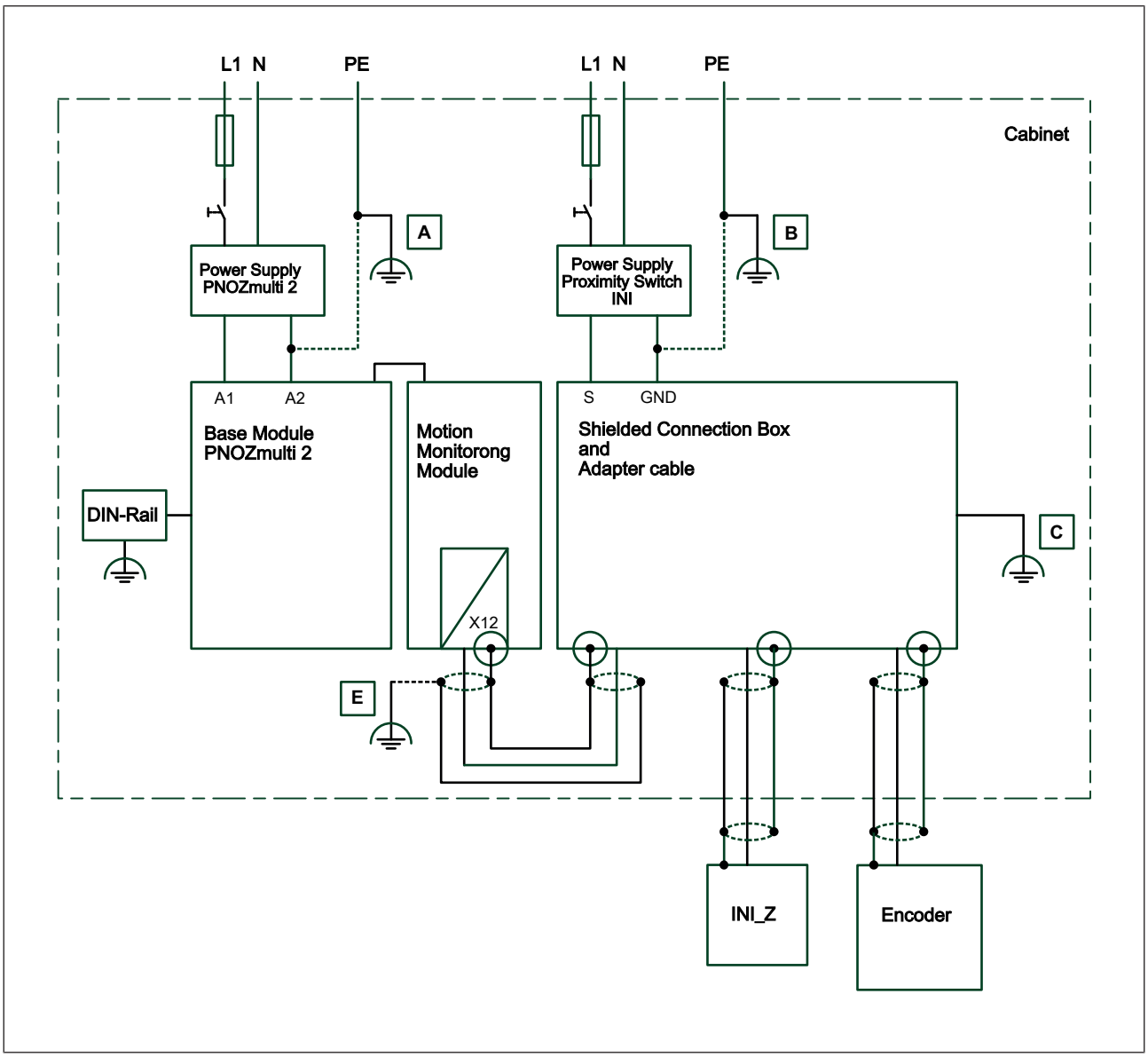
**EMC-compliant wiring for connecting 2 proximity switches**




To avoid EMC interference we recommend that the shield on the sensor cable is connected to earth at **C** or **E**. However, depending on the application, it may be helpful to establish the connection to functional earth at another point (in this case **A** or **B**).
Conductor loops outside the shield must be avoided.
If a shielded junction box is not used, the shield must run continuously from the sensor to the evaluation device.

## Motion monitoring modules
PNOZ m EF 2MM

**EMC-compliant wiring for connecting an encoder and a proximity switch**




To avoid EMC interference we recommend that the shield on the sensor cable is connected to earth at **C** or **E**. However, depending on the application, it may be helpful to establish the connection to functional earth at another point (in this case **A** or **B**).
Conductor loops outside the shield must be avoided.
If a shielded junction box is not used, the shield must run continuously from the sensor to the evaluation device.

# Motion monitoring modules
PNOZ m EF 2MM

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| Application range | **Failsafe** |
| Module's device code | **00E4h** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **24 V** |
| Kind | **DC** |
| Current consumption | **150 mA** |
| Power consumption | **3,5 W** |
| Max. power dissipation of module | **3,9 W** |
| Status indicator | **LED** |
| **Proximity switch input** | |
| Number of inputs | **4** |
| Input signal level | |
| Signal level at "1" | **11 - 30 V** |
| Signal level at "0" | **0 - 3 V** |
| Input resistance | **22 kOhm** |
| Input's frequency range | **0 - 5 kHz** |
| Configurable monitoring frequency | |
| Without hysteresis | **0.1 Hz - 5 kHz** |
| **Incremental encoder input** | |
| Number of inputs | **2** |
| Connection type | **Mini-IO female connector, 8-pin** |
| Input signal level | **0,5 - 30 Vss** |
| Phase position for the differential signals A, /A and B,/B | **90° ±30°** |
| Overload protection | **-50 - 65 V** |
| Input resistance | **20 kOhm** |
| Input's frequency range | **0 - 500 kHz** |
| Configurable monitoring frequency | |
| Without hysteresis | **0.1 Hz - 500 kHz** |
| **Inputs** | |
| Potential isolation | **yes** |
| **Times** | |
| Reaction time after limit value is exceeded | **1/f_ist + 16 ms** |

# Motion monitoring modules
PNOZ m EF 2MM

| | |
|---|---|
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Sensor and system voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **2500 V** |
| Potential isolation between | **Sensor 1 and sensor 2** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |

# Motion monitoring modules
PNOZ m EF 2MM

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **111 mm** |
| Weight | **120 g** |

Where standards are undated, the 2013-01 latest editions shall apply.

## Safety characteristic data

| Operating mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN IEC 62061 SIL CL | EN IEC 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| Monitoring 1 encoder | **PL d** | **Cat. 2** | **SIL CL 2** | **1,80E-08** | **SIL 2** | **1,58E-03** | **20** |
| Monitoring 2 encoder | **PL e** | **Cat. 3** | **SIL CL 3** | **1,01E-09** | **SIL 3** | **8,41E-05** | **20** |
| Monitoring safe encoder | **PL e** | **Cat. 4** | **SIL CL 3** | **2,35E-09** | **SIL 3** | **2,04E-04** | **20** |
| Logic | **PL e** | **Cat. 4** | **SIL CL 3** | **3,37E-10** | **SIL 3** | **2,88E-05** | **20** |

# Motion monitoring modules
PNOZ m EF 2MM

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

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m EF 2MM | Expansion module | 772 171 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ 2MM 1 set | Spring-loaded terminals, 1 pieces | 783 544 |
| Screw terminals<br>PNOZ 2MM 1 set | Screw terminals, 1 piece | 793 544 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

#### Adapter cable

| Product type | Features | Order No. |
|---|---|---|
| MM A MINI-IO CAB99 | 1.50 m | 772 200 |
| MM A MINI-IO CAB99 | 2.50 m | 772 201 |
| MM A MINI-IO CAB99 | 5.0 m | 772 202 |

| Product type | Features | Order No. |
|---|---|---|
| PNOZ msi b4 Box | Connection box | 773 845 |

# Link modules
PNOZ m EF Multi Link


## Overview

### Unit features

Using the product PNOZ m EF Multi Link:

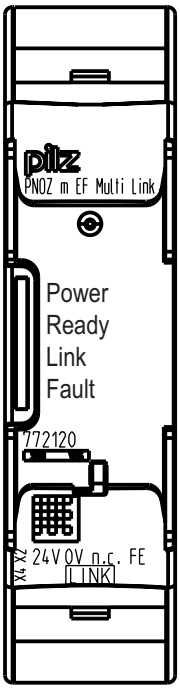
Link module to safely connect two configurable control systems PNOZmulti 2.

The product has the following features:

- Connection options:
  - Two base units PNOZmulti 2
- Can be configured in the PNOZmulti Configurator
- Point-to-point connection via 4-core shielded and twisted-pair cable
- 32 virtual inputs and 32 virtual outputs
- Status indicators
- Max. 4 PNOZ m EF Multi Link can be connected to the base unit
- LEDs for
  - Operating state
  - Error
  - Connection status
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

# Link modules
## PNOZ m EF Multi Link

### Front view




Legend:

- X2:
  - 0 V, 24 V:Supply connections
  - FE: Functional earth
- Link:
  Connection
- LEDs:
  - Power
  - Ready
  - Link
  - Fault

# Link modules
PNOZ m EF Multi Link

## Function Description

### Functions

The link module PNOZ m EF Multi Link is used to safely transfer the input information from 32 virtual inputs and 32 virtual outputs between two PNOZmulti systems. One link module is assigned to each base unit. Data is exchanged cyclically.

The function of the inputs and outputs on the control 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 LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

**Data exchange:**

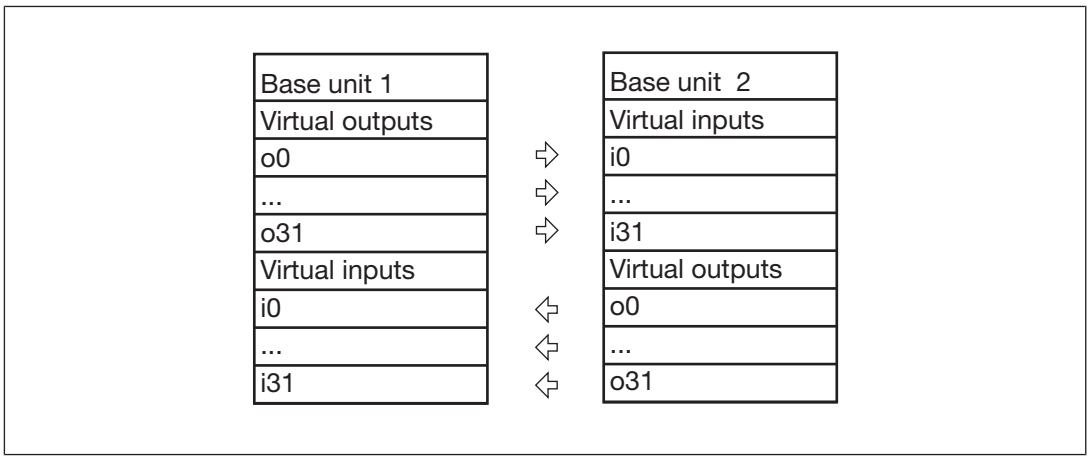
- Data is exchanged cyclically.
- After the end of a PNOZmulti cycle, each base unit sends its output data to its link module. This output data is immediately sent to the link module on the other base unit.
- At the same time, the base unit reads the input data from the link module.

**Connection of multiple base units:**

Any number of base units can be connected via link modules. Two link modules are required for a connection between two base units. However, only a maximum of 4 link modules may be connected to any one base unit.

**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.

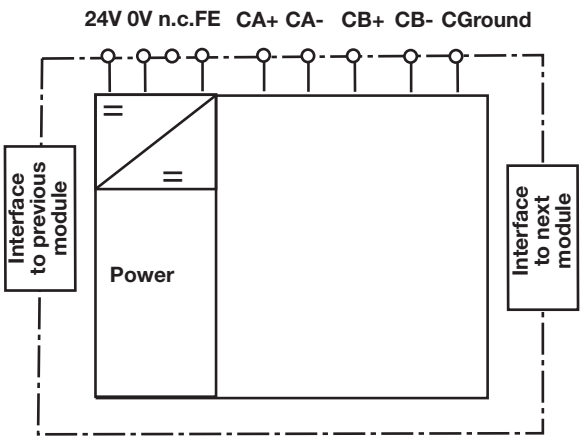


# Link modules
PNOZ m EF Multi Link

### System reaction time

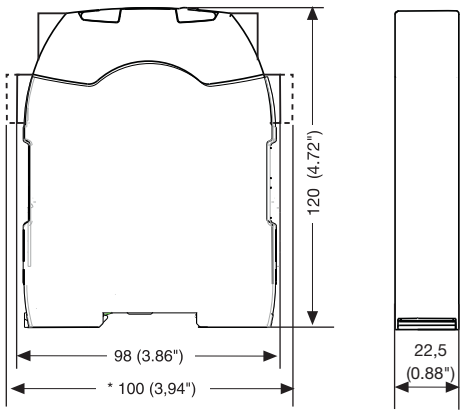
Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "System Expansion".

### Block diagram




## Installation

### Dimensions in mm



# Link modules
PNOZ m EF Multi Link

## Commissioning

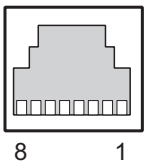
### Wiring

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

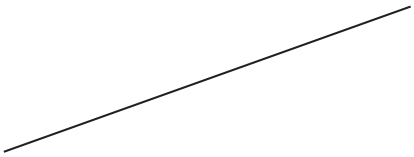
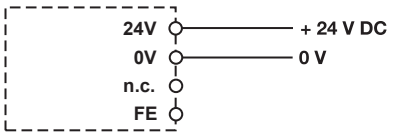
Please note:

- Information given in the Technical details [📖 811] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- The power supply must meet the regulations for extra low voltages with protective separation.
- 2 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. The current at each terminal may not exceed 3 A.
- The max. cable length between two link modules on a connection with one link module
  - PNOZ ml1p <V2.0: 100 m
  - PNOZ ml1p from V2.0, PNOZ mml1p, PNOZ m EF Multi Link: 1000 m
- Connect the inputs and outputs from two link modules with 4-core shielded cable. The cables must be twisted in pairs.
- Note the crossover cabling, e.g. CA+ with CB+.
- The cables must be classified into a minimum of Category 5 in accordance with ISO/IEC 11801.

### Connection

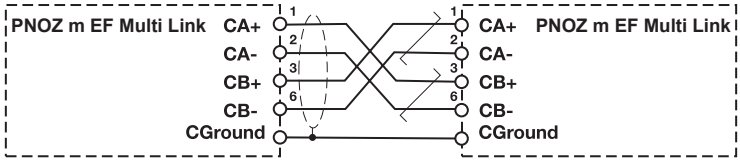
| RJ45 socket<br>8-pin | PIN | Layout |
|---|---|---|
|  | 1 | CA+ |
| | 2 | CA- |
| | 3 | CB+ |
| | 4 | n.c. |
| | 5 | n.c. |
| | 6 | CB- |
| | 7 | n.c. |
| | 8 | n.c. |
| | Shield | CGround |

## Link modules
PNOZ m EF Multi Link

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



**Connecting 2 base units PNOZmulti 2 via PNOZ m EF Multi Link**





## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| Application range | **Failsafe** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **2,5 W** |
| Potential isolation | **yes** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Galvanic isolation | **yes** |
| **Times** | |
| Max. data transmission time | **5 ms** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |

# Link modules
## PNOZ m EF Multi Link

| | |
|---|---|
| **Environmental data** | |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5 - 55 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Module and supply voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **2500 V** |
| Potential isolation between | **Module and system voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Mounting type | **plug-in** |

# Link modules
PNOZ m EF Multi Link

| Mechanical data | |
|---|---|
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Rigid single-core, flexible multi-core or multi-core with crimp connector | **0,5 - 1,5 mm²** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **120 mm** |
| Weight | **91 g** |

Where standards are undated, the 2013-01 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| 2-channel | **PL e** | **Cat. 4** | **SIL CL 3** | **8,82E-09** | **SIL 3** | **3,86E-05** | **20** |

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

# Link modules
PNOZ m EF Multi Link

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m EF Multi Link | Expansion module | 772 120 |

### Accessories

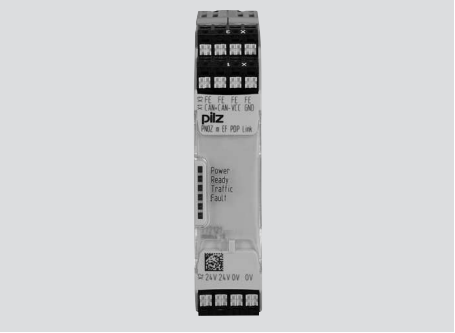
#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals PNOZ mmc2p, mml1p 1 pc. | Spring-loaded terminals, 1 pieces | 783 538 |
| Spring terminals PNOZ mmc2p,mml1p 10 pcs | Spring-loaded terminals, 10 pieces | 783 539 |
| Screw terminals PNOZ mmc2p, mml1p 1 pc. | Screw terminals, 1 piece | 793 538 |
| Screw terminals PNOZ mmc2p,mml1p 10 pcs. | Screw terminals, 10 piece | 793 539 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Link modules
PNOZ m EF PDP Link




## Overview

### Unit features

Using the product PNOZ m EF PDP Link:

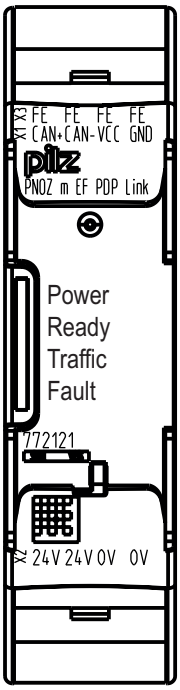
Link module to safely connect decentralised input/output modules to a configurable control system PNOZmulti 2

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Max. 4 PNOZ m EF PDP Link can be connected to the base unit
- Max. 4 decentralised modules can be connected to the link module PNOZ m EF PDP Link
- LEDs for
  - Operating state
  - Error
  - Connection status
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

# Link modules
PNOZ m EF PDP Link

### Front view




Legend:

- 0 V, 24 V:
  Supply connections
- CAN+, CAN-, VCC, GND:
  Connection for decentralised modules
- FE:
  Functional earth

## Function description

### Functions

The link module PNOZ m EF PDP Link is used to safely transfer the input information from decentralised modules to the control system PNOZmulti 2.

The function of the inputs and outputs on the control 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 LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

# Link modules
## PNOZ m EF PDP Link

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

**Data exchange:**

- Communication with the decentralised modules is via a safe data link.
- The link module PNOZ m EF PDP Link reads the input information from the decentralised modules as part of each cycle and then forwards it to the base unit.
- At the end of a PNOZmulti cycle, the base unit sends its output data to its link module. This output data is immediately sent to the decentralised modules.

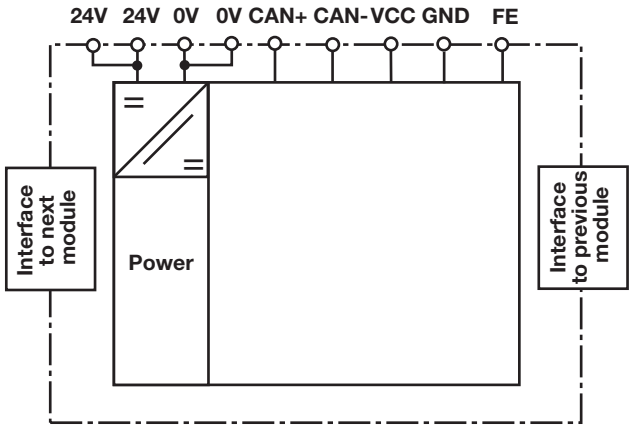
**Linking several decentralised modules:**

- A maximum of 4 link modules can be connected to a base unit PNOZmulti 2.
- A maximum of 4 decentralised modules can be connected to a link module PNOZ m EF PDP Link.
- If a decentralised module receives data intended for a different decentralised module that is connected, the data is forwarded without being processed.

### System reaction time

Calculation of the maximum reaction time between an input switching off and a linked output in the system switching off is described in the document "PNOZmulti System Expansion [30]".

