PNOZmulti Modular Safety System

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Configuration guide

COMPLETE
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Technical Catalogue 3.4 – August 2008 edition

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August 2008

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System description

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System description

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System description
Overview

Modular design

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

Configuration in the PNOZmulti Configurator

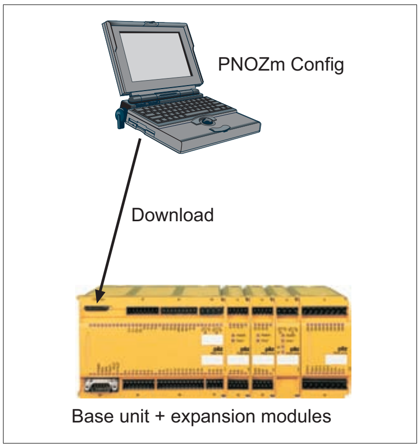
- The function of the safety system is established through the PNOZmulti Configurator.
- The PNOZmulti Configurator is a graphic tool which is used to define the functions of the units. Using predefined symbols, a simple circuit diagram shows how the units' inputs and outputs should be connected. This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

Inputs

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

Outputs

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



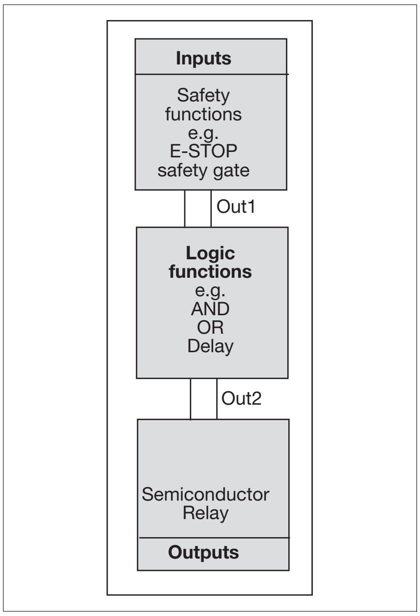
System description
Hardware

Design of the modular safety system

The modular safety system consists of the base unit and expansion modules. The base unit itself has

- 20 inputs
- 2 relay outputs
- 4 semiconductor outputs
- 1 auxiliary output, which is required for deleting the configuration data in the base unit
- 1 cascading input
- 1 cascading output

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



Operation of the units

The PNOZmulti Configurator generates a project file which is downloaded to the base unit; there it defines:

- Which safety functions the inputs are to carry out, e.g. E-STOP monitoring, safety gate monitoring
- How the inputs are connected to the outputs via logic functions
- Which output is configured (semiconductor, relay)

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

Fieldbus modules

The fieldbus modules are used to

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

RS 232 interface

The base unit has an RS 232 interface to

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

Safety functions

The safety system has inputs and outputs, which can be used for safety functions. The PNOZmulti safety system can be configured to monitor

- E-STOP pushbuttons
- Operating mode selector switches
- Enable switches
- Two-hand buttons
- Safety gates
- Light curtains
- Light beam devices
- Speeds
- Analogue input signals
- Safety mats
- Muting
- Mechanical presses
- Standstill

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

Standard functions

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

Press applications

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

System description
Software

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

Procedure

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

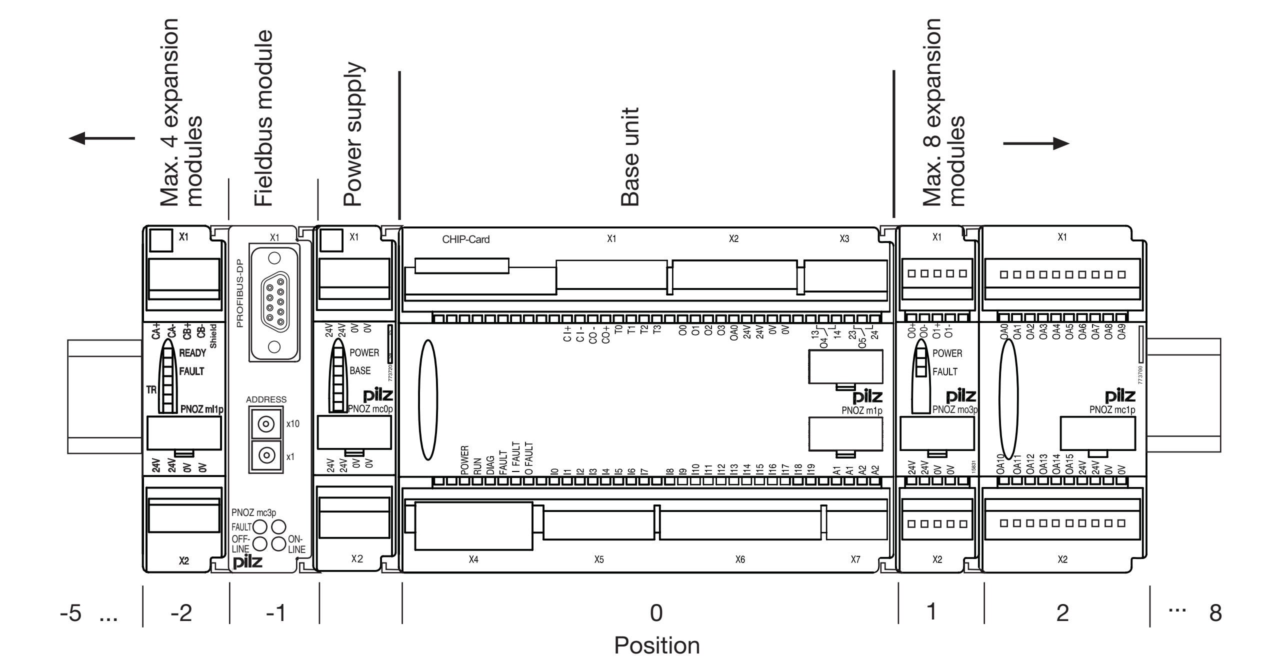
System description
Maximum system expansion

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

- Base units
- Expansion modules
- Fieldbus modules

Positioning of units

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



Base units:

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

System description
Maximum system expansion

Expansion modules:

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

Fieldbus modules:

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

System description
Diagnostics

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

Note

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

in the configuration guide “PNOZmulti – Special applications”.

LEDs on the base unit and expansion modules

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

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

Diagnostic Interface

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

Diagnostic data

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

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

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

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

Error stack

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

Diagnostic word

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

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

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

System description
Safety

Safety assessments

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

General safety requirements

Always ensure the following safety requirements are met:

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

Intended use

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

System description
Safety

Installation

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Installation

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Installation
Installing within the control cabinet

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

Positioning of units

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

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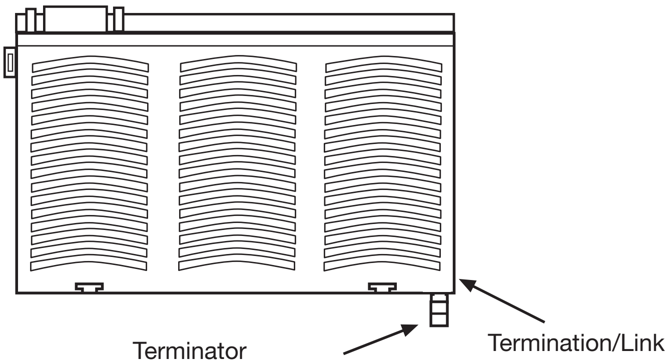
Installation
Installing the units

Installing a base unit without expansion modules

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

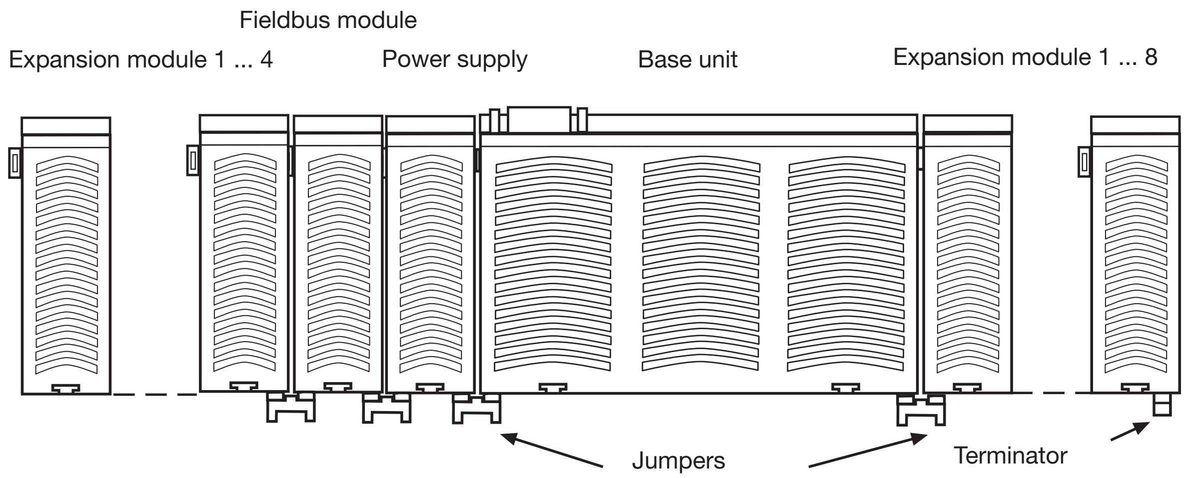


Connecting the base unit and expansion modules (PNOZ m1p, PNOZ m1p coated version, PNOZ m2p only)

Jumpers are used to connect the modules.

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

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



Electrical installation

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Electrical installation

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Electrical installation
General requirements

EMC

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

Supply voltage

- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation (SELV, PELV).
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 9 A.

Cables

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

Terminals

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

ESD

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

Electrical installation
General requirements

Configuration and Wiring

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Configuration and Wiring

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Configuration and Wiring
Inputs

Connection options

Depending on the unit type, the following may be connected to the inputs on the PNOZmulti:

- E-STOP pushbutton
- Safety gate limit switch
- Two-hand button
- Reset button
- Light beam device, light curtain
- Safety mats
- Enable switch
- Operating mode selector switch
- Proximity switch
- Incremental encoder
- Foot switch
- Key switch
- Limit switch
- Pushbutton
- Encoder or transducer to monitor safe analogue input signals

The PNOZmulti has inputs for both safety-related and standard applications.

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

Application with safety mats

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

Configuration in the PNOZmulti Configurator

The inputs on the PNOZmulti units are configured in the PNOZmulti Configurator.
For example, you can define the following:

- Switch types for various safety functions
- Connection assignment
- Detection of shorts between contacts in the input circuit
- Reset types
- Start-up test
- Detection of shorts between contacts in the reset circuit with test pulse assignment
- Input for standard function

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

Input signals

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

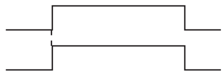
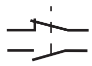
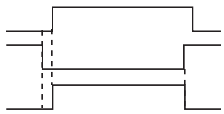
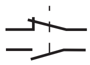
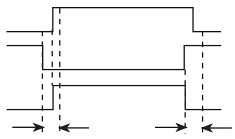
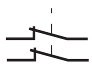
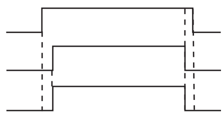
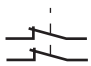
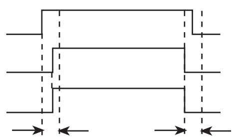
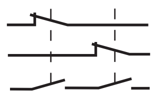
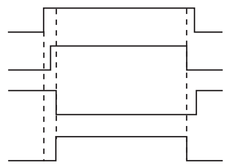
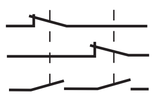
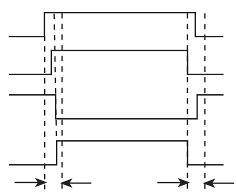
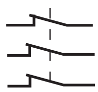
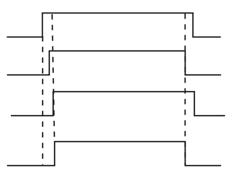
Connection assignment

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

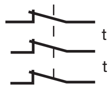
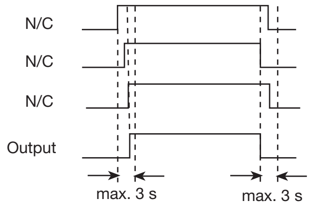
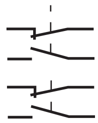
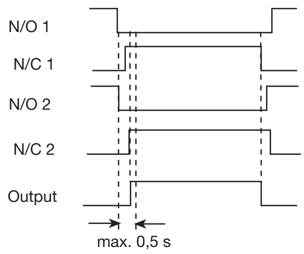
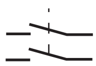
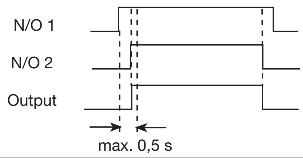
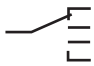
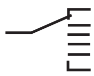
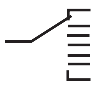
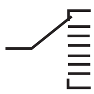
Select switch type

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

Configuration and Wiring
Inputs

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

Configuration and Wiring
Inputs

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

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Configuration and Wiring
Inputs

Input devices

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

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

The following may not be used:

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

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

Units with OSSD semiconductor outputs

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

ESPE

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

Operating modes

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

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

Reset button

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

Reset modes

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

- Automatic reset
- Manual reset
- Monitored reset

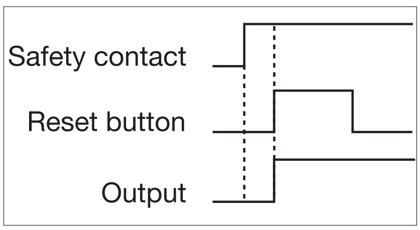
For a manual and monitored reset, the reset button can also be configured as a standard input.

- Automatic reset

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

- Manual reset

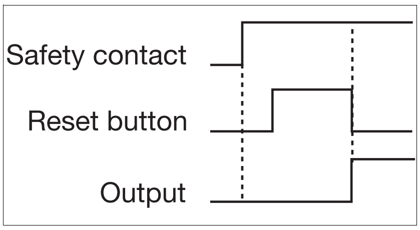
A N/O contact on the reset input generates the reset signal. The reset button must be operated after the safety switch has closed. The output on the input element is set to “1” when the reset button is operated.



- Monitored reset

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

Configuration and Wiring
Inputs



Test pulses and detection of shorts across contacts

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

Start-up test

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

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Configuration and Wiring
Logic elements

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

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

Speed monitor

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

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

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

Logic elements for press applications

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

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

Time elements

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

Muting

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

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

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

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

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

Configuration and Wiring
Outputs

Connection options

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

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

Configuration in the PNOZmulti Configurator

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

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

Switch-off delay

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

Relay

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

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

2-channel operation of loads

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

Semiconductor

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

Feedback loop

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

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

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

Contactor with positive-guided contacts

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

Configuration and Wiring
Inputs and outputs for standard functions

Inputs

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

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

Outputs

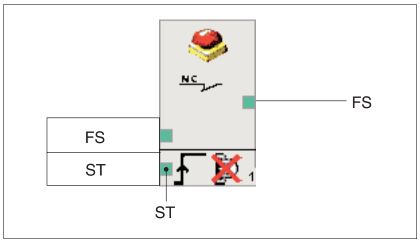
Outputs for standard functions may be
- Outputs for standard functions from units in the PNOZmulti-range
- 24 outputs for standard functions which are transmitted via the fieldbus
- 24 virtual outputs for standard functions which are transmitted via the serial interface

Use

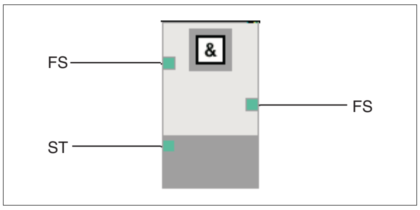
Inputs and outputs for standard functions must not be used for safety-related applications.

Examples in the PNOZmulti Configurator

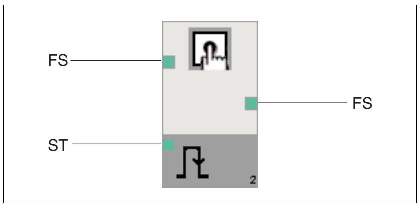
ST: Input or output for standard functions
FS: Input or output for safety functions
- Reset button on function elements



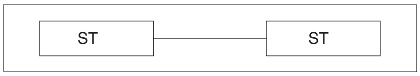
- AND connection



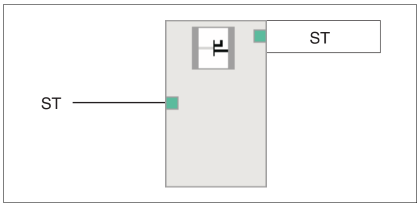
- Acknowledgement on reset element



- Direct connection of inputs and outputs for standard functions



- Input for driving an output for standard functions



Configuration and Wiring
Cascading

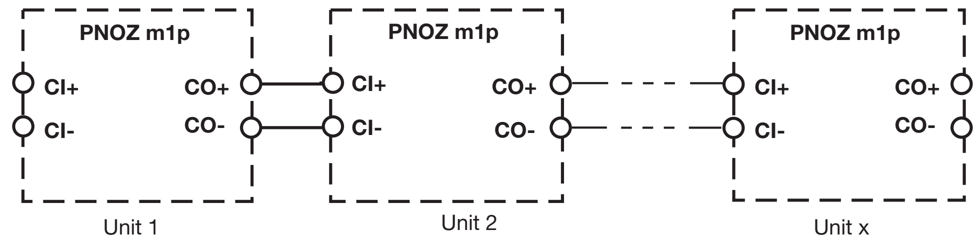
- Base units on the modular safety system can be networked. The cascading output on one base unit is connected to the cascading input on another base unit. In this way, one base unit can have direct access to a logic output and/or an input on the connected base unit.
- The base units can be connected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

System requirements

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

Series connection

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



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

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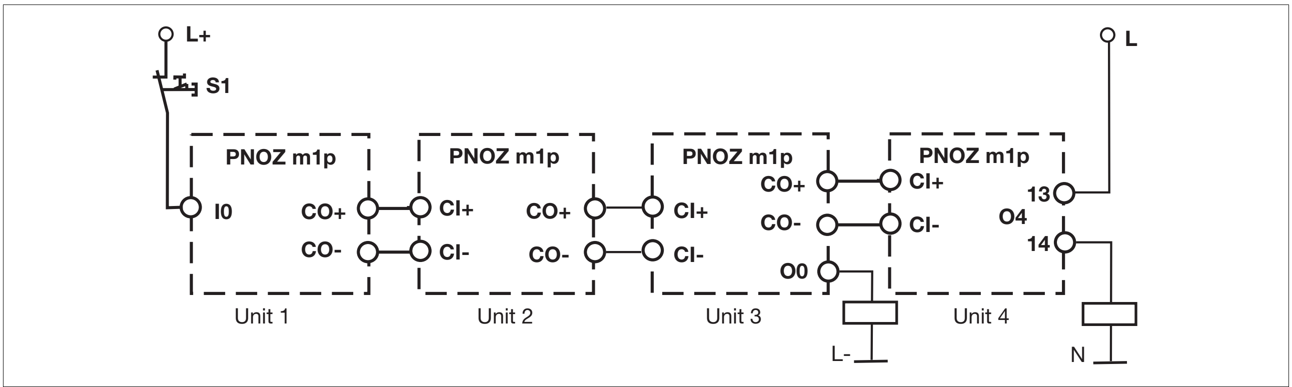
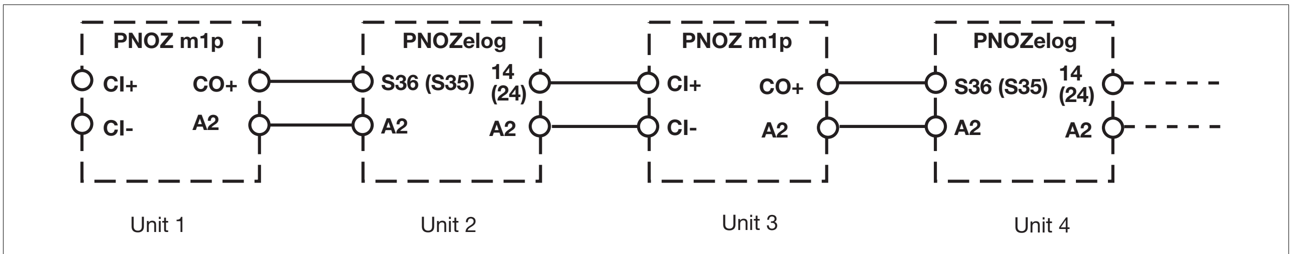
Configuration and Wiring
Cascading

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



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

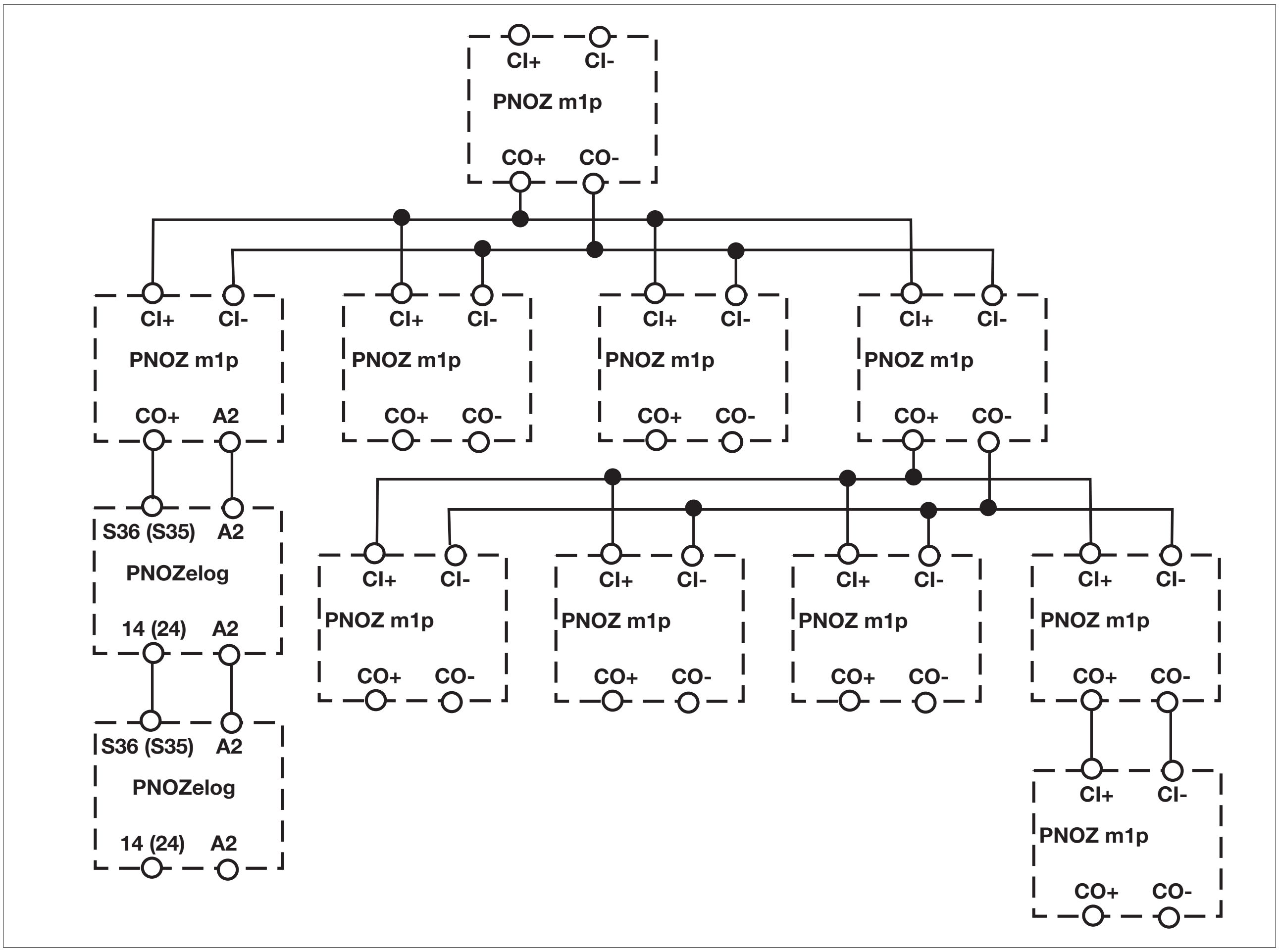


Configuration and Wiring
Cascading

Tree structure

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

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



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Configuration and Wiring
Cascading

Supply voltage for the cascaded units

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

Installing the cascaded units

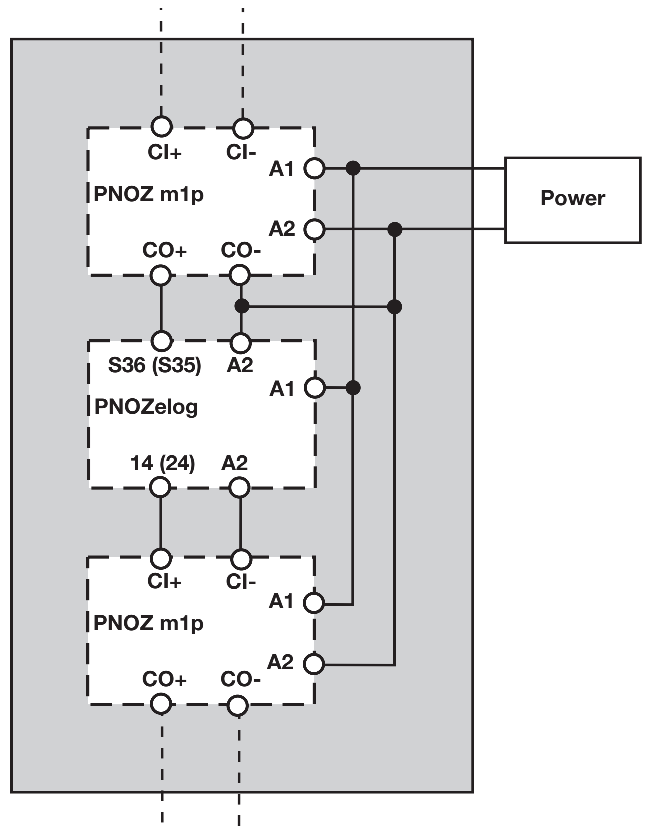
- If PNOZmulti units alone are being networked, the networked units may be housed in separate control cabinets.
- If PNOZelog units are integrated into the network, these PNOZelog units and their cascade cables must always be housed in the same control cabinet as the PNOZmulti units that are connected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

Wiring

Please observe the following when wiring:

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

1.4



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Selection guide

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Selection guide

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Selection guide
Base units and expansion modules

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

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Selection guide
Fieldbus modules

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

Base units

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more than automation
safe automation

Base units

Contents	Page

Base units
PNOZ m0p

Base units from the PNOZmulti modular safety system

Approvals

	PNOZ m0p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

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

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

Chip card

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

Safety features

The relay conforms to the following safety criteria:

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

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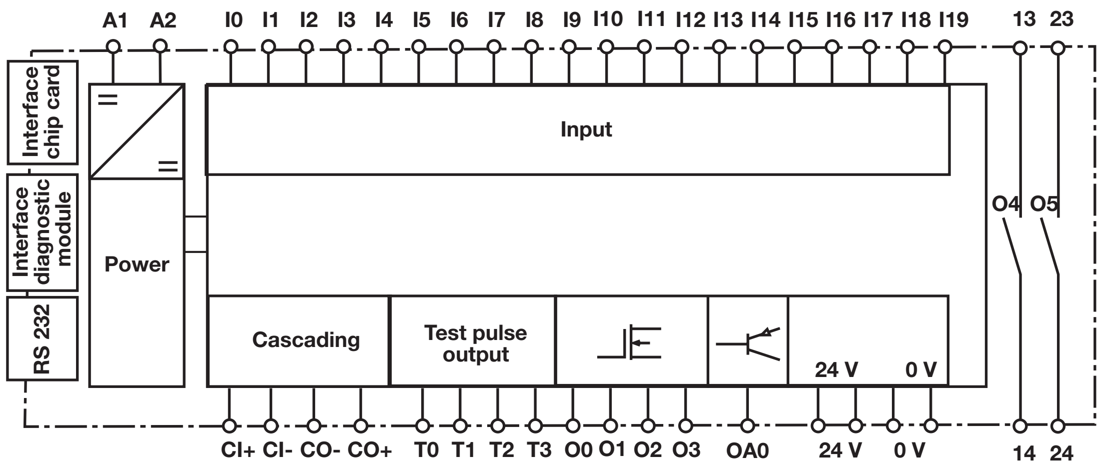
NSG-D-2-358-2007-09

Base units
PNOZ m0p

Block diagram



Base units

PNOZ m0p

Function description

The function of the inputs and outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly. The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

Wiring

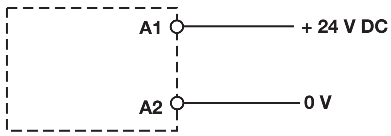
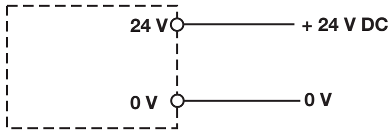
The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a particular safety function and the outputs that will switch this safety function.
Please note:

- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.
  Where test pulses are used for the safety mat, they may not be reused for other purposes.
  Safety mats are supported from Version 1.2 of the base unit.

Base units
PNOZ m0p

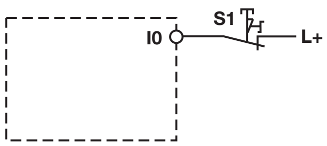
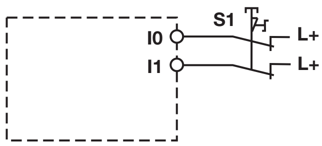
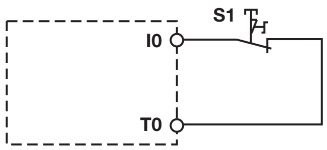
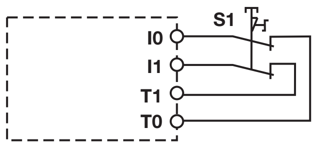
Preparing for operation

▸ Supply voltage

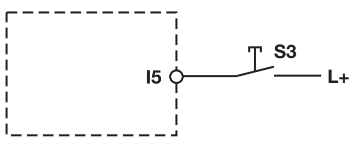
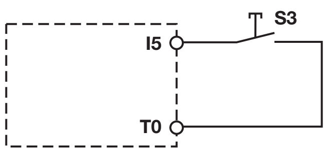
Supply voltage	AC	DC
For the safety system (connector X7)		
For the semiconductor outputs (connector X2) Must always be present, even if the semi-conductor outputs are not used		

Connection examples:

▸ Input circuit

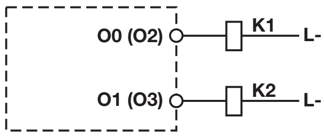
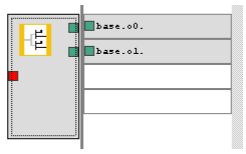
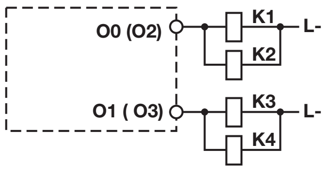
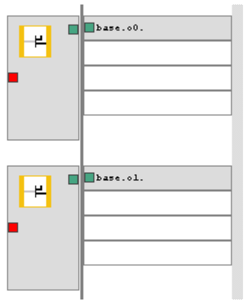
Input circuit	Single-channel	Dual-channel
Example: E-STOP **without** detection of shorts across con-tacts		
Example: E-STOP **with** detection of shorts across contacts		

▸ Reset circuit

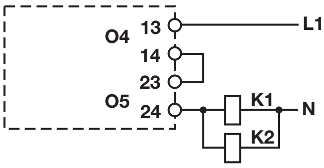
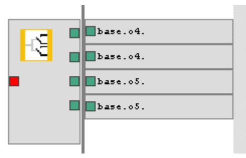
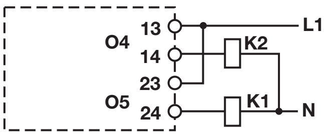
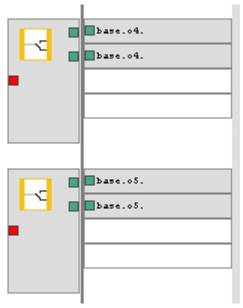
Reset circuit	Input circuit without detection of shorts across contacts	Input circuit with detection of shorts across contacts
Monitored reset		

Base units
PNOZ m0p

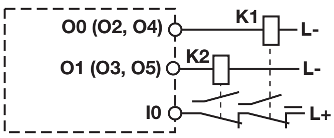
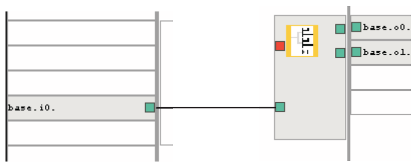
Semiconductor outputs

Redundant output		
Single output		

Relay outputs

Redundant		
Single		

Feedback loop

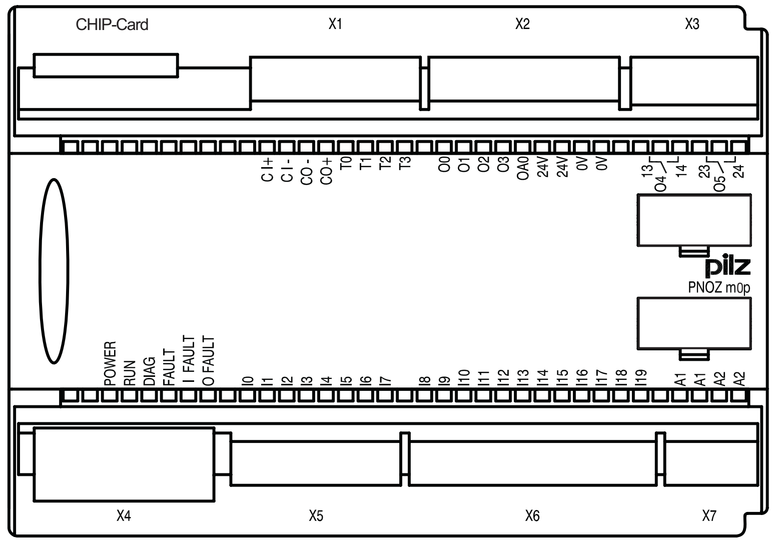
Feedback loop	Redundant output	
Contacts from external contactors		

Key

S1	E-STOP pushbutton
S3	Reset button

Base units
PNOZ m0p

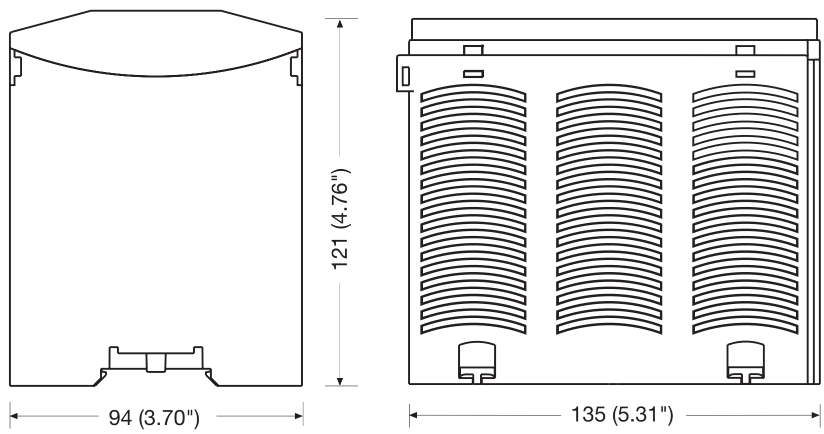
Terminal configuration



Installation

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

Dimensions



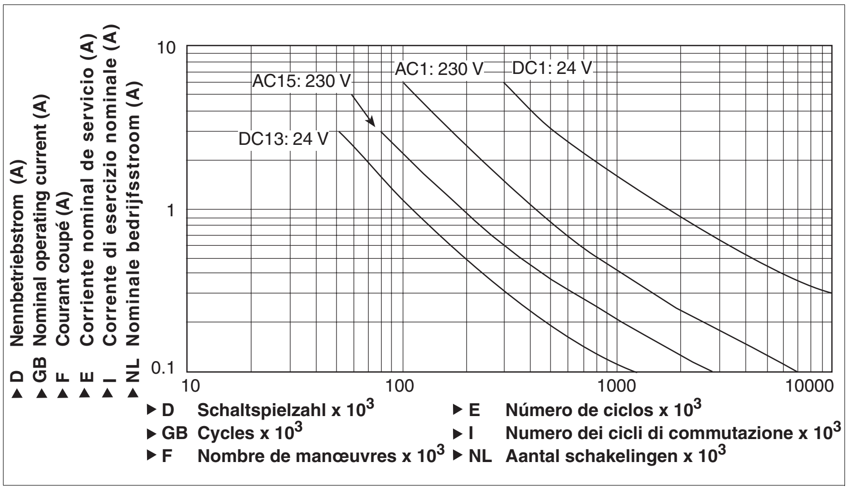
Base units

PNOZ m0p

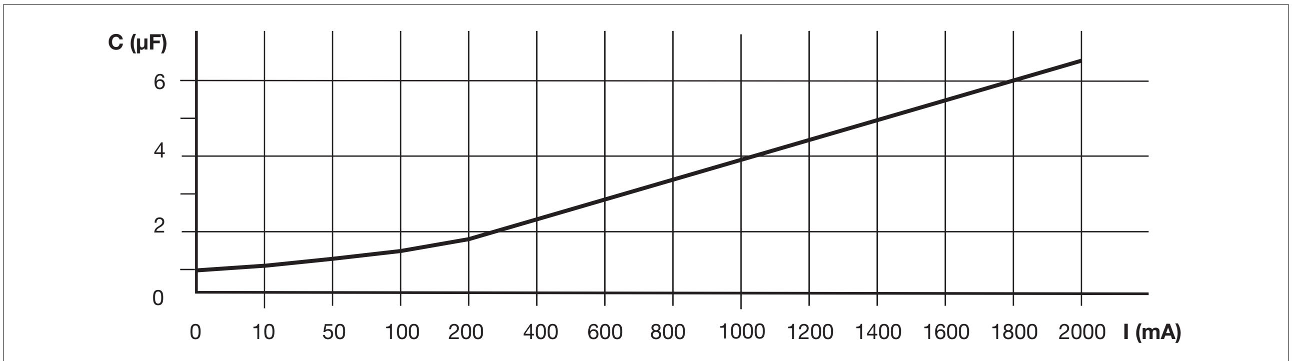
Notice

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

Service life graph



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



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

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Base units
PNOZ m0p

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

Base units
PNOZ m0p

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

Order reference

Type	Features	Order no.
PNOZ m0p	Base unit	773 110

Base units
PNOZ m1p

Base units from the PNOZmulti modular safety system

Approvals

	PNOZ m1p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

Chip card

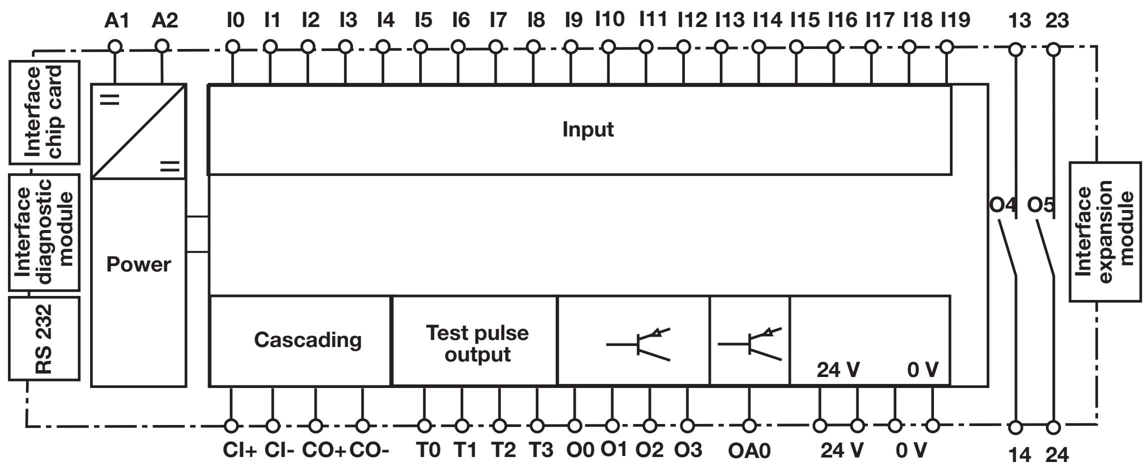
Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see chapter containing the order references).
The chip card with a memory of 32 kByte can only be used from PNOZ m1p Version 2.0.

Safety features

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

Base units
PNOZ m1p

Block diagram



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Base units
PNOZ m1p

Function description

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

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

Wiring

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

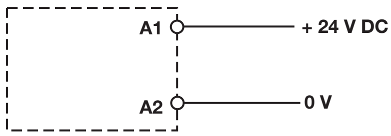
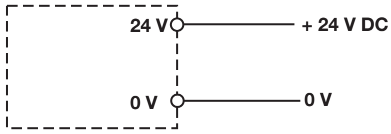
- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.

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

Base units
PNOZ m1p

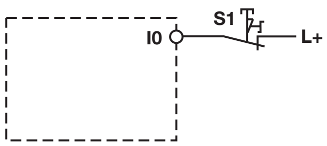
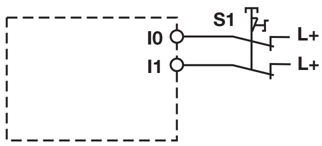
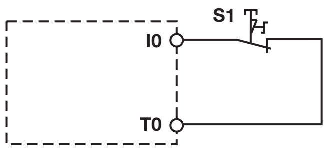
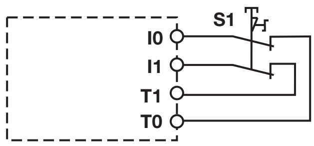
Preparing for operation

- Supply voltage

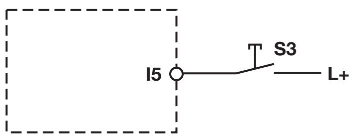
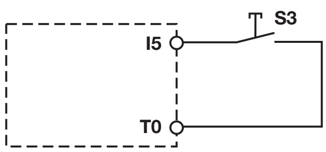
Supply voltage	AC	DC
For the safety system (connector X7)		
For the semiconductor outputs (connector X2) Must always be present, even if the semi-conductor outputs are not used		

Connection examples

- Input circuit

Input circuit	Single-channel	Dual-channel
E-STOP **without** detection of shorts across con-tacts		
E-STOP **with** detection of shorts across contacts		

- Reset circuit

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

2.2

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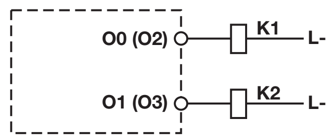
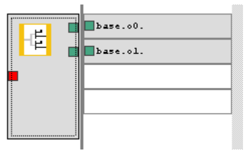
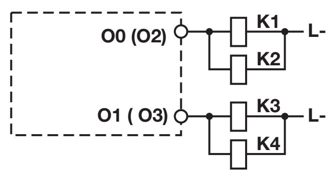
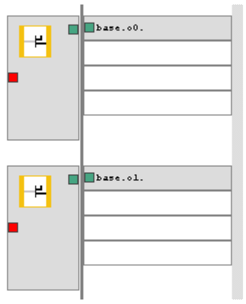
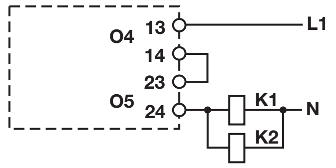
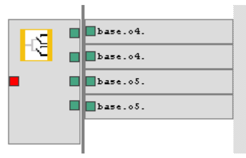
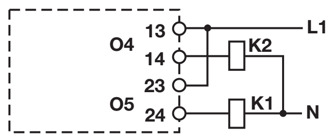
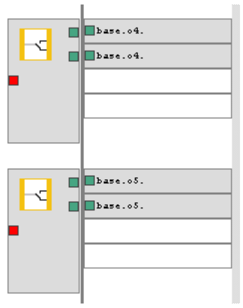
Base units
PNOZ m1p

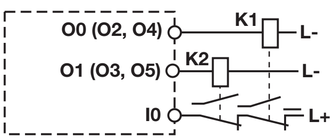
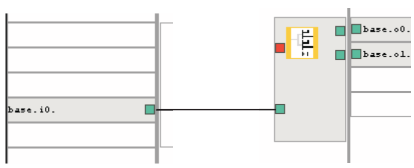
Semiconductor outputs

Redundant output		
Single output		

Relay outputs

Redundant output		
Single output		

Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

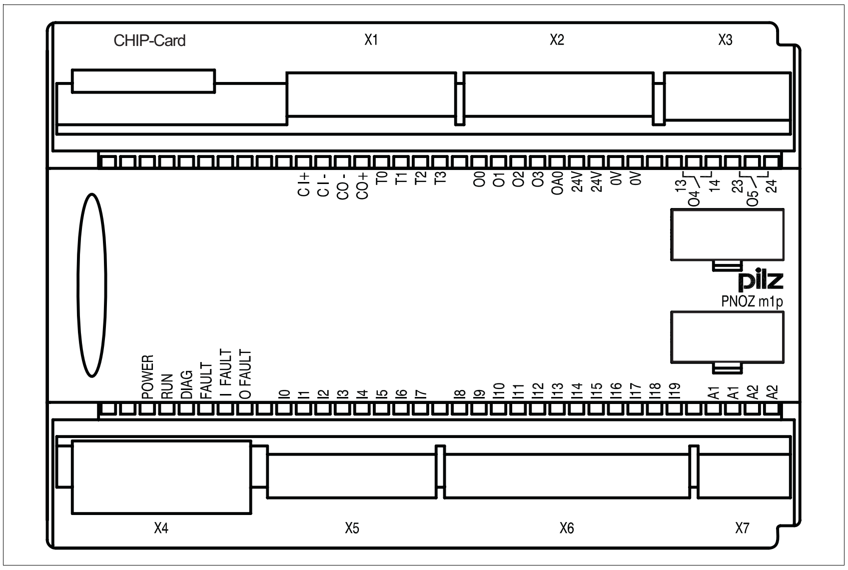
Key

S1	E-STOP pushbutton
S3	Reset button

Base units

PNOZ m1p

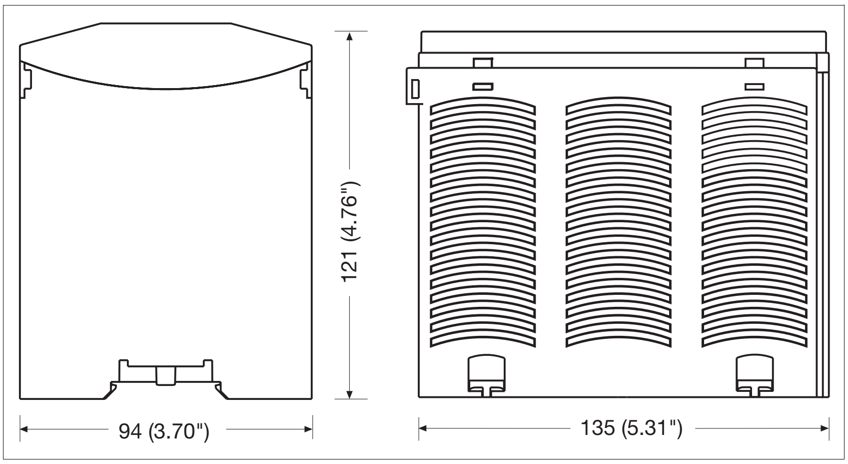
Terminal configuration



Installation

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

Dimensions

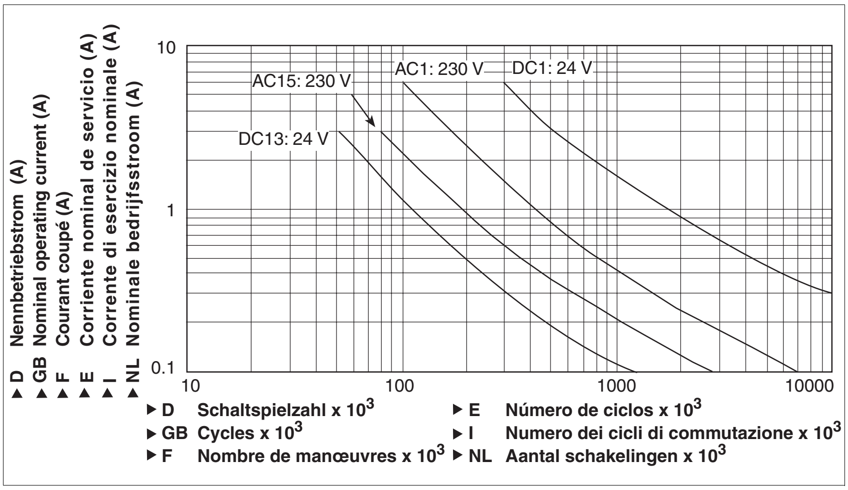


Base units
PNOZ m1p

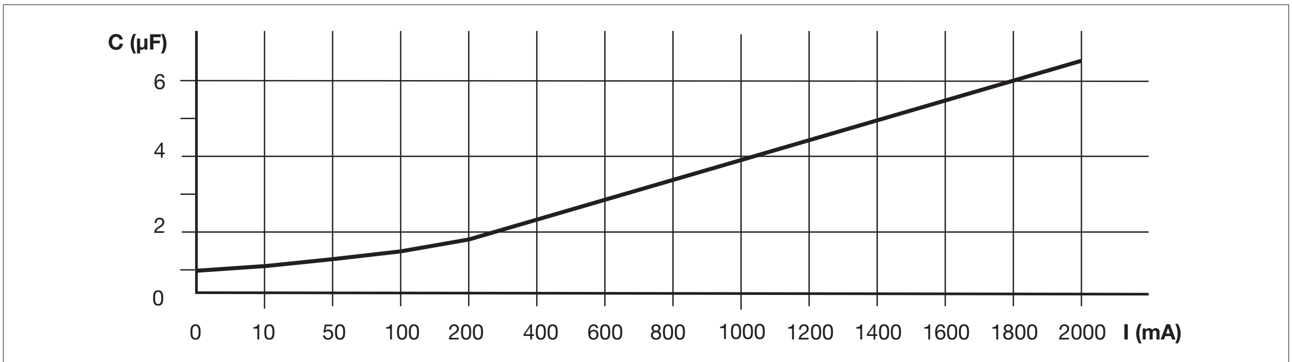
Notice

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

Service life graph



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



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

Base units
PNOZ m1p

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

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more than automation
safe automation

Base units
PNOZ m1p

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

Order reference

Type	Features	Order no.
PNOZ m1p	Base unit	773 100

2.2

Base units
PNOZ m1p coated version

Base units from the PNOZmulti modular safety system

Approvals

	PNOZ m1p coated version
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

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

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

Chip card

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

Safety features

The relay conforms to the following safety criteria:

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

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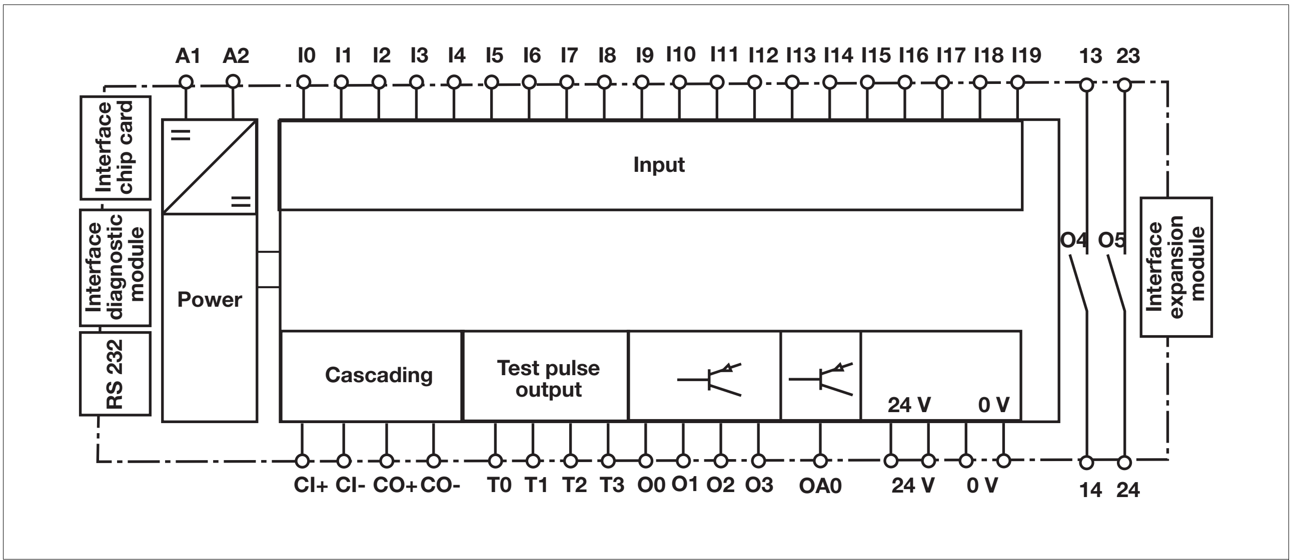
Base units
PNOZ m1p coated version

Block diagram



Base units
PNOZ m1p coated version

Function description

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

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

Wiring

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

- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.

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

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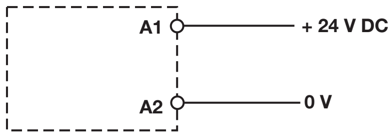
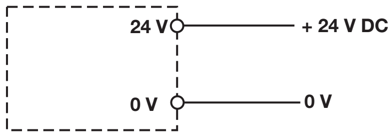
NSG-D-2-361-2007-09

Base units
PNOZ m1p coated version

Preparing for operation

- Supply voltage

<table>
<tr><th>Supply voltage</th><th>AC</th><th>DC</th></tr>
<tr><td>For the safety system
(connector X7)</td><td></td><td>
</td></tr>
<tr><td>For the semiconductor outputs
(connector X2)
Must always be present, even if the semi-conductor outputs are not used</td><td></td><td>
</td></tr>
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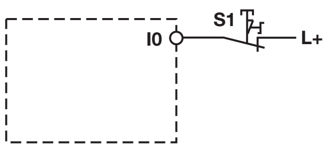
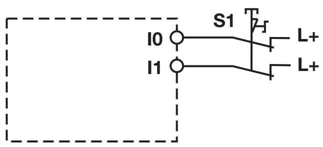
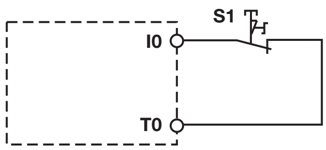
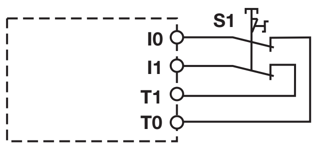
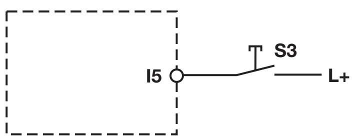
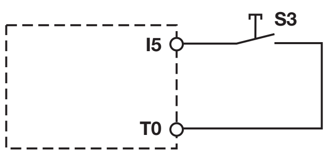
Connection examples

- Input circuit

<table>
<tr><th>Input circuit</th><th>Single-channel</th><th>Dual-channel</th></tr>
<tr><td>E-STOP
without detection of shorts across con-tacts</td><td>
</td><td>
</td></tr>
<tr><td>E-STOP
with detection of shorts across contacts</td><td>
</td><td>
</td></tr>
</table>

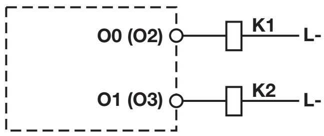
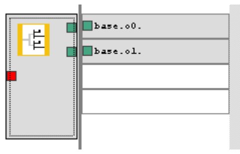
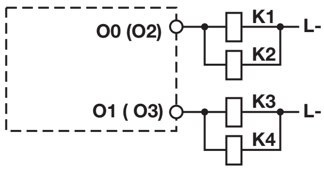
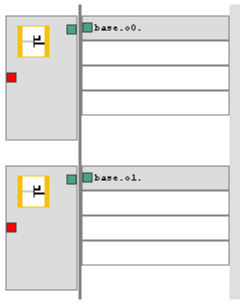
- Reset circuit

<table>
<tr><th>Reset circuit</th><th>Input circuit without detection of shorts across contacts</th><th>Input circuit with detection of shorts across contacts</th></tr>
<tr><td></td><td>
</td><td>
</td></tr>
</table>

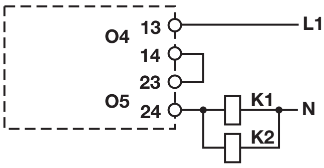
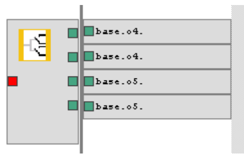
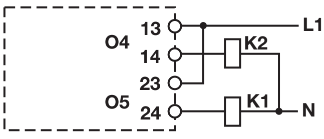
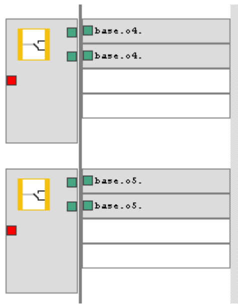
2.2

Base units
PNOZ m1p coated version

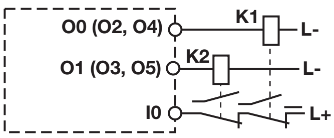
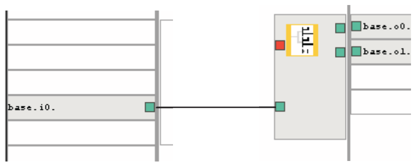
Semiconductor outputs

Redundant output		
Single output		

Relay outputs

Redundant output		
Single output		

Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

Key

S1	E-STOP pushbutton
S3	Reset button

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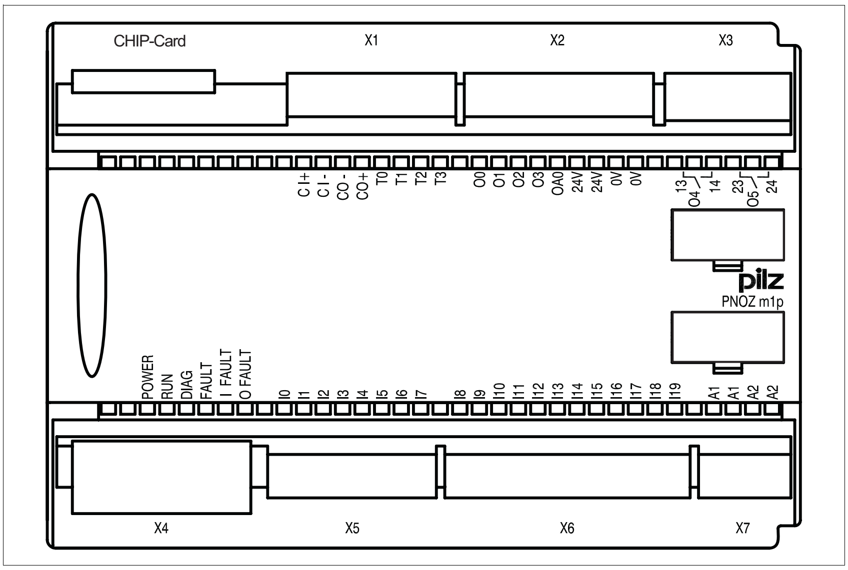
Base units

PNOZ m1p coated version

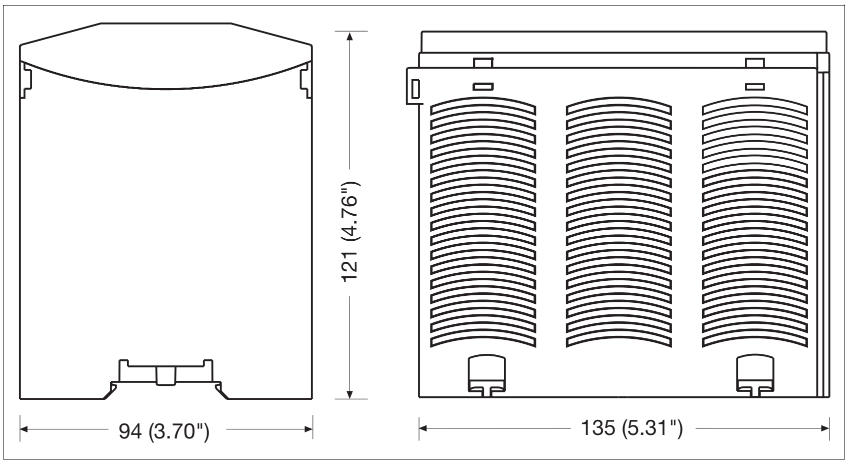
Terminal configuration



Installation

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

Dimensions



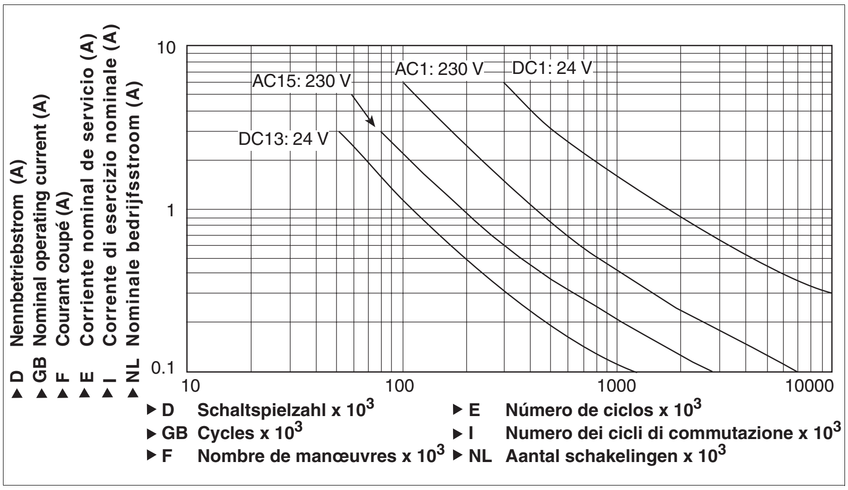
Base units

PNOZ m1p coated version

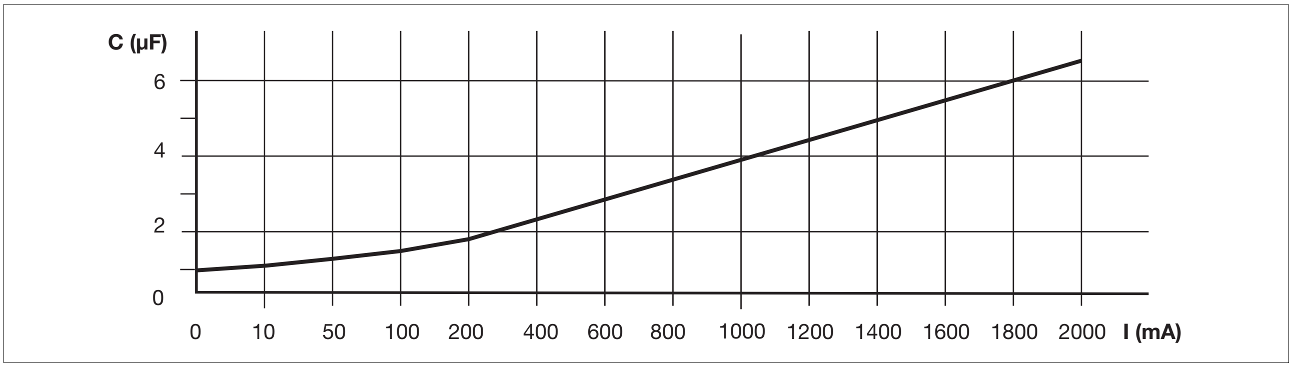
Notice

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

Service life graph



Maximum capacitive load C (µF) with load current I (mA) at the semi-conductor outputs



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

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Base units

PNOZ m1p coated version

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

Base units
PNOZ m1p coated version

Cascading output as auxiliary output	
Quantity	**1**
Voltage and current	**24 VDC / max. 0.2 A / max. 4.8 W**
Galvanic isolation	**No**
Short circuit protection	**Yes**
Residual current at "0"	**< 0.5 mA**
Environmental data	
Airgap creepage between relay contacts Relay contacts and other safe circuits	**DIN VDE 0110-1, 04/97** **3 mm** **5.5 mm**
Vibration in accordance with **EN 60068-2-6, 04/95** Frequency: Amplitude:	 **10 ... 55 Hz** **0.35 mm**
Climatic suitability	**DIN IEC 60068-2-3, 12/86**
EMC	**EN 60947-5-1, 01/00**
Ambient temperature With UL approval Without UL approval	 **0 ... +50 °C** **-25 ... +60 °C**
Storage temperature	**-25 ... +70 °C**
Corrosive gas check SO2: concentration 10 ppm, duration 10 days, passive H2S: concentration 1 ppm, duration 10 days, passive	 **DIN V 40046-36** **DIN V 40046-37**
Mechanical data	
Protection type Mounting (e.g. cabinet) Housing Terminals	 **IP54** **IP20** **IP20**
DIN rail Top hat rail Recess width	 **35 x 7.5 EN 50022** **27 mm**
Maximum cable runs Per input Sum of individual cable runs at the test pulse output	 **1 km** **40 km**
Cross section of external conductors Rigid single-core, flexible multi-core or multi-core With crimp connector Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1) auxiliary output (X2), cascading output Relay outputs (X3) Flexible multi-core with plastic sleeve Relay outputs (X3)	 **0.5 ... 1.5 mm²** **0.5 ... 2.5 mm²** **0.5 ... 1.5 mm²**
Torque setting for connection terminals (screws) Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1), auxiliary output (X2), cascading output Relay outputs (X3)	 **0.2 ... 0.25 Nm** **0.4 ... 0.5 Nm**
Housing material Housing Front	 **PPO UL 94 V0** **ABS UL 94 V0**
Dimensions (H x W x D)	**94 x 135 x 121 mm**
Weight with connector	**530 g**

Order reference

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

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NSG-D-2-361-2007-09

Base units
PNOZ m2p

Base units from the PNOZmulti modular safety system

Approvals

	PNOZ m2p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

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

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

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

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

Chip card

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

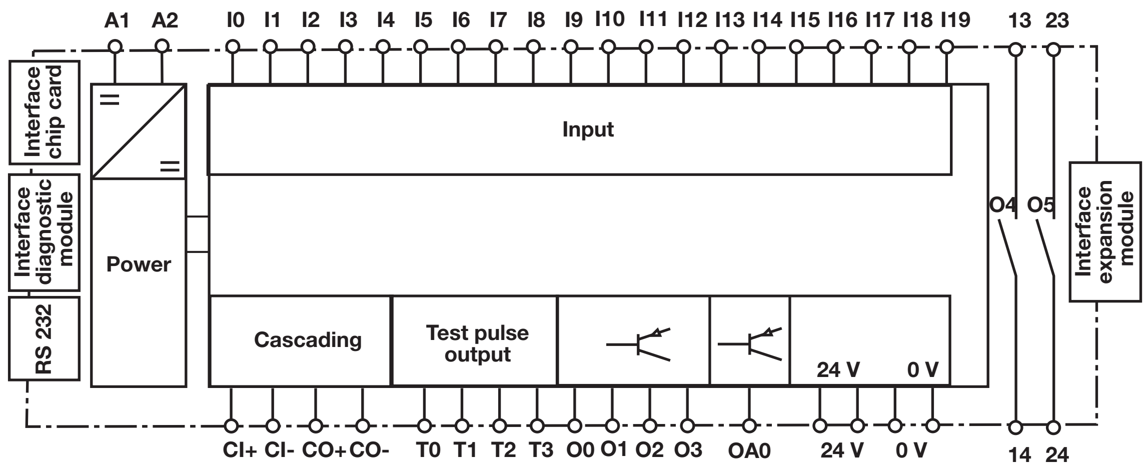
Safety features

The relay conforms to the following safety criteria:

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

Base units
PNOZ m2p

Block diagram



Base units
PNOZ m2p

Function description

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

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

Wiring

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

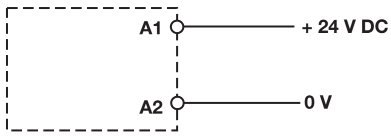
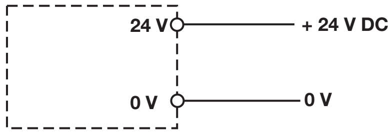
- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.