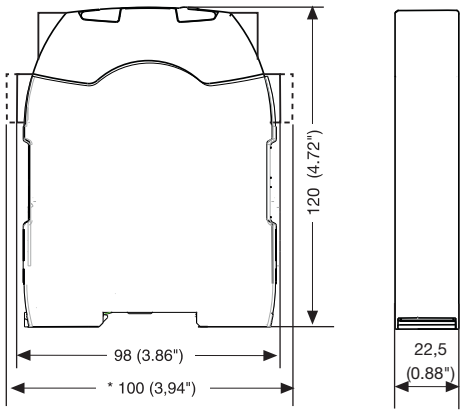
### Block diagram



# Link modules
PNOZ m EF PDP Link

## Installation

### Dimensions in mm




## Commissioning

### Wiring

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

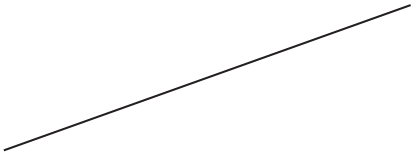
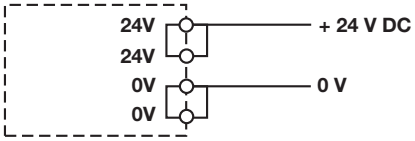
Please note:

- Information given in the Technical details [📖 822] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- External measures must be used to connect the FE terminal to the function earth (e.g. mounting rail).
- The power supply must meet the regulations for extra low voltages with protective separation.
- 2 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. The current at each terminal may not exceed 3 A.
- Please refer to the technical details for information on the maximum cable length. Please also read the section entitled "Voltage drop".
- Shielded cable must be used from a cable length of **30 m**.
- Pilz pre-assembled cable can be used to connect the decentralised modules (see order reference).
- The plug-in connection terminals are either designed as cage clamp terminals or screw terminals (see order reference).

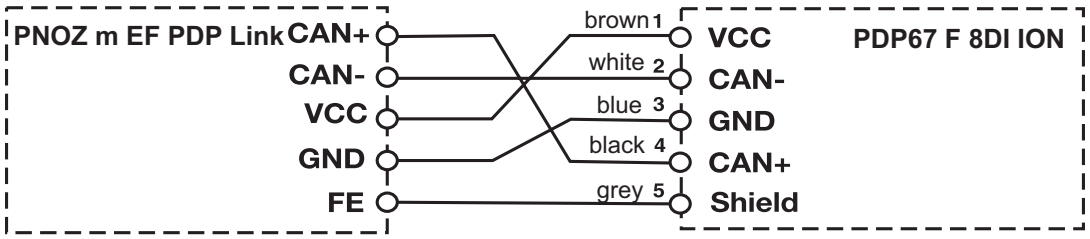
# Link modules
## PNOZ m EF PDP Link

The product PNOZ m EF PDP Link is connected to functional earth ⏚ via protection elements on the supply voltage. Insulation voltage tests are only possible with voltages up to ca. 42 V.

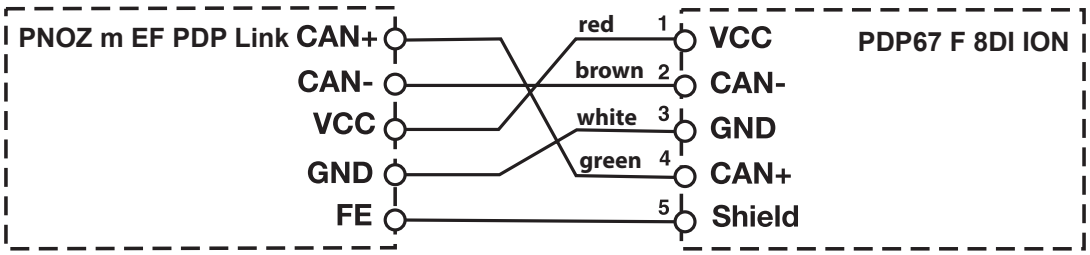
### Connection

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

**Connection to a decentralised input module PDP67 when using the PSEN op cable axial M12 5-pole from Pilz (see order reference)**




**Connection when using the PSS SB BUSCABLE LC in conjunction with a Pilz self-assembly "PSS67 M12 connector" (see order reference in the Technical Catalogue)**



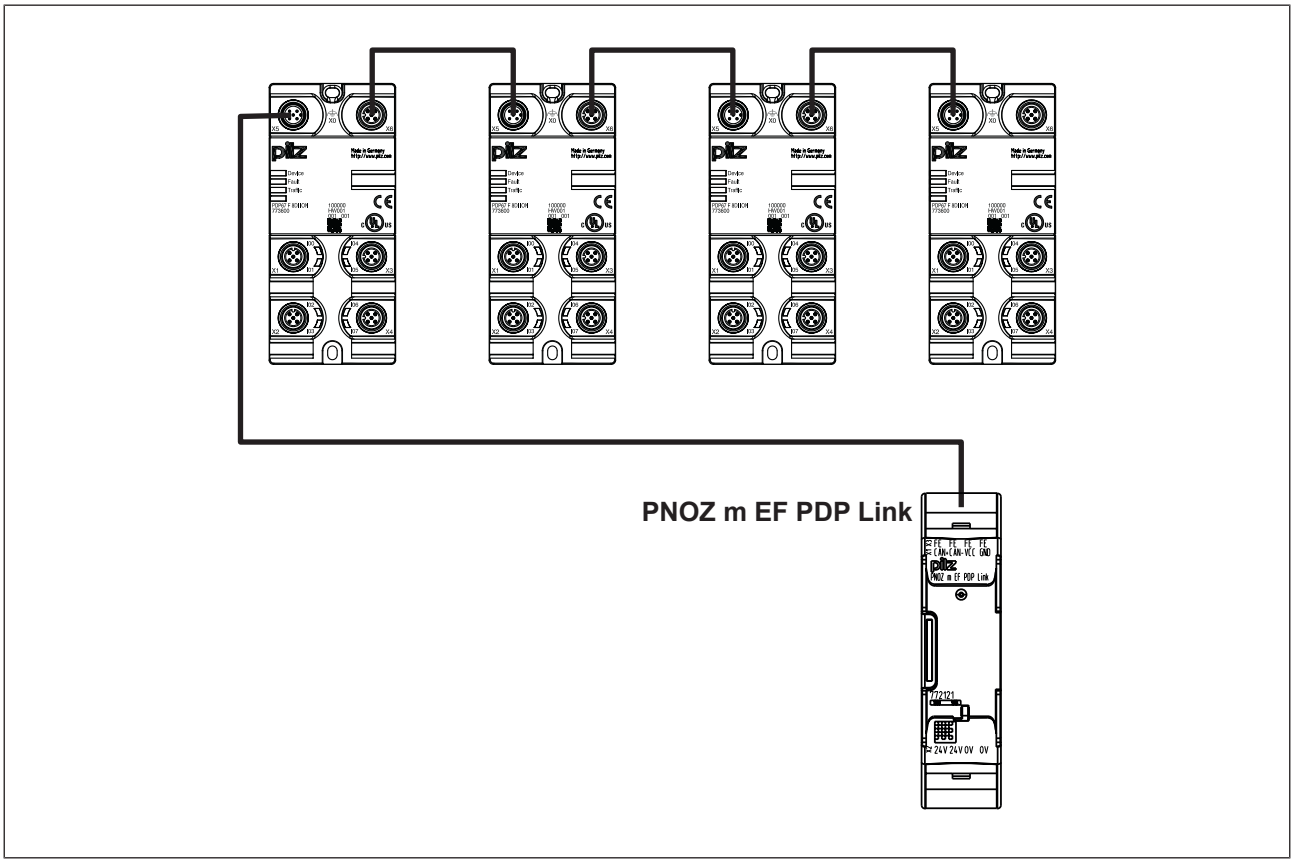

### Download modified project to the PNOZmulti safety system

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

# Link modules
## PNOZ m EF PDP Link

### Series connection of 4 decentralised modules

You can connect up to 4 decentralised modules in series to a PNOZmulti link module.




### Voltage drop

The max. cable length depends on the voltage drop in the supply voltage cables. The level of voltage drop is determined by the:

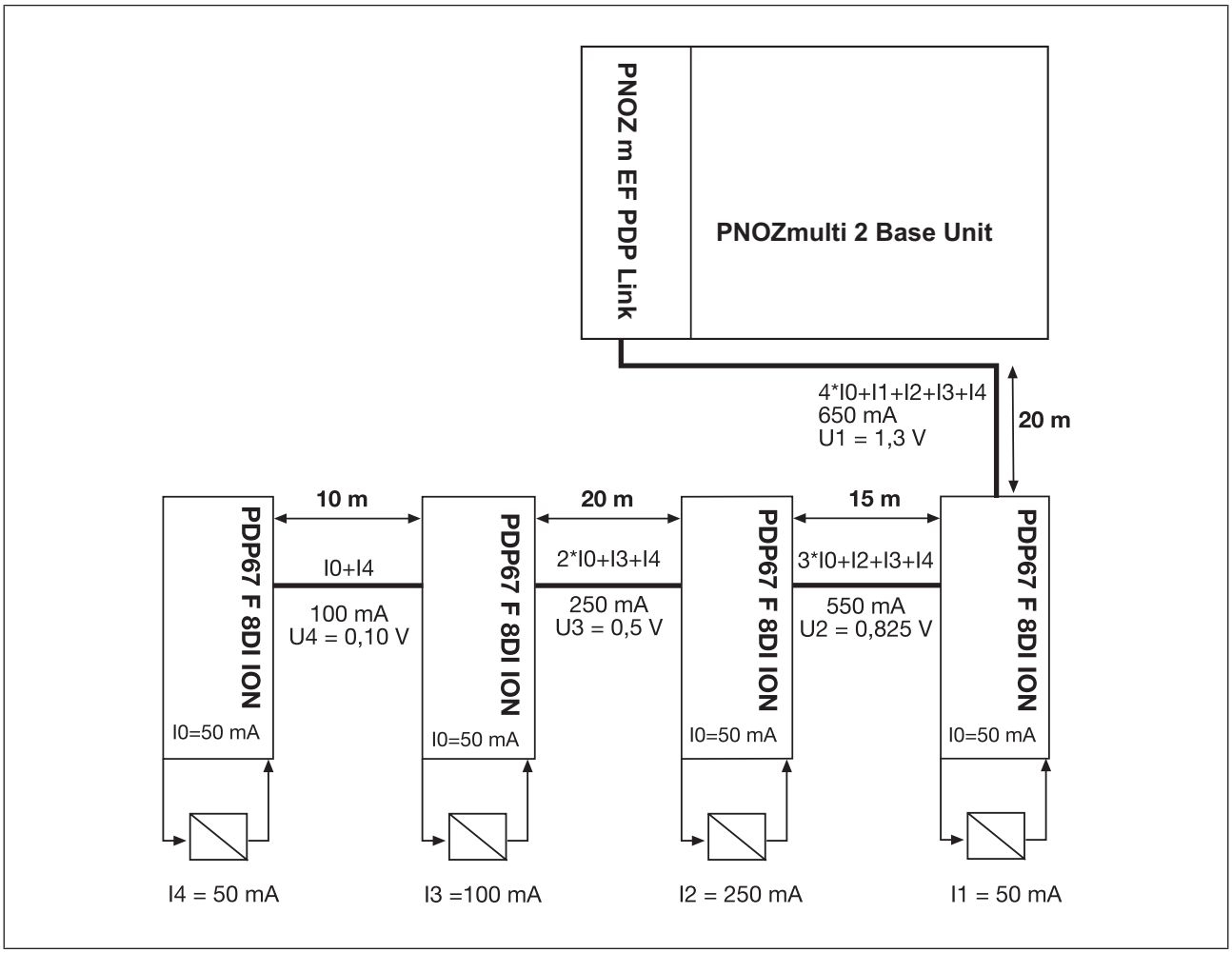
- Cable resistance on the supply voltage cables
- Operating current of the modules
- Load on the modules

To increase the max. cable length, the input voltage can be permanently increased by the voltage tolerance (see Technical Details).

| Cable type | Voltage drop per 10 m and per 100 mA |
|---|---|
| PSS SB BUSCABLE LC | 0.1 V |
| Sensor cable 0.25 mm$^2$ | 0.15 V |
| Sensor cable 0.34 mm$^2$ | 0.11 V |
| Sensor cable 0.5 mm$^2$ | 0.07 V |

## Link modules
PNOZ m EF PDP Link

- The PSS SB BUSCABLE LC is used in accordance with the pin assignment in section 6.2.2.
  Voltage drop per 10 m and per 100 mA: 0.1 V




Legend:

- I0: Module's consumption.
- I1 ... I5: Load current taken from the module
- U1 … U4: Voltage drop on the respective connection path

Total voltage drop from the link module PNOZ m EF PDP Link to the final PDP67 F 8DI ION:

$U_{total} = U_1 + U_2 + U_3 + U_4$

$U_{total}$ = 1.3 V + 0.825 V + 0.5 V + 0.10 V = 2.725 V

# Link modules
PNOZ m EF PDP Link

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **BG, CCC, CE, EAC (Eurasian), TÜV, cULus Listed** |
| Application range | **Failsafe** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24,0 V** |
| Kind | **DC** |
| Voltage tolerance | **-15 %/+20 %** |
| Output of external power supply (DC) | **101,0 W** |
| Output of external power supply (DC) at no load | **5,0 W** |
| Supply voltage | |
| for | **Supply to the system** |
| internal | **Via base unit** |
| Voltage | **3,3 V** |
| Kind | **DC** |
| Status indicator | **LED** |
| **Inputs** | |
| Maximum input delay | **15 ms** |
| **Semiconductor outputs** | |
| Switch-off delay | **5 ms** |
| **Test pulse outputs** | |
| Maximum output current, decentralised module supply | **4 A** |
| Short circuit protection of decentralised module supply | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |

# Link modules
## PNOZ m EF PDP Link

| | |
|---|---|
| **Environmental data** | |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **5,0 - 55,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Module and system voltage** |
| Type of potential isolation | **Protective separation** |
| Rated surge voltage | **2500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length unshielded | **30 m** |
| Max. cable length shielded | **100 m** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,50 Nm** |

# Link modules
## PNOZ m EF PDP Link

| Mechanical data | |
|---|---|
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **120,0 mm** |
| Weight | **96 g** |

Where standards are undated, the 2013-01 latest editions shall apply.

## Safety characteristic data

| Operating Mode | EN ISO 13849-1: 2015 PL | EN ISO 13849-1: 2015 Category | EN 62061 SIL CL | EN 62061 $PFH_D$ [1/h] | IEC 61511 SIL | IEC 61511 PFD | EN ISO 13849-1: 2015 $T_M$ [year] |
|---|---|---|---|---|---|---|---|
| – | **PL e** | **Cat. 4** | **SIL CL 3** | **5,35E-09** | **SIL 3** | **3,30E-05** | **20** |

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

# Link modules
PNOZ m EF PDP Link

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m EF PDP Link | Link module | 772 121 |

### Accessories

#### Connection terminals

| Product type | Features | Order No. |
|---|---|---|
| Spring terminals PNOZ mml2p 1 pc. | Spring-loaded terminals, 1 pieces | 783 540 |
| Spring terminals PNOZ mml2p 10 pcs. | Spring-loaded terminals, 10 pieces | 783 541 |
| Screw terminals PNOZ mml2p 1 pc. | Screw terminals, 1 piece | 793 540 |
| Screw terminals PNOZ mml2p 10 pcs. | Screw terminals, 10 pieces | 793 541 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

#### Cable

| Product type | Features | Order No. |
|---|---|---|
| PSS SB BUSCABLE LC | Cable, shielded, 1 - 100 m | 311074 |
| PSS67 I/O Cable | Cable, 1 - 30 m | 380 320 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 3 m | 380 200 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 5 m | 380 201 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 10 m | 380 202 |
| PSS67 Cable M8sf M12sm | Cable, straight M12 connector, straight M8 socket, 4-pin, 30 m | 380 203 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 3m | 380 204 |

## Link modules
PNOZ m EF PDP Link

| Product type | Features | Order No. |
|---|---|---|
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 5 m | 380 205 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 10 m | 380 206 |
| PSS67 Cable M8af M12sm | Cable, straight M12 connector, angled M8 socket, 4-pin, 30 m | 380 207 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 3m | 380 208 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 5 m | 380 209 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 10 m | 380 210 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 20 m | 380 220 |
| PSS67 Cable M12sf M12sm | Cable, straight M12 connector, straight M12 socket, 5-pin, 30 m | 380 211 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 3m | 380 212 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 5 m | 380 213 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 10 m | 380 214 |
| PSS67 Cable M12af M12am | Cable, angled M12 connector, angled M12 socket, 5-pin, 30 m | 380 215 |
| PSEN op cable axial M12 5-pole 3m | Cable, straight, M12, 5-pin, open-ended socket, 3 m | 630310 |
| PSEN op cable axial M12 5-pole 5m | Cable, straight, M12, 5-pin, open-ended socket, 5 m | 630311 |
| PSEN op cable axial M12 5-pole 10m | Cable, straight, M12, 5-pin, open-ended socket, 10 m | 630312 |
| PSEN op cable axial M12 5-pole 20m | Cable, straight, M12, 5-pin, open-ended socket, 20 m | 630298 |
| PSEN op cable axial M12 5-pole 30m | Cable, straight, M12, 5-pin, open-ended socket, 30 m | 630297 |

**Adapter**

| Product type | Features | Order No. |
|---|---|---|
| PSEN ma adapter | Adapter for connection to safety switch PSENmag | 380 300 |
| PSEN cs adapter | Adapter for connection to safety switch PSENcode | 380 301 |
| PSEN sl adapter | Adapter for connection to safety switch PSENslock | 380 325 |

# Link modules
## PNOZ m EF PDP Link

**Connector**

| Product type | Features | Order No. |
|---|---|---|
| PSS67 M12 connector | Connector, M12, straight, 5-pin, A-coded | 380 308 |
| PSS67 M12 connector | Socket, M12, straight, 5-pin, A-coded | 380 309 |
| PSS67 M12 connector | Connector, M12, angled, 5-pin, A-coded | 380 310 |
| PSS67 M12 connector | Socket, M12, angled, 5-pin, A-coded | 380 311 |
| PSS67 M8 connector | Connector, M8, straight, 4-pin | 380 316 |
| PSS67 M8 connector | Socket, M8, straight, 4-pin | 380 317 |
| PSS67 M8 connector | Connector, M8, angled, 4-pin | 380 318 |
| PSS67 M8 connector | Socket, M8, angled, 4-pin | 380 319 |

# Communication modules
PNOZ m ES ETH

## Overview

### Unit features

Using the product PNOZ m ES ETH:

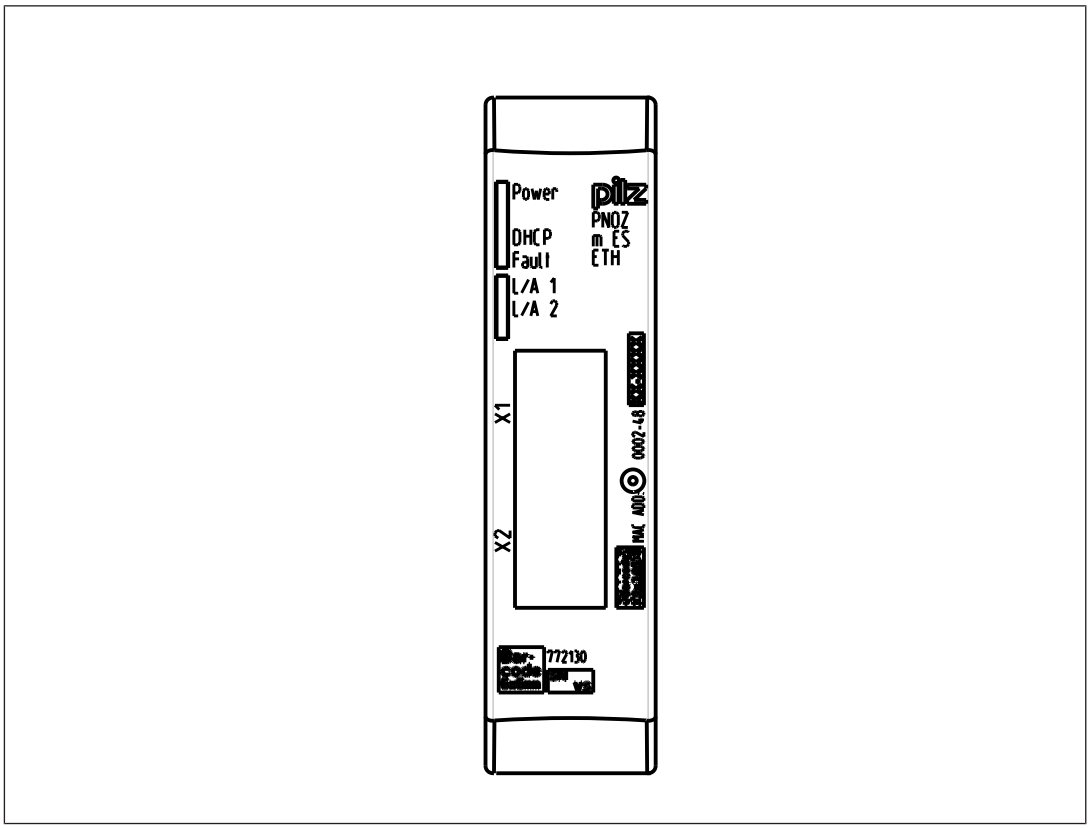
Communication module for connection to a base unit from the configurable control system PNOZmulti 2.