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

Base units
PNOZ m2p

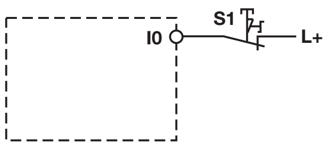
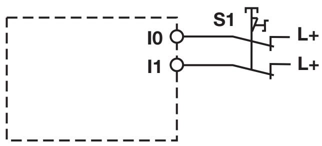
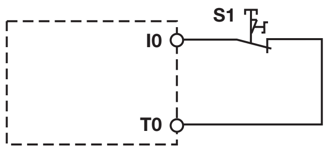
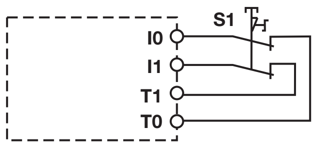
Preparing for operation

- Supply voltage

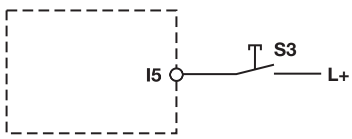
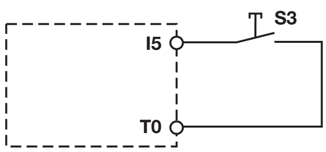
Supply voltage	AC	DC
For the safety system (connector X7)		
For the semiconductor outputs (connector X2) Must always be present, even if the semi-conductor outputs are not used		

Connection examples

- Input circuit

Input circuit	Single-channel	Dual-channel
E-STOP **without** detection of shorts across con-tacts		
E-STOP **with** detection of shorts across contacts		

- Reset circuit

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

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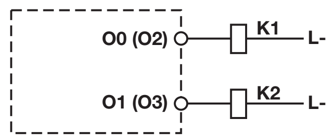
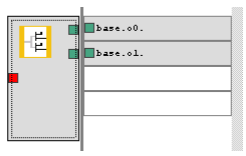
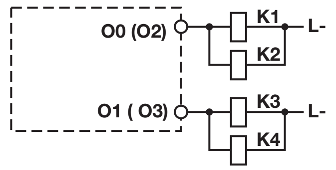
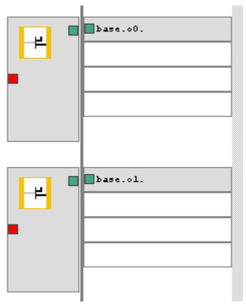
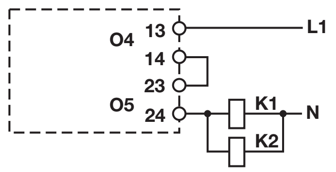
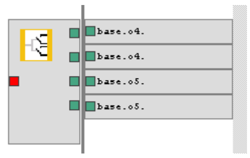
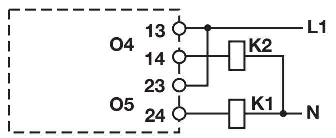
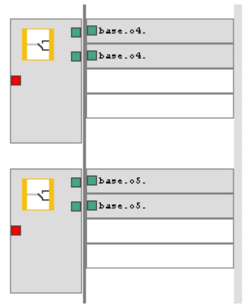
Base units
PNOZ m2p

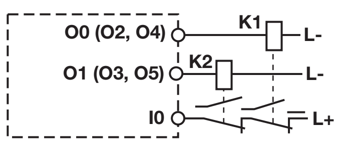
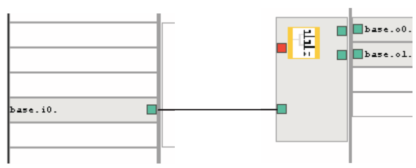
Semiconductor outputs

Redundant output		
Single output		

Relay outputs

Redundant output		
Single output		

Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

Key

S1	E-STOP pushbutton
S3	Reset button

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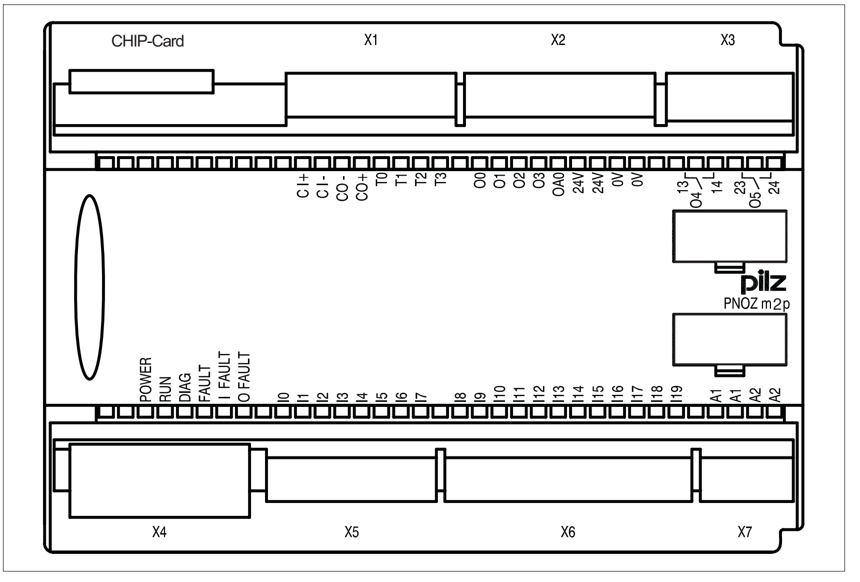
Base units
PNOZ m2p

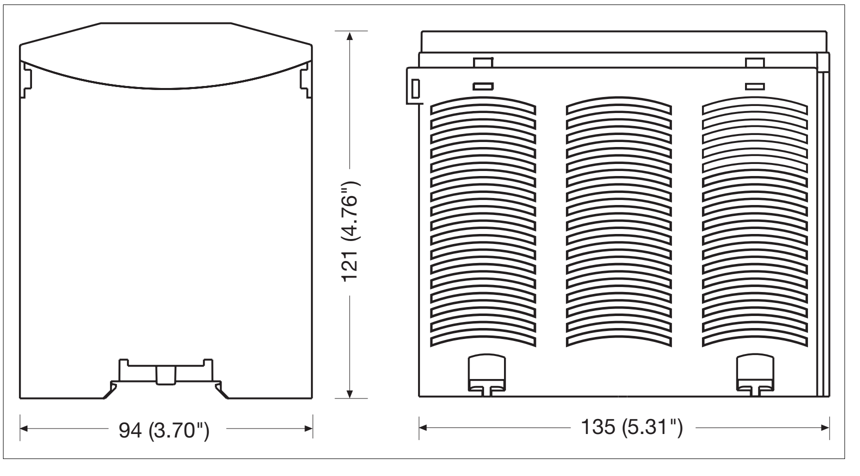
Terminal configuration



Installation

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

Dimensions

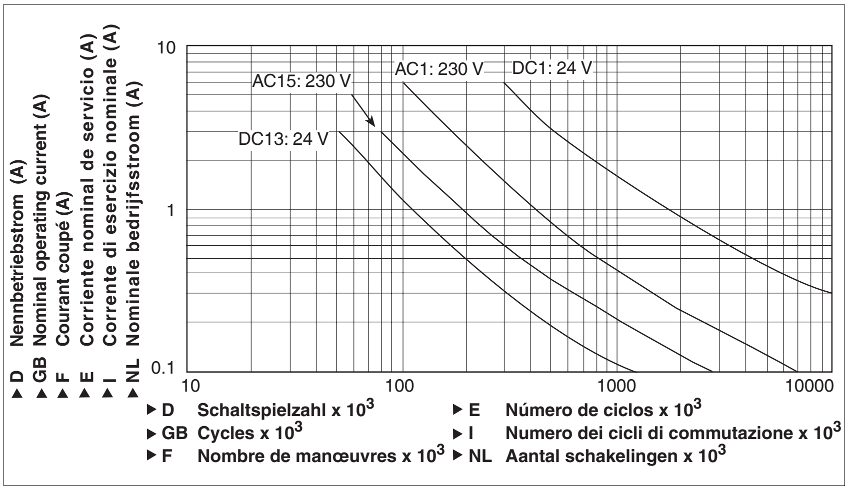


Base units
PNOZ m2p

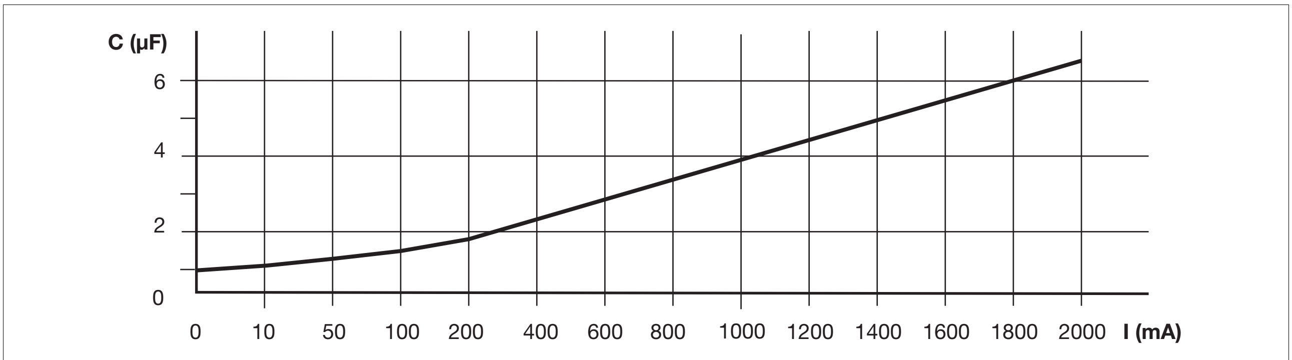
Notice

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

Service life graph



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



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

2.2

Base units
PNOZ m2p

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

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Base units
PNOZ m2p

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

Order reference

Type	Features	Order no.
PNOZ m2p	Base unit	773 120

more than automation
safe automation

Expansion modules

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
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Expansion modules

Contents	Page
Expansion modules	

Expansion modules
PNOZ ma1p

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

Approvals

	PNOZ ma1p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

The expansion module is an analogue input module. It provides 2 safe analogue inputs for current or voltage measurement. For current measurement, both inputs can be used independently. For voltage measurement, both inputs must always be wired. The analogue inputs are suitable for connecting transducers or input devices with standardised 10 V voltage signals or 20 mA current signals. The analogue inputs are designed as differential inputs. Each analogue input has a signal range of –10 VDC to +10 VDC or 0 mA to 25 mA.
The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

System requirements

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

Please contact Pilz if you have an older version.

Safety features

The PNOZ ma1p expansion module fulfils the following safety requirements:
The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

The analogue input module can be used for current measurement for applications up to SIL3.
For applications in accordance with SIL2 or SIL3, input devices must be connected that are certified for SIL2 in accordance with IEC 61508. The output signal of the input device must be monitored, i.e. the actual and set value must be compared. If there is any deviation there must be a reaction that the PNOZmulti will recognise and to which it will react.
- **SIL2 applications:**
  SIL2 applications are only possible for current measurement. If the analogue input module is to be used for current measurement on SIL2 applications, both inputs can be used independently for current measurement.
- **SIL 3 applications:**
  If the analogue input module is to be used for SIL3 applications, both inputs must be configured and then combined to form a SIL3 input. To do this, connect a suitable input device to each input. The analogue input module will then check the feasibility of the input signals, i.e. the values measured from both input signals are compared.

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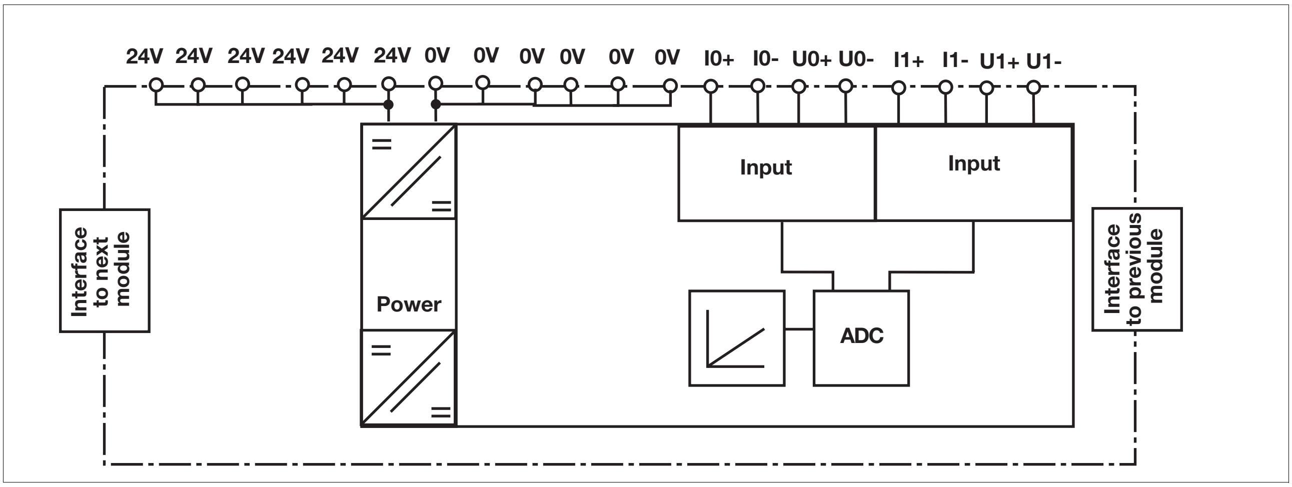
NSG-D-2-407-2008-03

Expansion modules
PNOZ ma1p

Block diagram



Function description

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

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

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

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

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

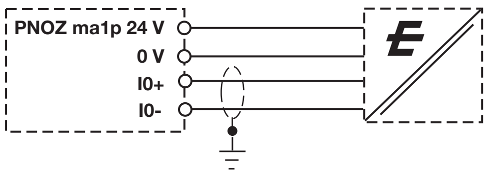
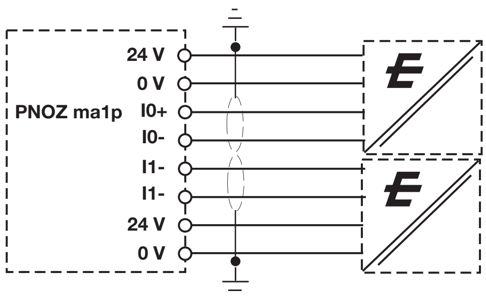
Expansion modules
PNOZ ma1p

Wiring

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

Preparing for operation

- Connection to transducer

Example for current measurement	
SIL2 application	
SIL3 application	

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

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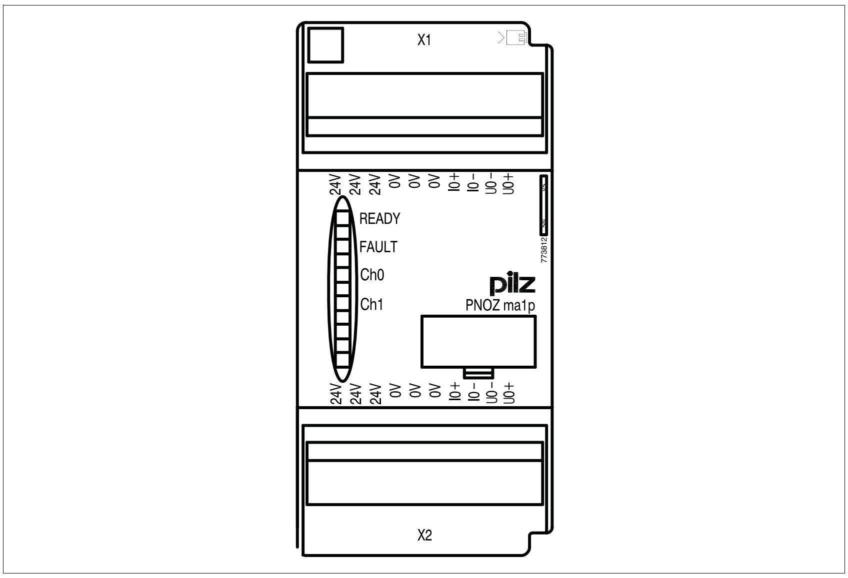
Expansion modules
PNOZ ma1p

Notice

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

Terminal configuration

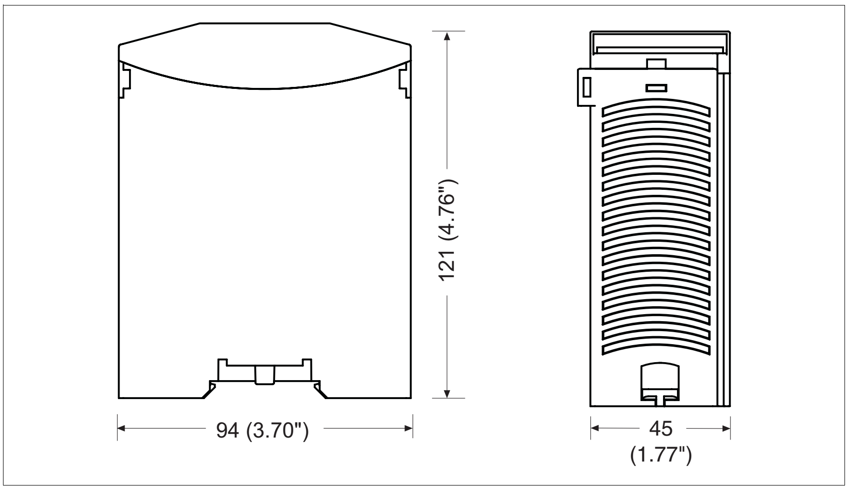


Installation

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

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

Dimensions



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Expansion modules
PNOZ ma1p

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

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Expansion modules
PNOZ ma1p

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

*****in relation to the measuring range

The standards current on 2007-08 apply.

Order reference

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

Expansion modules
PNOZ mi1p

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

Approvals

	PNOZ mi1p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

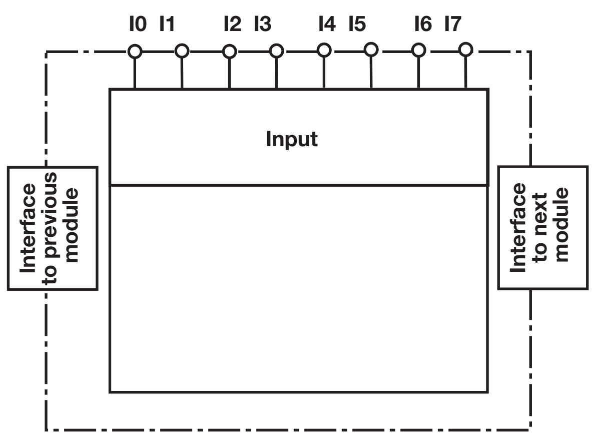
The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

Safety features

The relay conforms to the following safety criteria:
- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

Block diagram



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NSG-D-2-369-2007-09

Expansion modules
PNOZ mi1p

Function description

The expansion module provides additional inputs.
The function of the inputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

Wiring

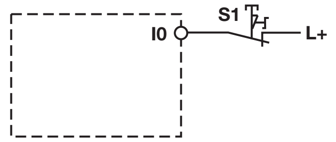
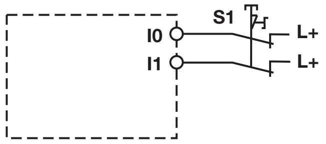
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.
Please note:

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

Expansion modules
PNOZ mi1p

Preparing for operation

- Input circuit

<table>
<tr><td>Input circuit</td><td>Single-channel</td><td>Dual-channel</td></tr>
<tr><td>Example:
E-STOP
without detection of shorts across contacts</td><td></td><td></td></tr>
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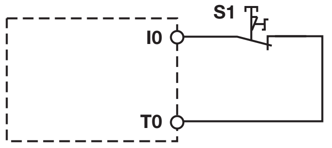
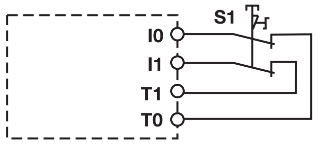
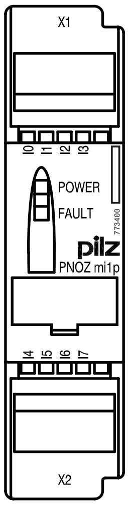
with detection of shorts across contacts</td><td></td><td></td></tr>
</table>

- Key

S1	E-STOP pushbutton

Expansion modules
PNOZ mi1p

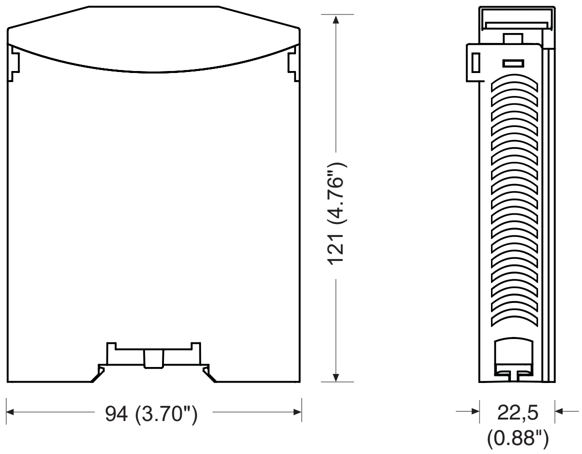
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mi1p

Notice

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

Technical details	
Electrical data	
Supply voltage (U_B)	**24 VDC**
Power consumption at U_B without load	**Max. 8.0 W + 2.5 W per expansion module**
Times	
Switch-on delay	**5 s (after U_B is applied)**
Simultaneity channel 1/2/3	**3 s, two-hand control relay: 0.5 s**
Supply interruption before de-energisation	**Min. 20 ms**
Inputs	
Quantity	**8**
Voltage and current	**24 VDC/8 mA**
Galvanic isolation	**No**
Signal level at “0”	**-3 ... +5 VDC**
Signal level at “1”	**15 ... 30 VDC**
Input delay	**0.6 ... 4 ms**
Status indicator	**LED**
Environmental data	
Airgap creepage	**DIN VDE 0110-1, 04/97**
Vibration in accordance with **EN 60068-2-6, 04/95** Frequency: Amplitude:	 **10 ... 55 Hz** **0.35 mm**
Climatic suitability	**EN 60068-2-78, 10/01**
EMC	**EN 60947-5-1, 11/97**
Ambient temperature	**0 ... +55 °C**
Storage temperature	**-25 ... +70 °C**
Mechanical data	
Protection type Mounting (e.g. cabinet) Housing Terminals	 **IP54** **IP20** **IP20**
DIN rail Top hat rail Recess width	 **35 x 7.5 EN 50022** **27 mm**
Cross section of external conductors Rigid single-core, flexible multi-core or multi-core With crimp connector	 **0.5 ... 1.5 mm²**
Torque setting for connection terminals (screws)	**0.2 ... 0.25 Nm**
Housing material Housing Front	 **PPO UL 94 V0** **ABS UL 94 V0**
Dimensions (H x W x D)	**94 x 22.5 x 121 mm**
Weight with connector	**130 g**

Order reference

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

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Expansion modules
PNOZ mi1p coated version

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

Approvals

	PNOZ mi1p coated version
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

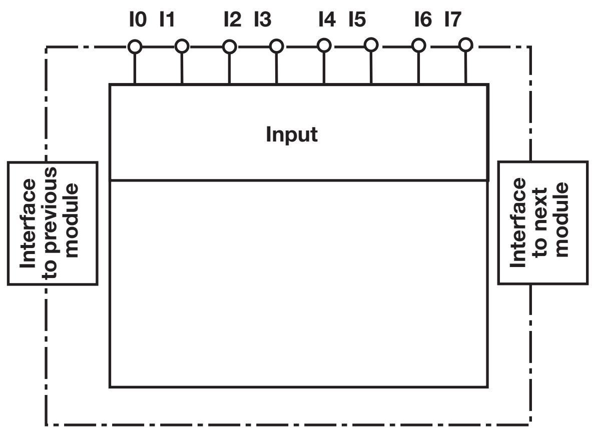
Unit description

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

Safety features

The relay conforms to the following safety criteria:
- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

Block diagram



2.3

Expansion modules
PNOZ mi1p coated version

Function description

The expansion module provides additional inputs.
The function of the inputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

Wiring

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

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Expansion modules
PNOZ mi1p coated version

Preparing for operation

▸ Input circuit

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<tr><td>Example:
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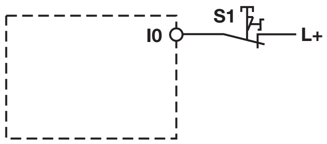
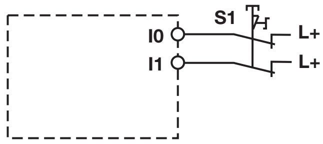
without detection of shorts across contacts</td><td></td><td></td></tr>
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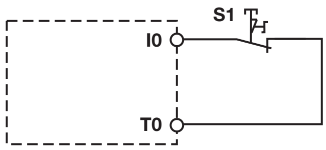
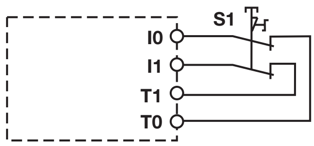
with detection of shorts across contacts</td><td></td><td></td></tr>
</table>

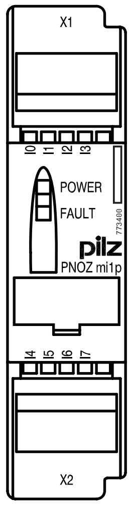
▸ Key

S1	E-STOP pushbutton

2.3

Expansion modules
PNOZ mi1p coated version

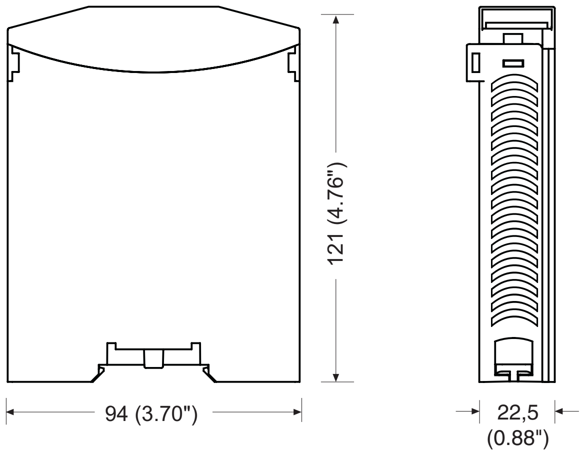
Terminal configuration



Installation

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

Dimensions



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more than automation
safe automation

Expansion modules

PNOZ mi1p coated version

Notice

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

Technical details	
Electrical data	
Supply voltage (U_B)	**24 VDC**
Power consumption at U_B without load	**Max. 8.0 W + 2.5 W per expansion module**
Times	
Switch-on delay	**5 s (after U_B is applied)**
Simultaneity channel 1/2/3	**3 s, two-hand control relay: 0.5 s**
Supply interruption before de-energisation	**Min. 20 ms**
Inputs	
Quantity	**8**
Voltage and current	**24 VDC/8 mA**
Galvanic isolation	**No**
Signal level at “0”	**-3 ... +5 VDC**
Signal level at “1”	**15 ... 30 VDC**
Input delay	**0.6 ... 4 ms**
Status indicator	**LED**
Environmental data	
Airgap creepage	**DIN VDE 0110-1, 04/97**
Vibration in accordance with **EN 60068-2-6, 04/95** Frequency: Amplitude:	 **10 ... 55 Hz** **0.35 mm**
Climatic suitability	**EN 60068-2-78, 10/01**
EMC	**EN 60947-5-1, 11/97**
Ambient temperature	**0 ... +50 °C**
Storage temperature	**-25 ... +70 °C**
Mechanical data	
Protection type Mounting (e.g. cabinet) Housing Terminals	 **IP54** **IP20** **IP20**
DIN rail Top hat rail Recess width	 **35 x 7.5 EN 50022** **27 mm**
Cross section of external conductors Rigid single-core, flexible multi-core or multi-core With crimp connector	 **0.5 ... 1.5 mm²**
Torque setting for connection terminals (screws)	**0.2 ... 0.25 Nm**
Housing material Housing Front	 **PPO UL 94 V0** **ABS UL 94 V0**
Dimensions (H x W x D)	**94 x 22.5 x 121 mm**
Weight with connector	**130 g**

Order reference

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

Expansion modules
PNOZ mi2p

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

Unit features

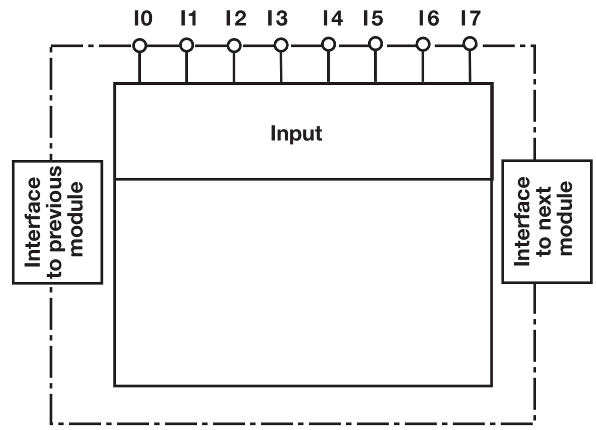
- 8 inputs for standard functions
- Can be configured in the PNOZmulti Configurator
- LED indicator for:
  - Status of the PNOZmulti safety system
- Max. 8 PNOZ mi1p units can be connected to the base unit
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

Unit description

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

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

Block diagram



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Expansion modules
PNOZ mi2p

Function description

The expansion module provides additional inputs for standard functions. The function of the inputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

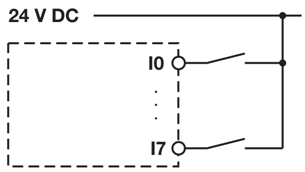
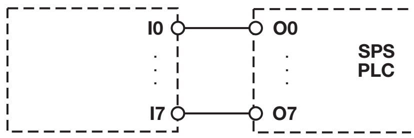
Wiring

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

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

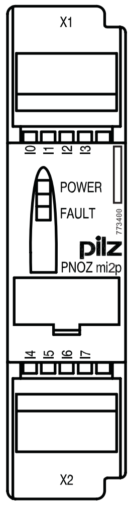
Preparing for operation

- Input circuit

Input circuit	Contact	Semiconductor
Non-safety-related		

Expansion modules
PNOZ mi2p

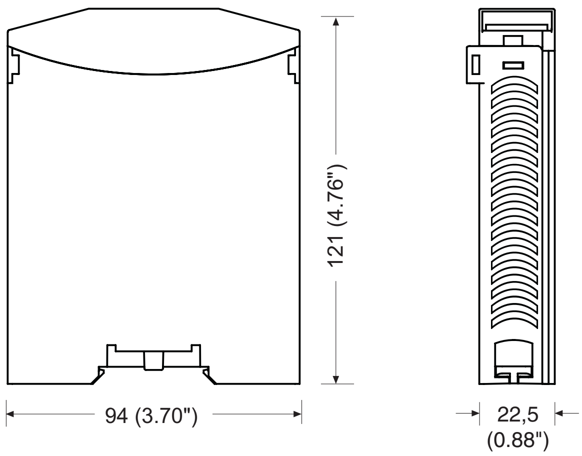
Terminal configuration



Installation

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

Dimensions



Expansion modules

PNOZ mi2p

NOTICE

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

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

Order reference

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

Expansion modules
PNOZ mo1p

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

Approvals

	PNOZ mo1p
cULus LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

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

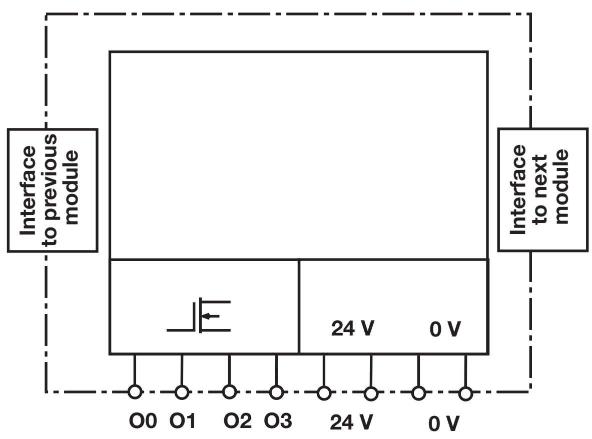
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

Safety features

The relay conforms to the following safety criteria:

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

Block diagram



2.3

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Expansion modules
PNOZ mo1p

Function description

The expansion module provides additional semiconductor outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

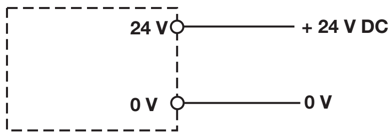
Wiring

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

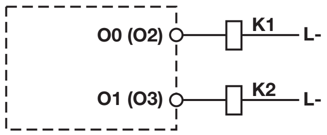
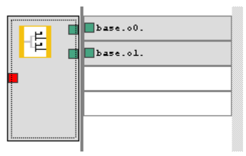
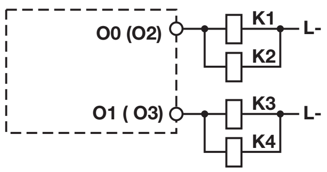
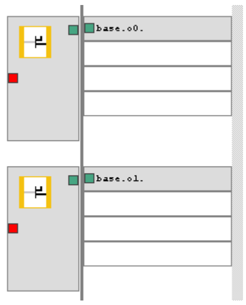
Expansion modules
PNOZ mo1p