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- 2 Ethernet interfaces
- Status indicators for supply voltage, communication and errors
- Max. 1 communication module can be connected to the left of the base unit PNOZmulti 2
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

# Communication modules
PNOZ m ES ETH

### Front view




**Legend:**

- X1, X2:
  Ethernet interfaces
- LEDs:
  - Power
  - DHCP
  - L/A 1 (Link/‘Act 1)
  - L/A 2 (Link/Act 2)

## Function description

### Unit properties

The product PNOZ m ES ETH has two Ethernet interfaces to

- Download the project
- Read the diagnostic data
- Set virtual inputs for standard functions
- Read virtual outputs for standard functions

# Communication modules
PNOZ m ES ETH

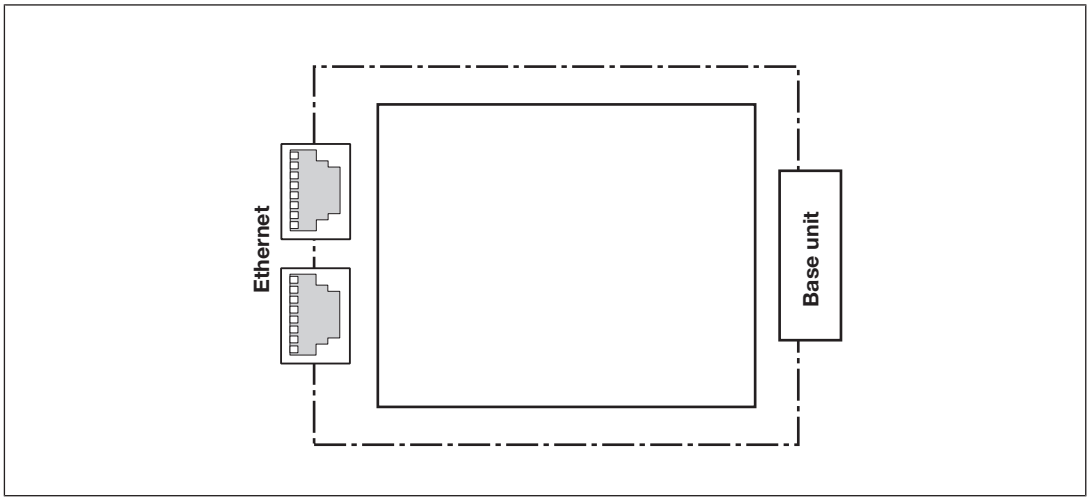
via Ethernet (TCP/IP, Modbus/TCP).

Information on diagnostics via the Ethernet interfaces can be found in the document entitled " PNOZmulti 2 communication interfaces".

The connection to Ethernet is made via the two 8-pin RJ45 sockets.

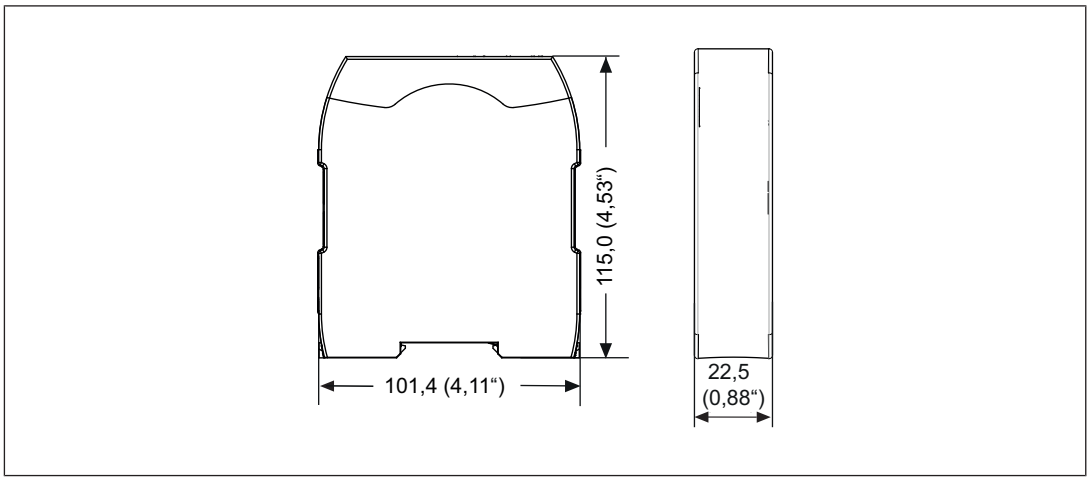
The Ethernet interface is configured in the PNOZmulti Configurator and is described in the online help for the PNOZmulti Configurator.

### Block diagram




## Installation

### Dimensions in mm



# Communication modules
PNOZ m ES ETH

## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [📖 831] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.

### Preparing for operation

Detection and activation of the Ethernet interface, depending on the USB interface on the base unit:

- **USB interface on the base unit not connected**

  If the USB interface on the base unit is not connected, the Ethernet interface will be detected and activated by the base unit as soon as the communication module has been connected to the base unit.

- **USB interface on the base unit connected**

  If the USB interface on the base unit is already connected, the "Ethernet" interface will first need to be selected on the base unit display to enable the Ethernet interface on the base unit to be detected and activated (see operating manual for the base unit for details of the setting).

## Tecnical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| Application range | **Standard** |
| Module's device code | **1202h** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **3,3 V** |
| Kind | **DC** |
| Voltage tolerance | **-2 %/+2 %** |
| Current consumption | **295 mA** |
| Power consumption | **1,0 W** |
| Status indicator | **LED** |

## Communication modules
PNOZ m ES ETH

| | |
|---|---|
| **Ethernet interface** | |
| Number | **2** |
| IP address (automatically off) | **169.254.60.1** |
| Connection type | **RJ45** |
| Transmission rate | **10 MBit/s, 100 MBit/s** |
| **Fieldbus interface** | |
| Fieldbus interface | **Modbus TCP** |
| Device type | **Slave** |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |

# Communication modules
PNOZ m ES ETH

| Mechanical data | |
|---|---|
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **0,1 km** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **111,0 mm** |
| Weight | **80 g** |

Where standards are undated, the 2012-04 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m ES ETH | Expansion module | 772 130 |

### Accessories

**Terminator, jumper**

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Communication modules
PNOZ m ES RS232

## Overview

### Unit features

Using the product PNOZ m ES RS232:

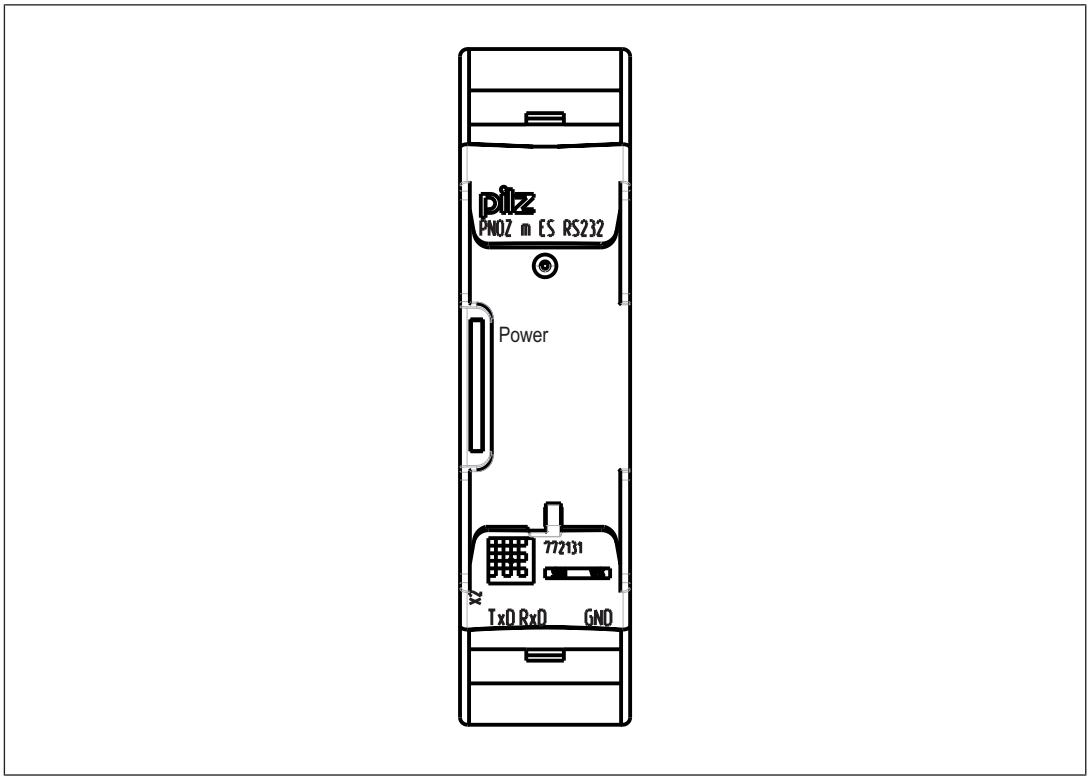
Communication module for connection to a base unit from the configurable control system PNOZmulti 2.

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- 1 serial interface RS232
- Status indicator for supply voltage
- Max. 1 communication module can be connected to the left of the base unit PNOZmulti 2
- Plug-in connection terminals (either cage clamp terminals or screw terminals)

# Communication modules
PNOZ m ES RS232

### Front view




Key:

- X2: Serial interface RS 232
- LED:
  - Power

## Function description

### Functions

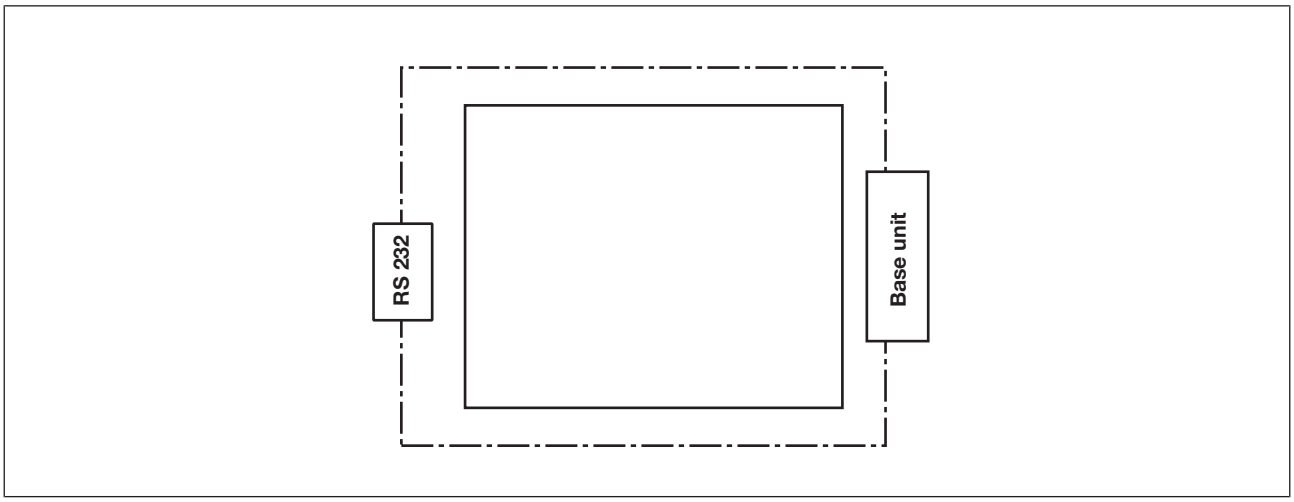
The product PNOZ m ES RS232 has a serial interface RS232 interface to

- Download the project
- Read the diagnostic data
- Set virtual inputs for standard functions
- Read virtual outputs for standard functions.

Information on diagnostics can be found in the document "Communication Interfaces".

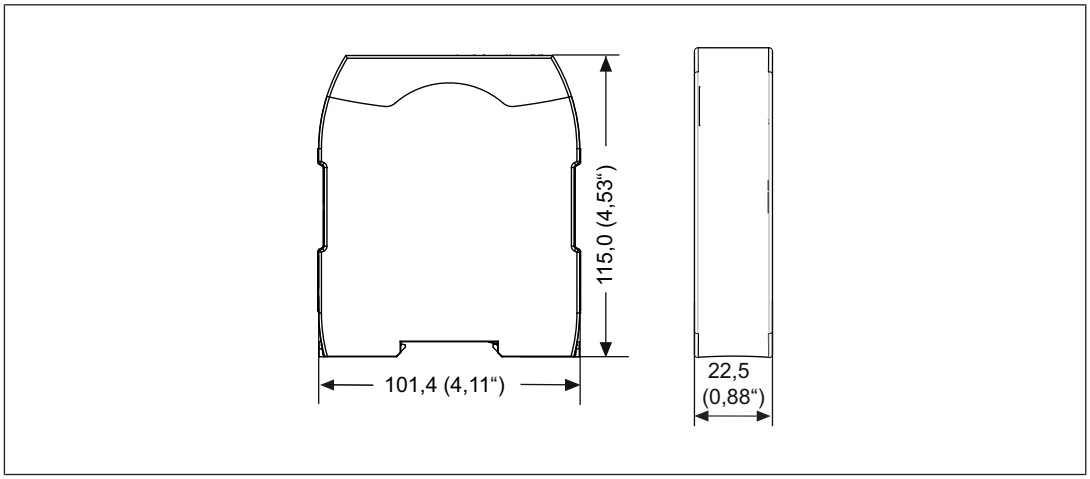
# Communication modules
PNOZ m ES RS232

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

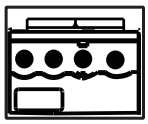
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Please note:

- Information given in the Technical details [📖 837] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.

# Communication modules
PNOZ m ES RS232

### Interface configuration

| Serial interface<br>RS232 | Standard |
|---|---|
|  <br>TxD RxD GND | TxD (Transmit) |
| | RxD (Receive) |
| | GND (Ground) |

### Preparing for operation

The serial interface RS 232 is activated and detected depending on the USB interface on the base unit:

- **USB interface on the base unit not connected**

  In this case, the serial interface RS 232 will be detected and activated by the base unit as soon as the communication module has been connected to the base unit.

- **USB interface on the base unit connected**

  If the USB interface on the base unit is already connected, the "External" interface will first need to be selected on the base unit display to enable the serial interface RS 232 on the base unit to be detected and activated (see operating manual for the base unit for details of the setting).

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, GOST, cULus Listed** |
| Application range | **Standard** |
| **Electrical data** | |
| Supply voltage | |
| internal | **Via base unit** |
| Current consumption | **9 mA** |
| Power consumption | **0,3 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Galvanic isolation | **No** |
| **Serial interface** | |
| Number of RS232 interfaces | **1** |

# Communication modules
## PNOZ m ES RS232

| | |
|---|---|
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Max. cable length | |
| Max. cable length per input | **22,0 m** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |

# Communication modules
PNOZ m ES RS232

| Mechanical data | |
|---|---|
| Mounting type | **plug-in** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Rigid single-core, flexible multi-core or multi-core with crimp connector | **0,5 - 1,5 mm²** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **120,0 mm** |
| Weight | **85 g** |

Where standards are undated, the 2012-04 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m ES RS232 | Expansion module | 772 131 |

### Accessories

**Terminator, jumper**

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Communication modules
## PNOZ m ES RS232

**Connection terminals**

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals PNOZ mmc2p, mml1p 1 pc. | Spring-loaded terminals, 1 pieces | 783 538 |
| Spring terminals PNOZ mmc2p,mml1p 10 pcs | Spring-loaded terminals, 10 pieces | 783 539 |
| Screw terminals PNOZ mmc2p, mml1p 1 pc. | Screw terminals, 1 piece | 793 538 |
| Screw terminals PNOZ mmc2p,mml1p 10 pcs. | Screw terminals, 10 piece | 793 539 |

# Fieldbus modules
PNOZ m ES Profibus

## Overview

### Unit features

Using the product PNOZ m ES Profibus:

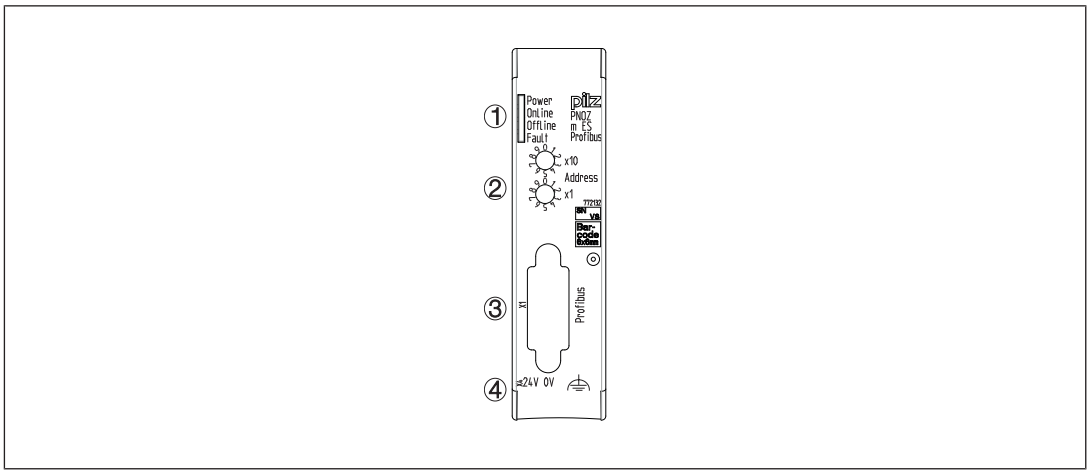
Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following 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
- In the PNOZmulti Configurator, 128 virtual outputs of the PNOZmulti 2 control system can be defined for communication with the fieldbus PROFIBUS-DP .
- Max. 1 PNOZ m ES Profibus can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Please refer to the document "PNOZmulti System Expansion" for details of the base units PNOZmulti 2 that can be connected.

# Fieldbus modules
PNOZ m ES Profibus

### Front view




**Legend**

① LED:
- Power
- Online
- Offline
- Fault

② Rotary switch
- x10 = Tens digit for the station address
- x1 = Units digit for the station address

③ X1: PROFIBUS-DP interface (female 9-pin D-Sub connector)

④ X4: 0 V, 24 V:
Supply connections

⏚ Functional earth

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via PROFIBUS are selected and configured in the PNOZmulti Configurator. The base unit and the expansion modulePNOZ m ES Profibus are connected via a jumper.

The station address is set via rotary switches. After the supply voltage is switched on or the control system PNOZmulti 2 is reset, the expansion module PNOZ m ES Profibus is configured and started automatically.

LEDs indicate the status of the expansion module on PROFIBUS.

The configuration is described in detail in the PNOZmulti Configurator's online help.

### Data access

The data is structured as follows:

- Virtual data
  - Input area PNOZ m ES Profibus

    The values for the inputs are set in the Master as an output and transferred to the PNOZmulti 2.
  - Output area PNOZ m ES Profibus

    The outputs are configured in the PNOZmulti Configurator and transferred to the Master.
- Status of LEDs:

  LED status 1 Output Byte
  The LED status of the base unit can be requested directly as follows
  - Bit 0 = 1: LED OFAULT is lit or flashes
  - Bit 1 = 1: LED IFAULT is lit or flashes
  - Bit 2 = 1: LED FAULT is lit or flashes
  - Bit 3 = 1: LED DIAG is lit or flashes
  - Bit 4 = 1: LED RUN FS is lit
  - Bit 5: Reserved
  - Bit 6 = 1: LED RUN ST is lit (not for PNOZ m B0)
  - Bit 7: Reserved
- Data exchange is displayed in Bit 5.
- Polling the payload data: 2 Bytes with the table number and segment number are sent by the Master for access to the payload data table (15 Bytes are returned to the Master).

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

### Assigning the inputs/outputs in the PNOZmulti Configurator to the PROFIBUS-DP inputs/outputs

Virtual inputs and outputs can be requested or set directly via the following objects. Each element can be selected individually in the master control system, e.g. virtual inputs i0-31. The data width is also established this way.

# Fieldbus modules
## PNOZ m ES Profibus

### Input data

The Master writes to the virtual inputs of the PNOZmulti 2.

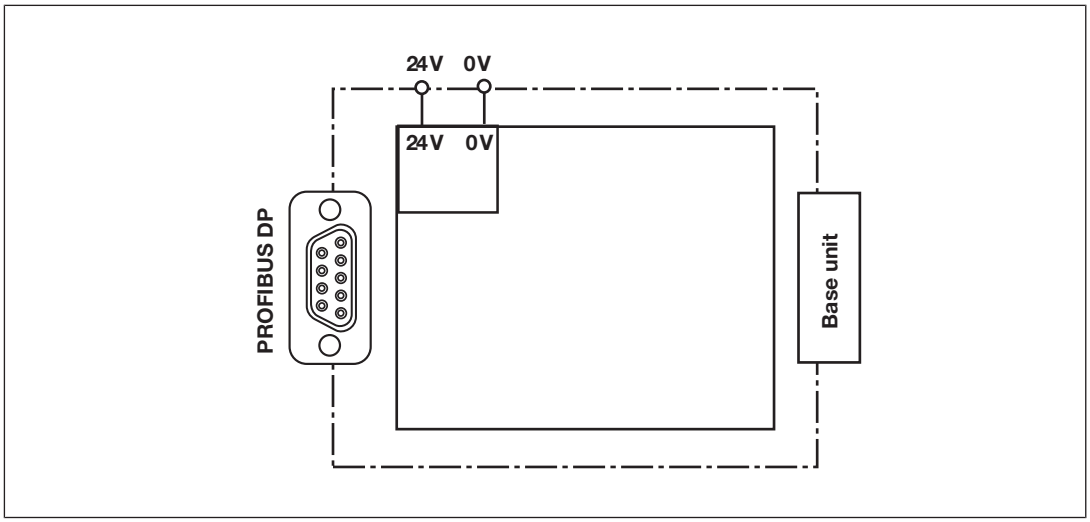
| Description | Input data from PNOZmulti 2 |
|---|---|
| Virtual inputs i0 – i31 | 4 Input Bytes |
| Virtual inputs i32 – i63 | 4 Input Bytes |
| Virtual inputs i64 – i95 | 4 Input Bytes |
| Virtual inputs i96 – i127 | 4 Input Bytes |

### Output data

The Master reads the virtual outputs of the PNOZmulti 2.

| Description | Output data from PNOZmulti 2 |
|---|---|
| Virtual outputs o0 – o31 | 4 Output Bytes |
| Virtual outputs o32 – o63 | 4 Output Bytes |
| Virtual outputs o64 – o95 | 4 Output Bytes |
| Virtual outputs o96 – o127 | 4 Output Bytes |

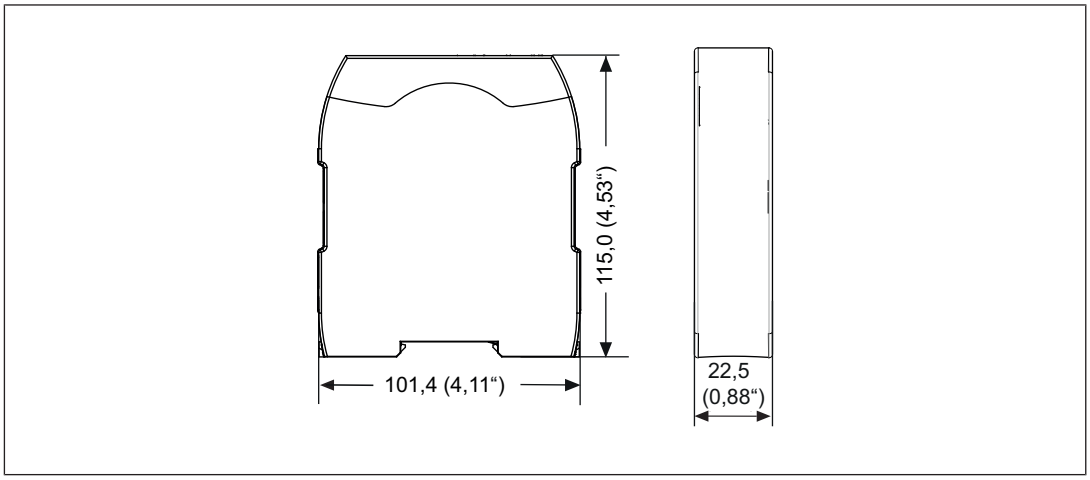
## Block diagram



# Fieldbus modules
PNOZ m ES Profibus

## Installation

### Dimensions in mm




## Commissioning

### Wiring

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

Please note:

- Information given in the Technical details [📖 848] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- External measures must be used to connect the terminal ⏚ to the functional earth, when the mounting rail is **not** connected to the functional earth.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

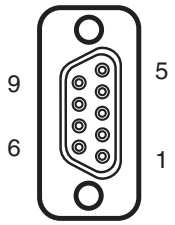
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

## Fieldbus modules
PNOZ m ES Profibus

It is possible to define which outputs on the control system will communicate with PROFIBUS-DP. The connection to PROFIBUS-DP is made via a female 9-pin D-Sub connector in accordance with the guidelines of the PROFIBUS User Group (PNO).




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

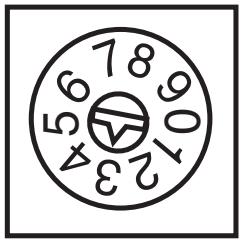
Please note the following when connecting to PROFIBUS-DP:

- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces

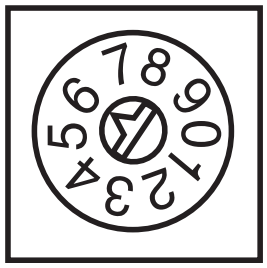
# Fieldbus modules
## PNOZ m ES Profibus

### Preparing for operation

The station address of the expansion module PNOZ m ES Profibus is set between 0 ... 99 (decimal) via two rotary switches x1 and x10.




- On the upper rotary switch x10, use a small screwdriver to set the tens digit for the address (“3” in the example).

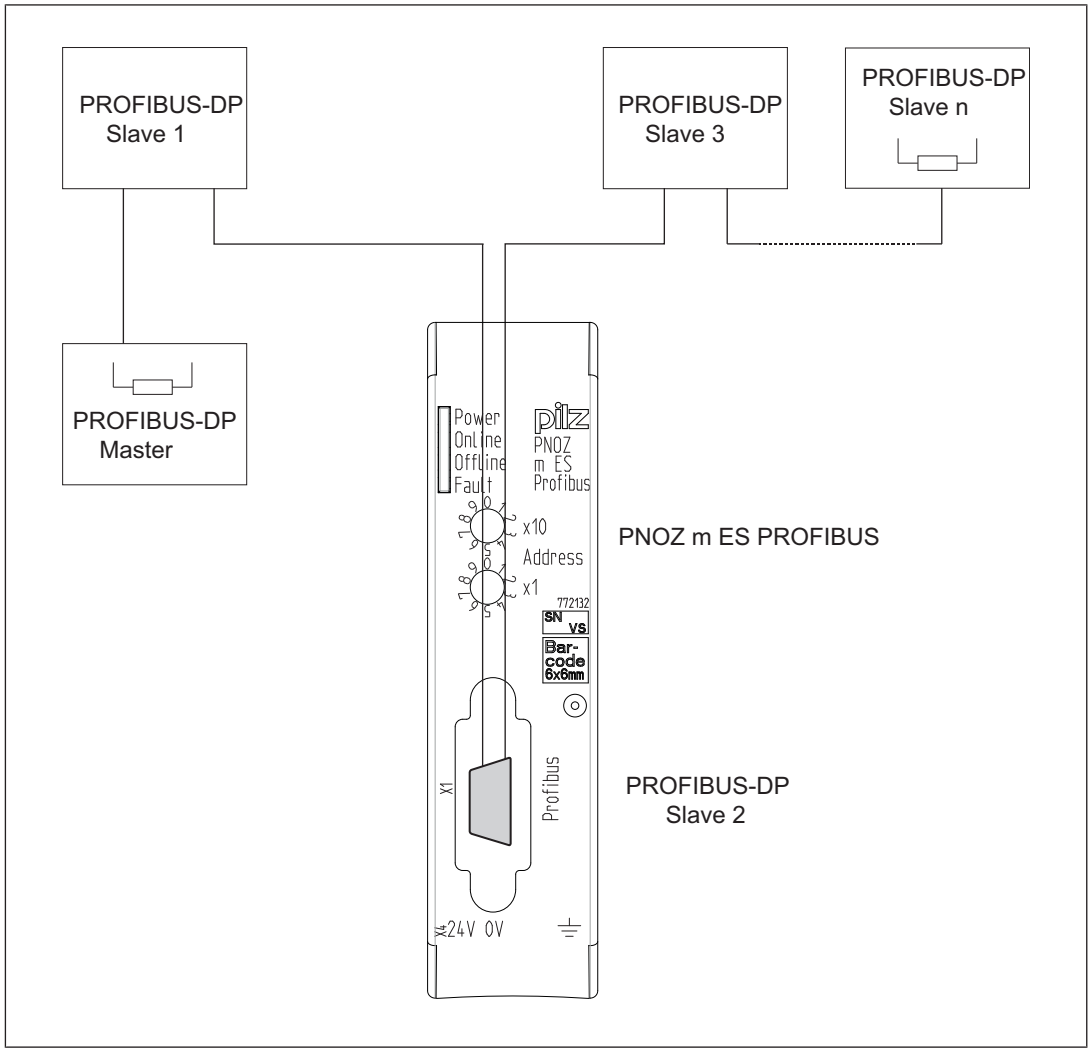



- On the lower rotary switch x1, set the ones digit for the address (“6” in the example).

Station address 36 is set in the diagrams as an example.

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

## Fieldbus modules
PNOZ m ES Profibus




# Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Supply voltage | |
| Current consumption | **35 mA** |
| Power consumption | **0,9 W** |

# Fieldbus modules
## PNOZ m ES Profibus

| | |
|---|---|
| **Electrical data** | |
| Max. power dissipation of module | **1,50 W** |
| Status indicator | **LED** |
| **PROFIBUS-DP interface** | |
| Number | **1** |
| **Fieldbus interface** | |
| Fieldbus interface | **PROFIBUS DP** |
| Device type | **Slave DPV0** |
| Station address | **0 - 99d** |
| Transmission rate | **9,6 kBit/s - 12 MBit/s** |
| Connection | **9-pin D-Sub female connector** |
| Galvanic isolation | **yes** |
| Test voltage | **500 V AC** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10,0 - 150,0 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |

# Fieldbus modules
## PNOZ m ES Profibus

| | |
|---|---|
| **Environmental data** | |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,50 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,20 - 1,50 mm², 24 - 16 AWG** |
| Rigid single-core, flexible multi-core or multi-core with crimp connector | **0,5 - 1,5 mm²** |
| Torque setting with screw terminals | **0,50 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,20 - 2,50 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **115,0 mm** |
| Weight | **95 g** |

Where standards are undated, the 2012-10 latest editions shall apply.

# Fieldbus modules
PNOZ m ES Profibus

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m ES Profibus | Fieldbus module, PROFIBUS for PNOZ m Bx | 772 132 |

### Accessories

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

# Fieldbus modules
PNOZ m ES CANopen

## Overview

### Unit features

Using the product PNOZ m ES CANopen:

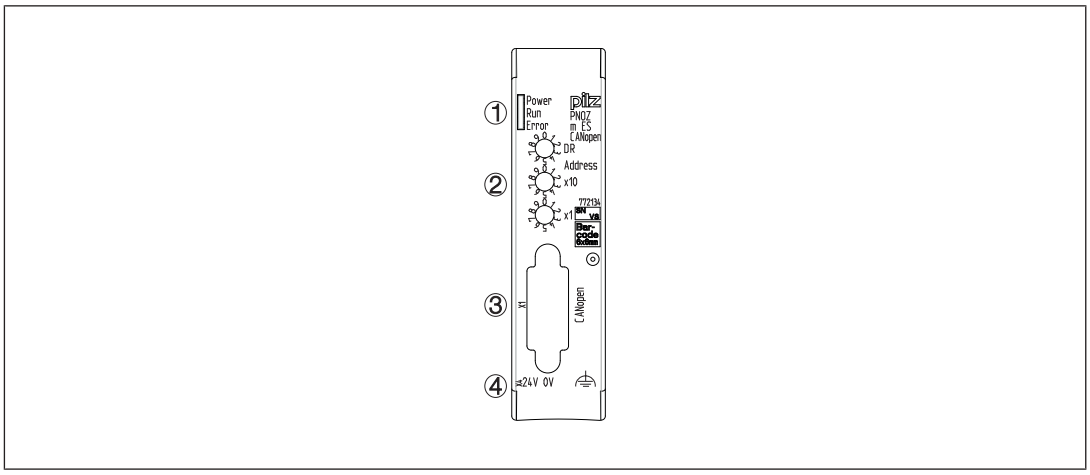
Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for CANopen
- Station addresses from 0 ... 99, selected via rotary switch
- Transmission rate selected via rotary switch (1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s)
- Status indicators for communication with CANopen and for errors
- 128 virtual inputs and outputs on the control system PNOZmulti 2 can be defined in the PNOZmulti Configurator for communication with the fieldbus CANopen.
- Max. 1 PNOZ m ES CANopen can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- For details of the PNOZmulti 2 base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
PNOZ m ES CANopen

### Front view




**Legend**

① LED
- Power
- Run
- Error

② Rotary switch
- DR = Transmission rate
- X10 = Tens digit for the station address
- X1 = Units digit for the station address

③ X1: CANopen interface (male 9-pin D-Sub connector)

④ X4: 0 V, 24 V:
Supply connections

⏚ Functional earth

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via CANopen are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ m ES CANopen are connected via a jumper. The station address and the transmission rate are set using rotary switches. After the supply voltage is switched on or the control system PNOZmulti 2 is reset, the expansion module PNOZ m ES CANopen is configured and started automatically.

LEDs indicate the status of the expansion module on CANopen.

The configuration is described in detail in the PNOZmulti Configurator's online help.

# Fieldbus modules
## PNOZ m ES CANopen

### Data access

The data is structured as follows:

- Virtual data
  - Input area PNOZ m ES CANopen

    The values for the inputs are set as an output in the Master and transferred to the PNOZmulti 2.
  - Output area PNOZ m ES CANopen

    The outputs are configured in the PNOZmulti Configurator and transferred to the Master.
- Status of LEDs:
  - Bits 0 … 4: Status of LEDs on the PNOZmulti 2

    Bit 0: OFAULT

    Bit 1: IFAULT

    Bit 2: FAULT

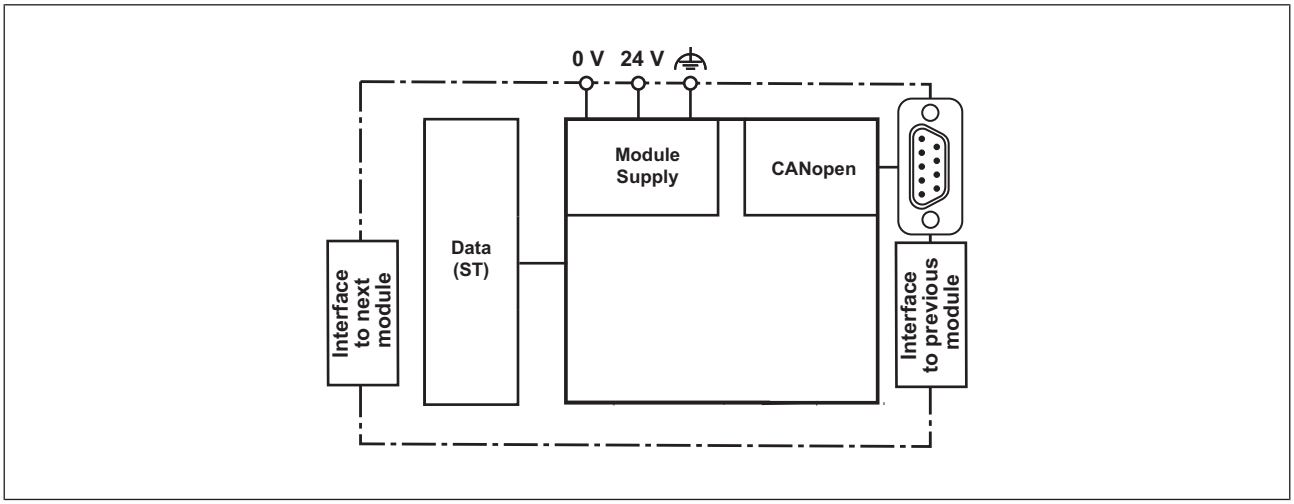
    Bit 3: DIAG

    Bit 4: RUN
- Data exchange is displayed in Bit 5.
- Polling the payload data: 2 Bytes with the table number and segment number are sent by the Master for access to the payload data table (15 Bytes are returned to the Master).

The document "Communication Interfaces" contains detailed information

- on data exchange (tables, segments) in the section entitled "Fieldbus modules",
- and on virtual data in the section entitled "Object directory (Manufacturer Specific Profile Area) for PNOZ m ES CANopen .

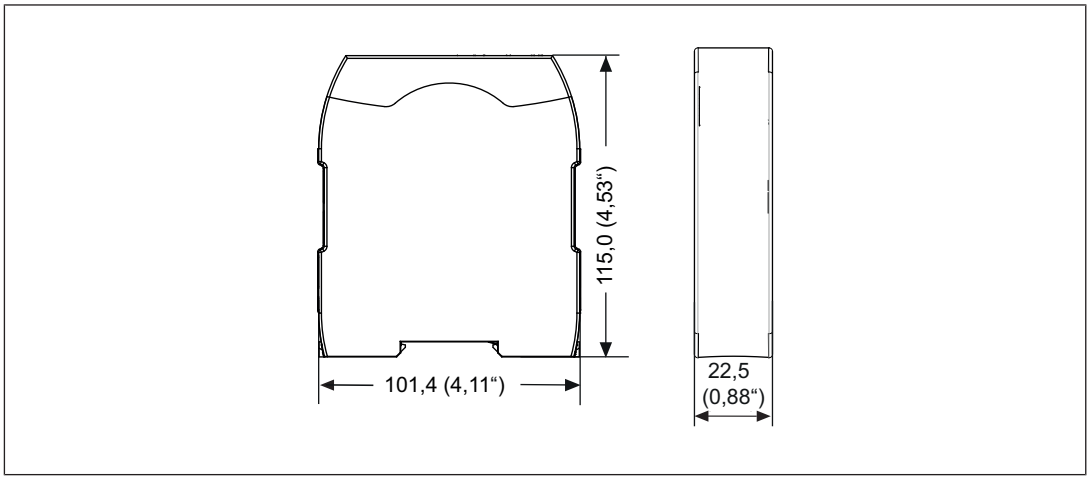
### Block diagram



# Fieldbus modules
PNOZ m ES CANopen

## Installation

### Dimensions in mm




## Commissioning

### Wiring

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

Please note:

- Information given in the Technical details [📖 859] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- External measures must be used to connect the terminal ⏚ to the functional earth, when the mounting rail is **not** connected to the functional earth.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

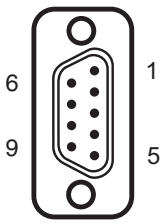
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

# Fieldbus modules
## PNOZ m ES CANopen

The connection to CANopen is made via a male 9-pin D-Sub connector.




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

n.c. = not connected

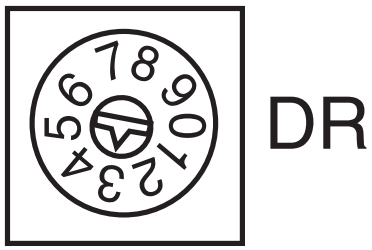
Please note the following when connecting to CANopen:

- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces

**Termination CANopen**

To minimise cable reflection and to guarantee a defined rest signal on the transmission line, CANopenmust be terminated at both ends.

### Setting the transmission rate



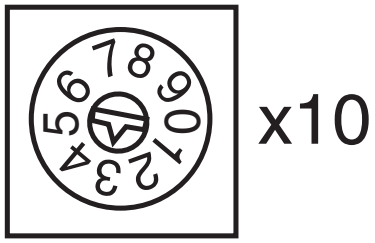

- On the upper rotary switch DR, use a small screwdriver to set the transmission rate (in the example, "3" corresponds to 50 kBit/s).

| Switch setting | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Transmission rate | - | 10 kBit/s | 20 kBit/s | 50 kBit/s | 125 kBit/s | 250 kBit/s | 500 kBit/s | 800 kBit/s | 1 MBit/s | - |

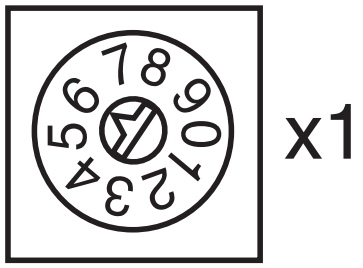
### Setting the station address

The station address of the expansion module PNOZ m ES CANopen is set between 0 ... 99 (decimal) via two rotary switches x1 and x10.

## Fieldbus modules
PNOZ m ES CANopen




- On the middle rotary switch x10, use a small screwdriver to set the tens digit for the address (“3” in the example).