Preparing for operation

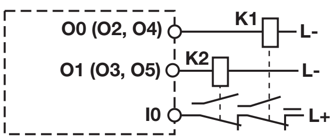
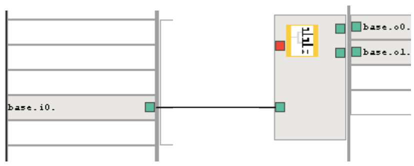
- Supply voltage

Supply voltage	AC	DC
		

- Semiconductor outputs

Redundant output		
Single output		

- Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

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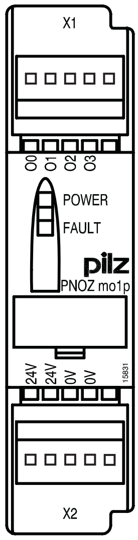
NSG-D-2-362-2006-02

Expansion modules
PNOZ mo1p

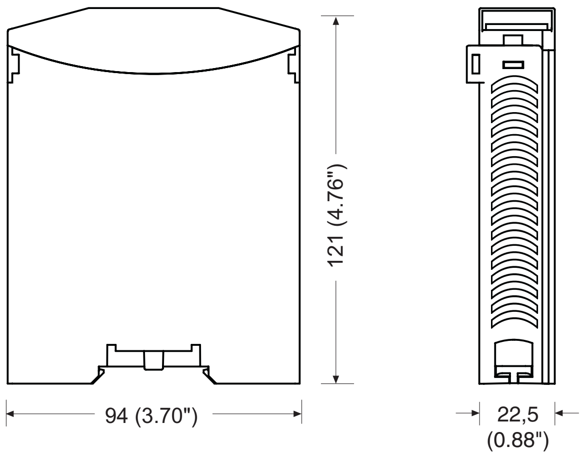
Terminal configuration



Installation

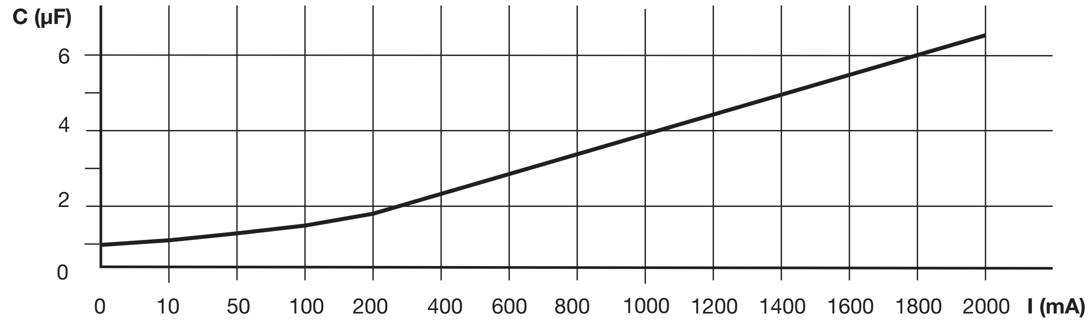
- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to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

Dimensions



Expansion modules
PNOZ mo1p

Maximum capacitive load C (µF) with load current I (mA) at the semi-conductor outputs



Notice

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

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

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Expansion modules
PNOZ mo1p

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

Order reference

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

Expansion modules
PNOZ mo1p coated version

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

Approvals

	PNOZ mo1p coated version
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

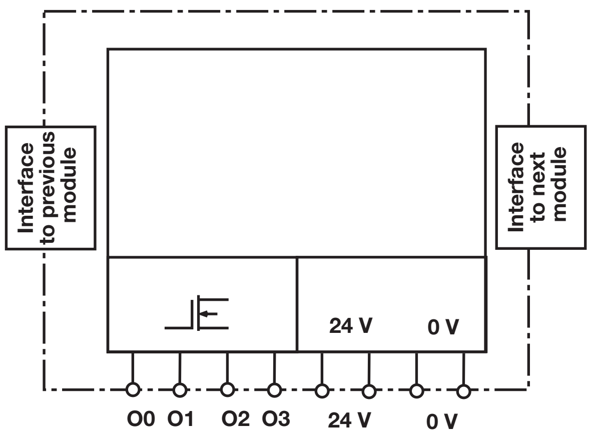
The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part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

Safety features

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

2.3

Block diagram



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Expansion modules
PNOZ mo1p coated version

Function description

The expansion module provides additional semiconductor outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

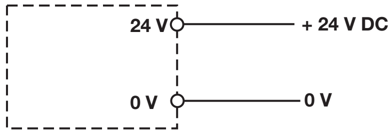
Wiring

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

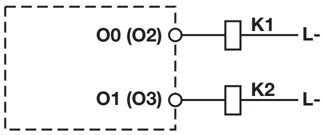
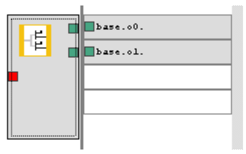
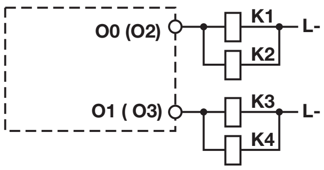
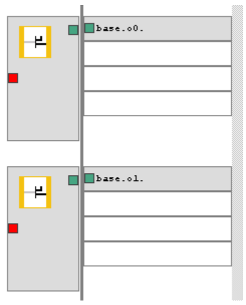
Expansion modules
PNOZ mo1p coated version

Preparing for operation

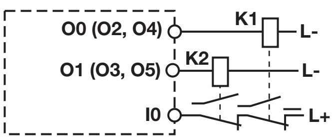
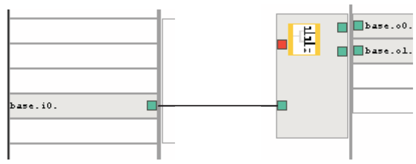
- Supply voltage

Supply voltage	AC	DC
		

- Semiconductor outputs

Redundant output		
Single output		

- Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

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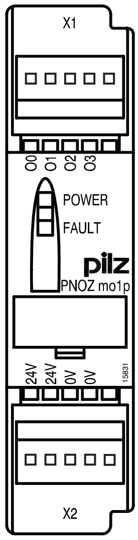
Expansion modules

PNOZ mo1p coated version

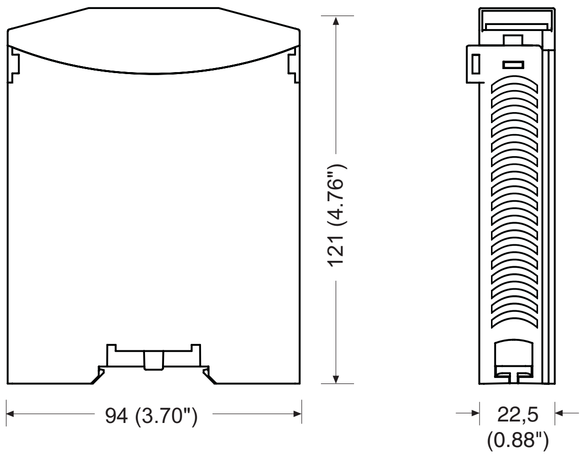
Terminal configuration



Installation

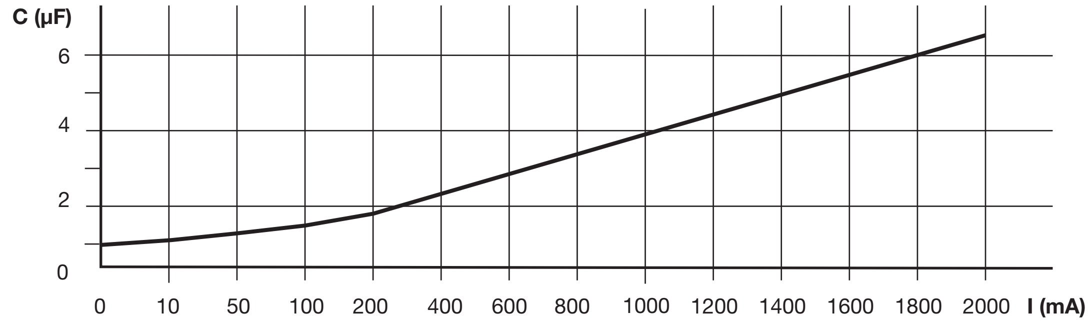
- The safety system should be installed in a control cabinet with a protection type of at least IP54. Fit the safety system to a horizontal DIN rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.
- Use the notches on the back of the unit to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

Dimensions



Expansion modules
PNOZ mo1p coated version

Maximum capacitive load C (µF) with load current I (mA) at the semi-conductor outputs



Notice

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

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

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
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Expansion modules
PNOZ mo1p coated version

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

Order reference

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

Expansion modules
PNOZ mo2p

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

Approvals

	PNOZ mo2p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

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

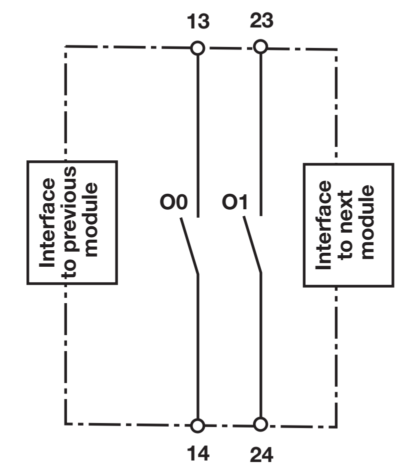
Safety features

- A defective relay contact will be detected during switching.

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

2.3

Block diagram



Expansion modules
PNOZ mo2p

Function description

The expansion module provides additional relay outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

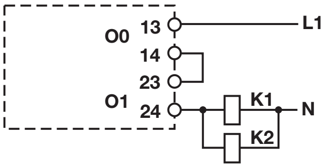
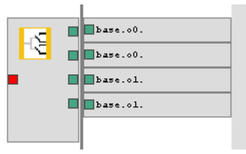
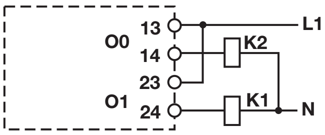
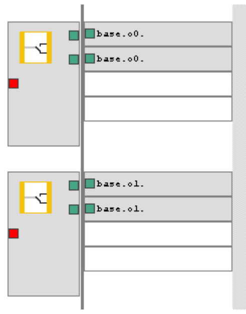
Wiring

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

Expansion modules
PNOZ mo2p

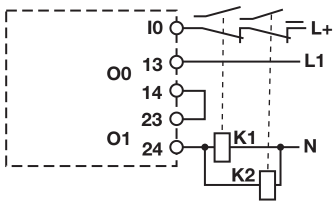
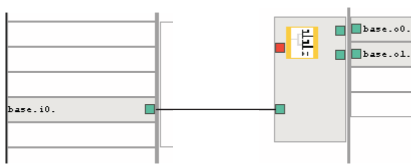
Preparing for operation

- Relay outputs

Redundant		
Single		

2.3

- Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

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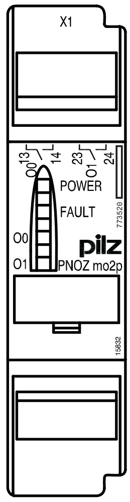
NSG-D-2-364-2006-02

Expansion modules

PNOZ mo2p

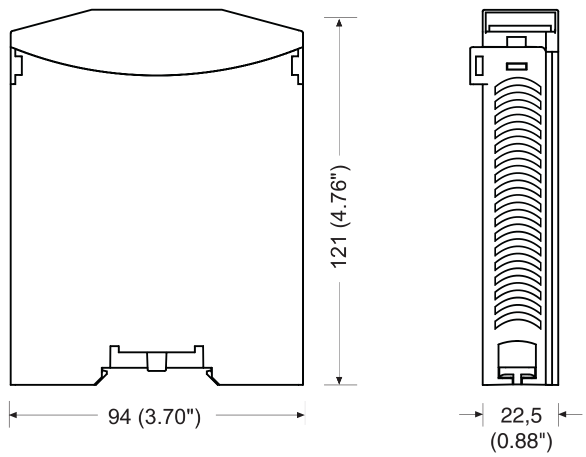
Terminal configuration



Installation

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

Dimensions



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Expansion modules
PNOZ mo2p

Notice

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

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

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Expansion modules
PNOZ mo2p

Order reference

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

Expansion modules
PNOZ mo2p coated version

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

Approvals

	PNOZ mo2p coated version
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

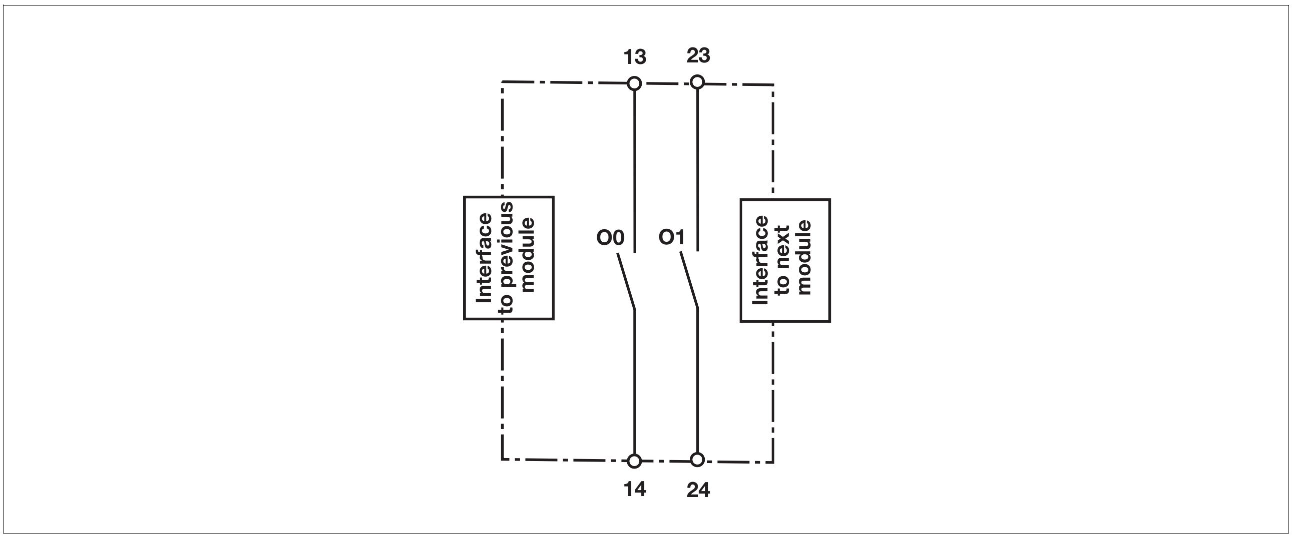
The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part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

Safety features

- A defective relay contact will be detected during switching.

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

Block diagram



Expansion modules
PNOZ mo2p coated version

Function description

The expansion module provides additional relay outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

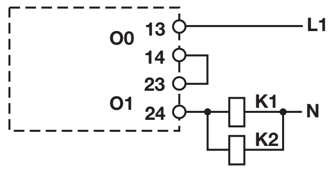
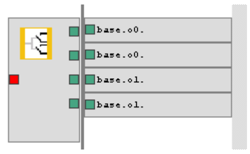
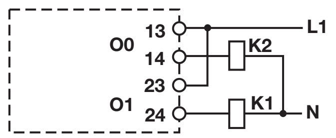
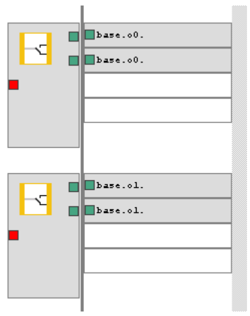
Wiring

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

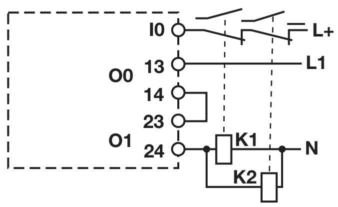
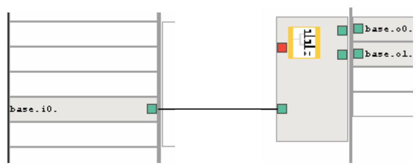
Expansion modules
PNOZ mo2p coated version

Preparing for operation

- Relay outputs

Redundant		
Single		

- Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

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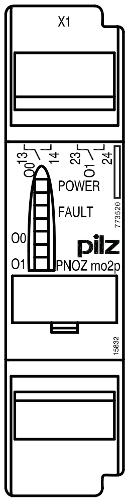
Expansion modules
PNOZ mo2p coated version

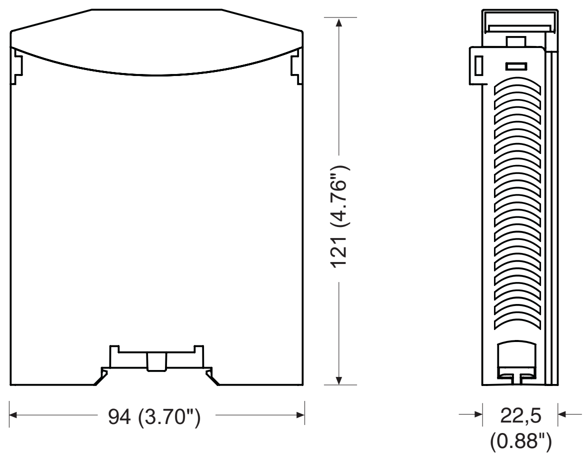
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mo2p coated version

Notice

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

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

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NSG-D-2-365-2006-02

Expansion modules
PNOZ mo2p coated version

Order reference

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

Expansion modules
PNOZ mo3p

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

Approvals

	PNOZ mo3p
c UL us LISTED	◆
BG-PRÜFZERT	◆
	◆

Unit features

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

Unit description

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

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

System requirements

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

Please contact Pilz if you have an older version.

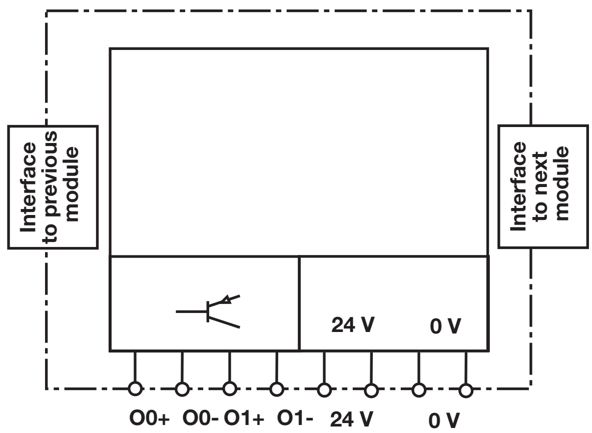
Safety features

- The safety outputs are checked periodically via tests.

The relay conforms to the following safety criteria:

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

Block diagram



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NSG-D-2-366-2008-08

Expansion modules
PNOZ mo3p

Function description

The expansion module provides additional semiconductor outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

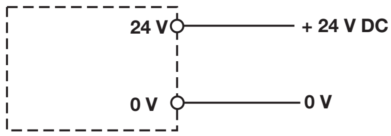
Wiring

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

Expansion modules
PNOZ mo3p

Preparing for operation

- Supply voltage

<table>
<tr><td>Supply voltage</td><td>AC</td><td>DC</td></tr>
<tr><td></td><td></td><td>
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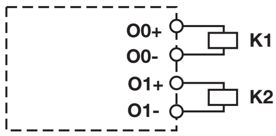
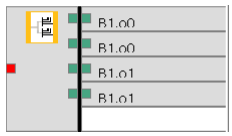
- Semiconductor outputs

<table>
<tr><td>Redundant output</td><td>
</td><td>
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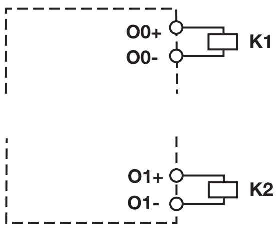
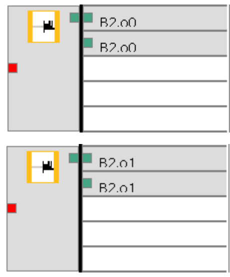
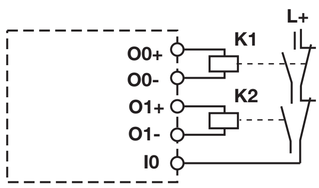
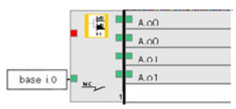
<tr><td>Single output</td><td>
</td><td>
</td></tr>
</table>

- Feedback loop

<table>
<tr><td>Feedback loop</td><td>Redundant output</td><td></td></tr>
<tr><td>Contacts from external contactors</td><td>
</td><td></td></tr>
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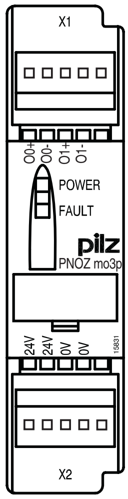
Expansion modules
PNOZ mo3p

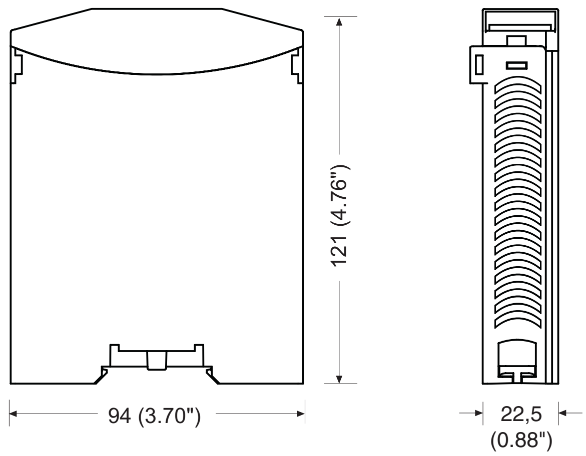
Terminal configuration



Installation

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

Dimensions



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Expansion modules
PNOZ mo3p

Notice

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

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

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NSG-D-2-366-2008-08

Expansion modules
PNOZ mo3p

Order reference			

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

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Expansion modules
PNOZ mo4p

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

Approvals

	PNOZ mo4p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

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

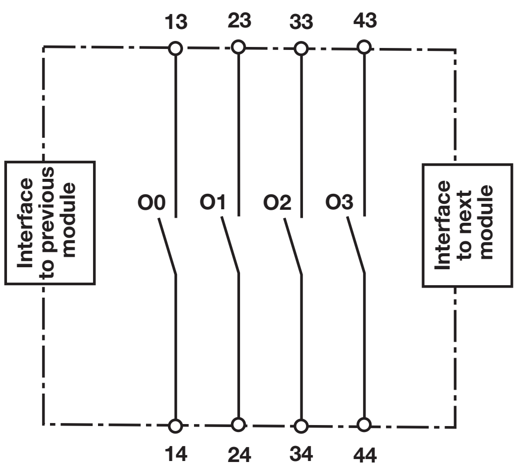
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

Safety features

The relay conforms to the following safety criteria:

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

Block diagram



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NSG-D-2-367-2006-02

Expansion modules
PNOZ mo4p

Function description

The expansion module provides additional relay outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

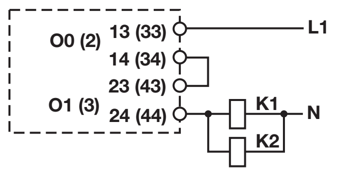
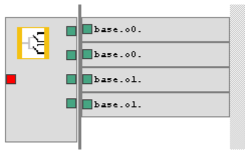
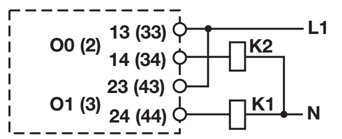
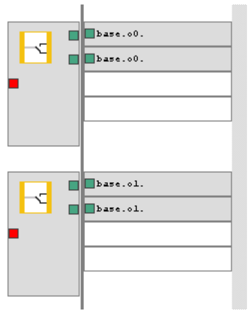
Wiring

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

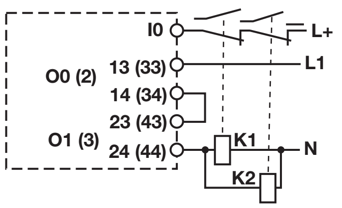
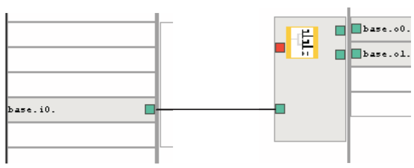
Expansion modules
PNOZ mo4p

Preparing for operation

- Relay outputs

Redundant		
Single		

- Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

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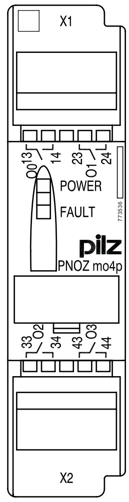
Expansion modules

PNOZ mo4p

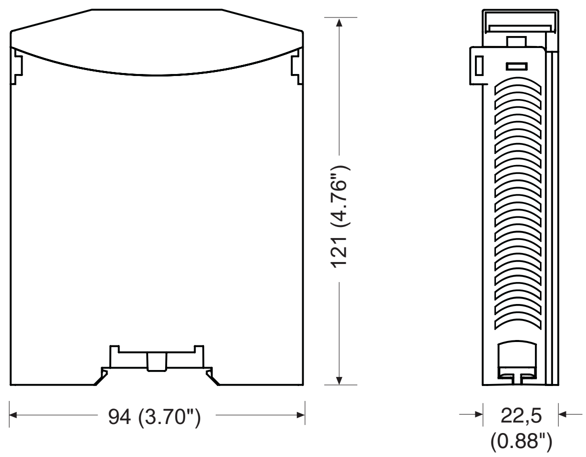
Terminal configuration



Installation

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

Dimensions



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Expansion modules
PNOZ mo4p

Notice

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

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

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Expansion modules
PNOZ mo4p

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

Order reference

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

Expansion modules
PNOZ mo4p coated version

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

Approvals

	PNOZ mo4p coated version
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

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

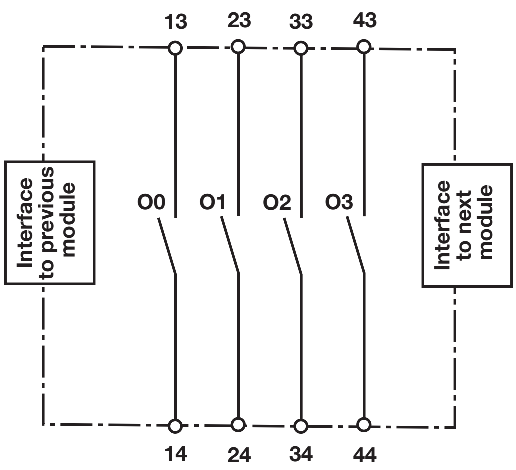
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

Safety features

The relay conforms to the following safety criteria:

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

Block diagram



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Expansion modules
PNOZ mo4p coated version

Function description

The expansion module provides additional relay outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

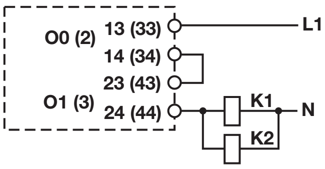
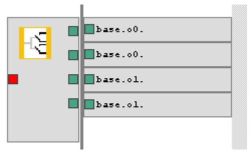
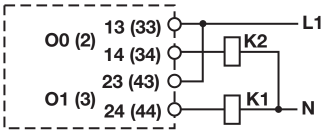
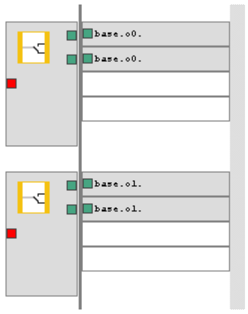
Wiring

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

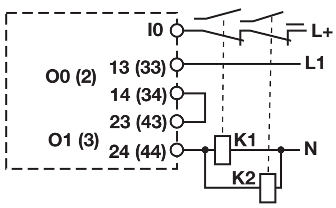
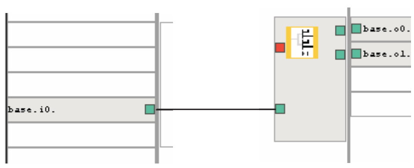
Expansion modules
PNOZ mo4p coated version

Preparing for operation

- Relay outputs

Redundant		
Single-pole		

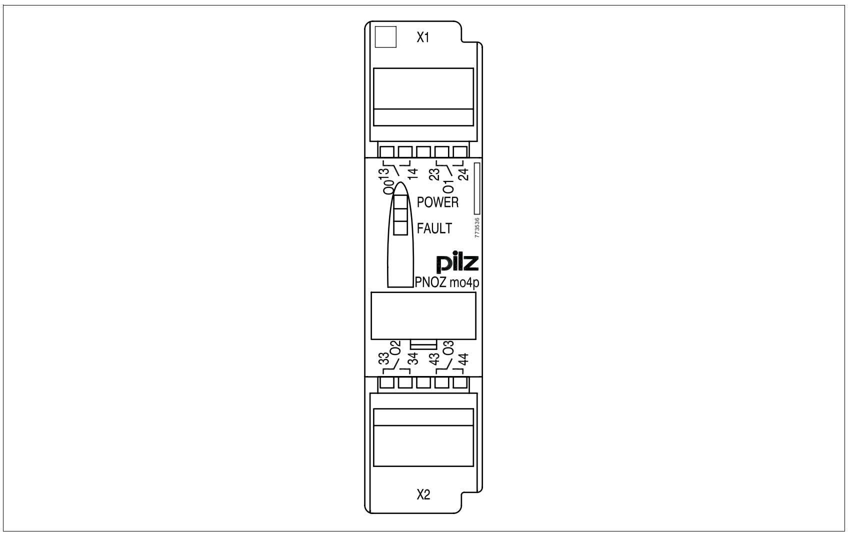
- Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

Expansion modules

PNOZ mo4p coated version

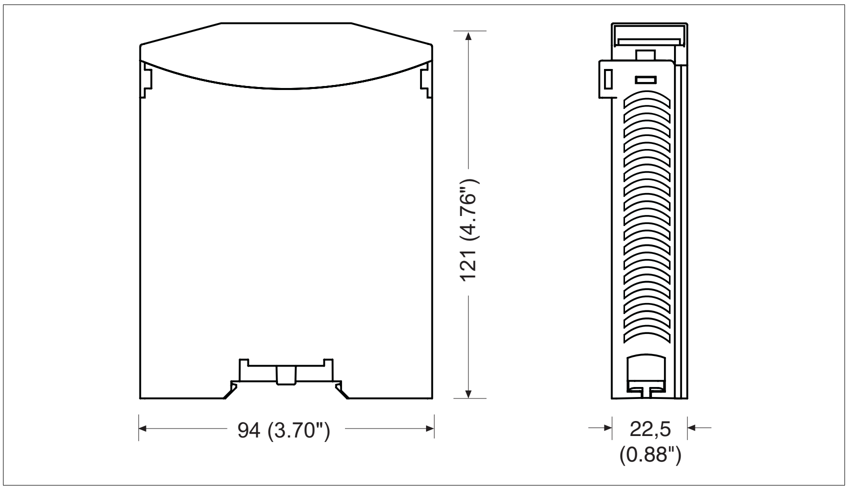
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mo4p coated version

Notice

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

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

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NSG-D-2-368-2006-02

Expansion modules
PNOZ mo4p coated version

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

Order reference

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

2.3

Expansion modules
PNOZ mc0p

Unit not shown

Power supply to supply voltage to fieldbus modules

Unit features

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

Unit description

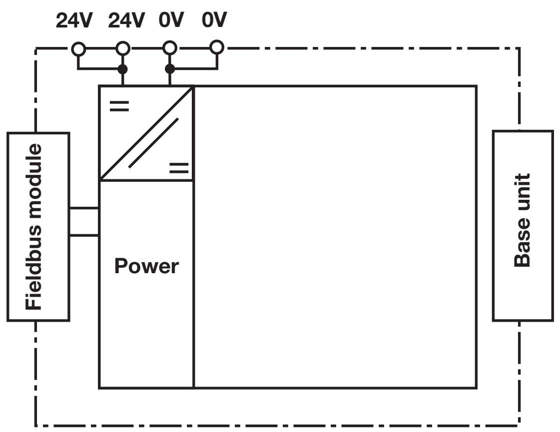
The expansion module may only be connected to a base unit from the PNOZmulti modular safety system. The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:

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

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

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

Block diagram



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NSG-D-2-383-2006-02

Expansion modules
PNOZ mc0p

Function description

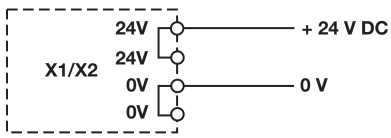
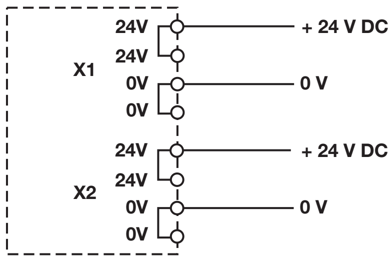
The PNOZ mc0p power supply provides the fieldbus module with the necessary internal supply voltage. This way the fieldbus module remains available even when the base unit is switched off. The power supply is connected to the base unit and fieldbus module via jumpers. When the 24 VDC supply voltage is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

Wiring

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

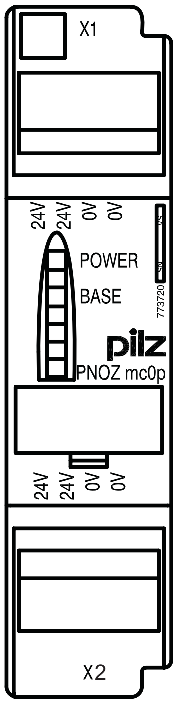
Preparing for operation

- Supply voltage

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

Expansion modules
PNOZ mc0p

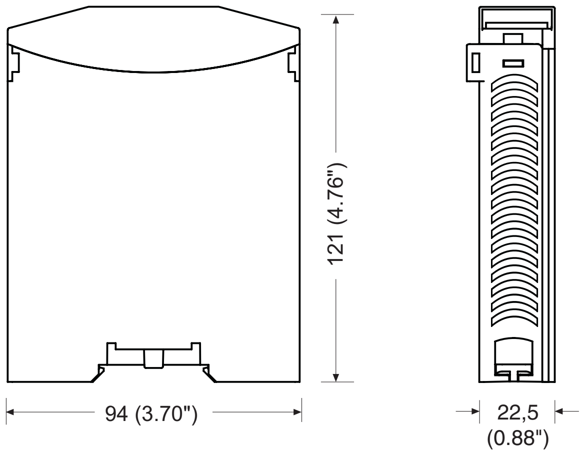
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mc0p

NOTICE

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

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

Order reference

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

2.3

Expansion modules
PNOZ mc1p

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

Approvals

	PNOZ mc1p
c UL US LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

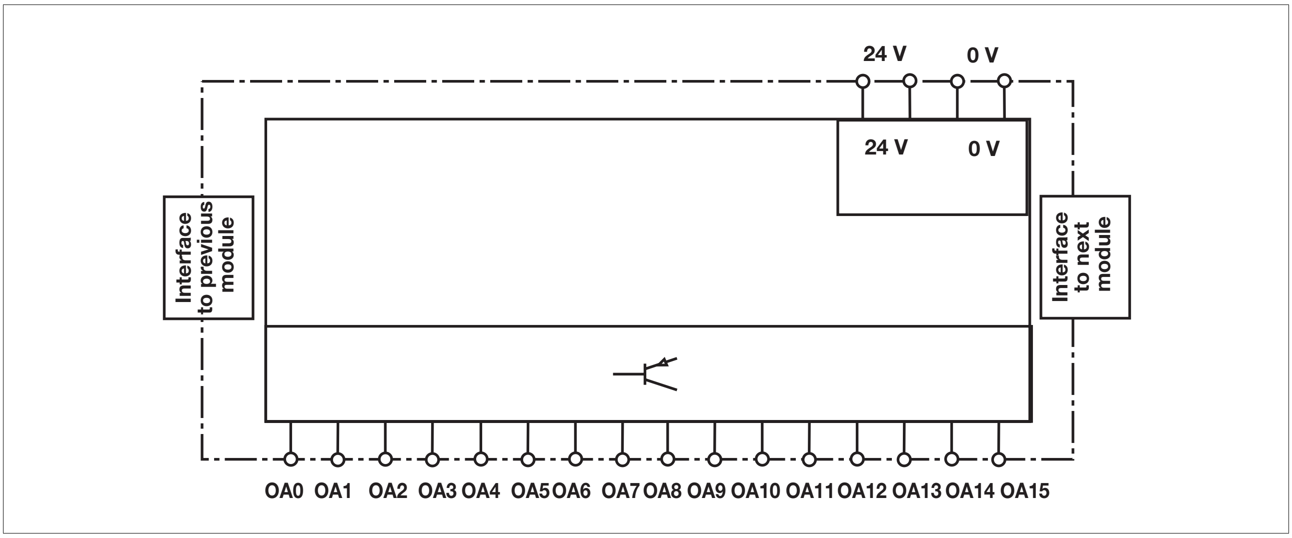
- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  – 16 auxiliary outputs
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mc1p units can be connected to the base unit

Unit description

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

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

Block diagram



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NSG-D-2-371-2008-08

Expansion modules
PNOZ mc1p

Function description

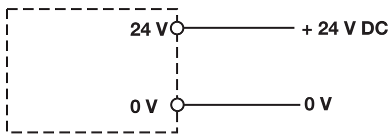
The expansion module operates as a signal module with non-safety-related outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly. The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

Wiring

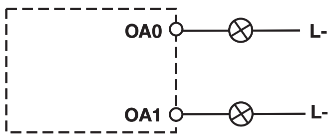
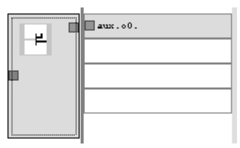
The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs OA0 to OA15 are auxiliary outputs using semiconductor technology.
- Use copper wire that can withstand 75 °C.