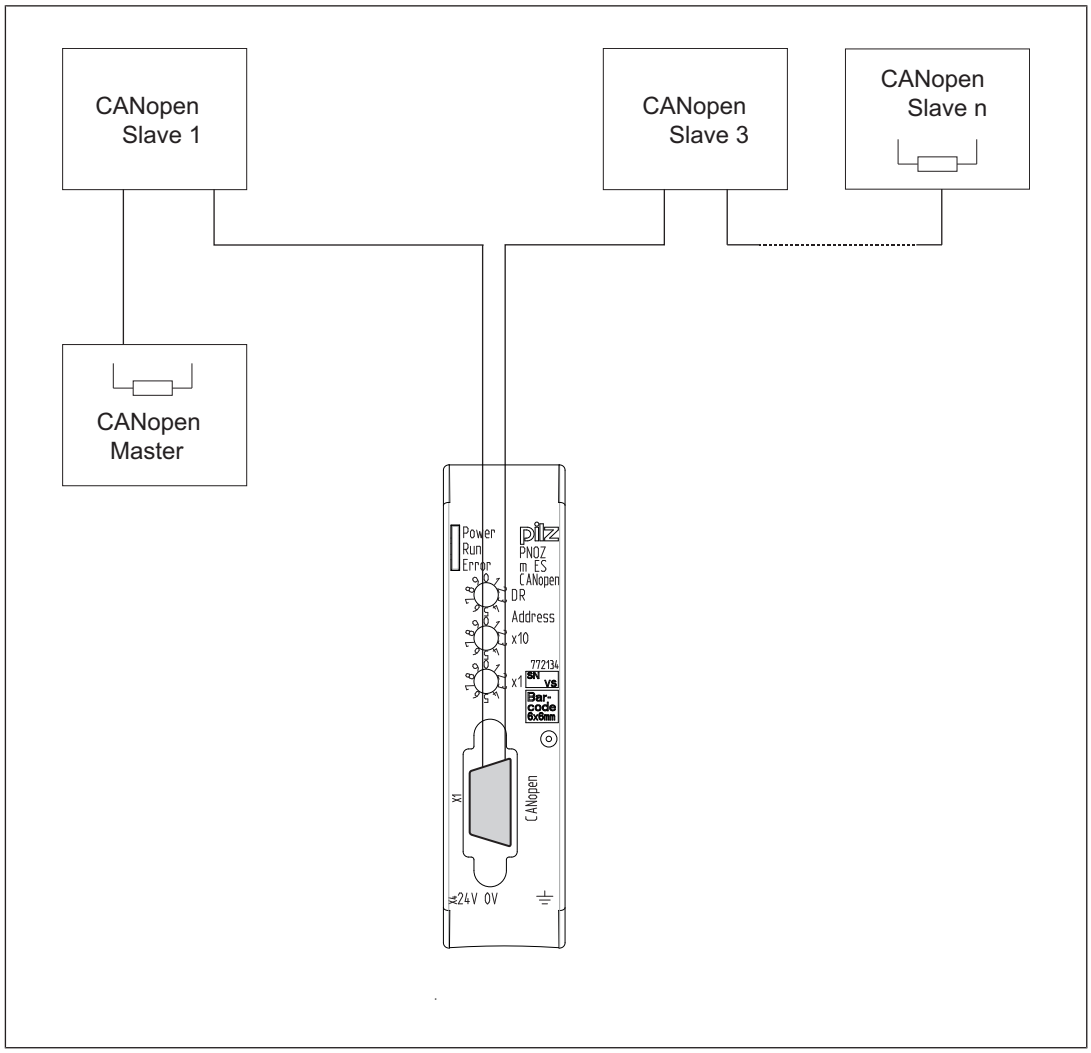



- On the lower rotary switch x1, set the ones digit for the address (“6” in the example).

Station address 36 is set in the diagrams as an example.

# Fieldbus modules
PNOZ m ES CANopen

## Connection example




## Download modified project to the PNOZmulti safety system

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

# Fieldbus modules
PNOZ m ES CANopen

## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Supply voltage | |
| Current consumption | **35 mA** |
| Power consumption | **0,9 W** |
| Max. power dissipation of module | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **CANopen** |
| Device type | **Slave** |
| Log | **CiA 301 V4.2.0** |
| Station address | **0 - 99d** |
| Transmission rates | **1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s** |
| Connection | **9-pin D-Sub male connector** |
| Galvanic isolation | **yes** |
| Test voltage | **500 V AC** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10 - 150 Hz** |
| Acceleration | **1g** |

# Fieldbus modules
## PNOZ m ES CANopen

| | |
|---|---|
| **Environmental data** | |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **115 mm** |
| Weight | **95 g** |

Where standards are undated, the 2012-10 latest editions shall apply.

# Fieldbus modules
PNOZ m ES CANopen

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m ES CANopen | Fieldbus module, CANopen for PNOZ m Bx | 772 134 |

### Accessories

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

# Fieldbus modules
PNOZ m ES EtherCAT

## Overview

### Unit features

Using the product PNOZ m ES EtherCAT:

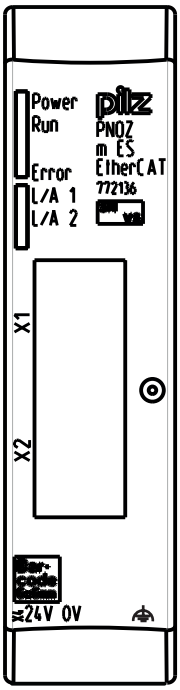
Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Network protocols: EtherCAT
- Supports CANopen over EtherCAT (DS301 V4.02 compliant)
- Status indicators for communication with EtherCAT and for errors
- 128 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus EtherCAT.
- Max. 1 PNOZ m ES EtherCAT can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- For details of the PNOZmulti 2 base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
## PNOZ m ES EtherCAT

### Front view




Legend:

- X1: EtherCAT IN
- X2: EtherCAT OUT
- X4: 0 V, 24 V:
  Supply connections

Functional earth

- LEDs:
  - Power
  - Run
  - Error
  - L/A 1
  - L/A 2

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

# Fieldbus modules
PNOZ m ES EtherCAT

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via EtherCAT are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ m ES EtherCAT are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module PNOZ m ES EtherCAT is configured and started automatically.

The connection to EtherCAT is made via the two RJ45 sockets.

LEDs indicate the status of the expansion module on EtherCAT.

The configuration is described in detail in the PNOZmulti Configurator's online help.

### Data access

The data is structured as follows:

- Virtual data
  - Input area PNOZ m ES EtherCAT

    The values for the inputs are set as an output in the Master and transferred to the PNOZmulti 2.
  - Output area PNOZ m ES EtherCAT

    The outputs are configured in the PNOZmulti Configurator and transferred to the Master.
- Status of LEDs:
  - Bits 0 … 4: Status of LEDs on the PNOZmulti 2

    Bit 0: OFAULT

    Bit 1: IFAULT

    Bit 2: FAULT

    Bit 3: DIAG

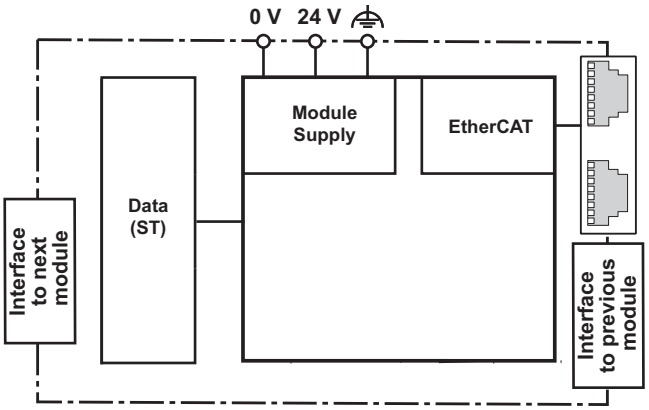
    Bit 4: RUN
- Data exchange is displayed in Bit 5.
- Polling the payload data: 2 Bytes with the table number and segment number are sent by the Master for access to the payload data table (15 Bytes are returned to the Master).

The document "Communication Interfaces" contains detailed information

- on data exchange (tables, segments) in the section entitled "Fieldbus modules",
- and on virtual data in the section entitled "Object directory (Manufacturer Specific Profile Area) for PNOZ m ES EtherCAT .

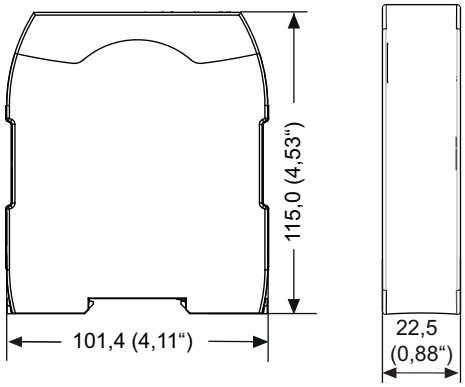
# Fieldbus modules
PNOZ m ES EtherCAT

### Block diagram




## Installation

### Dimensions in mm



# Fieldbus modules
PNOZ m ES EtherCAT

## Commissioning

### General wiring guidelines

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 EtherCAT.

Note:

- Information given in the "Technical details" must be followed.
- Use copper wire that can withstand 75 °C.
- External measures must be used to connect the terminal ⏚ to the functional earth, when the mounting rail is **not** connected to the functional earth.

Please note the following when connecting to EtherCAT:

- 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 EtherCAT are met, as stated in the Installation Manual published by the User Group.

### Connecting the supply voltage

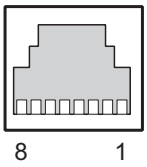
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

# Fieldbus modules
PNOZ m ES EtherCAT

## Interface assignment

| RJ45 socket<br>8-pin | 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

## Download modified project to the PNOZmulti safety system

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

## Preparing for operation

- Install Device Description File

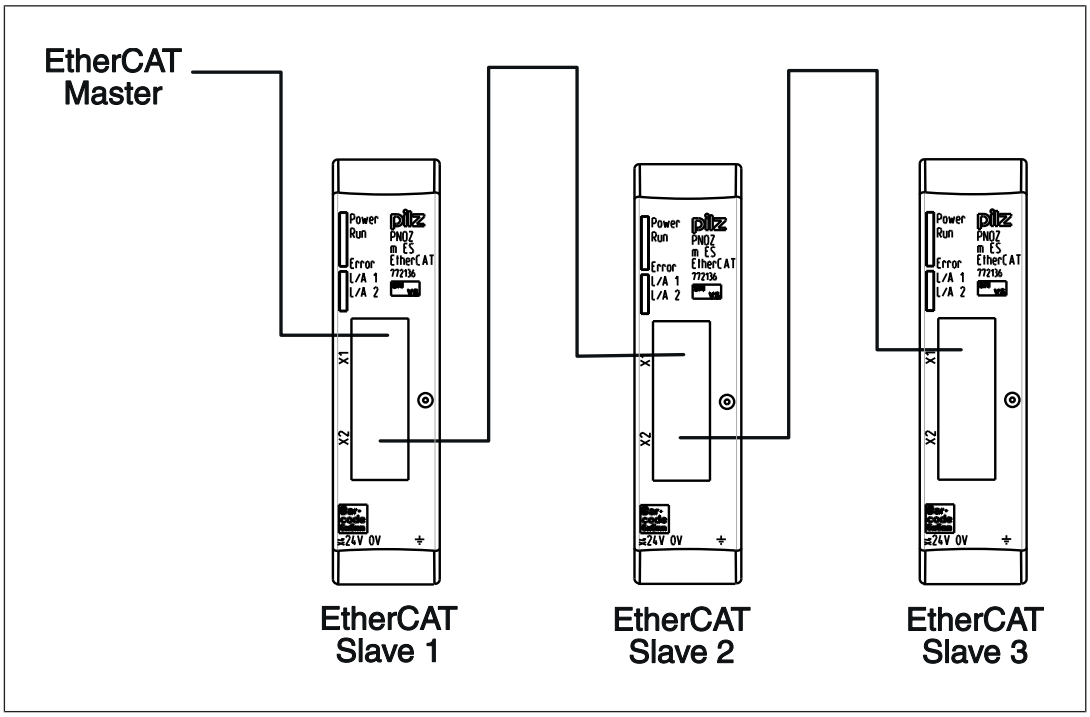
  Install the *Device Description File* in your configuration software. You can only then use the PNOZ m ES EtherCAT.
- Connect the supply voltage to the base unit:

  Terminals **24 V** and **A1 (+)**: + 24 VDC

  Terminals **0 V** and **A2 (-)** : 0 V

## Fieldbus modules
PNOZ m ES EtherCAT

### Connection example




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Supply voltage | |
| Current consumption | **35 mA** |
| Power consumption | **0,9 W** |
| Max. power dissipation of module | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **EtherCAT** |
| Device type | **Slave** |
| Log | **CANopen over EtherCAT** |
| Transmission rates | **100 MBit/s** |

# Fieldbus modules
## PNOZ m ES EtherCAT

| | |
|---|---|
| **Fieldbus interface** | |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |

# Fieldbus modules
PNOZ m ES EtherCAT

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **115 mm** |
| Weight | **85 g** |

Where standards are undated, the 2013-06 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m ES EtherCAT | Fieldbus module, EtherCAT | 772 136 |

### Accessories

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Fieldbus modules
## PNOZ m ES EtherCAT

**Connection terminals**

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

# Fieldbus modules
PNOZ m ES EtherNet/IP

## Overview

### Unit features

Using the product PNOZ m ES EtherNet/IP:

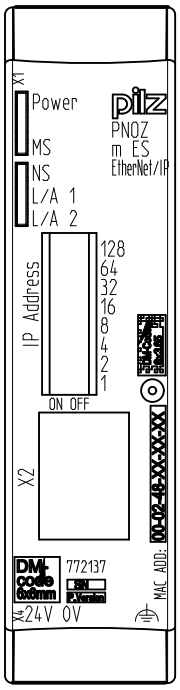
Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for EtherNet/IP as adapter
- Transmission rate 10 MBit/s (10BaseT) and 100 MBit/s (100BaseTX)
- Status indicators for communication and for errors
- 128 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus EtherNet/IP.
- Max. 1 PNOZ m ES EtherNet/IP can be connected to the base unit
- 2-port switch
- Device Level Ring (DLR)
- Integrated web server
- For details of the PNOZmulti 2 base units that can be connected, please refer to the document "PNOZmulti System Expansion".

# Fieldbus modules
## PNOZ m ES EtherNet/IP

### Front view




**Legend:**

- X1, X2: EtherNet/IP - Interfaces
- 0 V, 24 V: Supply connections
- IP address: for setting the IP address
- ⏚: Functional earth
- LED:
  - Power
  - MS
  - NS
  - L/A 1
  - L/A 2

EtherNet/IP™ is registered trademark and patented technology, licensed by ODVA.

# Fieldbus modules
PNOZ m ES EtherNet/IP

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via the fieldbus EtherNet/IP are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ m ES EtherNet/IP are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the fieldbus module PNOZ m ES EtherNet/IP is configured and started automatically.

LEDs indicate the status of the fieldbus module EtherNet/IP.

The configuration is described in detail in the PNOZmulti Configurator's online help.

### Data exchange

17 or 32 bytes must always be sent and received for communication with the PNOZmulti.

Fixed parameters for the input/output assembly instances are set in the fieldbus module PNOZ m ES EtherNet/IP. The following data lengths can be selected:

| Assembly Instance Input | Data length | Description |
|---|---|---|
| 100 | 32 Bytes | Inputs, tables |
| 101 | 17 Bytes | Inputs |

| Assembly Instance Output | Data length | Description |
|---|---|---|
| 150 | 32 Bytes | Outputs, LEDs, tables |
| 151 | 17 Bytes | Outputs, LEDs |

| Assembly Instance Configuration | Data length | Description |
|---|---|---|
| 4 | 0 Bytes | - |

### Input and output data

The data is structured as follows:

#### Input area

The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number I12.

| Virtual inputs PNOZmulti Configurator | I0 … I7 | I8 … I15 | I16 … I23 | ... | I120…I127 |
|---|---|---|---|---|---|
| EtherNet/IP | Byte 0: Bit 0 … 7 | Byte 1: Bit 0 … 7 | Byte 2: Bit 0 … 7 | ... | Byte 15: Bit 0 … 7 |

# Fieldbus modules
## PNOZ m ES EtherNet/IP

**Output range**

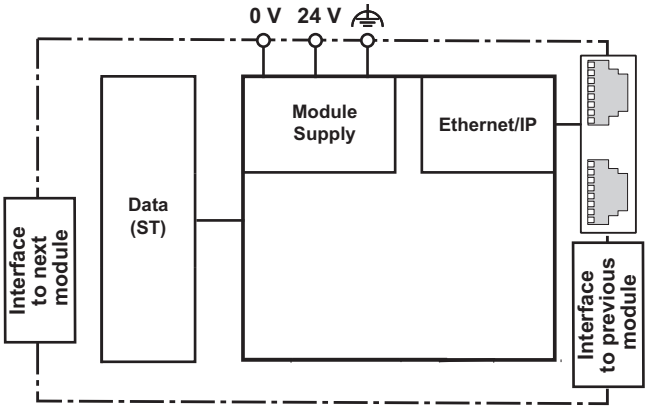
The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. O0, O5... .
The status of output O0 is stored in bit 0 of byte 0; the status of output O5 is stored in bit 5 of byte 0 etc.

| | | | | | |
|---|---|---|---|---|---|
| Virtual inputs<br>PNOZmulti Configurator | O0 … O7 | O8 … O15 | O16 …<br>O23 | ... | O120…<br>O127 |
| EtherNet/IP | Byte 0:<br>Bit 0 … 7 | Byte 1:<br>Bit 0 … 7 | Byte 2:<br>Bit 0 … 7 | ... | Byte 15:<br>Bit 0 … 7 |

- Bit 0 … 4: Status of LEDs on the PNOZmulti 2
  Bit 0: OFAULT
  Bit 1: IFAULT
  Bit 2: FAULT
  Bit 3: DIAG
  Bit 4: RUN
- Data exchange is displayed in Bit 5.
- Polling the payload data: 2 Bytes with the table number and segment number are sent by the Master for access to the payload data table (15 Bytes are returned to the Master).

Detailed information on data exchange is available in the document "Communication Interfaces PNOZmulti 2" in the section entitled "Fieldbus modules".

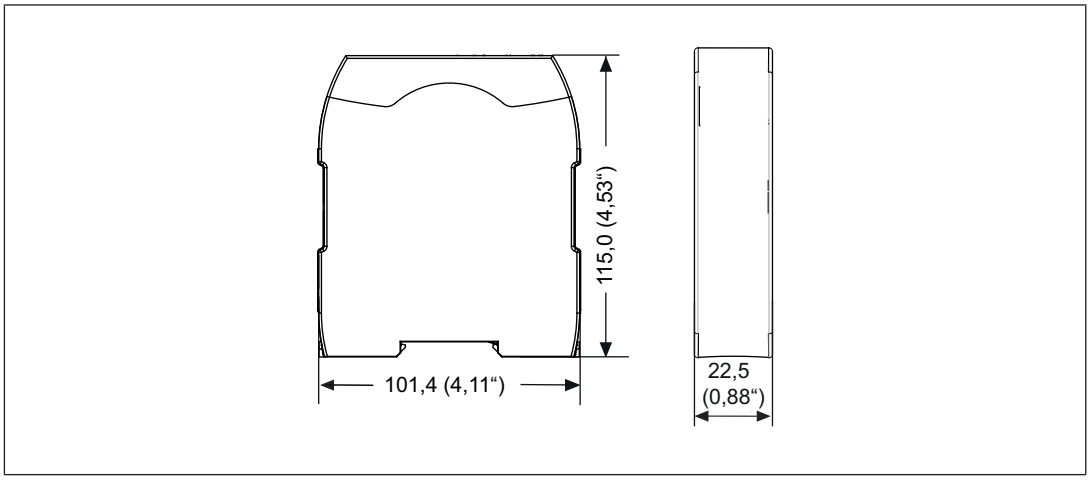
## Block diagram



# Fieldbus modules
PNOZ m ES EtherNet/IP

## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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.

Please note:

- Information given in the "Technical details [📖 879]" must be followed.
- Use copper wiring with a temperature stability of 75 °C.

Please note the following when connecting to EtherNet/IP:

- 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 EtherNet/IP are met, as stated in the Installation Manual published by the User Group.
- External measures must be used to connect the terminal ⏚ to the functional earth, when the mounting rail is **not** connected to the functional earth.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.

- The power supply must meet the regulations for extra low voltages with protective separation.

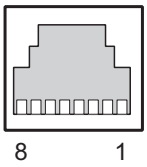
### Connecting the supply voltage

Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

### Interface assignment

| RJ45 socket<br>8-pin | 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

### Set IP address

The IP address of the fieldbus module PNOZ m ES EtherNet/IP is set using the DIP switch on the front.

- The first three bytes of the IP address are: 192.168.1.
- Subnet mask: 255.255.255.0.
- The last byte of the IP address is configured (value range: 1 ...255).

There are various options for setting the IP address.

- Use of the DHCP Server is enabled

  DHCP is automatically enabled on a new module. In this case the IP address is taken from the DHCP Server, if the DIP switch is set to 0. The module waits to receive an address from a DHCP Server.

- If a fixed IP address has been assigned via the web server or by the EtherNet/IP scanner, then this will be used. The DIP switch must be set to zero for this purpose.
- Setting via the DIP switch

  The IP address that is set at the DIP switch is used. DHCP is therefore disabled.

  Set the DIP switch to a value between 1 – 254.
- Enable DHCP via DIP switch

  If you set the DIP switch to 255, then DHCP will always be used, irrespective of the configuration in the web server.

Example: DIP switch: 00010100 (20 decimal)

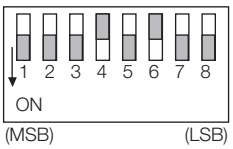
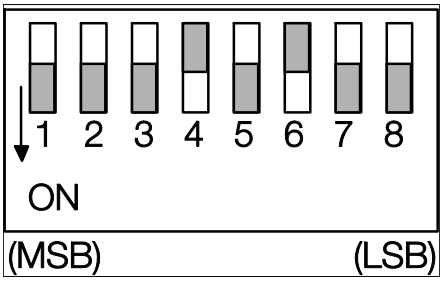



Fig.: DIP switch setting: 20 (decimal) as the value for the last byte of the IP address

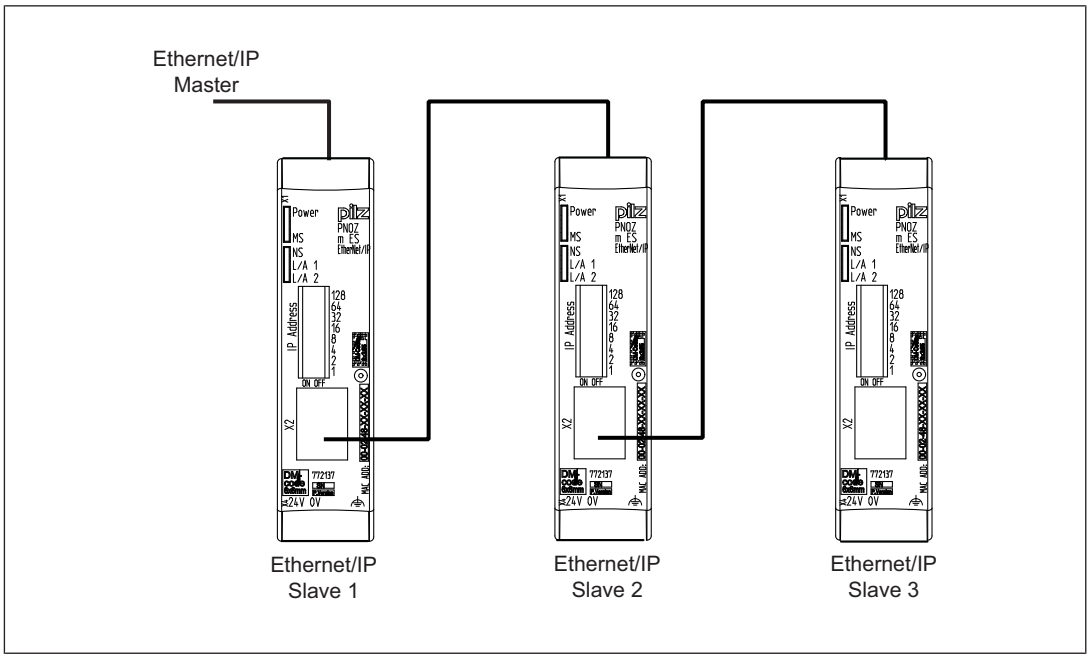
| **DIP switch "IP address"** | **Meaning** | | **Example: IP address $020_D$** |
|---|---|---|---|
| | OFF | ON |  |
| 1 | 0 | $128_D$ | |
| 2 | 0 | $64_D$ | |
| 3 | 0 | $32_D$ | |
| 4 | 0 | $16_D$ | |
| 5 | 0 | $8_D$ | |
| 6 | 0 | $4_D$ | |
| 7 | 0 | $2_D$ | |
| 8 | 0 | $1_D$ | |



DIP switch IP address

# Fieldbus modules
PNOZ m ES EtherNet/IP

### Connection example




## Technical Details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Supply voltage | |
| Current consumption | **50 mA** |
| Power consumption | **1,2 W** |
| Max. power dissipation of module | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **EtherNet/IP** |
| Device type | **Adapter** |
| Transmission rates | **10 MBit/s, 100 MBit/s** |
| Connection | **2 x RJ45** |
| Galvanic isolation | **yes** |

# Fieldbus modules
## PNOZ m ES EtherNet/IP

| | |
|---|---|
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |

# Fieldbus modules
## PNOZ m ES EtherNet/IP

| Mechanical data | |
|---|---|
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **110,4 mm** |
| Weight | **90 g** |

Where standards are undated, the 2014-04 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m ES EtherNet/IP | Fieldbus module, EtherNet/IP | 772 137 |

### Accessories

**Terminator, jumper**

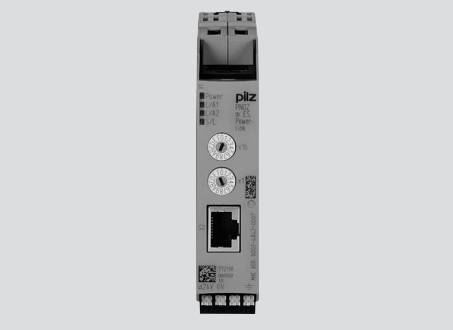
| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Fieldbus modules
## PNOZ m ES EtherNet/IP

**Connection terminals**

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

# Fieldbus modules
PNOZ m ES Powerlink



## Overview

### Unit features

Using the product PNOZ m ES Powerlink:

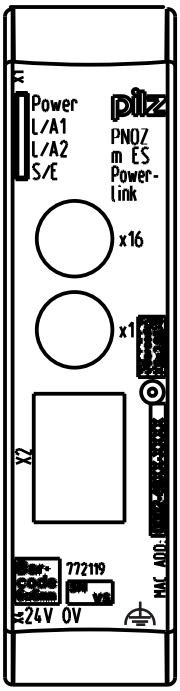
Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for Ethernet POWERLINK (Ethernet POWERLINK V 2 protocol)
- Station addresses from 1 ... 239, selected via rotary switch
- The minimum cycle time for an application of 32 Byte Output and 32 Byte Input is 275µs. The minimum cycle time is 500 µs at the maximum PDO size of 254 Byte Input and 32 Byte Output. (The inputs and outputs in this case are viewed from the Managing Node.)
- 128 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus Ethernet POWERLINK.
- Max. 1 PNOZ m ES Powerlink can be connected to the base unit
- For details of the PNOZmulti 2 base units that can be connected, please refer to the document "PNOZmulti System Expansion".
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

# Fieldbus modules
PNOZ m ES Powerlink

### Front view




**Legend:**

- X1, X2: Ethernet POWERLINK interfaces
- 0 V, 24 V: Supply connections
- ⏚: Functional earth
- LED:
  - Power
  - L/A1
  - L/A2
  - S/E (Status/Error)

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via the fieldbus Ethernet POWERLINK are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ m ES Powerlink are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the fieldbus module PNOZ m ES Powerlink is configured and started automatically.

# Fieldbus modules
## PNOZ m ES Powerlink

LEDs indicate the status of the fieldbus module Ethernet POWERLINK.

The configuration is described in detail in the PNOZmulti Configurator's online help.

### Input and output data

The data is structured as follows:

- Input area PNOZ m ES Powerlink

  The values for the virtual inputs are set as an output in the Managing Node and transferred to the PNOZmulti 2. Each input has a number, e.g. input bit 4 of SDO 2100:02 has the number i12.

| Virtual inputs<br>PNOZmulti Configurator | I0 … I7 | I8 … I15 | I16 … I23 |
|---|---|---|---|
| Ethernet POWERLINK | SDO 2100:01:<br>Bit 0 … 7 | SDO 2100:02:<br>Bit 0 … 7 | SDO 2100:03:<br>Bit 0 … 7 |

- Output range PNOZ m ES Powerlink

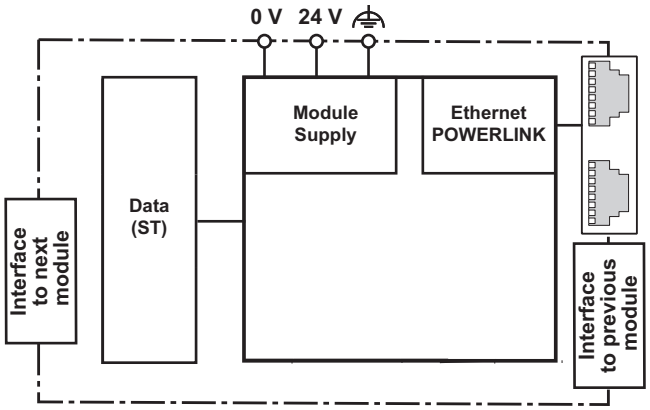
  The virtual outputs are configured in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The state of output o0 is stored in Bit 0 of SDO 2000:01.

| Virtual outputs<br>PNOZmulti Configurator | O0 … O7 | O8 … O15 | O16 … O23 |
|---|---|---|---|
| Ethernet POWERLINK | SDO 2000:01:<br>Bit 0 … 7 | SDO 2000:02:<br>Bit 0 … 7 | SDO 2000:03:<br>Bit 0 … 7 |

Detailed information on data exchange is available in the document "Communication Interfaces PNOZmulti 2" in the section entitled "Fieldbus modules".

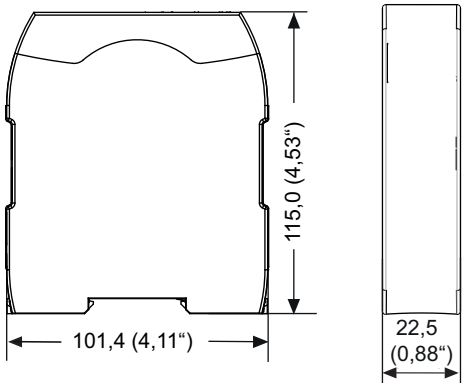
# Fieldbus modules
PNOZ m ES Powerlink

### Block diagram




## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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 POWERLINK.

Please note:

- Information given in the "Technical details [📖 889]" must be followed.
- Use copper wiring with a temperature stability of 75 °C.

# Fieldbus modules
## PNOZ m ES Powerlink

Please note the following when connecting to Ethernet POWERLINK:

- 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 Ethernet POWERLINK are met, as stated in the Installation Manual published by the User Group.
- External measures must be used to connect the terminal ⏚ to the functional earth, when the mounting rail is **not** connected to the functional earth.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

### Connecting the supply voltage

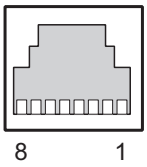
Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

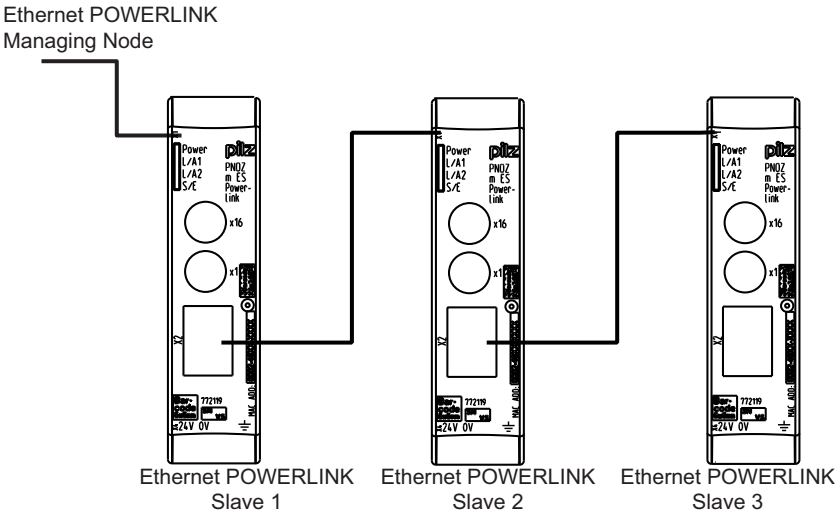
# Fieldbus modules
## PNOZ m ES Powerlink

### Interface assignment

| RJ45 socket<br>8-pin | 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

### Connection example



# Fieldbus modules
PNOZ m ES Powerlink

## Technical Details

| | |
|---|---|
| **General** | |
| Approvals | **CCC, CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Supply voltage | |
| Current consumption | **50 mA** |
| Power consumption | **1,2 W** |
| Max. power dissipation of module | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **Ethernet POWERLINK V2** |
| Device type | **Controlled Node** |
| Transmission rates | **100 MBit/s** |
| Connection | **RJ45** |
| Galvanic isolation | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |

# Fieldbus modules
## PNOZ m ES Powerlink

| | |
|---|---|
| **Environmental data** | |
| Max. operating height above sea level | **2000 m** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **110,4 mm** |
| Weight | **90 g** |

Where standards are undated, the 2013-10 latest editions shall apply.

# Fieldbus modules
PNOZ m ES Powerlink

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m ES Powerlink | Fieldbus module, Ethernet POWERLINK | 772 119 |

### Accessories

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

# Fieldbus modules
PNOZ m ES Profinet

## Overview

### Unit features

Using the product PNOZ m ES Profinet:

Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

The product has the following features:

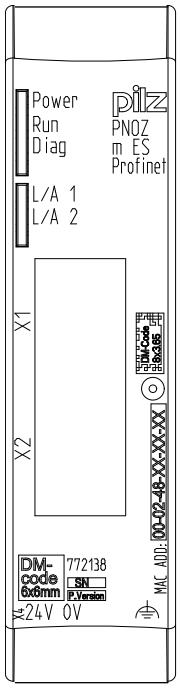
- Can be configured in the PNOZmulti Configurator
- Connection for PROFINET
- Status, diagnostic and error displays for communication with PROFINET
- 128 virtual inputs and outputs on the control system PNOZmulti 2 can be defined in the PNOZmulti Configurator for communication with the fieldbus PROFINET.
- Transmission rate 100 MBit/s (100BaseTX), full and half duplex
- Max. 1 PNOZ m ES Profinet can be connected to the base unit
- Two RJ45 ports
- PNOZ m ES Profinet <V2.0: Profinet IO device V2.2 functions in accordance with Conformance Class C
  PNOZ m ES Profinet from V2.0: Profinet IO device V2.3 functions in accordance with Conformance Class C
- Supported functions:
  - RT
  - IRT
  - MRP
  - LLDP
  - I&M 0-4
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)

## Fieldbus modules
PNOZ m ES Profinet

- Please refer to the document "PNOZmulti System Expansion" for details of the base units PNOZmulti 2 that can be connected.

# Fieldbus modules
## PNOZ m ES Profinet

### Front view




**Legend:**

- X1, X2: Profinet interfaces
- 0 V, 24 V: Supply connections
- : Functional earth
- LED:
  - Power
  - Run
  - Diag
  - L/A 1
  - L/A 2

# Fieldbus modules
PNOZ m ES Profinet

## Function description

### Operation

The virtual inputs and outputs that are to be transferred via PROFINET are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module PNOZ m ES Profinet are connected via a jumper.

After the supply voltage is switched on or the PNOZmulti 2 is reset, the expansion module PNOZ m ES Profinet is configured and started automatically.

LEDs indicate the status of the fieldbus module PROFINET.

The configuration is described in detail in the PNOZmulti Configurator's online help.

### Data access

The data is structured as follows:

- Virtual data
  - Input area PNOZ m ES Profinet

    The values for the inputs are set in the Master as an output and transferred to the PNOZmulti 2.
  - Output area PNOZ m ES Profinet

    The outputs are configured in the PNOZmulti Configurator and transferred to the Master.
- Status of LEDs:

  LED status 1 Output Byte
  The LED status of the base unit can be requested directly as follows
  - Bit 0 = 1: LED OFAULT is lit or flashes
  - Bit 1 = 1: LED IFAULT is lit or flashes
  - Bit 2 = 1: LED FAULT is lit or flashes
  - Bit 3 = 1: LED DIAG is lit or flashes
  - Bit 4 = 1: LED RUN FS is lit
  - Bit 5: Reserved
  - Bit 6 = 1: LED RUN ST is lit (not for PNOZ m B0)
  - Bit 7: Reserved
- Data exchange is displayed in Bit 5.
- Polling the payload data: 2 Bytes with the table number and segment number are sent by the Master for access to the payload data table (15 Bytes are returned to the Master).

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

# Fieldbus modules
PNOZ m ES Profinet

## Assigning the inputs/outputs in the PNOZmulti Configurator to the PROFINET inputs/outputs

Virtual inputs and outputs can be requested or set directly via the following modules. Each element can be selected individually in the master control system, e.g. virtual inputs i0-31. The data width is also established this way.

### Input data

The Master writes to the virtual inputs of the PNOZmulti 2.

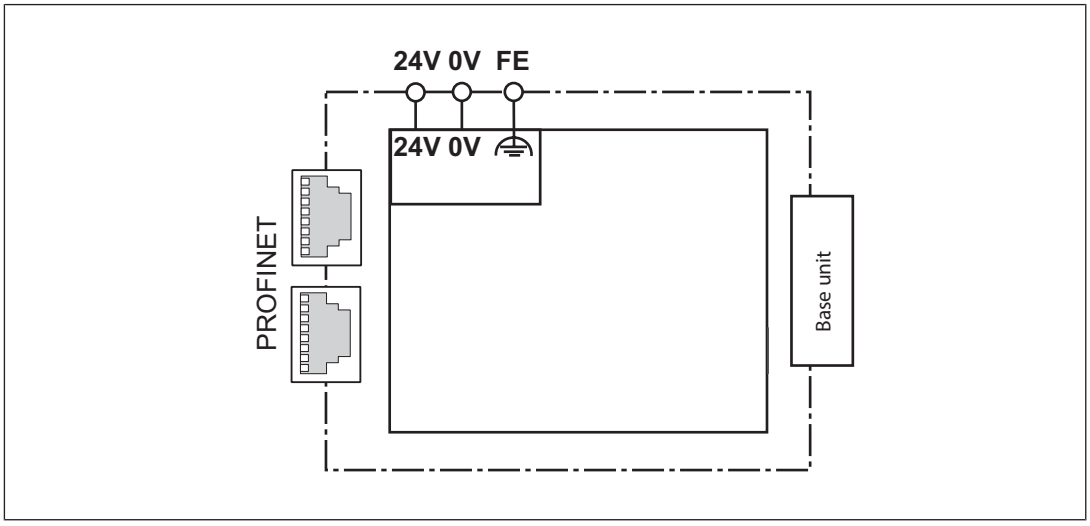
| Description | Input data from PNOZmulti 2 |
|---|---|
| Virtual inputs i0 – i31 | 4 Input Bytes |
| Virtual inputs i32 – i63 | 4 Input Bytes |
| Virtual inputs i64 – i95 | 4 Input Bytes |
| Virtual inputs i96 – i127 | 4 Input Bytes |

### Output data

The Master reads the virtual outputs of the PNOZmulti 2.

| Description | Output data from PNOZmulti 2 |
|---|---|
| Virtual outputs o0 – o31 | 4 Output Bytes |
| Virtual outputs o32 – o63 | 4 Output Bytes |
| Virtual outputs o64 – o95 | 4 Output Bytes |
| Virtual outputs o96 – o127 | 4 Output Bytes |

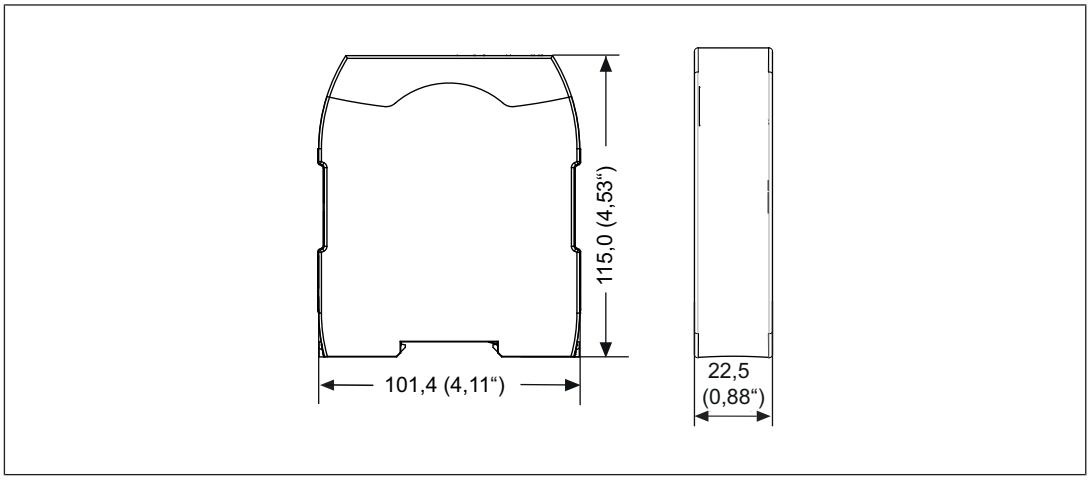
## Block diagram



# Fieldbus modules
PNOZ m ES Profinet

## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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.

Please note:

- Information given in the "Technical details [📖 899]" must be followed.
- Use copper wiring with a temperature stability of 75 °C.

Please note the following when connecting to PROFINET:

- 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 are met, as stated in the Installation Manual published by the User Group.
- External measures must be used to connect the terminal ⏚ to the functional earth, when the mounting rail is **not** connected to the functional earth.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.

- The power supply must meet the regulations for extra low voltages with protective separation.