Preparing for operation

- Supply voltage

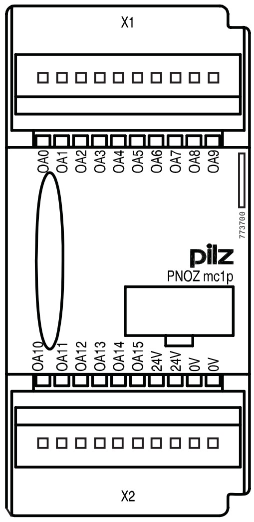
Supply voltage	AC	DC
		

- Semiconductor outputs

Expansion modules
PNOZ mc1p

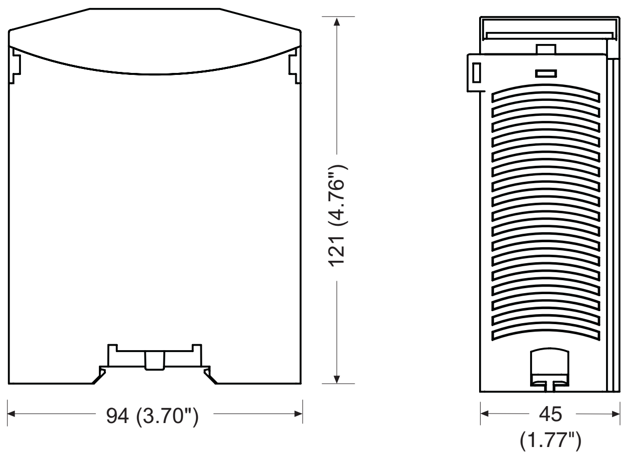
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mc1p

Notice

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

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

Order reference

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

2.3

Expansion modules
PNOZ mc1p coated version

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

Approvals

	PNOZ mc1p coated version
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

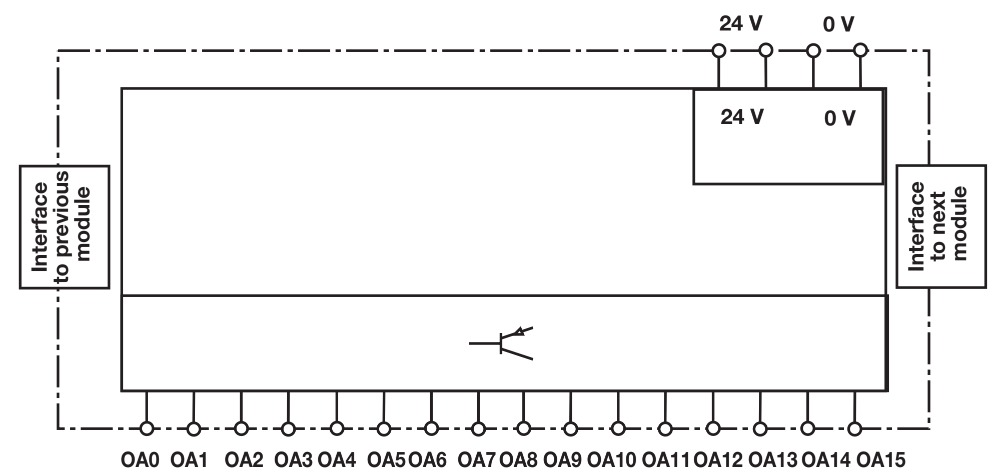
- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  – 16 auxiliary outputs
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 6 PNOZ mc1p units can be connected to the base unit

Unit description

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

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

Block diagram



2.3

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NSG-D-2-372-2008-08

Expansion modules
PNOZ mc1p coated version

Function description

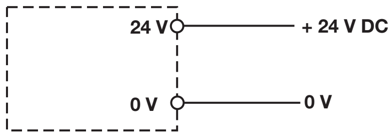
The expansion module operates as a signal module with non-safety-related outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly. The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

Wiring

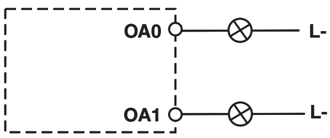
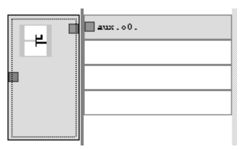
The wiring is defined in the circuit diagram in the Configurator.
Please note:
- Information given in the "Technical details" must be followed.
- Outputs OA0 to OA15 are auxiliary outputs using semiconductor technology.
- Use copper wire that can withstand 75 °C.

Preparing for operation

- Supply voltage

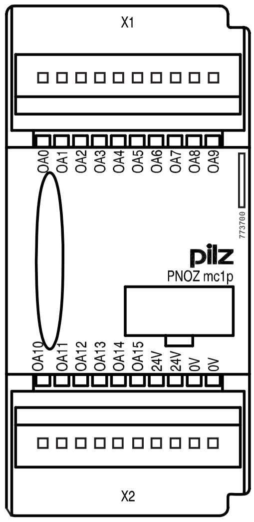
Supply voltage	AC	DC
		

- Semiconductor outputs

Expansion modules
PNOZ mc1p coated version

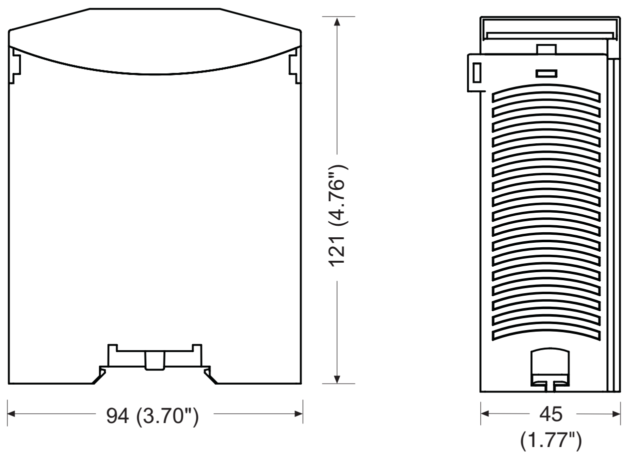
Terminal configuration



Installation

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

Dimensions



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Expansion modules
PNOZ mc1p coated version

Notice

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

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

Expansion modules
PNOZ mc1p coated version

Order reference

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

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Expansion modules
PNOZ mc3p

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

Approvals

	PNOZ mc3p
c UL us LISTED	◆
CCC	◆

Unit features

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

Unit description

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

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

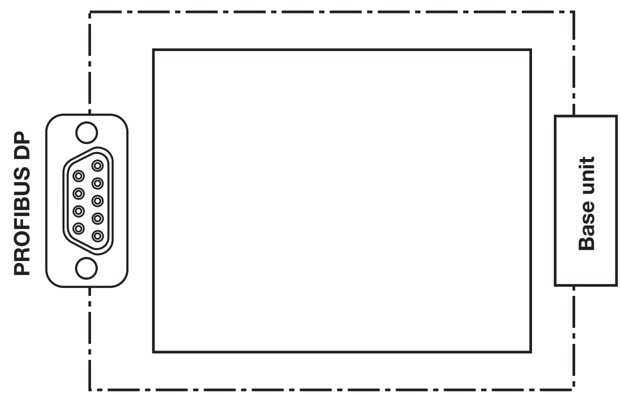
The PNOZ mc3p expansion module is used for communication between the PNOZmulti modular safety system and PROFIBUS-DP.
PROFIBUS-DP is designed for fast data exchange at field level. The PNOZ mc3p expansion module is a passive PROFIBUS-DP subscriber (Slave). The basic functions of communication with PROFIBUS-DP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

System requirements

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

Please contact Pilz if you have an older version.

Block diagram



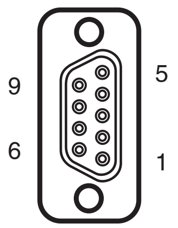
Expansion modules
PNOZ mc3p

Function description

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

Wiring

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



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

n.c. = not connected

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

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

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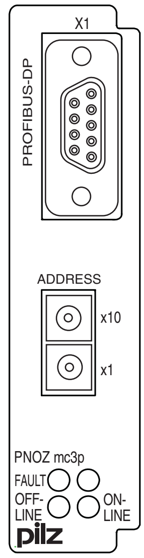
Expansion modules
PNOZ mc3p

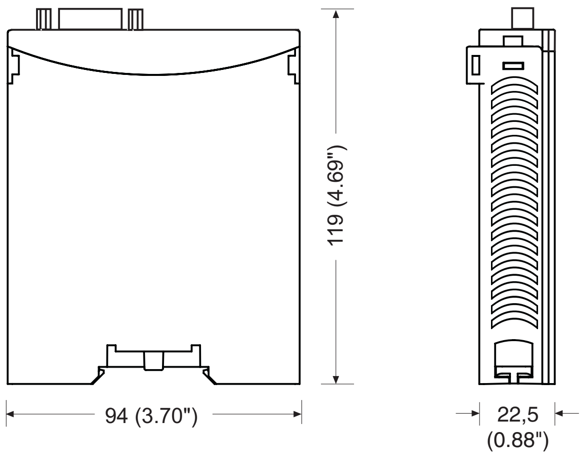
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mc3p

Notice

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

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

Order reference

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

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NSG-D-2-373-2006-02

Expansion modules
PNOZ mc4p

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

Approvals

	PNOZ mc4p
c UL us LISTED	◆
CCC	◆

Unit features

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

Unit description

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

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

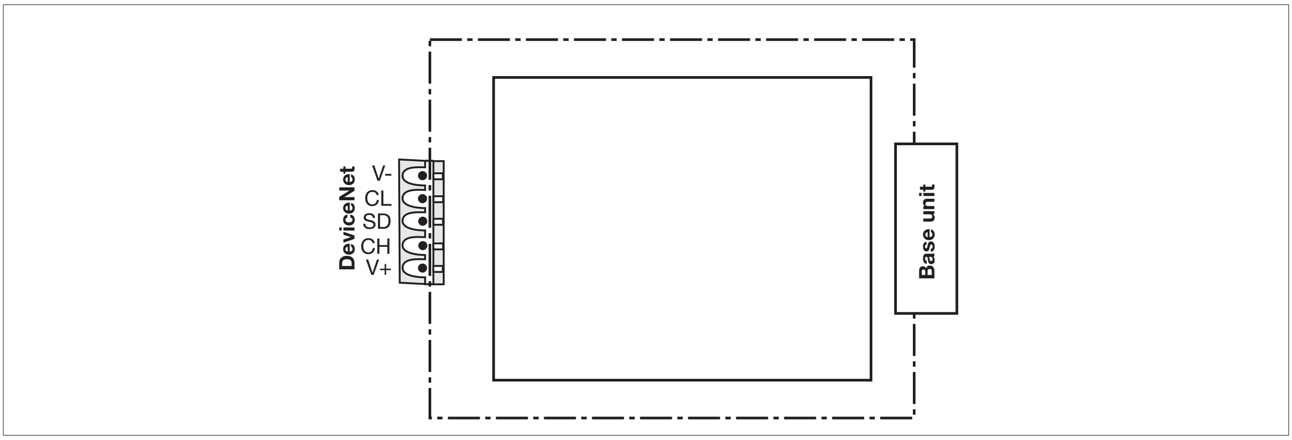
The PNOZ mc4p expansion module is used for communication between the PNOZmulti modular safety system and DeviceNet.
DeviceNet is designed for fast data exchange at field level. The PNOZ mc4p expansion module is a passive DeviceNet subscriber (Slave). The basic communication functions meet the requirements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

System requirements

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

Please contact Pilz if you have an older version.

Block diagram



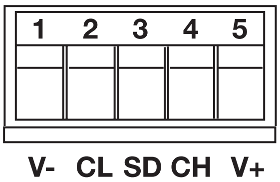
Expansion modules
PNOZ mc4p

Function description

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

Wiring

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

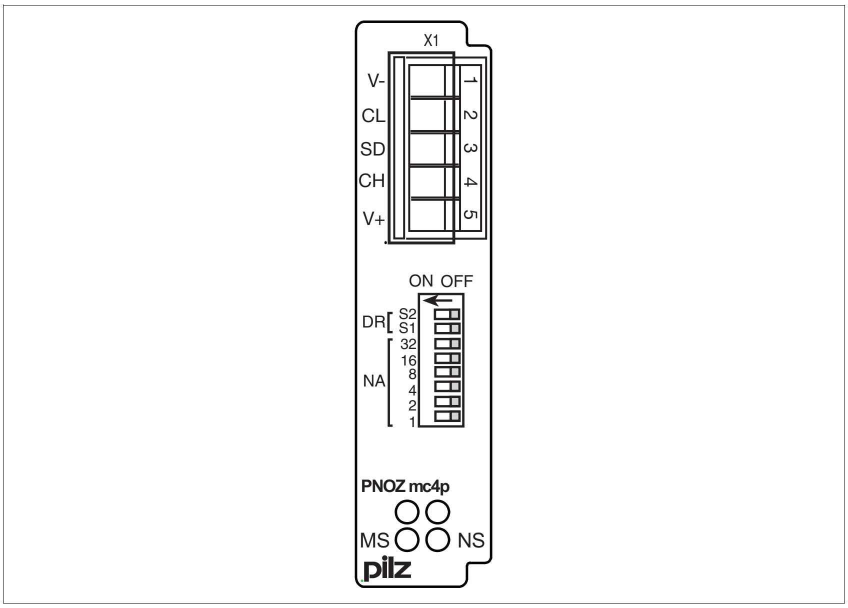


1: V-
2: CL (CAN_L)
3: SD
4: CH (CAN_H)
5: V+

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

Expansion modules
PNOZ mc4p

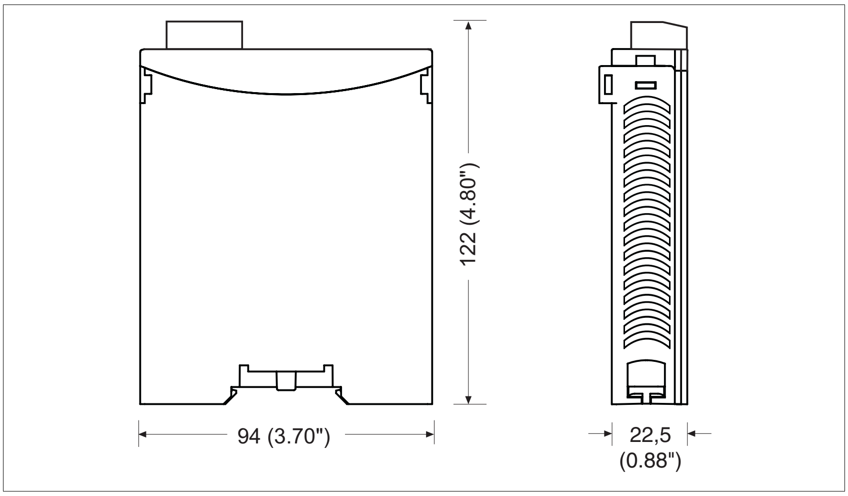
Terminal configuration



Installation

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

Dimensions



more than automation
safe automation

Expansion modules
PNOZ mc4p

Notice

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

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

Order reference

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

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NSG-D-2-374-2006-02

Expansion modules

PNOZ mc4p coated version

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

Approvals

	PNOZ mc4p coated version
c UL us LISTED	◆
CCC	◆

Unit features

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

Unit description

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

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

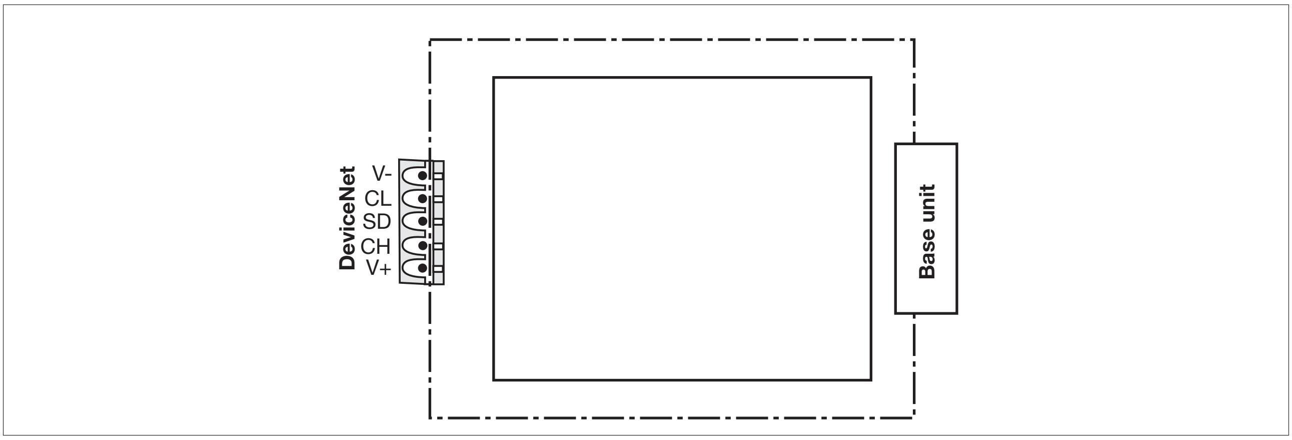
The PNOZ mc4p expansion module is used for communication between the PNOZmulti modular safety system and DeviceNet.
DeviceNet is designed for fast data exchange at field level. The PNOZ mc4p expansion module is a passive DeviceNet subscriber (Slave). The basic communication functions meet the requirements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

System requirements

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

Please contact Pilz if you have an older version.

Block diagram



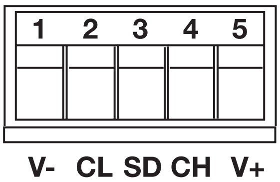
Expansion modules
PNOZ mc4p coated version

Function description

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

Wiring

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



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

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

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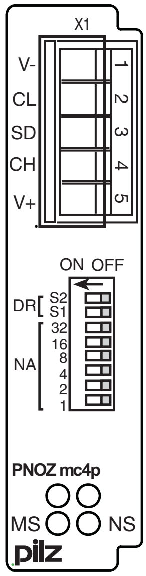
Expansion modules
PNOZ mc4p coated version

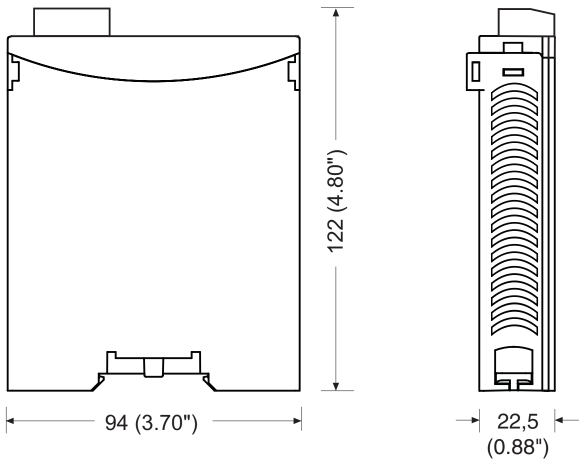
Terminal configuration



Installation

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

Dimensions



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Expansion modules

PNOZ mc4p coated version

NOTICE

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

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

Order reference

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

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NSG-D-2-388-2006-02

Expansion modules
PNOZ mc5p

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

Approvals

	PNOZ mc5p
c UL us LISTED	◆
CCC	◆

Unit features

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

Unit description

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

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

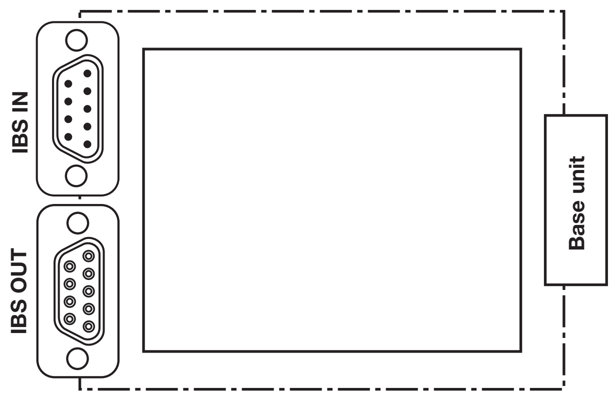
The PNOZ mc5p expansion module is used for communication between the PNOZmulti modular safety system and INTERBUS.
INTERBUS is designed for fast data exchange at field level. The PNOZ mc5p expansion module is a passive INTERBUS subscriber (Slave). The basic functions of communication with INTERBUS conform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

System requirements

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

Please contact Pilz if you have an older version.

Block diagram



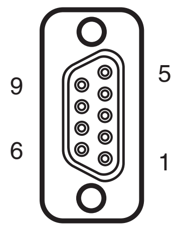
Expansion modules
PNOZ mc5p

Function description

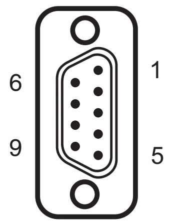
The data to be transferred via INTERBUS is selected and configured in the PNOZmulti Configurator. The base unit and the PNOZ mc5p are connected via a jumper. The PNOZ mc5p is also supplied with voltage via this jumper. After the supply voltage is switched on or the PNOZmulti safety system is reset, the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

Wiring

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



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



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

n. c. = not connected

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

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

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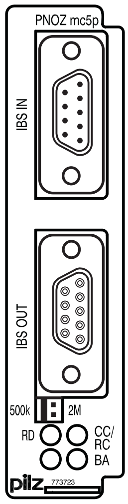
NSG-D-2-375-2006-02

Expansion modules
PNOZ mc5p

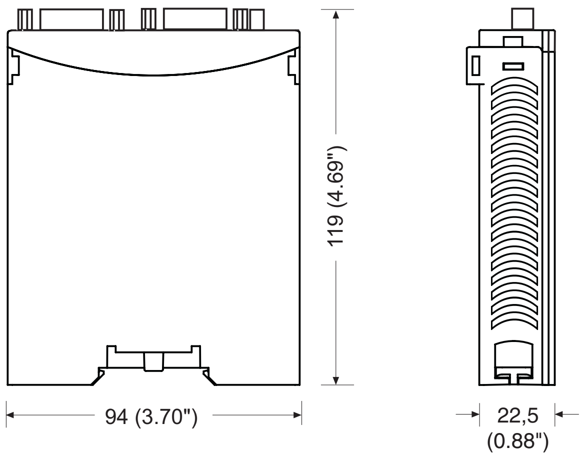
Terminal configuration



Installation

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

Dimensions



Expansion modules

PNOZ mc5p

Notice

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

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

Order reference

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

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NSG-D-2-375-2006-02

Expansion modules
PNOZ mc5.1p

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

Approvals

	PNOZ mc5.1p
CCC	◆

Unit features

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

Unit description

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

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

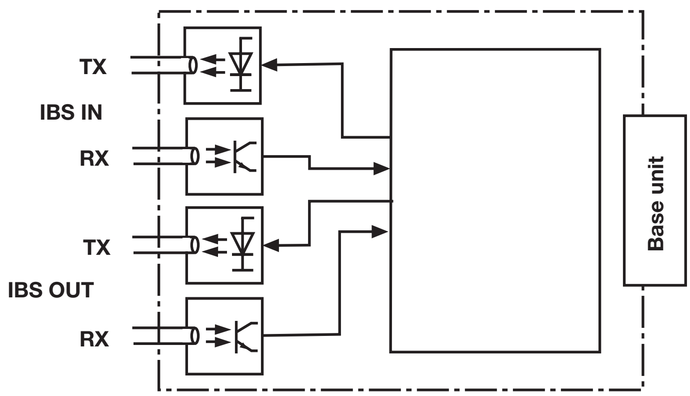
The PNOZ mc5.1p expansion module is used for communication between the PNOZmulti modular safety system and INTERBUS FO.
INTERBUS FO is designed for fast data exchange at field level. The PNOZ mc5.1p expansion module is a passive INTERBUS FO subscriber (Slave). The basic functions of communication with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

System requirements

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

Please contact Pilz if you have an older version.

Block diagram



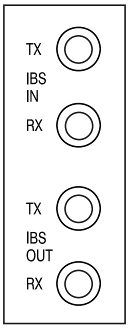
Expansion modules
PNOZ mc5.1p

Function description

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

Wiring

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



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

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

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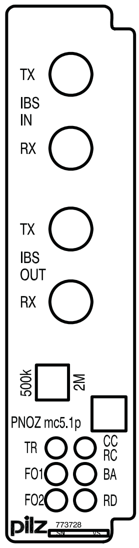
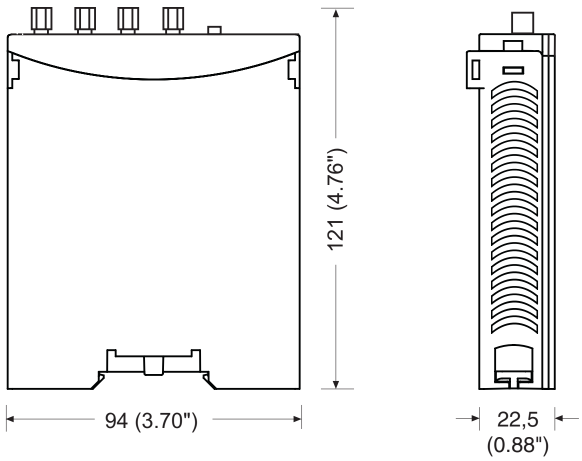
Expansion modules
PNOZ mc5.1p

Terminal configuration



Dimensions



Installation

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

2.3

Expansion modules

PNOZ mc5.1p

NOTICE

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

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

Order reference

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

2.3

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NSG-D-2-384-2006-02

Expansion modules
PNOZ mc6p

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

Approvals

	PNOZ mc6p
c UL us LISTED	◆
CCC	◆

Unit features

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

Unit description

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

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

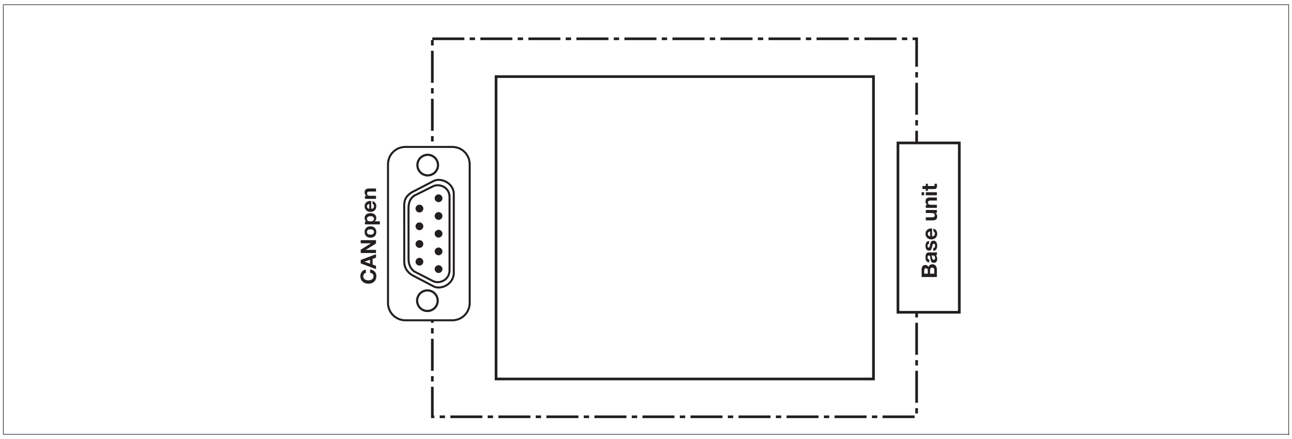
The PNOZ mc6p expansion module is used for communication between the PNOZmulti modular safety system and CANopen.
CANopen is designed for fast data exchange at field level. The PNOZ mc6p expansion module is a passive CANopen subscriber (Slave). The basic communication functions conform to CiA DS-301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

System requirements

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

Please contact Pilz if you have an older version.

Block diagram



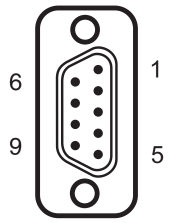
Expansion modules
PNOZ mc6p

Function description

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

Wiring

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



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

n.c. = not connected

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

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

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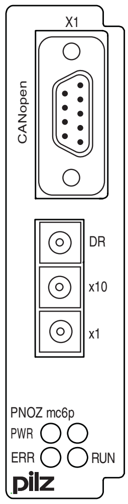
Expansion modules
PNOZ mc6p

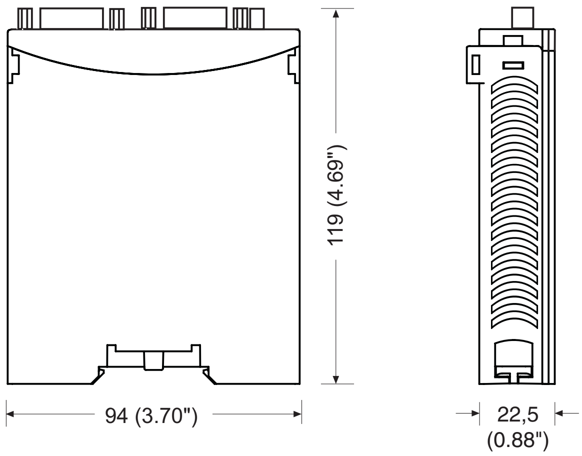
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mc6p

Notice

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

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

Order reference

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

Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
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Expansion modules
PNOZ mc6p coated version

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

Approvals

	PNOZ mc6p coated version
c UL us LISTED	◆
CCC	◆

Unit features

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

Unit description

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

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

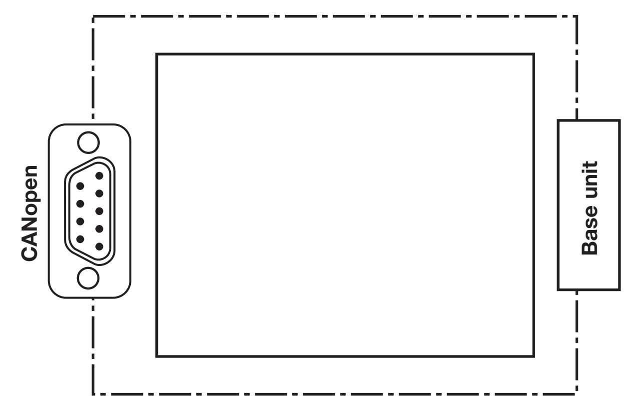
The PNOZ mc6p expansion module is used for communication between the PNOZmulti modular safety system and CANopen.
CANopen is designed for fast data exchange at field level. The PNOZ mc6p expansion module is a passive CANopen subscriber (Slave). The basic communication functions conform to CiA DS-301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

System requirements

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

Please contact Pilz if you have an older version.

Block diagram



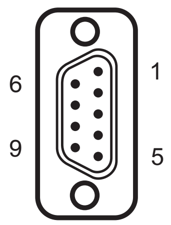
Expansion modules
PNOZ mc6p coated version

Function description

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

Wiring

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



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

n.c. = not connected

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

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

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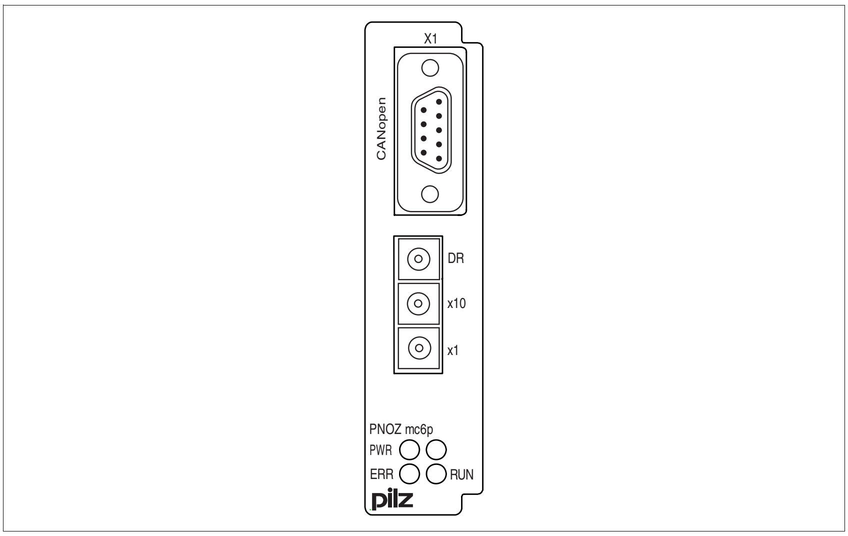
Expansion modules

PNOZ mc6p coated version

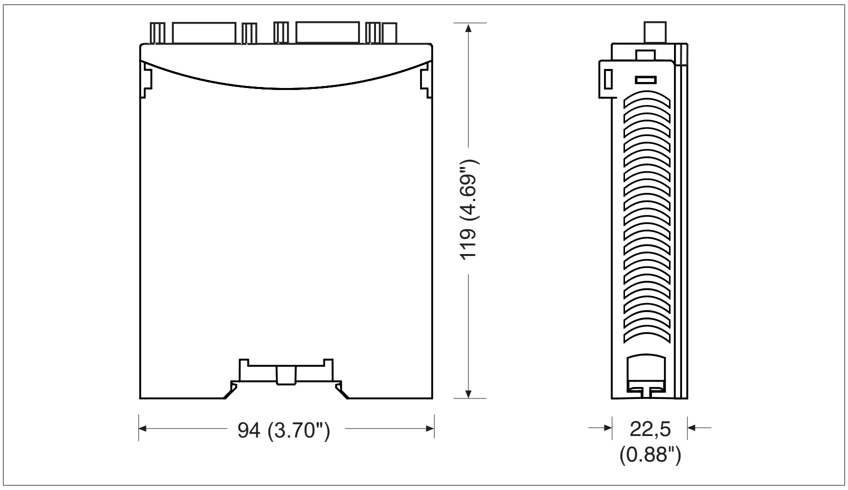
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mc6p coated version

Notice

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

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

Order reference

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

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Expansion modules
PNOZ mc7p

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

Approvals

	PNOZ mc7p
	◆
	◆

Unit features

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

Unit description

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

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

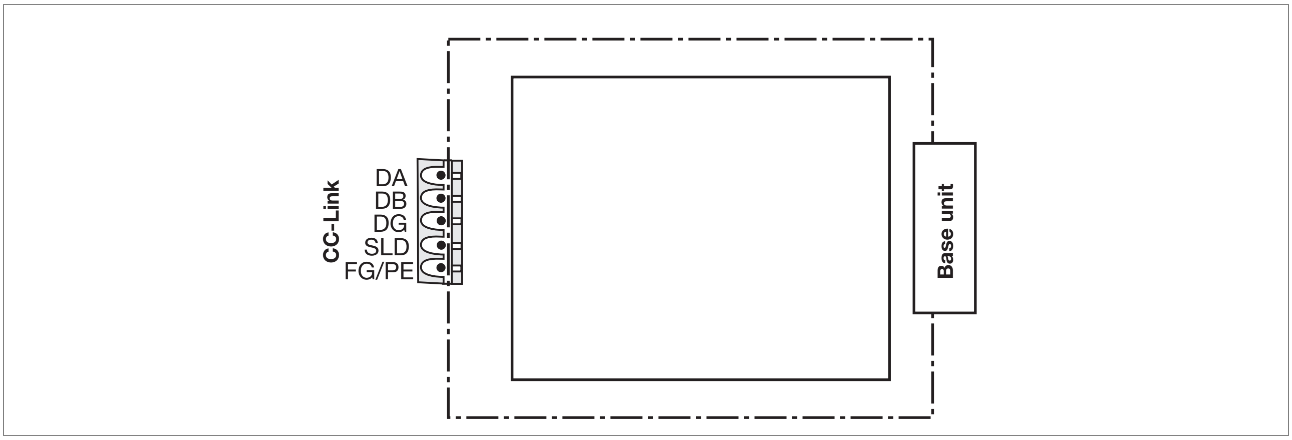
The PNOZ mc7p expansion module is used for communication between the PNOZmulti modular safety system and CC-Link.
CC-Link is designed for fast data exchange at field level. The expansion module PNOZ mc7p is a passive CC-Link subscriber (Slave). The basic communication functions conform to CC-Link Ver.1.10.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

System requirements

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

Please contact Pilz if you have an older version.

Block diagram



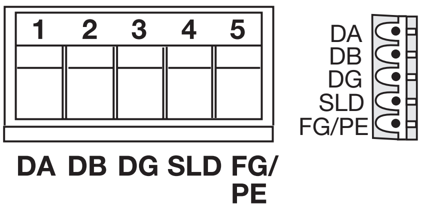
Expansion modules
PNOZ mc7p

Function description

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

Wiring

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



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

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

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

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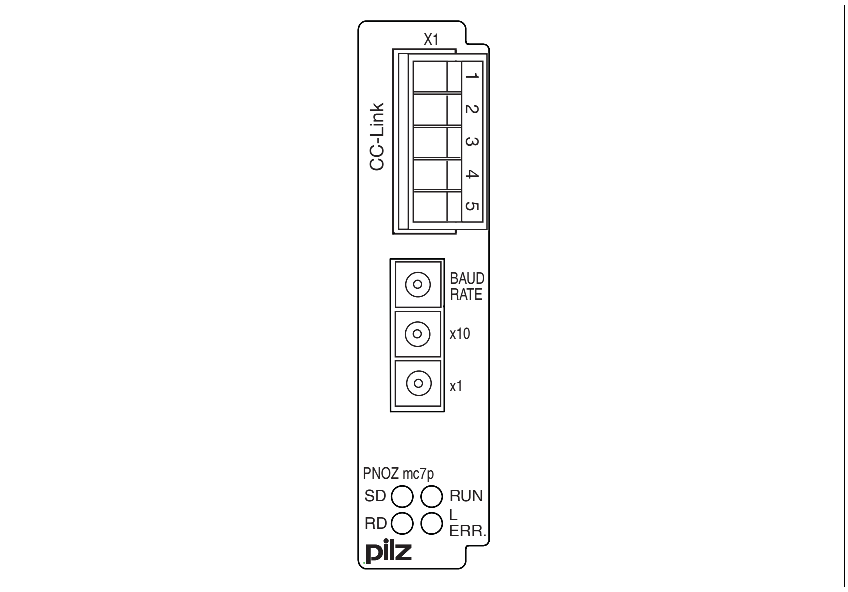
Expansion modules
PNOZ mc7p

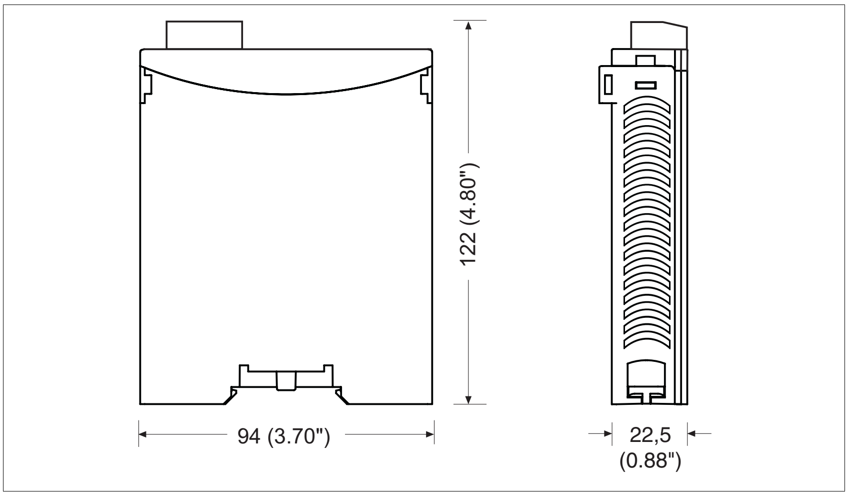
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mc7p

Notice

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

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

Order reference

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

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NSG-D-2-378-2006-02

Expansion modules
PNOZ mc8p

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

Approvals

	PNOZ mc8p
	◆

Unit features

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

Unit description

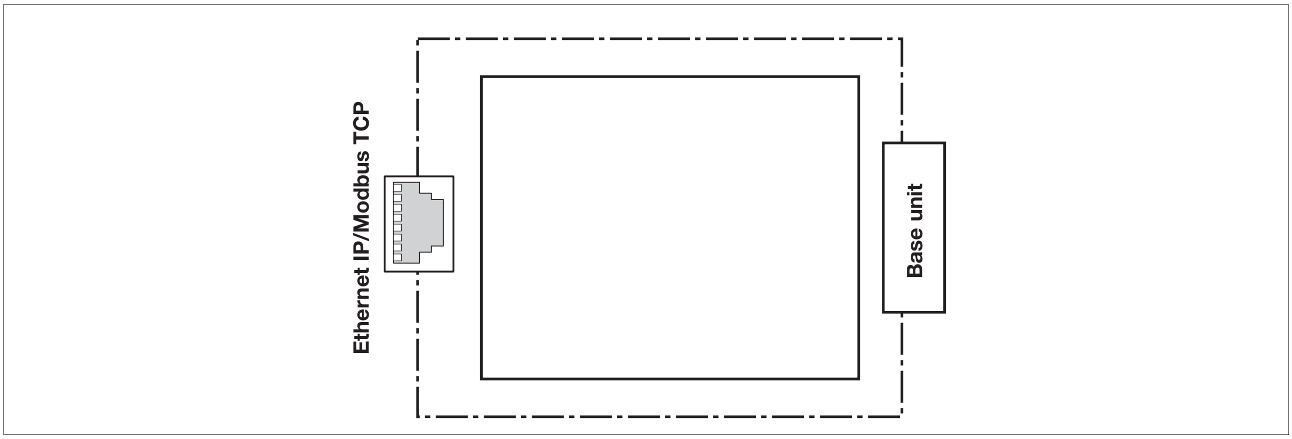
The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It connects the PNOZmulti modular safety system to Ethernet IP and Modbus TCP.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits.
The unit is designed for use in:
- E-STOP installations
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

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

System requirements

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

Block diagram



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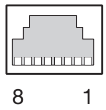
Expansion modules
PNOZ mc8p

Function description

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

Verdrahtung

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



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

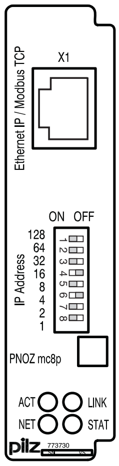
n.c.: not connected

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

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

Expansion modules
PNOZ mc8p

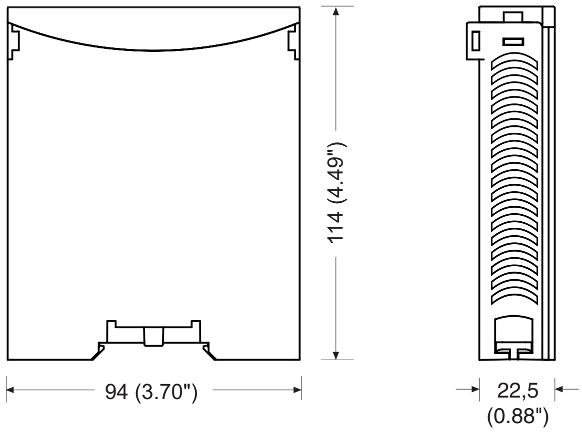
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ mc8p

Notice

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

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

Order reference

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

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NSG-D-2-391-2006-04

Expansion modules
PNOZ mc9p

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

Approvals

	PNOZ mc9p
CCC	◆

Unit features

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

Unit description

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

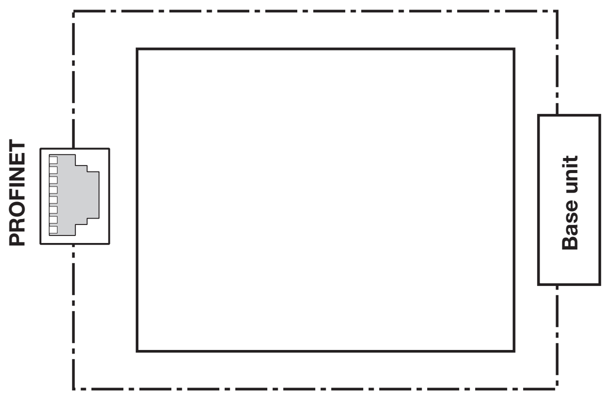
The PNOZ mc9p expansion module is used for communication between the PNOZmulti modular safety system and PROFINET IO.
PROFINET IO is designed for fast data exchange at field level. The PNOZ mc9p expansion module is a passive PROFINET IO subscriber. The basic communication functions with PROFINET IO conform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

System requirements

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

2.3

Block diagram



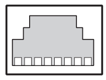
Expansion modules
PNOZ mc9p

Function description

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

Wiring

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



8 1

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

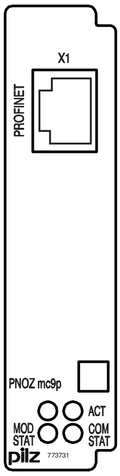
n.c.: not connected

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

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

Expansion modules
PNOZ mc9p

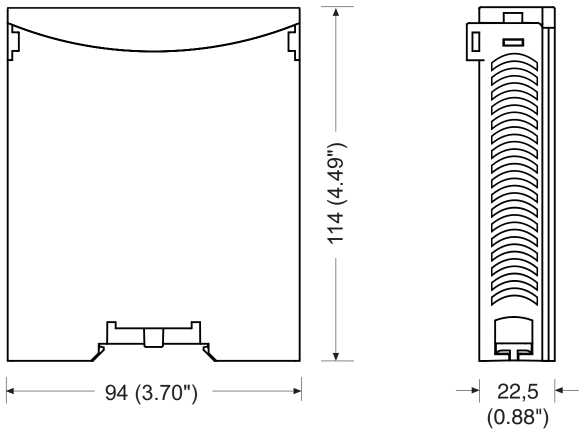
Terminal configuration



Installation

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

Dimensions



Expansion modules

PNOZ mc9p

Notice

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

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

Order reference

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

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NSG-D-2-402-2006-11

Expansion modules
PNOZ ml1p

Connection module for the safe connection of two PNOZmulti safety systems

Approvals

	PNOZ ml1p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

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

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

System requirements

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

Please contact Pilz if you have an older version.

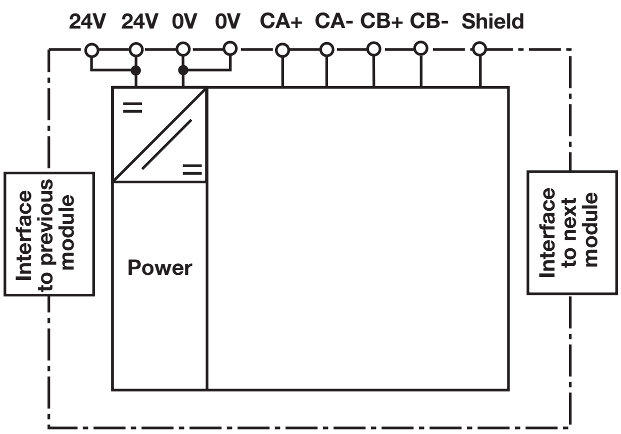
Safety features

The relay conforms to the following safety criteria:

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

2.3

Block diagram



Expansion modules
PNOZ ml1p

Function description

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

The function of the inputs and outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly. The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

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

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

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

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

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

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

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

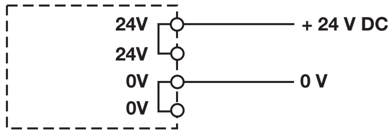
Wiring

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

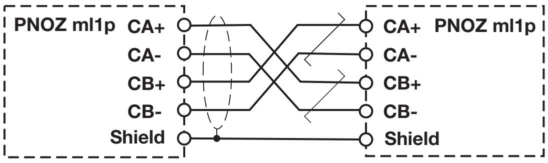
Expansion modules
PNOZ ml1p

Preparing for operation

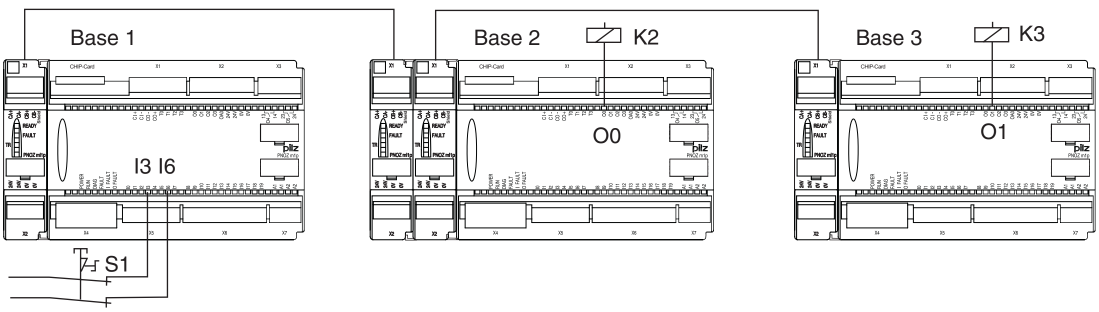
- Supply voltage

Supply voltage	AC	DC
		

- Connection of two PNOZmulti base units via PNOZ ml1p

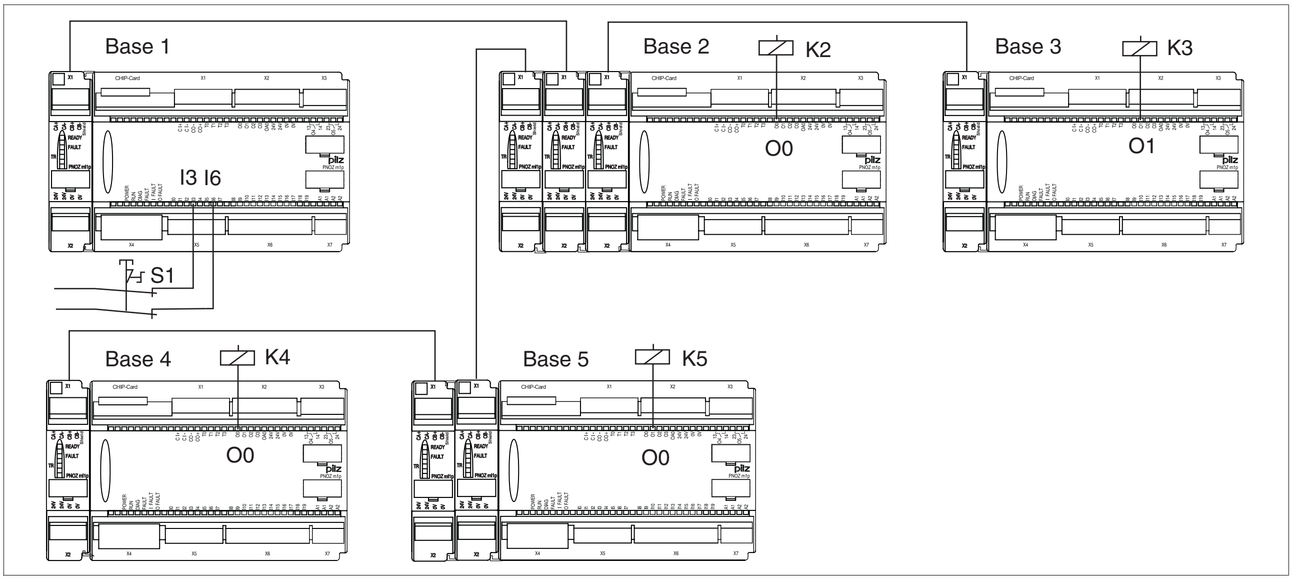


- Connection example 1
  Series connection of 3 base units
  Reaction time t_{SUM} between base unit Base 1 and Base 2:
  Input delay t_{ON} at I3 and I6 + data transmission time 1 * t_{BUS} through connection module + switch-off delay t_{COND} of semiconductor output at O0
  $t_{SUM} = t_{ON} + (n *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



Expansion modules
PNOZ ml1p

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



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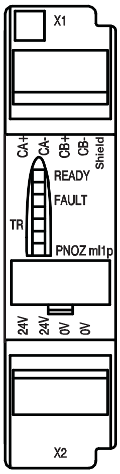
Expansion modules
PNOZ ml1p

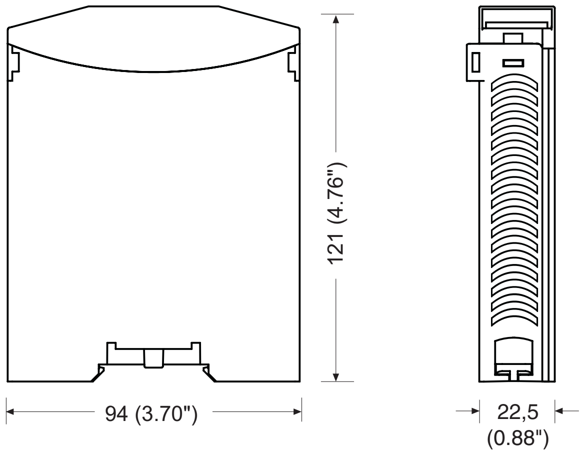
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ ml1p

NOTICE

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

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

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Expansion modules
PNOZ ml1p

Order reference

Type	Features		Terminals	Order no.
PNOZ ml1p	Expansion module			773 540
PNOZ mli1p	Cable	5 m	With screw terminals	773 890
PNOZ mli1p	Cable	10 m	With screw terminals	773 891
PNOZ mli1p	Cable	50 m	With screw terminals	773 892
PNOZ mli1p	Cable	5 m	With cage clamp terminals	773 893
PNOZ mli1p	Cable	10 m	With cage clamp terminals	773 894
PNOZ mli1p	Cable	50 m	With cage clamp terminals	773 895
PNOZ mi1p	1 set of cage clamp terminals			783 400
PNOZ mi1p	1 set of screw terminals			793 400

Expansion modules
PNOZ ms1p

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

Approvals

	PNOZ ms1p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It monitors standstill, speed and direction of rotation up to Category 3 of EN 954-1.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

System requirements

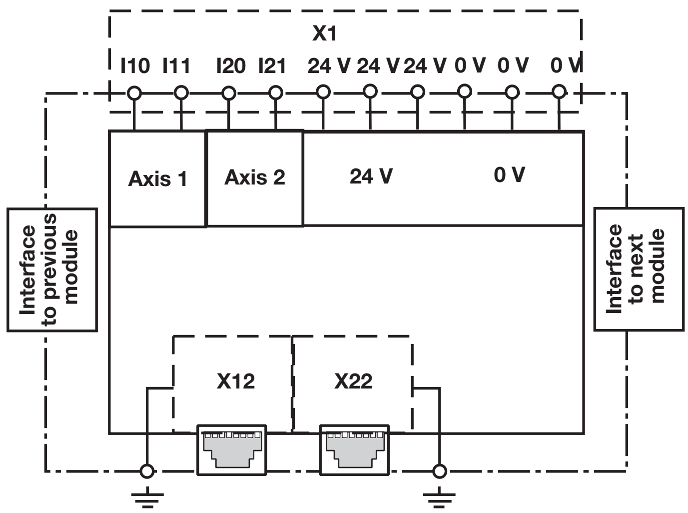
- PNOZmulti Configurator: from Version 5.1.0
- Base unit PNOZ m1p: from Version 5.2
- Base unit PNOZ m2p: from Version 2.2

Please contact Pilz if you have an older version.

Safety features

The relay conforms to the following safety criteria:
- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

Block diagram



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Expansion modules
PNOZ ms1p

Function description

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

Wiring

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

Proximity switches

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

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

Incremental encoders

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

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

Incremental encoder and proximity switch on one axis

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

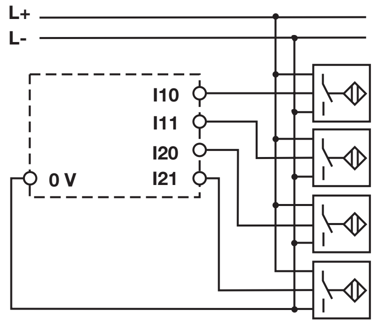
and
- The proximity switch signals “Rotating shaft”

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

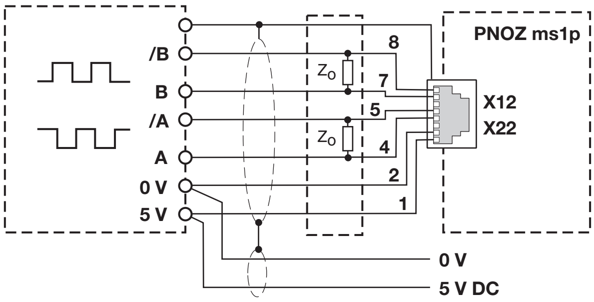
Expansion modules
PNOZ ms1p

Preparing for operation

- Proximity switch



- Incremental encoder

Encoder type 1 Vss, 5 V-TTL Terminate incremental encoder mit Z_o = 120 Ohm	

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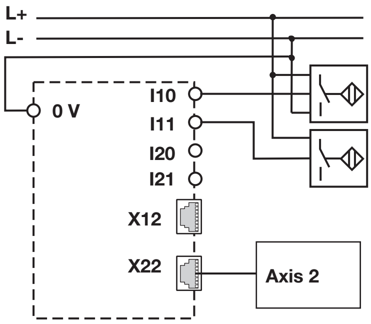
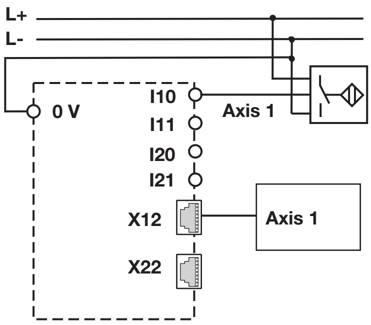
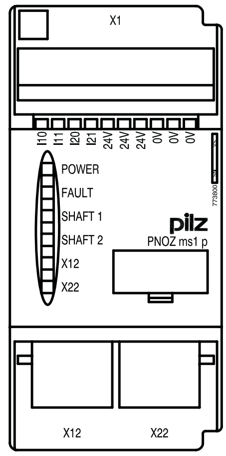
Expansion modules
PNOZ ms1p

- Proximity switch and incremental encoder

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

Expansion modules
PNOZ ms1p

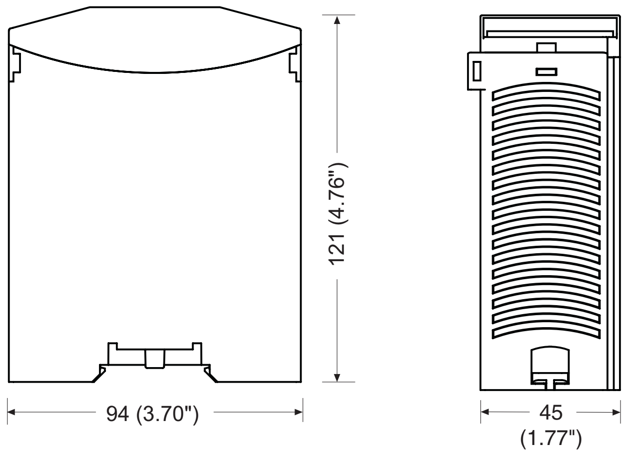
Terminal configuration



Installation

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

Dimensions



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Expansion modules
PNOZ ms1p

Notice

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

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

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more than automation
safe automation

Expansion modules
PNOZ ms1p

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

Order reference

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

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Expansion modules
PNOZ ms2p

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

Approvals

	PNOZ ms2p
cULus LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
It monitors standstill, speed and direction of rotation up to Category 3 of EN 954-1.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- Emergency stop equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

System requirements

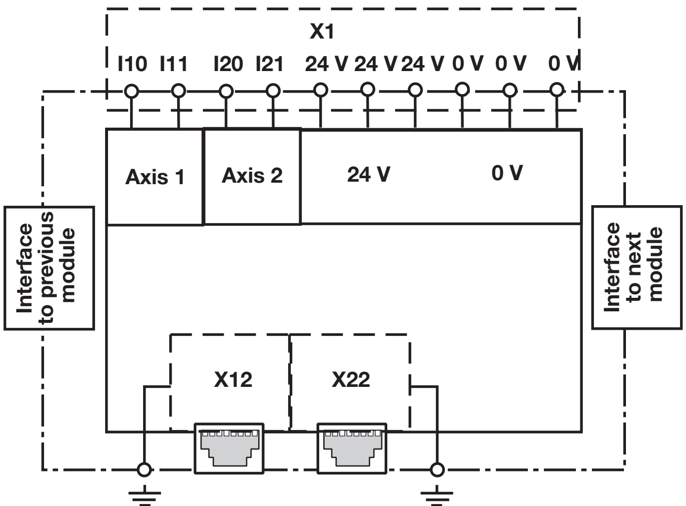
- PNOZmulti Configurator: from Version 5.1.0
- Base unit PNOZ m1p: from Version 5.2
- Base unit PNOZ m2p: from Version 2.2

Please contact Pilz if you have an older version.

Safety features

The relay conforms to the following safety criteria:
- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.