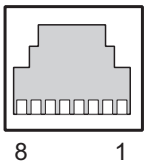
### Connecting the supply voltage

Connect the supply voltage to the fieldbus module:

- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

    or
  - Blow-out fuse, slow, 6A

### Interface assignment

| RJ45 socket<br>8-pin | 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

### Preparing for operation

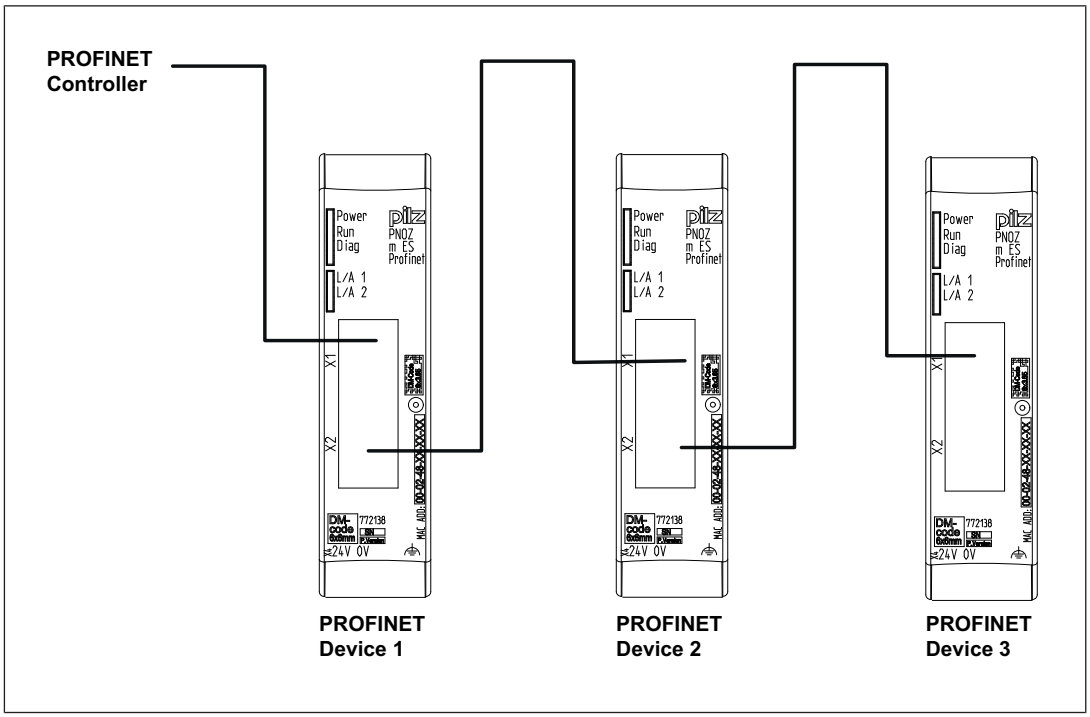
There are two options:

- Automatic assignment of the IP address with the Dynamic Host Configuration Protocol (DHCP)
- Assignment of the IP address by the IO controller before system startup based on the unique unit name.

Install the GDSML file. You can find the GSDML file in the Internet at www.pilz.de.

# Fieldbus modules
PNOZ m ES Profinet

### Connection example




## Technical details

| | |
|---|---|
| **General** | |
| Approvals | **CE, EAC (Eurasian), cULus Listed** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Supply voltage | |
| Current consumption | **60 mA** |
| Power consumption | **1,4 W** |
| Max. power dissipation of module | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **PROFINET** |
| Device type | **IO-Device** |
| Transmission rates | **100 MBit/s** |
| Connection | **2 x RJ45** |

# Fieldbus modules
## PNOZ m ES Profinet

| | |
|---|---|
| **Fieldbus interface** | |
| Galvanic isolation | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| Max. operating height above sea level | **2000 m** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Mounting area (e.g. control cabinet) | **IP54** |
| Housing | **IP20** |
| Terminals | **IP20** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |

# Fieldbus modules
PNOZ m ES Profinet

| Mechanical data | |
|---|---|
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **110,4 mm** |
| Weight | **86 g** |

Where standards are undated, the 2014-04 latest editions shall apply.

## Order reference

### Product

| Product type | Features | Order no. |
|---|---|---|
| PNOZ m ES Profinet | Fieldbus module, PROFINET for PNOZmulti 2 | 772 138 |

### Accessories

#### Terminator, jumper

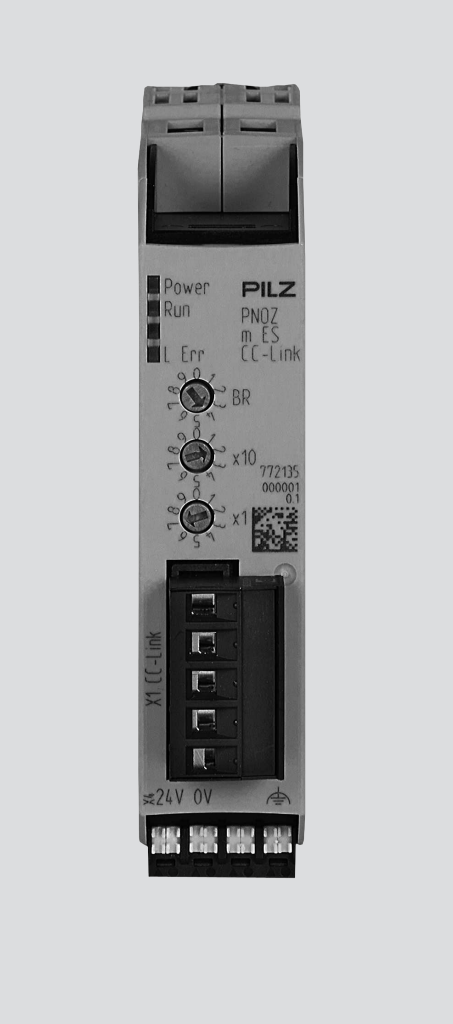
| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# Fieldbus modules
## PNOZ m ES Profinet

**Connection terminals**

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

# Fieldbus modules
PNOZ m ES CC-Link




## Overview

### Unit features

Using the product PNOZ m ES CC-Link:

Expansion module for connection to a base unit from the configurable control system PNOZmulti 2 .

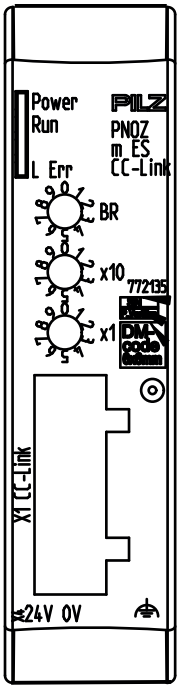
The product has the following features:

- Can be configured in the PNOZmulti Configurator
- Connection for CC-Link
- Station addresses from 1 ... 63, selected via rotary switch
- Station type: Remote Device
- Occupied stations: 3

# Fieldbus modules
## PNOZ m ES CC-Link

- 128 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus CC-Link.
- Max. 1 PNOZ m ES CC-Link can be connected to the base unit
- Plug-in connection terminals:
  either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected.

### Front view




**Legend:**

| | |
|---|---|
| X1: | CC-Link interface |
| X4: 0 V, 24 V: | Supply connections |
| ⏚: | Functional earth |
| Rotary switch | For setting the station addresses |
| LEDs: | Power, Run, L Err |

# Fieldbus modules
PNOZ m ES CC-Link

## Function description

### Functions

The virtual inputs and outputs that are to be transferred via the fieldbus CC-Link are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ m ES CC-Link are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the fieldbus module PNOZ m ES CC-Link is configured and started automatically.

LEDs indicate the status of the fieldbus module CC-Link.

The configuration is described in detail in the PNOZmulti Configurator's online help.

To send and receive data three stations have to be created in CC-Link master.

### Input and output data

Virtual inputs and outputs can be requested or set directly via the following addresses. The implementation to the names of the inputs and outputs in PNOZmulti 2 is performed as in the table listed below.

The data is structured as follows:

- **Input area**
  - Inputs on PNOZmulti Configurator: i00 .. i127
  - Input data CC-Link: RYmn.. RY(m+50)n, RWw l .. RWw l+2

    with l = address can be set as required on the master side (word address)

    with m = address can be set as required on the master side (Bit address)

    with n = 0 .. F (Bit number)

    Example: (with m=100) i23 -> n = 7 -> RY117

Bit addressed input data i00 - i87

| n | F | E | D | C | B | A | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RY m n** | i15 | i14 | i13 | i12 | i11 | i10 | i09 | i08 | i07 | i06 | i05 | i04 | i03 | i02 | i01 | i00 |
| **RY(m+10)n** | i31 | i30 | i29 | i28 | i27 | i26 | i25 | i24 | i23 | i22 | i21 | i20 | i19 | i18 | i17 | i16 |
| **RY(m+20)n** | i47 | i46 | i45 | i44 | i43 | i42 | i41 | i40 | i39 | i38 | i37 | i36 | i35 | i34 | i33 | i32 |
| **RY(m+30)n** | i63 | i62 | i61 | i60 | i59 | i58 | i57 | i56 | i55 | i54 | i53 | i52 | i51 | i50 | i49 | i48 |
| **RY(m+40)n** | i79 | i78 | i77 | i76 | i75 | i74 | i73 | i72 | i71 | i70 | i69 | i68 | i67 | i66 | i65 | i64 |
| **RY(m+50)n** | | | | | | | | | i87 | i86 | i85 | i84 | i83 | i82 | i81 | i80 |

## Fieldbus modules
PNOZ m ES CC-Link

Word addressed input data i88 - i127

| | High byte | | | | | | | | Low byte | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bit no** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **RWw l** | i103 | i102 | i101 | i100 | i99 | i98 | i97 | i96 | i95 | i94 | i93 | i92 | i91 | i90 | i89 | i88 |
| **RWw l+1** | i119 | i118 | i117 | i116 | i115 | i114 | i113 | i112 | i111 | i110 | i109 | i108 | i107 | i106 | i105 | i104 |
| **RWw l+2** | - | - | - | - | - | - | - | - | i127 | i126 | i125 | i124 | i123 | i122 | i121 | i120 |

- **Output range**
  - Outputs on PNOZmulti Configurator: o00 .. o127
  - Output data CC-Link: RXmn .. RX(m+50)n, RWr l .. RWr l+2

    with l = address can be set as required on the master side (word address)

    with m = address can be set as required on the master side (Bit address)

    with n = 0 .. F (Bit number)

    Example: (with m=100) o22 -> n = 6 -> RX116

Bit addressed output data o00 - o87

| **n** | **F** | **E** | **D** | **C** | **B** | **A** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RX m n** | o15 | o14 | o13 | o12 | o11 | o10 | o09 | o08 | o07 | o06 | o05 | o04 | o03 | o02 | o01 | o00 |
| **RX(m+10)n** | o31 | o30 | o29 | o28 | o27 | o26 | o25 | o24 | o23 | o22 | o21 | o20 | o19 | o18 | o17 | o16 |
| **RX(m+20)n** | o47 | o46 | o45 | o44 | o43 | o42 | o41 | o40 | o39 | o38 | o37 | o36 | o35 | o34 | o33 | o32 |
| **RX(m+30)n** | o63 | o62 | o61 | o60 | o59 | o58 | o57 | o56 | o55 | o54 | o53 | o52 | o51 | o50 | o49 | o48 |
| **RX(m+40)n** | o79 | o78 | o77 | o76 | o75 | o74 | o73 | o72 | o71 | o70 | o69 | o68 | o67 | o66 | o65 | o64 |
| **RX(m+50)n** | | | | | | | | | o87 | o86 | o85 | o84 | o83 | o82 | o81 | o80 |

Word addressed output data o88 - o127

| | High byte | | | | | | | | Low byte | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bit No.** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **RWr l** | o103 | o102 | o101 | o100 | o99 | o98 | o97 | o96 | o95 | o94 | o93 | o92 | o91 | o90 | o89 | o88 |
| **RWr l +1** | o119 | o118 | o117 | o116 | o115 | o114 | o113 | o112 | o111 | o110 | o109 | o108 | o107 | o106 | o105 | o104 |
| **RWr l +2** | - | - | - | LED RUN FS | LED DIAG | LED FAULT | LED IFAULT | LED OFAULT | o127 | o126 | o125 | o124 | o123 | o122 | o121 | o120 |

# Fieldbus modules
## PNOZ m ES CC-Link

### LED status

The LED status of PNOZmulti 2 can be read out via the following High Byte.

| | High Byte | | | | | | | | Low Byte | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bit no** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **0** |
| **RWr (I+2)** | LED Byte | | | | | | | | Output data o120 - o127 | | | | | | | |

Bit 5-7: Reserved

The LED status of the base unit PNOZ m B0 can be requested directly as follows

- Bit 0 = 1: LED OFAULT is lit or flashes
- Bit 1 = 1: LED IFAULT is lit or flashes
- Bit 2 = 1: LED FAULT is lit or flashes
- Bit 3 = 1: LED DIAG is lit or flashes
- Bit 4 = 1: LED RUN is lit
- Bit 5-7: Reserved

The LED status of the base unit PNOZ m B1 can be requested directly as follows

- Bit 0 = 1: LED OFAULT is lit or flashes
- Bit 1 = 1: LED IFAULT is lit or flashes
- Bit 2 = 1: LED FAULT is lit or flashes
- Bit 3 = 1: LED DIAG is lit or flashes
- Bit 4 = 1: LED RUN FS is lit
- Bit 5: Reserved
- Bit 6 = 1: LED RUN ST is lit
- Bit 7: Reserved

### Access to table segments

The data in the tables can be requested via the following addresses.

#### Input data

The Master requests a table segment:

| | High Byte | Low Byte |
|---|---|---|
| **RWw (I+3)** | Segment number | Table number |

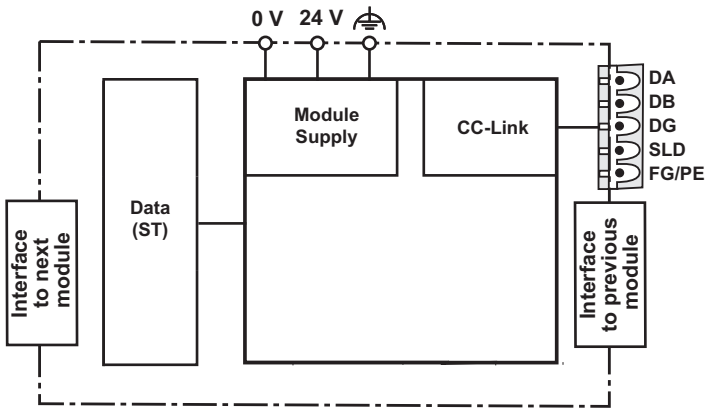
# Fieldbus modules
## PNOZ m ES CC-Link

**Output data**

PNOZmulti 2 answers as follows:

| | High Byte | Low Byte |
|---|---|---|
| **RWr (I+3)** | Segment number | Table number |
| **RWr(I+4)** | Segment Byte 1 | Segment Byte 0 |
| **RWr(I+5)** | Segment Byte 3 | Segment Byte 2 |
| **RWr(I+6)** | Segment Byte 5 | Segment Byte 4 |
| **RWr(I+7)** | Segment Byte 7 | Segment Byte 6 |
| **RWr(I+8)** | Segment Byte 9 | Segment Byte 8 |
| **RWr(I+9)** | Segment Byte 11 | Segment Byte 10 |
| **RWr(I+A)** | Reserved | Segment Byte 12 |
| **RWr(I+B)** | Reserved | Reserved |

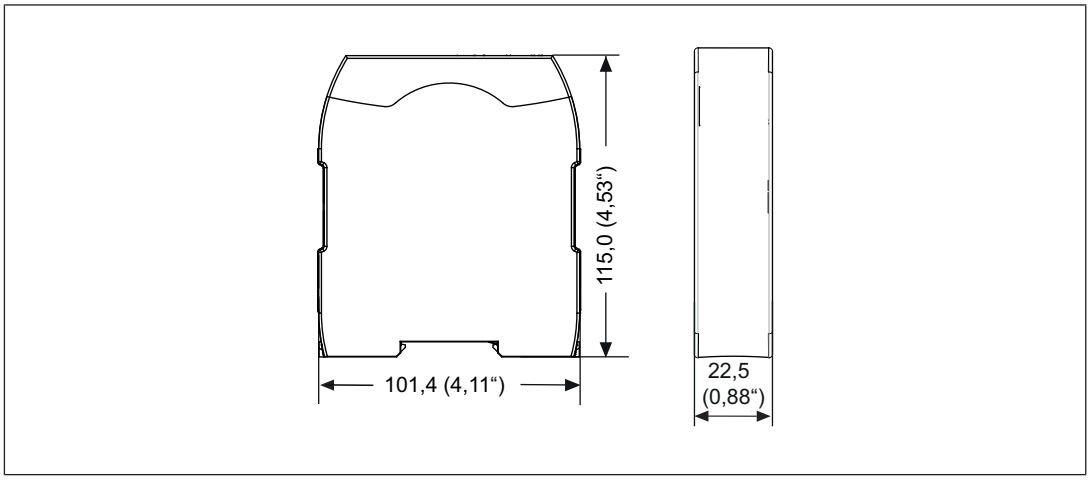
### Block diagram



# Fieldbus modules
PNOZ m ES CC-Link

## Installation

### Dimensions in mm




## Commissioning

### General wiring guidelines

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

Please note:

- Information given in the Technical details [911] must be followed.
- The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.
- Use copper wire that can withstand 75° C.
- External measures must be used to connect the terminal ⏚ to the functional earth, when the mounting rail is **not** connected to the functional earth.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with protective separation.

### Connecting the supply voltage

Connect the supply voltage to the fieldbus module:

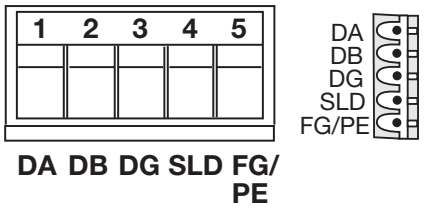
- **24 V** terminal: + 24 VDC
- **0 V** terminal: 0 V
- Protect the supply voltage as follows:
  - Circuit breaker, characteristic C - 6 A

or

– Blow-out fuse, slow, 6A

### Interface assignment

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.




1: DA (Channel A)

2: DB (Channel B)

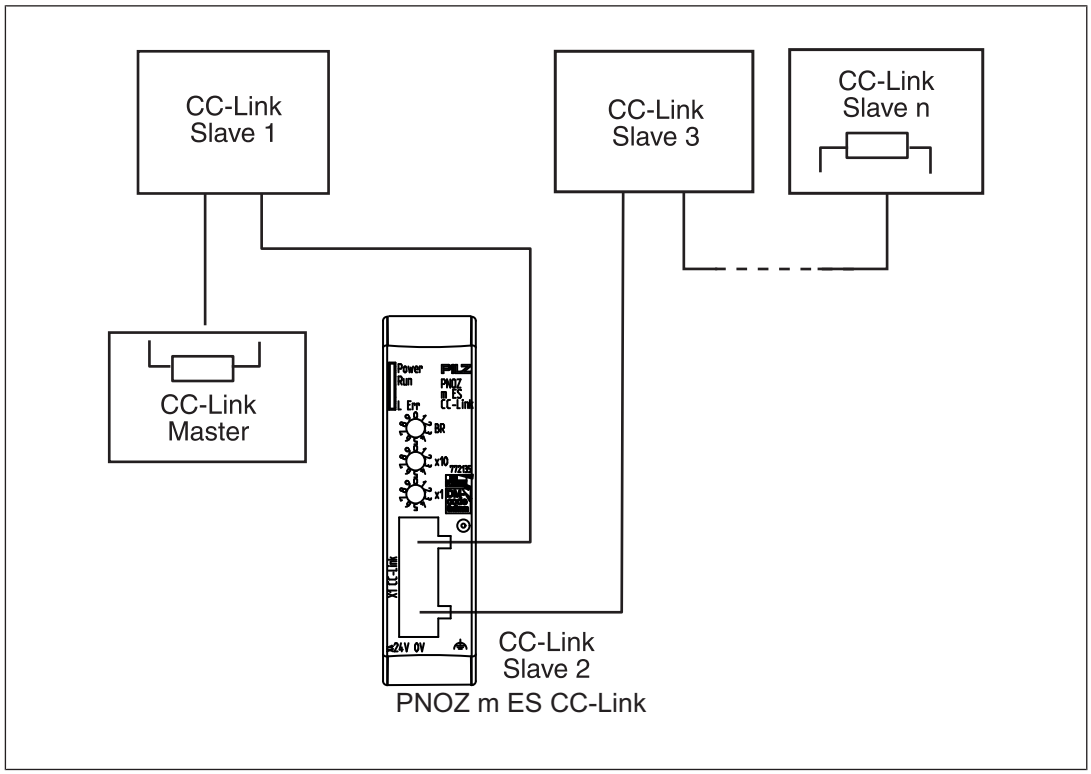
3: DG (Earth)

4: SLD (Cable shield)

5: FG/PE (Functional earth)

## Fieldbus modules
PNOZ m ES CC-Link

### Connection example




## Technical Details

| | |
|---|---|
| **General** | |
| Approvals | **CE, EAC (Eurasian), cULus Listed** |
| Application range | **Standard** |
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| Voltage | **24 V** |
| Kind | **DC** |
| Voltage tolerance | **-20 %/+25 %** |
| Max. continuous current that the external power supply must provide | **45 mA** |
| Output of external power supply (DC) | **1,1 W** |
| Potential isolation | **yes** |

# Fieldbus modules
## PNOZ m ES CC-Link

| | |
|---|---|
| **Electrical data** | |
| Supply voltage | |
| for | **Module supply** |
| internal | **Via base unit** |
| Voltage | **3,3 V** |
| Kind | **DC** |
| Current consumption | **60 mA** |
| Power consumption | **0,2 W** |
| Max. power dissipation of module | **1,5 W** |
| Status indicator | **LED** |
| **Fieldbus interface** | |
| Fieldbus interface | **CC-Link V1.10** |
| Device type | **Slave** |
| Station address | **1 ... 63d** |
| Transmission rates | **10 MBit/s, 156 kbit/s, 2,5 MBit/s, 5 MBit/s, 625 kbit/s** |
| Connection | **5-pin Combicon plug-in connector** |
| Assigned stations | **3** |
| Galvanic isolation | **yes** |
| **Environmental data** | |
| Ambient temperature | |
| In accordance with the standard | **EN 60068-2-14** |
| Temperature range | **0 - 60 °C** |
| Forced convection in control cabinet off | **55 °C** |
| Storage temperature | |
| In accordance with the standard | **EN 60068-2-1/-2** |
| Temperature range | **-25 - 70 °C** |
| Climatic suitability | |
| In accordance with the standard | **EN 60068-2-30, EN 60068-2-78** |
| Condensation during operation | **Not permitted** |
| Max. operating height above sea level | **2000 m** |
| EMC | **EN 61131-2** |
| Vibration | |
| In accordance with the standard | **EN 60068-2-6** |
| Frequency | **10 - 150 Hz** |
| Acceleration | **1g** |
| Shock stress | |
| In accordance with the standard | **EN 60068-2-27** |
| Acceleration | **15g** |
| Duration | **11 ms** |

# Fieldbus modules
## PNOZ m ES CC-Link

| | |
|---|---|
| **Environmental data** | |
| Airgap creepage | |
| In accordance with the standard | **EN 61131-2** |
| Overvoltage category | **II** |
| Pollution degree | **2** |
| Rated insulation voltage | **30 V** |
| Protection type | |
| In accordance with the standard | **EN 60529** |
| Housing | **IP20** |
| Terminals | **IP20** |
| Mounting area (e.g. control cabinet) | **IP54** |
| **Potential isolation** | |
| Potential isolation between | **Fieldbus and module voltage** |
| Type of potential isolation | **Functional insulation** |
| Rated surge voltage | **500 V** |
| **Mechanical data** | |
| Mounting position | **Horizontal on top hat rail** |
| DIN rail | |
| Top hat rail | **35 x 7,5 EN 50022** |
| Recess width | **27 mm** |
| Material | |
| Bottom | **PC** |
| Front | **PC** |
| Top | **PC** |
| Connection type | **Spring-loaded terminal, screw terminal** |
| Conductor cross section with screw terminals | |
| 1 core flexible | **0,25 - 2,5 mm², 24 - 12 AWG** |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | **0,2 - 1,5 mm², 24 - 16 AWG** |
| Torque setting with screw terminals | **0,5 Nm** |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | **0,2 - 2,5 mm², 24 - 12 AWG** |
| Spring-loaded terminals: Terminal points per connection | **2** |
| Stripping length with spring-loaded terminals | **9 mm** |
| Dimensions | |
| Height | **101,4 mm** |
| Width | **22,5 mm** |
| Depth | **110,4 mm** |
| Weight | **90 g** |

Where standards are undated, the 2015-08 latest editions shall apply.

# Fieldbus modules
PNOZ m ES CC-Link

## Order reference

### Product

| Product type | Features | Order No. |
|---|---|---|
| PNOZ m ES CC-Link | Fieldbus module, CC-Link | 772135 |

### Accessories

#### Connection terminals

| Product type | Features | Order no. |
|---|---|---|
| Spring terminals<br>PNOZ mmcxp 1 pc. | Spring-loaded terminals, 1 pieces | 783 542 |
| Spring terminals<br>PNOZ mmcxp 10 pcs. | Spring-loaded terminals, 10 pieces | 783 543 |
| Screw terminals<br>PNOZ mmcxp 1 pc. | Screw terminals, 1 piece | 793 542 |
| Screw terminals<br>PNOZ mmcxp 10 pcs. | Screw terminals, 10 pieces | 793 543 |

#### Terminator, jumper

| Product type | Features | Order No. |
|---|---|---|
| PNOZ mm0.xp connector left | Jumper yellow/black to connect the modules, 10 piece | 779 260 |

# PNOZmulti Configurator
PNOZmulti Configurator


## Features

- Graphic configuration of safety circuit
- Project configuration, configuration generation, documentation, commissioning
- Data transfer via integrated interface or chip card
- User interface in German, English, French, Italian, Spanish, Japanese, Chinese (selectable)

## System requirements

Please refer to the readme file for the PNOZmulti Configurator for details of the current system requirements.

## Description

The PNOZmulti Configurator is a graphic tool for the configuration and programming of the configurable control system PNOZmulti.

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 PNOZmulti via a chip card or via the integrated interface.

The safety circuit can also be uploaded from the 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

- Enabling switch
- Operating mode selector switches
- Press functions
- Light beam device
- Light grid
- Pressure sensitive 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 integrated interface. They are handled in exactly the same way 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.

## Licences and versions

In order to use the full scope of the PNOZmulti Configurator, you will need a valid licence in addition to the software package.

Without a licence, the PNOZmulti Configurator can only be used in a demo version.

A range of licences are available to meet varying requirements:

- **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.
- **Lite Licence**

  Licence limited to the base units PNOZ m0p and the base units PNOZmulti Mini, for use on one workstation.
- **Multi-user Licence**

  Multi-user licence, graduated according to the number of workstations (up to 25, 50, 100 and over 100)
- **Project Licence**

  Licence to use the software within a contractually limited framework.

## PNOZmulti Configurator
PNOZmulti Configurator

- **Basic/User/Multi User/Project Upgrade Licence**

  Discounted licence enabling owners of a licence to change to a newer version of the software
- **Time Limited Licence**

  Basic licence restricted to 2, 3 or 4 months

These licence types are available as a full version or service version.

**Full version** The full version provides the whole functional range of a licence.

**Service version:** The service version of a licence is intended for service and maintenance. The service version only offers limited editing features.

The following functions are available on the respective versions:

| Functions | Demo version | Service version | Full version |
|---|---|---|---|
| Load and save error stack | x | x | x |
| Function elements | Max. 10 | Infinite | Infinite |
| Save project | | x | x |
| Load project from hardware | | x | x |
| Save project to hardware | | x | x |
| Dynamic program display | | x | x |
| Print function | | x | x |
| Change project | x | | x |
| Password level 1 | x | | x |
| Password level 2 | x | x | x |
| Password level 3 | x | x | x |
| Project write protection | x | | x |
| Project read protection | x | | x |
| Import/export | x | | x |
| Create macro | x | | x |

# PNOZmulti Configurator
PNOZmulti Configurator

## Order reference

| PNOZmulti Configurator | Features | Order No. |
|---|---|---|
| Software + Manual | CD and manual | 773 000 |
| Software | CD | 773 000D |
| Basic Licence | Single user licence, issued to one owner (company name and location/project must be stated), full version | 773 010B |
| User Licence | Discounted licence for an additional workstation, issued to the owner of a basic licence, full version | 773 010K |
| Lite Licence | Licence limited to the PNOZ m0p and the base units PNOZmulti Mini, for use on one workstation, full version | 773 010L |
| Multi User Licence | Multi user licence, graduated according to the number of workstations (up to 25, 50, 100 and over 100), full version | 773 010M |
| Project Licence | Licence issued for a specific project. In contrast to the multi user licence, this licence is not limited to one legal entity. Full Version | 773 010G |
| Basic Upgrade Licence | Discounted licence enabling owners of a basic licence to change to a newer version of the software, full version | 773 010U |
| User Upgrade Licence | Discounted licence enabling owners of a user licence to change to a newer version of the software, full version | 773 010V |
| Multi User Upgrade Licence | Discounted licence enabling owners of a multi user licence to change to a newer version of the software, full version | 773 010N |
| Project Upgrade Licence | Discounted licence enabling owners of a project licence to change to a newer version of the software, full version | 773 010W |
| Time Limited Licence, 2Mth | Basic licence restricted to 2 months, full version | 773 010S |
| Time Limited Licence, 3Mth | Basic licence restricted to 3 months, full version | 773 010R |
| Time Limited Licence, 4Mth | Basic licence restricted to 4 months, full version | 773 010Q |
| Basic Licence, Service | Single user licence, issued to one owner (company name and location/project must be stated), service version | 773 011B |
| User Licence, Service | Discounted licence for an additional workstation, issued to the owner of a basic licence, service version | 773 011K |
| Lite Licence, Service | Licence limited to the PNOZ m0p and the base units PNOZmulti Mini, for use on one workstation, service version | 773 011L |
| Multi User Licence, Service | Multi user licence, graduated according to the number of workstations (up to 25, 50, 100 and over 100), service version | 773 011M |
| Project Licence, Service | Licence issued for a specific project. In contrast to the multi user licence, this licence is not limited to one legal entity. Service Version | 773 011G |
| Basic Upgrade Licence, Service | Discounted licence enabling owners of a basic licence to change to a newer version of the software, service version | 773 011U |

## PNOZmulti Configurator
PNOZmulti Configurator

| PNOZmulti Configurator | Features | Order No. |
|---|---|---|
| User Upgrade Licence, Service | Discounted licence enabling owners of a user licence to change to a newer version of the software, service version | 773 011V |
| Multi User Upgrade Licence, Service | Changing a multi user licence to a newer version of the software (discounted), service version | 773 011N |
| Project Upgrade Licence, Service | Discounted licence enabling owners of a project licence to change to a newer version of the software, service version | 773 011W |

# Accessories

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## Software, chip card

| Tool Kit, chip card | Order No. |
|---|---|
| Tool Kit, in a 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, 1 pieces | 779 201 |
| Chip card, 8 kByte, 10 pieces | 779 200 |
| Chip card 32 kByte, 1 pieces | 779 211 |
| Chip card 32 kByte, 10 pieces | 779 212 |
| Chip card holder | 779 240 |
| Chip card reader | 779 230 |
| Labels for chip card, seal, 10 pieces | 779 250 |

| Software, licences | Order No. |
|---|---|
| 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, Lite Licence | 773 010L |
| 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, Lite Licence | 773 011L |
| 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 | 773 011V |
| PNOZmulti Service Tool, Project Upgrade Licence | 773 011W |

## Software, chip card

| Software, licences | Order No. |
|---|---|
| PNOZmulti Service Tool, Multi User Upgrade Licence | 773 011N |

## Cable, adapter

| Cable, adapter | Order No. |
|---|---|
| PSS SB BUSCABLE LC cable, shielded, 1 -100 m | 311 074 |
| PSSu A USB-CAB03 Mini-USB cable, 3 m | 312 992 |
| PSSu A USB-CAB05 Mini-USB cable, 5 m | 312 993 |
| SafetyNET p cable, 1 - 500 m | 380 000 |
| PSS67 Cable, M8sf M12sm cable, straight M12 connector, straight M8 socket, 4-pin, 3m | 380 200 |
| PSS67 Cable, M8sf M12sm cable, straight M12 connector, straight M8 socket, 4-pin, 5 m | 380 201 |
| PSS67 Cable, M8sf M12sm cable, straight M12 connector, straight M8 socket, 4-pin, 10 m | 380 202 |
| PSS67 Cable, M8sf M12sm cable, straight M12 connector, straight M8 socket, 4-pin, 30 m | 380 203 |
| PSS67 Cable, M8af M12sm cable, straight M12 connector, angled M8 socket, 4-pin, 3m | 380 204 |
| PSS67 Cable, M8af M12sm cable, straight M12 connector, angled M8 socket, 4-pin, 5 m | 380 205 |
| PSS67 Cable, M8af M12sm cable, straight M12 connector, angled M8 socket, 4-pin, 10 m | 380 206 |
| PSS67 Cable, M8af M12sm cable, straight M12 connector, angled M8 socket, 4-pin, 30 m | 380 207 |
| PSS67 Cable, M12sf M12sm cable, straight M12 connector, straight M12 socket, 5-pin, 3m | 380 208 |
| PSS67 Cable, M12sf M12sm cable, straight M12 connector, straight M12 socket, 5-pin, 5 m | 380 209 |
| PSS67 Cable, M12sf M12sm cable, straight M12 connector, straight M12 socket, 5-pin, 10 m | 380 210 |
| PSS67 Cable, M12sf M12sm cable, straight M12 connector, straight M12 socket, 5-pin, 30 m | 380 211 |
| PSS67 Cable, M12af M12am cable, angled M12 connector, angled M12 socket, 5-pin, 3m | 380 212 |
| PSS67 Cable, M12af M12am cable, angled M12 connector, angled M12 socket, 5-pin, 5 m | 380 213 |
| PSS67 Cable, M12af M12am cable, angled M12 connector, angled M12 socket, 5-pin, 10 m | 380 214 |
| PSS67 Cable, M12af M12am cable, angled M12 connector, angled M12 socket, 5-pin, 30 m | 380 215 |
| PSS67 Cable M12sf, M12sm, 20m | 380 220 |
| PSS67 Supply Cable IN sf OUT sm, B, 3m | 380 250 |
| PSS67 Supply Cable IN sf OUT sm, B, 5m | 380 251 |

## Cable, adapter

| Cable, adapter | Order No. |
|---|---|
| PSS67 Supply Cable IN sf OUT sm, B, 10m | 380 252 |
| PSS67 Supply Cable IN sf, B, 3m | 380 256 |
| PSS67 Supply Cable IN sf, B, 5m | 380 257 |
| PSS67 Supply Cable IN sf, B, 10m | 380 258 |
| PSEN ma adapter for connection to safety switch PSENmag | 380 300 |
| PSEN cs adapter for connection to safety switch PSENcode | 380 301 |
| PSS67 M12 connector, plug, M12, straight, 5-pin, A-coded | 380 308 |
| PSS67 M12 connector, socket, M12, straight, 5-pin, A-coded | 380 309 |
| PSS67 M12 connector, plug, M12, angled, 5-pin, A-coded | 380 310 |
| PSS67 M12 connector, socket, M12, angled, 5-pin, A-coded | 380 311 |
| PSS67 M8 connector, plug, M8, straight, 4-pin | 380 316 |
| PSS67 M8 connector, socket, M8, straight, 4-pin | 380 317 |
| PSS67 M8 connector, plug, M8, angled, 4-pin | 380 318 |
| PSS67 M8 connector, socket, M8, angled, 4-pin | 380 319 |
| PSS67 I/O Cable, 1 - 30 m | 380 320 |
| PSEN sl adapter | 380 325 |
| SafetyNET p Connector RJ45 – RJ45 plug-in connector | 380 400 |
| PDP67 cable M12-5sm, 5m, open-ended | 380 705 |
| PDP67 cable M12-5sm, 10m, open-ended | 380 706 |
| PDP67 cable M12-5sm, 10m, open-ended | 380 707 |
| PDP67 cable M12-5sm, 30m, open-ended | 380 708 |
| PDP67 cable M12-5sm, 3m, open-ended | 380 709 |
| MM A MINI-IO-CAB01 1.5m | 772 200 |
| MM A MINI-IO-CAB01 2.5m | 772 201 |
| MM A MINI-IO-CAB01 5m | 772 202 |
| PNOZ msi1Bp adapter and cable, 25-pin, 5.0 m for speed monitor PNOZ msxp | 773 839 |
| PNOZ msi1Ap adapter and cable, 25-pin, 2.5 m for speed monitor PNOZ msxp | 773 840 |
| PNOZ msi1Bp adapter and cable, 25-pin, 2.5 m for speed monitor PNOZ msxp | 773 841 |
| PNOZ msi3Ap adapter and cable, 15-pin, 2.5 m for speed monitor PNOZ msxp | 773 842 |
| PNOZ msi3Bp adapter and cable, 15-pin, 2.5 m for speed monitor PNOZ msxp | 773 843 |
| PNOZ msi1Ap adapter and cable, 25-pin, 5.0 m for speed monitor PNOZ msxp | 773 844 |
| PNOZ msi b4 Box | 773 845 |
| PNOZ msi19p connection cable, 1.5 m for PNOZ ms2p/PNOZ ms3p/PNOZ ms4p | 773 846 |
| PNOZ msi19p connection cable, 2.5 m for PNOZ ms2p/PNOZ ms3p/PNOZ ms4p | 773 847 |

## Cable, adapter

| Cable, adapter | Order No. |
|---|---|
| PNOZ msi10p adapter cable 2.5 m for speed monitor PNOZ msxp | 773 854 |
| PNOZ msi11p adapter cable 1.5 m for speed monitor PNOZ msxp | 773 855 |
| PNOZ msi9p adapter cable 5.0 m for speed monitor PNOZ msxp | 773 856 |
| PNOZ msi5p adapter and cable, Bos/Rex, 15-pin, 2.5 m for speed monitor PNOZ msxp | 773 857 |
| PNOZ msi5p adapter and cable, Bos/Rex, 15-pin, 1.5 m for speed monitor PNOZ msxp | 773 858 |
| PNOZ msi6p adapter and cable, Elau, 9-pin, 7.5 m for PNOZ ms2p/PNOZ ms3p/ PNOZ ms4p | 773 859 |
| PNOZ msi6p adapter and cable, Elau, 9-pin, 2.5 m for PNOZ ms2p/PNOZ ms3p/ PNOZ ms4p | 773 860 |
| PNOZ msi6p adapter and cable, Elau, 9-pin, 1.5 m for PNOZ ms2p/PNOZ ms3p/ PNOZ ms4p | 773 861 |
| PNOZ msi8p adapter and cable, Lenze, 9-pin, 2.5 m for speed monitor PNOZ msxp | 773 862 |
| PNOZ msi8p adapter and cable, Lenze, 9-pin, 1.5 m for speed monitor PNOZ msxp | 773 863 |
| PNOZ msi7p adapter and cable, SEW, 15-pin, 2.5 m for speed monitor PNOZ msxp | 773 864 |
| PNOZ msi7p adapter and cable, SEW, 15-pin, 1.5 m for speed monitor PNOZ msxp | 773 865 |
| PNOZ msi16p adapter, Baumuell, 15/15 2.5m | 773 867 |
| PNOZ msi12p Rockwell 15/15 2.5m | 773 868 |
| PNOZ msi13p Fanuc 20/20 2.5m | 773 869 |
| PNOZ msi S09 9-pin adapter for speed monitor PNOZ msxp, connector set | 773 870 |
| PNOZ msi S15 15-pin adapter for speed monitor PNOZ msxp, connector set | 773 871 |
| PNOZ msi S25 25-pin adapter for speed monitor PNOZ msxp, connector set | 773 872 |
| PNOZ msi15p adapter, Tendo, 15/15 2.5m | 773 874 |
| PNOZ msi17p Bos/Rex 15/15 5.0m | 773 875 |
| PNOZ msi14p Leroy 15/15 2.5m | 773 878 |
| PNOZ MSI20P PARKER HD 15/15 2.5M | 773 879 |
| PNOZ msi b1 Box 15p | 773 880 |
| PNOZ msi b0 cable 15/RJ45 | 773 881 |
| PNOZ msi b1 Box 9p | 773 882 |
| PNOZ msi b1 Box 25p | 773 883 |
| PNOZ msi b0 cable 25/RJ45 | 773 884 |
| PNOZ mli1p 5m screw, 5-pin cable, shielded, screw terminal, 5 m | 773 890 |
| PNOZ mli1p 10m screw, 5-pin cable, shielded, screw terminal, 10 m | 773 891 |
| PNOZ mli1p 50m screw, 5-pin cable, shielded, screw terminal, 50 m | 773 892 |

## Cable, adapter

| Cable, adapter | Order No. |
|---|---|
| PNOZ mli1p 5m spring, 5-pin cable, shielded, spring-loaded terminal, 5 m | 773 893 |
| PNOZ mli1p 10m spring, 5-pin cable, shielded, spring-loaded terminal, 10 m | 773 894 |
| PNOZ mli1p 50m spring, 5-pin cable, shielded, spring-loaded terminal, 50 m | 773 895 |
| PNOZ mli1p 50m spring, 5-pin cable, shielded, spring-loaded terminal, 1.5 m | 773 896 |
| PNOZ mli1p 50m screw, 5-pin cable, shielded, screw terminal, 5 m | 773 897 |
| KOP-XE - Jumper | 774 639 |
| PNOZmulti bus terminator | 779 110 |
| PNOZmulti bus terminator coated | 779112 |

## Connectors, terminals

For details of the respective connection terminals, terminators and jumpers, please refer to the data sheets for the relevant products.