Block diagram



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Expansion modules
PNOZ ms2p

Function description

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

Wiring

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

Proximity switches

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

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

Incremental encoders

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

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

Incremental encoder and proximity switch on one axis

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

and
- The proximity switch signals “Rotating shaft”

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

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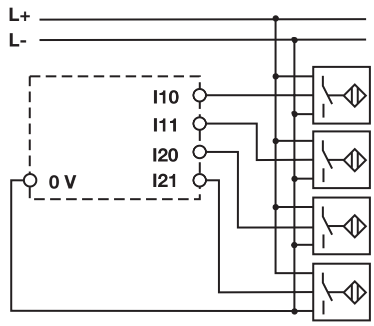
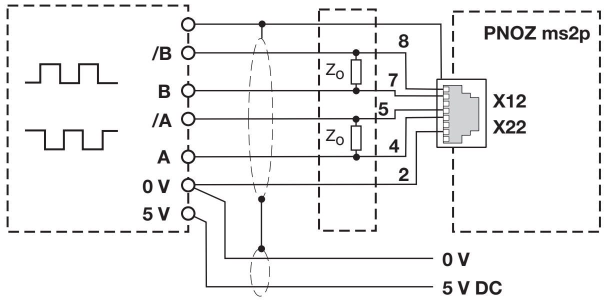
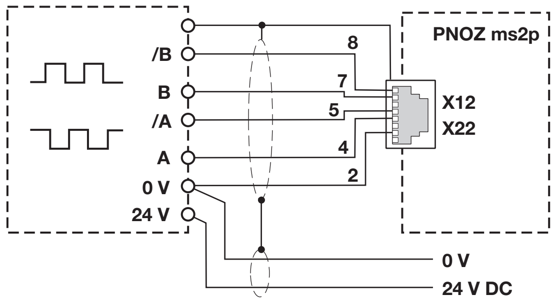
Expansion modules
PNOZ ms2p

Preparing for operation

- Proximity switch

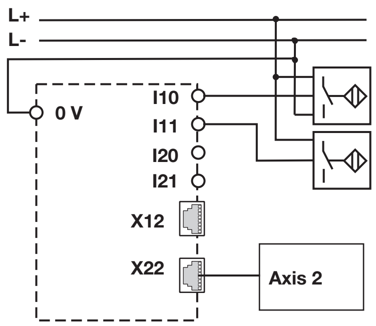
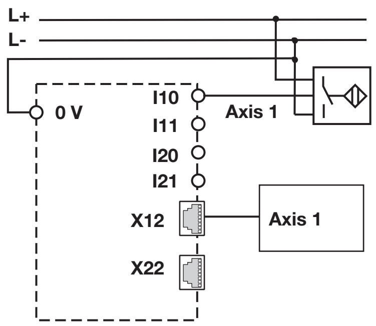


- Incremental encoder

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

Expansion modules
PNOZ ms2p

- Proximity switch and incremental encoder

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

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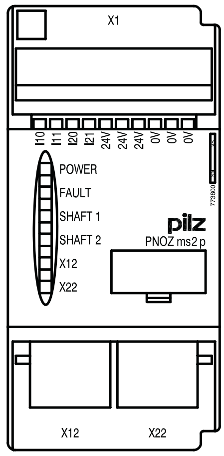
Expansion modules
PNOZ ms2p

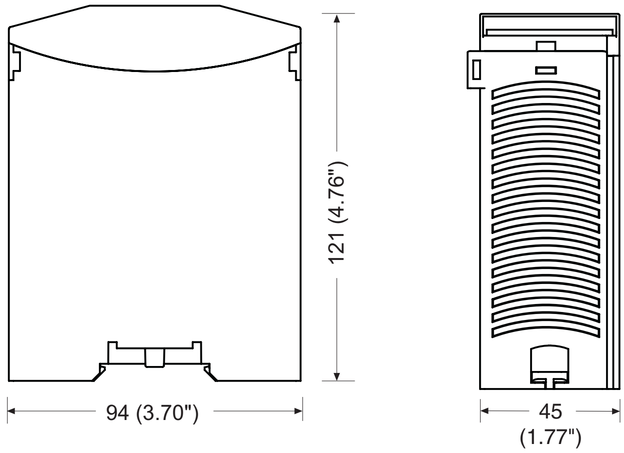
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ ms2p

Notice

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

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

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Expansion modules
PNOZ ms2p

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

Order reference

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

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Adapter for PNOZ ms1p and PNOZ ms2p

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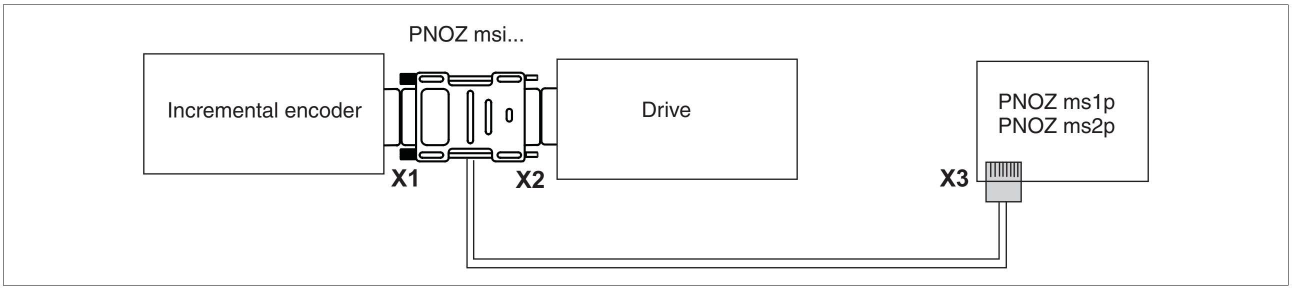
Adapter for PNOZ ms1p and PNOZ ms2p

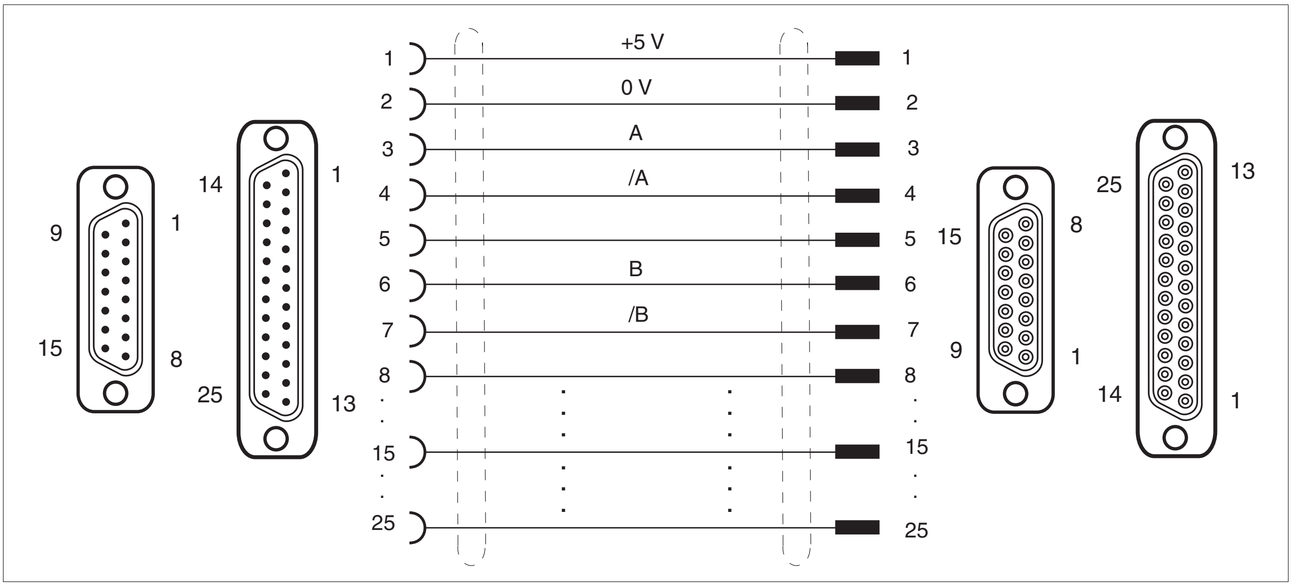
Contents	Page

Adapter for PNOZ ms1p and PNOZ ms2p
PNOZ msi1Ap, PNOZ msi1Bp, PNOZ msi3Ap, PNOZ msi3Bp

Connection



Pin assignment



Unit types

Various versions are available:
- PNOZ msi1Ap
25-pin D-Sub connector and cable runs of 2.5 m
- PNOZ msi1Ap
25-pin D-Sub connector and cable runs of 5 m
- PNOZ msi1Bp
25-pin D-Sub connector and cable runs of 2.5 m
- PNOZ msi1Bp
25-pin D-Sub connector and cable runs of 5 m
- PNOZ msi3Ap
15-pin D-Sub connector and cable runs of 2.5 m
- PNOZ msi3Bp
15-pin D-Sub connector and cable runs of 2.5 m

Technical details

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

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Adapter for PNOZ ms1p and PNOZ ms2p
PNOZ msi1Ap, PNOZ msi1Bp, PNOZ msi3Ap, PNOZ msi3Bp

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

Order reference

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

Adapter for PNOZ ms1p and PNOZ ms2p

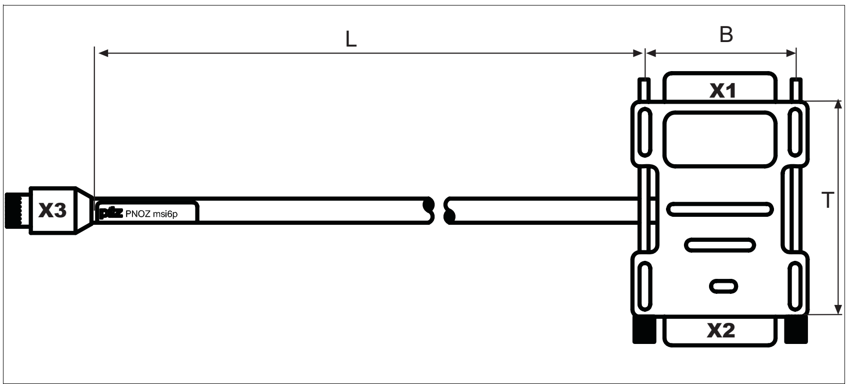
PNOZ msi6p

Description

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

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

Signal	Pin No.
A	2
/A	1
B	4
/B	3
Vcc	nc
GND	9



Technical details	
Environmental data	
Connector X1	**Male 9-pin D-Sub connector**
Connector X2	**Female 9-pin D-Sub connector**
Connector X3	**RJ-45 connector**
Fixing screws	**M3**
Ambient temperature	**0 ... +60 °C**
Storage temperature	**-25 ... +70 °C**
Protection type	**IP51**
Dimensions W/D	**31.5 mm/40.0 mm**
Cable runs L	**7500 mm** Order no.: 773859 **2500 mm** Order no.: 773860 **1500 mm** Order no.: 773861
Weight	**325 g** Order no.: 773859 **125 g** Order no.: 773860 **95 g** Order no.: 773861

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Adapter for PNOZ ms1p and PNOZ ms2p
PNOZ msi6p

Order reference

Type	Features	Order no.
PNOZ msi6p	7500 mm	773 859
PNOZ msi6p	2500 mm	773 860
PNOZ msi6p	1500 mm	773 861

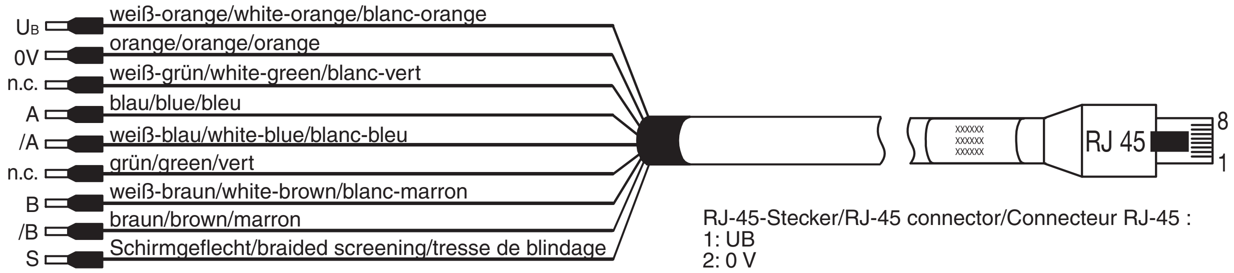
Adapter for PNOZ ms1p and PNOZ ms2p
PNOZ msi9p, PNOZ msi10p, PNOZ msi11p

Description

The connection cables PNOZ msi9p, PNOZ msi10p and PNOZ msi11p are used to connect an incremental encoder or adapter to the speed monitor PNOZ ms1p or PNOZ ms2p.
The connection to the speed monitor is made via the RJ-45 connector.

The cable cores for connecting the incremental encoder or adapter feature wires with crimp connectors. The cable cores are labelled.

Terminal assignment



RJ-45-Stecker/RJ-45 connector/Connecteur RJ-45 :
1: UB
2: 0 V
3. n.c.
4: A
5: /A
6: n.c.
7: B
8: /B
S: Schirm/Screen/Blindage

n.c. = nicht belegt/not connected/non utilisé

Technical details

Environmental data

Cable runs	
PNOZ msi9p	**5.0 m**
PNOZ msi10p	**2.5 m**
PNOZ msi11p	**1.5 m**
Cable type	**CAT6, flexible, silicone-free**
Colour coding in accordance with	**EIA/TIA 568B**
Temperature resistance of insulation material	**max. 60° C**
Climatic suitability	**EN 60068-2-78**
Condensation	**Not permitted**
Ambient temperature	**0 ... +60 °C**
Storage temperature	**-25 ... +70 °C**
Protection type	**IP20**
Weight	
PNOZ msi9p	**180 g**
PNOZ msi10p	**90 g**
PNOZ msi11p	**75 g**

Order reference

Type	L	Order no.
PNOZ msi9p	5.0 m	773 856
PNOZ msi10p	2.5 m	773 854
PNOZ msi11p	1.5 m	773 855

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Adapter for PNOZ ms1p and PNOZ ms2p
PNOZ msi9p, PNOZ msi10p, PNOZ msi11p

Order reference for accessories

Type	Features	Order no.
PNOZ msi S09	9-pin	773 870
PNOZ msi S15	15-pin	773 871
PNOZ msi S25	25-pin	773 872

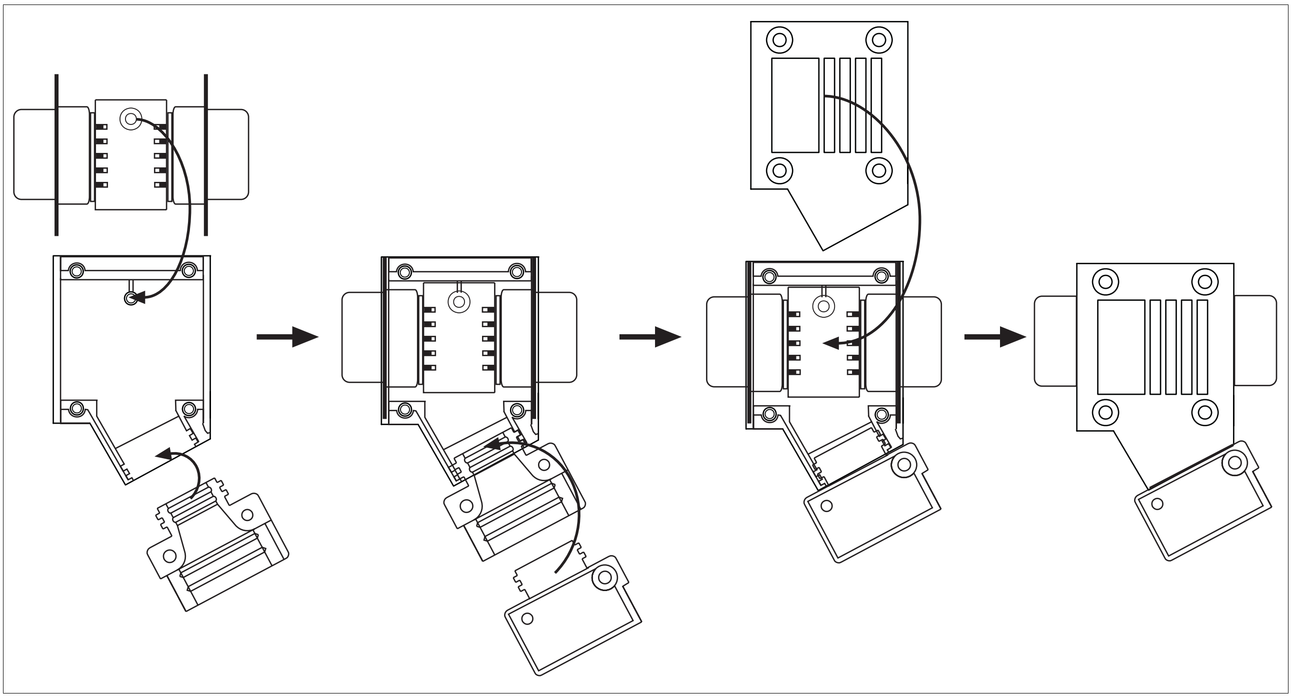
Adapter for PNOZ ms1p and PNOZ ms2p
PNOZ msi S09, PNOZ msi S16, PNOZ msi S25

Description

The PNOZ msi connector sets are used to connect frequency converters to the speed monitor PNOZ ms1p or PNOZ ms2p.

The contacts on the female D-SUB connector and the male D-SUB connector are connected via the PCB and have the same assignment. The signals that are relevant for the speed monitor are recorded in parallel and are fed to the RJ-45 connector via the cable. (Pilz adapter cable, see order reference for accessories).

The individual connector set components are assembled as shown in the diagram:



Supplied with the connector sets	
Adapter housing	**9, 15 or 25-pin**
male D-SUB connector	**9, 15 or 25-pin**
female D-SUB connector	**9, 15 or 25-pin**
PCB for adapter housing	**9, 15 or 25-pin**
Cable clip	**1 piece**

Technical details

Plug-in connector	
Supply voltage in accordance with VDE 0110	**125 VAC**
Volume resistance	**≤3 mOhm**
Test voltage	**1000 V, eff**
Ambient temperature	**-55 ... +125 °C**

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Adapter for PNOZ ms1p and PNOZ ms2p
PNOZ msi S09, PNOZ msi S16, PNOZ msi S25

Plug-in connector	
Insulator material	**PBTP UL 94 V-0**
Housing material	**Steel, Sn over Ni**
Dimensions (H x W x D)	**44 mm x 30 mm x 17.6 mm** Order no.: 773870 **52.3 mm x 30 mm x 17.6 mm** Order no.: 773871 **66.2 mm x 30 mm x 17.6 mm** Order no.: 773872
Weight	**90 g** Order no.: 773870 **100 g** Order no.: 773871 **115 g** Order no.: 773872

Adapter housing	
Housing material	**Zinc diecasting**
Protection type	**IP40**

Order reference

Type	Features	Order no.
PNOZ msi S09	9-pin	773 870
PNOZ msi S15	15-pin	773 871
PNOZ msi S25	25-pin	773 872

Order reference for accessories

Type	Features	Order no.
PNOZ msi10p	Adapter cable 2.5 m	773 854
PNOZ msi11p	Adapter cable 1.5 m	773 855

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Software

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Software

Contents	Page

Software
PNOZmulti Configurator

PNOZmulti Configurator is a graphic tool for the configuration and programming of the PNOZmulti modular safety system.

Features

- Graphic configuration of safety circuit
- Project configuration, configuration generation, documentation, commissioning
- Data transfer via serial interface or chip card
- User interface in German, English, French, Italian, Spanish, Japanese, Chinese (selectable)
- For Windows 2000 and XP and Vista

Description

The PNOZmulti Configurator is a graphic tool for the configuration and programming of the PNOZmulti modular safety system.
The elements of the safety circuit are depicted as icons on the Configurator user interface.
The safety circuit can be created quickly and easily using drag & drop.
The PNOZmulti Configurator downloads the complete safety circuit to the modular PNOZmulti via a chip card or via the serial interface.
The safety circuit can also be uploaded from the modular PNOZmulti to the PNOZmulti Configurator for revision.

Safety functions that can be created using the PNOZmulti Configurator include, for example:

- E-STOP
- Two-hand button
- Enable switch
- Operating mode selector switch
- Press functions
- Light beam device
- Light grid
- Safety mat
- Speed monitoring
- Muting

Users can configure fieldbus inputs and outputs in conjunction with the fieldbus modules. These inputs and outputs can only be used for standard functions.
Virtual inputs and outputs can be configured via the serial interface. These inputs and outputs are treated in the same manner as fieldbus inputs and outputs.
Inputs and outputs for standard functions are supported.

The PNOZmulti Configurator contains a wide range of test and diagnostic options, such as:

- Dynamic program display
- Diagnostic word for evaluating the element status
- Display PNOZmulti error stack

The project can be protected through passwords.

System requirements

- Operating system: Windows(r) 2000 or XP or Vista
- Processor: Min. 800 MHz processor
- RAM: Min. 512 MB
- Hard drive: 20 GB; min. 15 GB of available disk space
- Support for Super VGA graphics
- CD-ROM drive

Order reference

Software licences	Features		Order no.
PNOZmulti Configurator	Software	CD and manual	773 000
PNOZmulti Configurator	Software	CD	773 000D
PNOZmulti Configurator	Software	Basic Licence	773 010B
PNOZmulti Configurator	Software	User Licence	773 010K
PNOZmulti Configurator	Software	Project Licence	773 010G
PNOZmulti Configurator	Software	Basic Upgrade Licence	773 010U
PNOZmulti Configurator	Software	User Upgrade Licence	773 010V

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Software
PNOZmulti Configurator

Software licences	Features		Order no.
PNOZmulti Configurator	Software	Project Upgrade Licence	773 010W
PNOZmulti Configurator	Software	Time Limited Licence, 2 months	773 010S
PNOZmulti Configurator	Software	Time Limited Licence, 3 months	773 010R
PNOZmulti Configurator	Software	Time Limited Licence, 4 months	773 010Q

Order guidelines
Basic Licence: Single user licence, issued to one owner (company name and location/project must be stated)
User Licence Discounted licence for an additional workstation, issued to the owner of a basic licence
Basic Upgrade Licence: Discounted licence enabling owners of a basic licence to change to a newer version of the software
User Upgrade Licence: Discounted licence enabling owners of a user licence to change to a newer version of the software
Time Limited Licence, 2 months: Basic licence restricted to 2 months
Time Limited Licence, 3 months: Basic licence restricted to 3 months
Time Limited Licence, 4 months: Basic licence restricted to 4 months

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Star-delta start-up, Category B, EN 954-1	3.0-23
Motor ON/OFF, Category B, EN 954-1	3.0-27

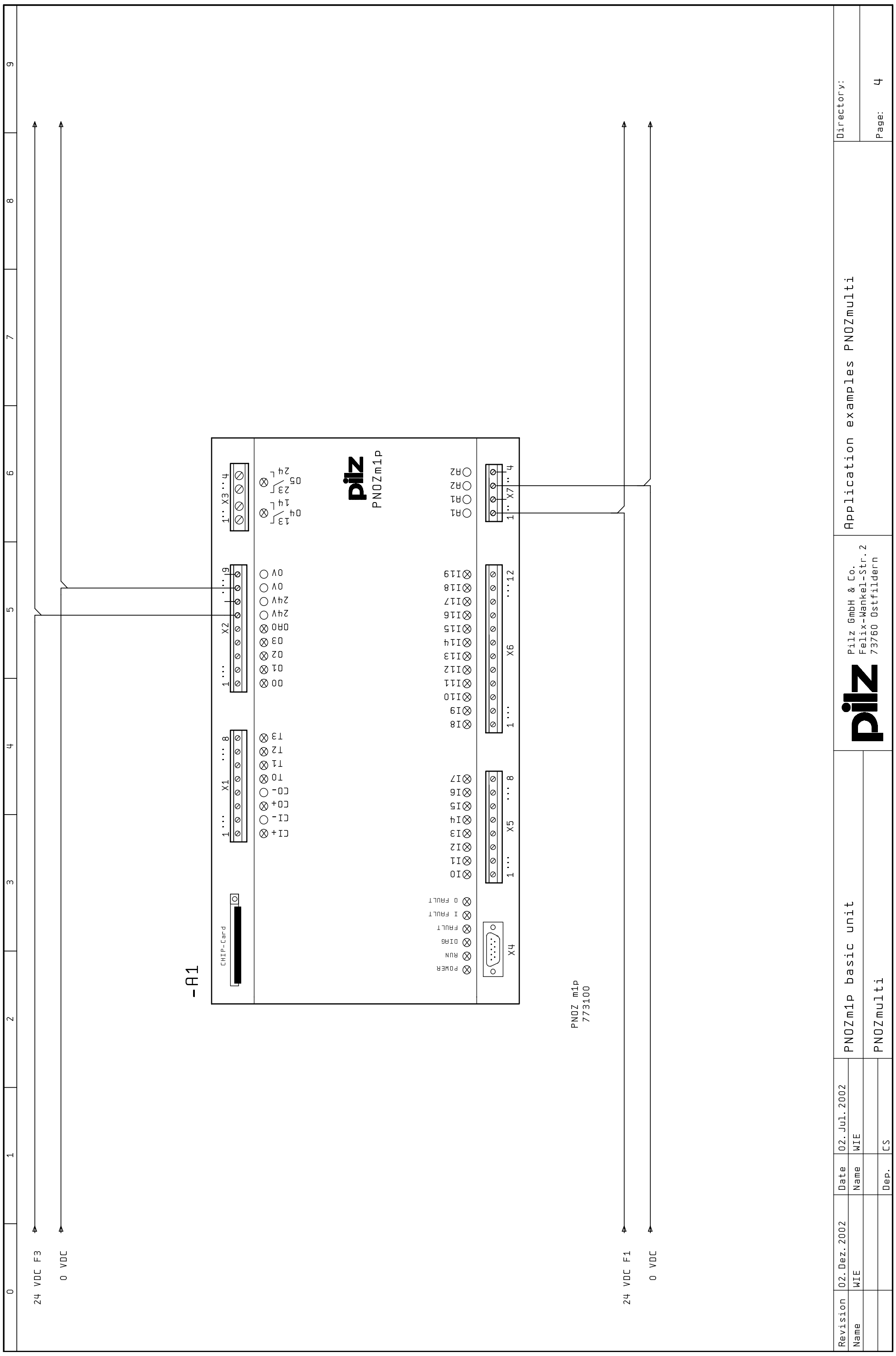
Safety assessments

Before using a unit it is necessary to perform a safety assessment in accordance with the Machinery Directive. The units as individual components guarantee functional safety, but not the safety of the entire application. You should therefore define the safety requirements for the plant as a whole, and also define how these will be implemented from a technical and organisational standpoint (e.g. refer to BIA [BG Institute for Occupational Safety] Report 6/97).

Base unit configuration

All the applications use the PNOZ m1p. Details of how the unit is wired are given just once, at the start of the chapter.

Base unit configuration



Using connection points

Features

- 3 E-STOP buttons
- 2 light curtains
- Dual-channel with detection of shorts across contacts
- 3 instantaneous load shutdowns

Description

This example illustrates the use of connection point elements in the PNOZmulti Configurator. Connection point elements enable you to create wiring diagrams that extend over several pages in the PNOZmulti Configurator.
Three E-STOP buttons are AND-linked. If none of the buttons are operated, there will be a high signal at output A1.o0. A connection point is used to AND-link the result of the AND operation to the signal from light curtain 2. The signal at output A1.o2 will only be high if no E-STOP button has been operated and the light curtain is not interrupted.
A connection point is used to AND-link light curtain 1 to E-STOP button 1. The signal at output A1.01 will only be high if E-STOP button 1 has not been operated and the light curtain is not interrupted.

Feedback loop

The feedback loop is not used.

Reset

The unit is ready for operation when the conditions at the inputs have been met (automatic reset).

Safety assessment

- A short circuit between 24 VDC and inputs A1.i0 ... A1.i9 will be detected as an error. The safety outputs will carry a low signal.
- A short circuit between 24 VDC and a safety output will be detected and the safety outputs will carry a low signal.

Configuration, page 1

- 3 E-STOP
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i0, A1.i2, A1.i4 - test pulse 0, A1.i1, A1.i3, A1.i5 - test pulse 1)
  - Automatic reset
- 2 connection point elements
  - Source connection point 1 and source connection point 2
- AND element
  - 3 inputs
- Output
  - Safety output, semiconductor type
  - Single-pole

Continued overleaf

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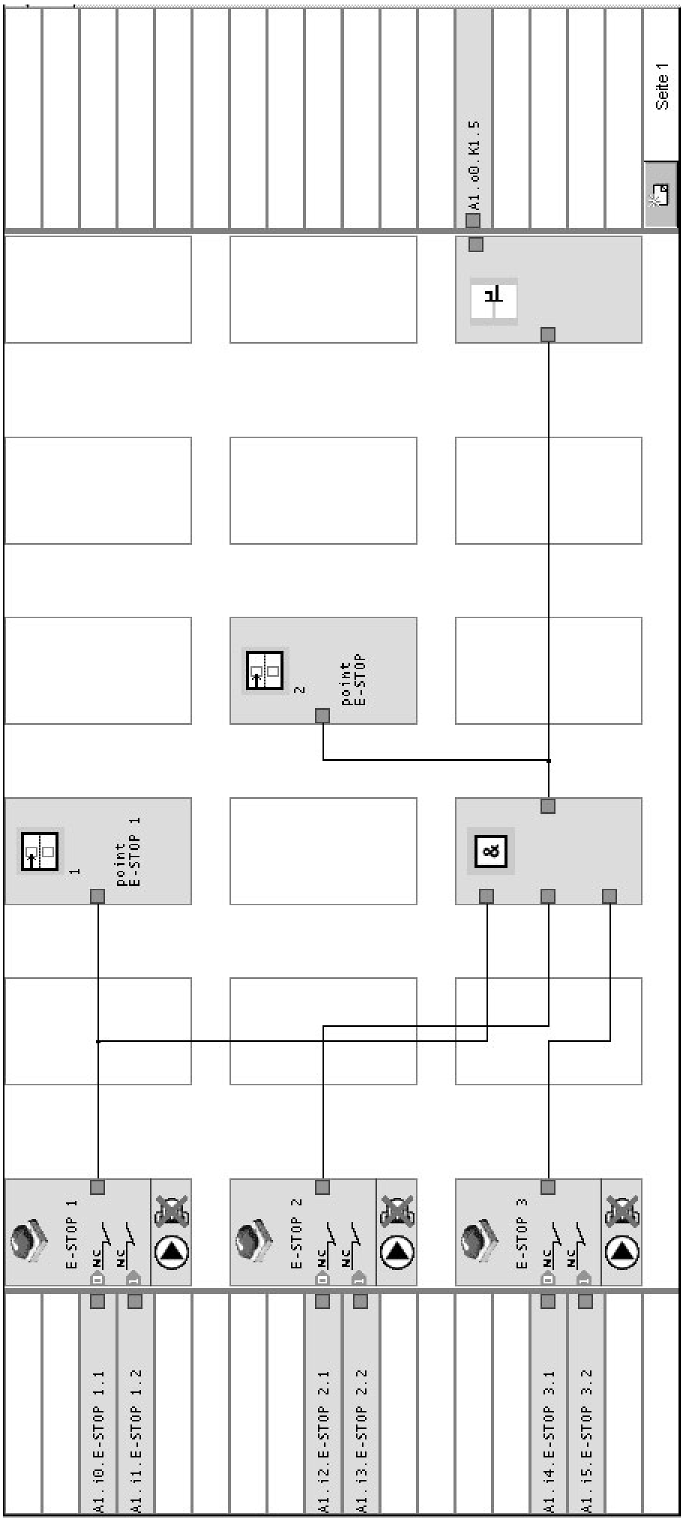
Using connection points



Using connection points

Configuration, page 2

- 2 light curtains
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i6, A1.i8 - test pulse 0, A1.i7, A1.i9 - test pulse 1)
  - Automatic reset
- 2 connection point elements
  - Destination connection point 1 and destination connection point 2
- 2 AND elements
  - 2 inputs
- 2 outputs
  - Safety output, semiconductor type
  - Single-pole

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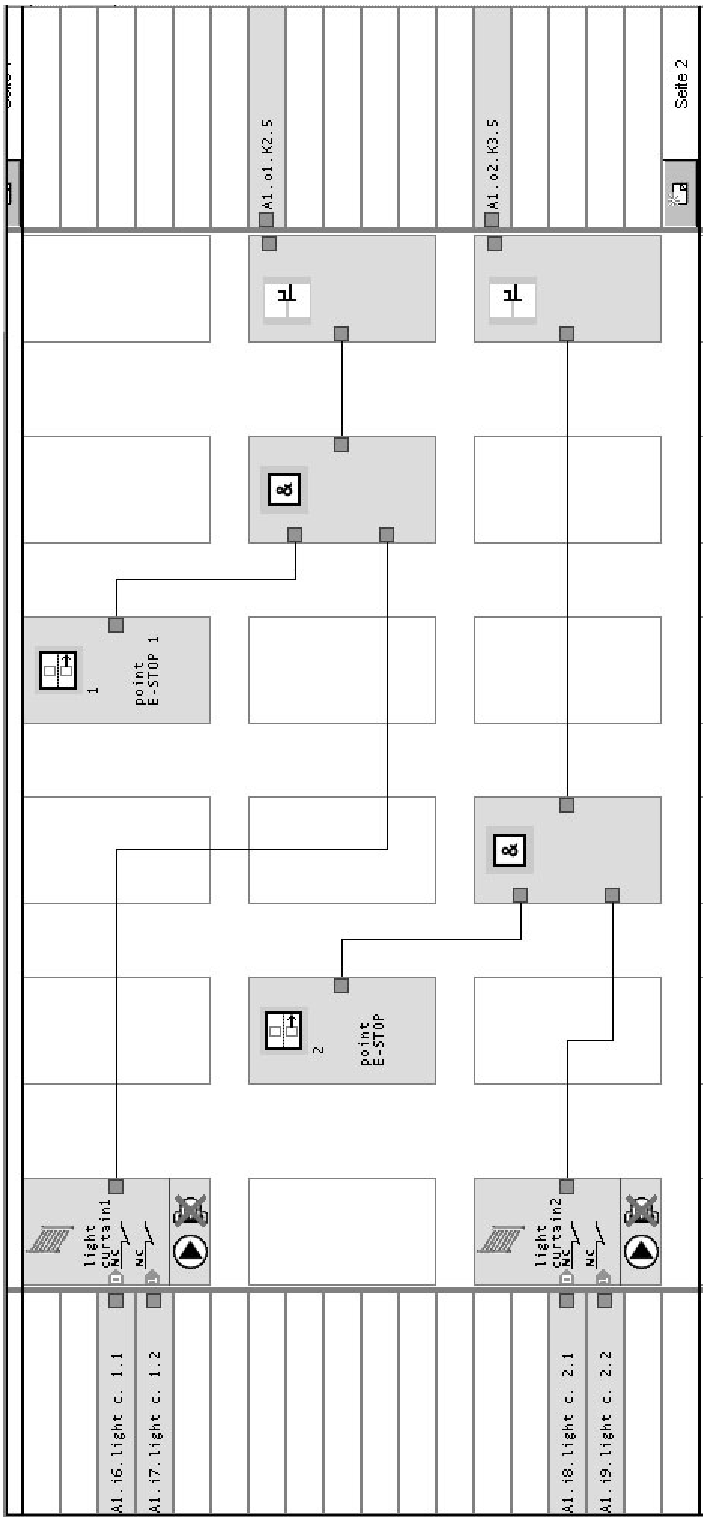
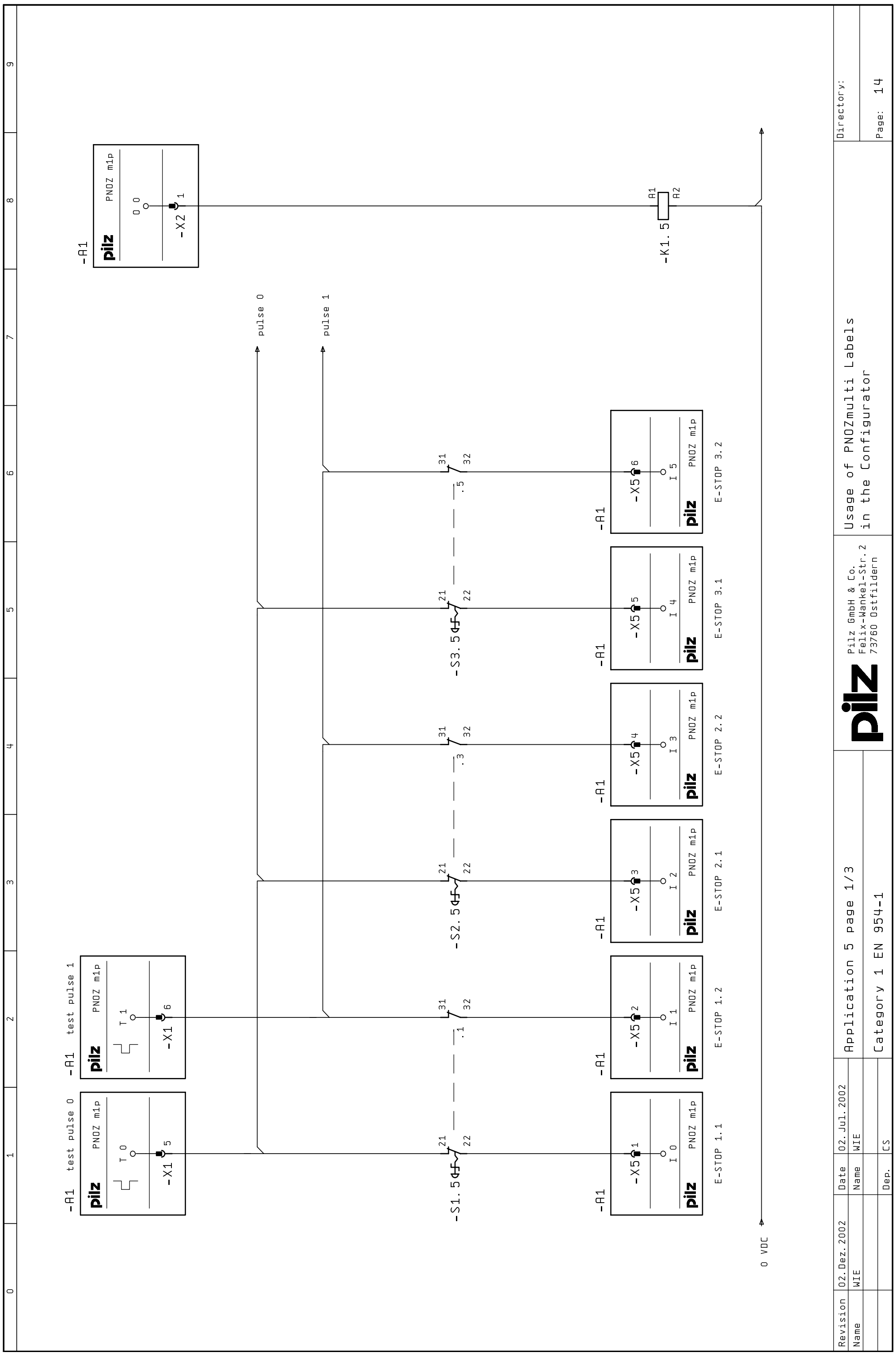
Using connection points



Using connection points



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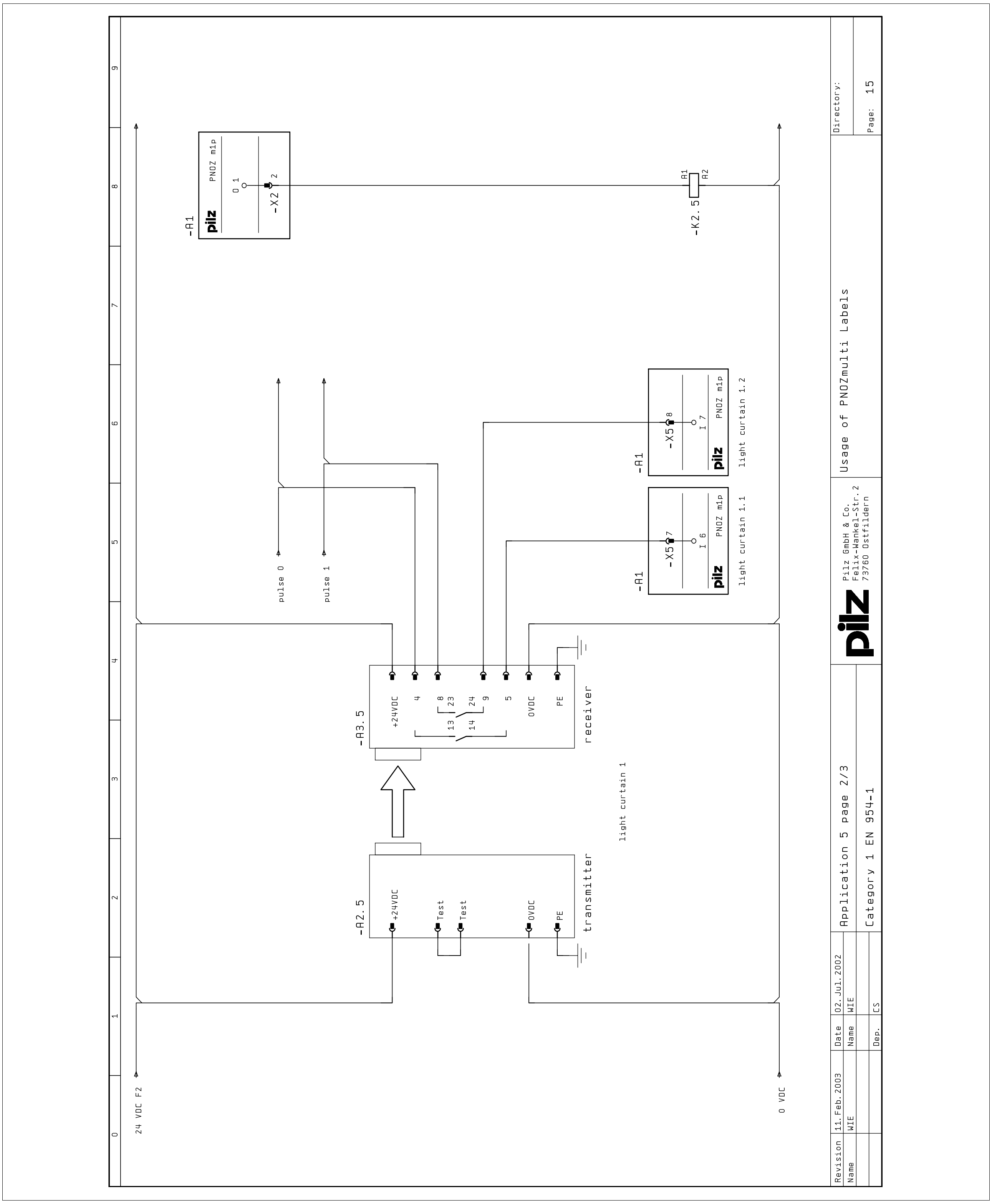
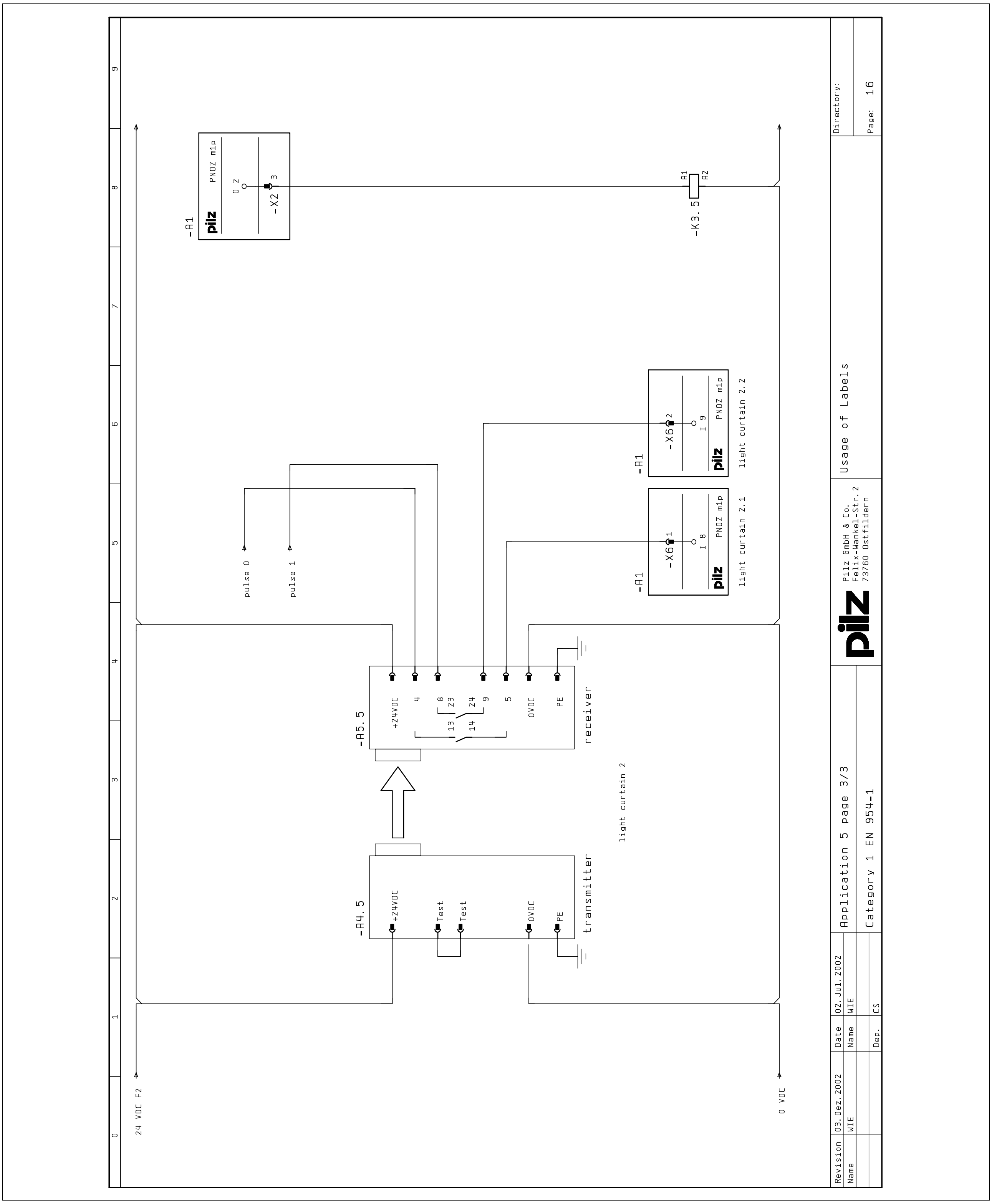
Using connection points



Using connection points



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E-STOP and light guard, Category 4, EN 954-1

Features

- 1 E-STOP button
- 1 light curtain
- Dual-channel with detection of shorts across contacts
- 1 PLC enabling signal
- 1 instantaneous controller enable
- 1 delayed load shutdown

Description

A light curtain is used to protect a hazardous area. The machine's motor will only be switched on if:
- The light curtain is not interrupted and
- The E-STOP button has not been operated.

If these safety conditions are met, a pulse (not safety-related) at the enable input will start the motor and the controller will be enabled.
If the light curtain is interrupted or the E-STOP button is operated, the signal at outputs A1.o0, A1.o4 and A1.o5 will switch from high to low. The controller enable will be interrupted and the motor will switch off after a delay of 0.5 s.

Feedback loop

The N/C contacts KM1.2 and KM2.2 on contactors KM1.2 and KM2.2 are connected to the feedback loop input A1.i8.

Reset

If the conditions for starting the motor have been met and the feedback loop is closed, the PLC enabling pulse must be sent. This pulse (monitored reset) enables plant operation.

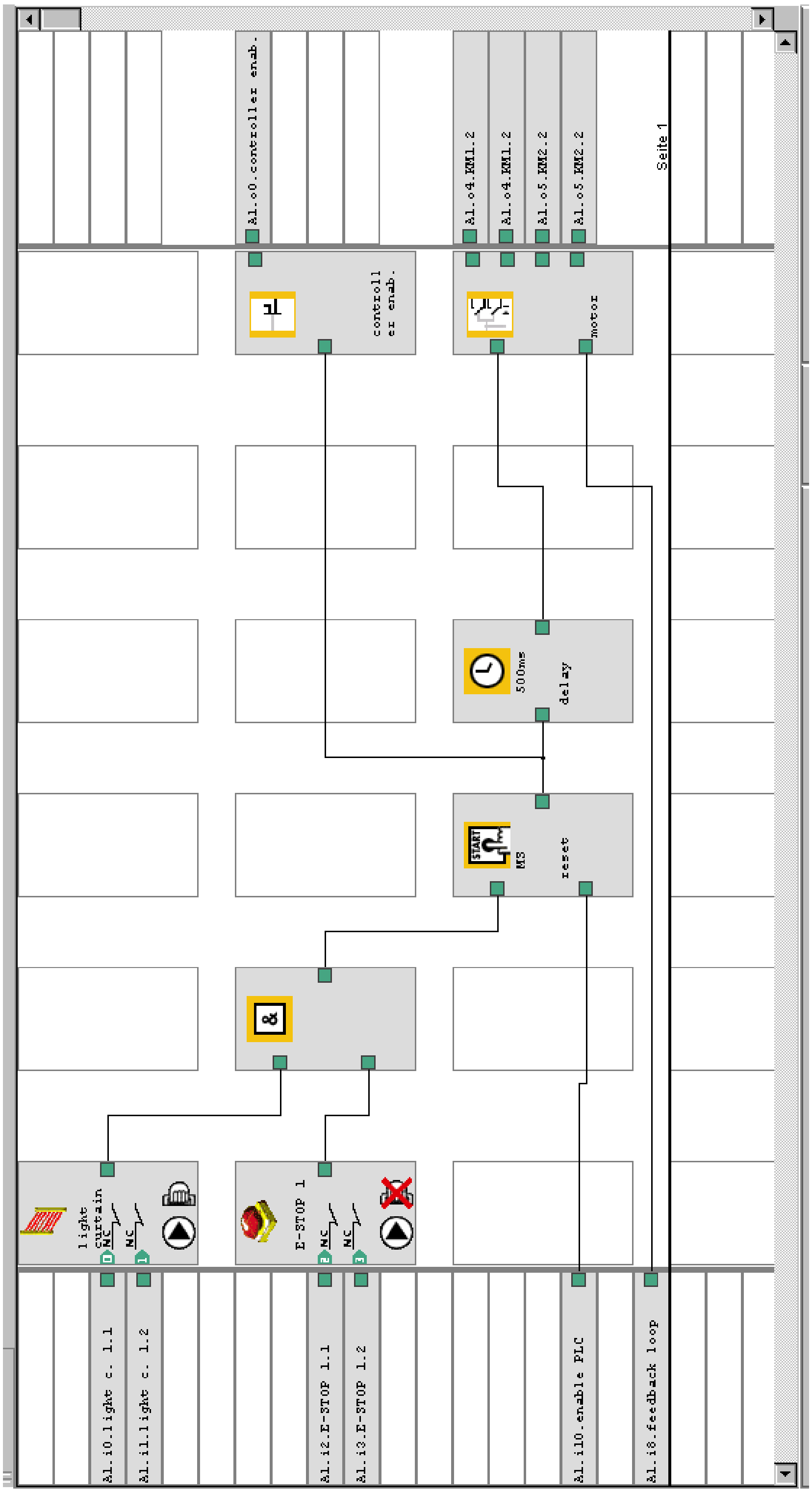
Safety assessment

- The PNOZ m1p and contactors
- KM1.2 and KM2.2 must be installed in a single location.
- If a switch contact (A1.i0 ... A1.i3) is overridden, this will be detected as an error at the next operation. Safety outputs A1.o4 and A1.o5 will carry a low signal.
- A short circuit between 24 VDC and inputs A1.i0 ... A1.i3 will be detected as an error. All the safety outputs will carry a low signal.
- A short circuit between 24 VDC and a safety output will be detected and all the safety outputs will carry a low signal.

Configuration

- Light curtain
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i0 - test pulse 0, A1.i1 - test pulse 1)
  - Automatic reset
  - Start-up test
- E-STOP
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i2 - test pulse 2, A1.i3 - test pulse 3)
  - Automatic reset
- AND element
  - 2 inputs
- Reset element
  - Monitored reset
- Delay element
  - 500 ms
- Motor output
  - Safety output, relay type
  - Redundant
  - Use feedback loop
- Controller enable output
  - Safety output, semiconductor type
  - Single-pole

E-STOP and light guard, Category 4, EN 954-1



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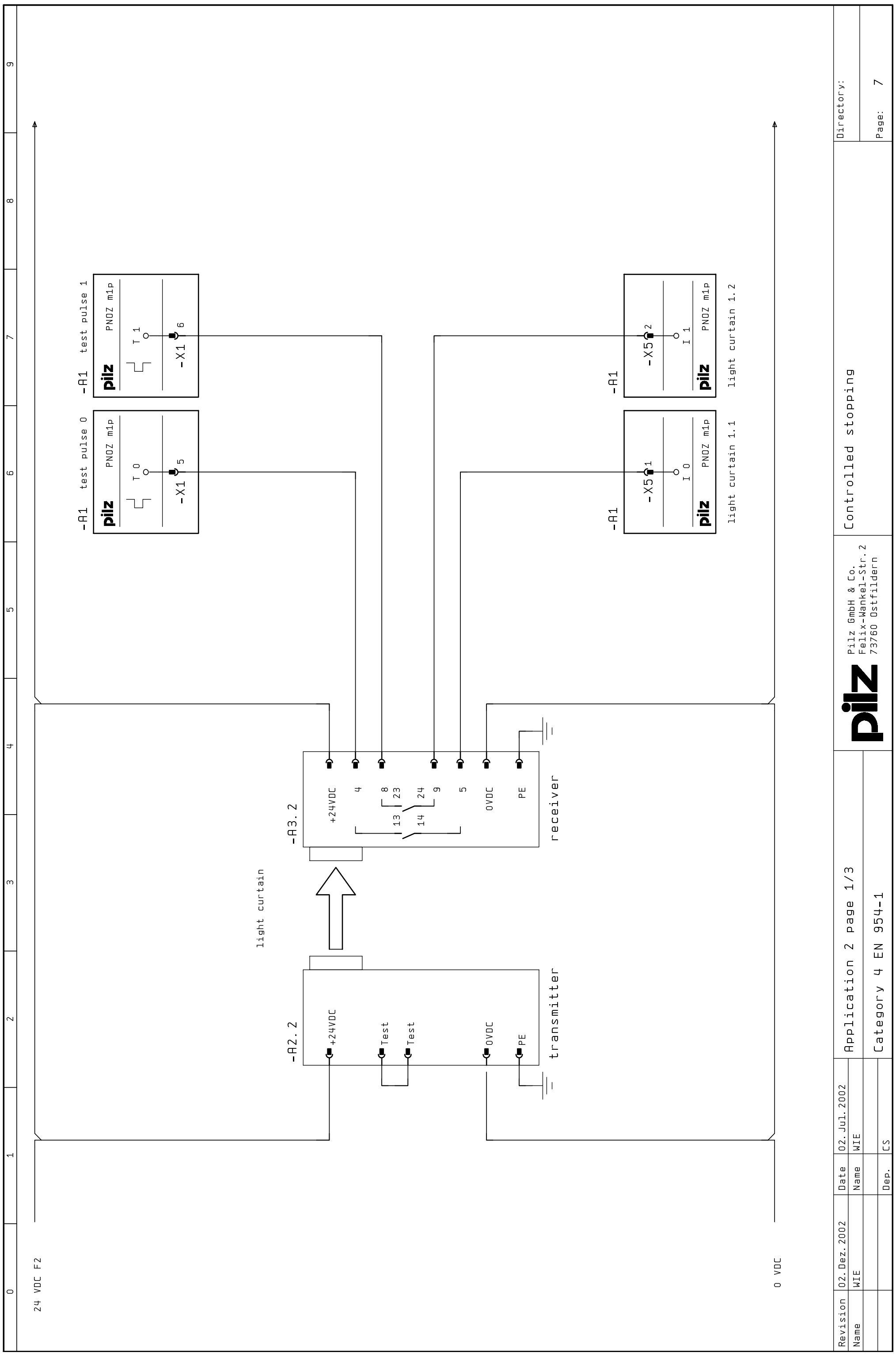
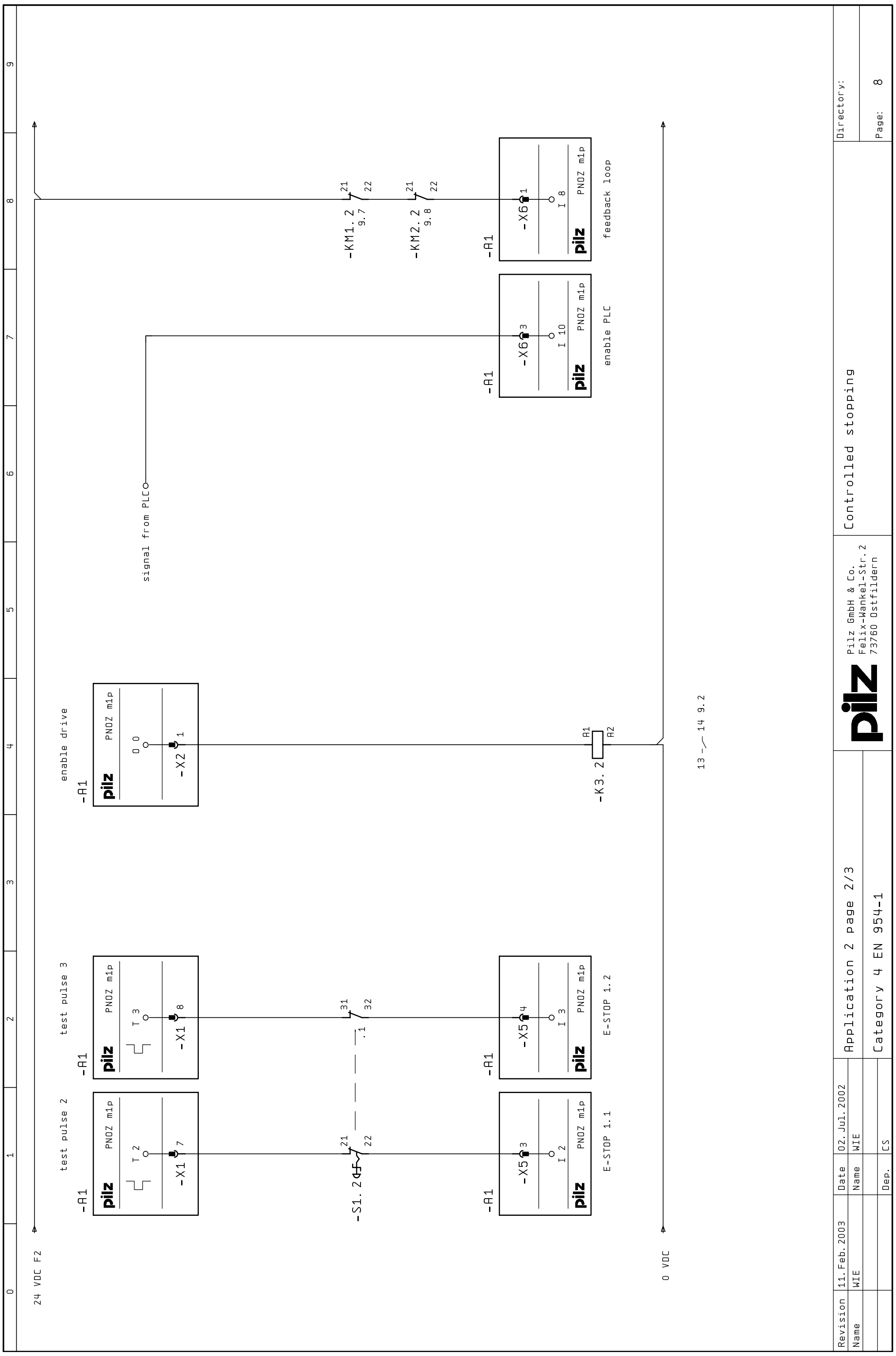
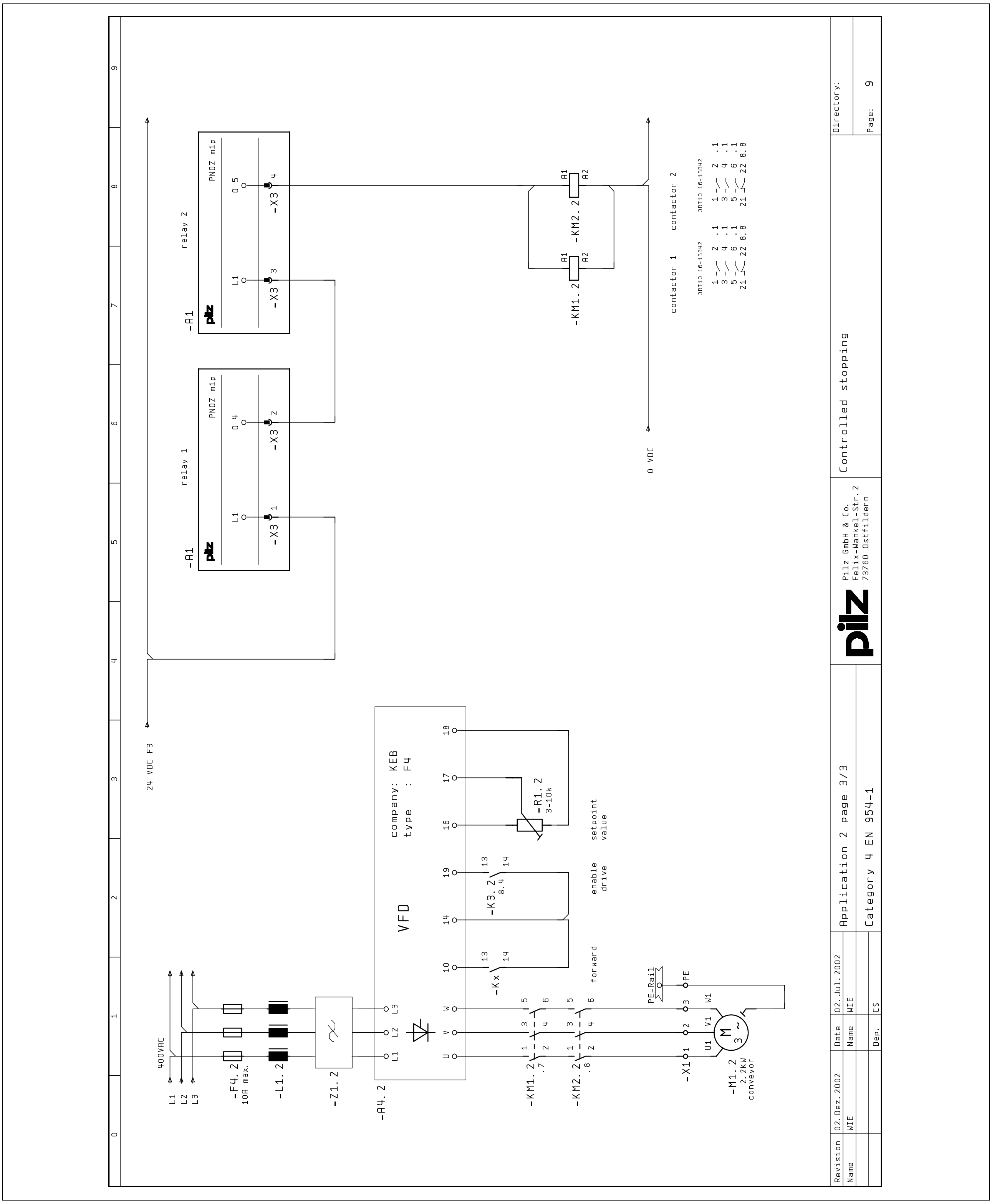
E-STOP and light guard, Category 4, EN 954-1



E-STOP and light guard, Category 4, EN 954-1



E-STOP and light guard, Category 4, EN 954-1



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Two-hand with override, Category 4, EN 954-1

Features

- 1 operating mode selector switch
- 1 E-STOP button
- 2 two-hand controls
- Dual-channel with detection of shorts across contacts
- 1 instantaneous load shutdown

Description

A machine can be operated by one or two people. The machine is enabled via two-hand buttons.
The machine's motor is switched on if:
- The E-STOP button has not been operated
  and
- The operating mode selector switch is in position “0” and both two-hand buttons are operated or
  The operating mode selector switch is in position “1” and two-hand button 2 is operated.

If one of these conditions is not met, the signal at output A1.o0 will switch from high to low and the motor will be switched off. The status of the operating mode selector switch is signalled at outputs A1.o1 and A1.o3.

Feedback loop

The N/C contacts KM1.3 and KM2.3 on contactors KM1.3 and KM2.3 are connected to the feedback loop input A1.i11.

Reset

E-STOP monitoring must be activated through the reset button S6.3 (manual reset). If the conditions for starting the motor have been met and the feedback loop is closed, operation of the plant is enabled.

Safety assessment

- If a switch contact (A1.i0 ... A1.i14) is overridden, this will be detected as an error at the next operation. Safety outputs A1.o0 and A1.o2 will carry a low signal.
- A short circuit between 24 VDC and inputs A1.i0, A1.i1, A1.i3 ... A1.i10 will be detected as an error. The safety outputs will carry a low signal.
- A short circuit between 24 VDC and the reset input A1.i12 will be detected.
- A short circuit between 24 VDC and the override input A1.i13 or A1.i14 will be detected.
- A short circuit between 24 VDC and a safety output will be detected and the safety outputs will carry a low signal.
- It must be possible to protect the operating mode selector switch from unauthorised operation.

Configuration, page 1

- E-STOP
  - Switch type 3 (2 N/C)
  - Detection of shorts between contacts (A1.i0 - test pulse 0, A1.i1 - test pulse 1)
  - Manual reset (A1.i12 - test pulse 3)
- Connection point
  - Source connection point 1

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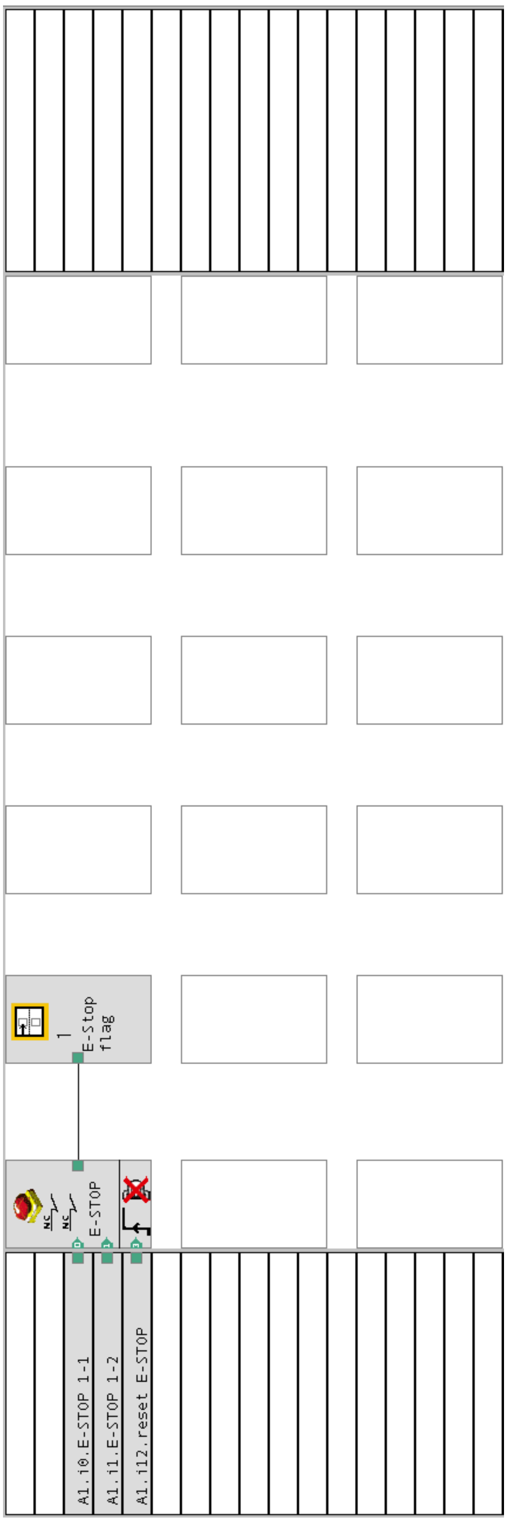
Two-hand with override, Category 4, EN 954-1



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Two-hand with override, Category 4, EN 954-1

Configuration, page 2

- Two-hand button
  - Switch type 6 (N/O - N/C)
  - Detection of shorts between contacts (A1.i3, A1.i4 and A1.i7, A1.i8 - test pulse 0A1.i5, A1.i6 and A1.i9, A1.i10 - test pulse 1)
- Operating mode selector switch
  - Switch type 9
  - Detection of shorts between contacts (A1.i13, A1.i14 - test pulse 2)
- Connection point
  - Source connection point 1
- OR element
  - 2 inputs
- AND element
  - 3 inputs
- Motor output
  - Safety output, semiconductor type
  - Redundant
  - Use feedback loop
- Two-hand on output
  - Safety output, semiconductor type
  - Single-pole
- Two-hand off output
  - Safety output, semiconductor type
  - Single-pole

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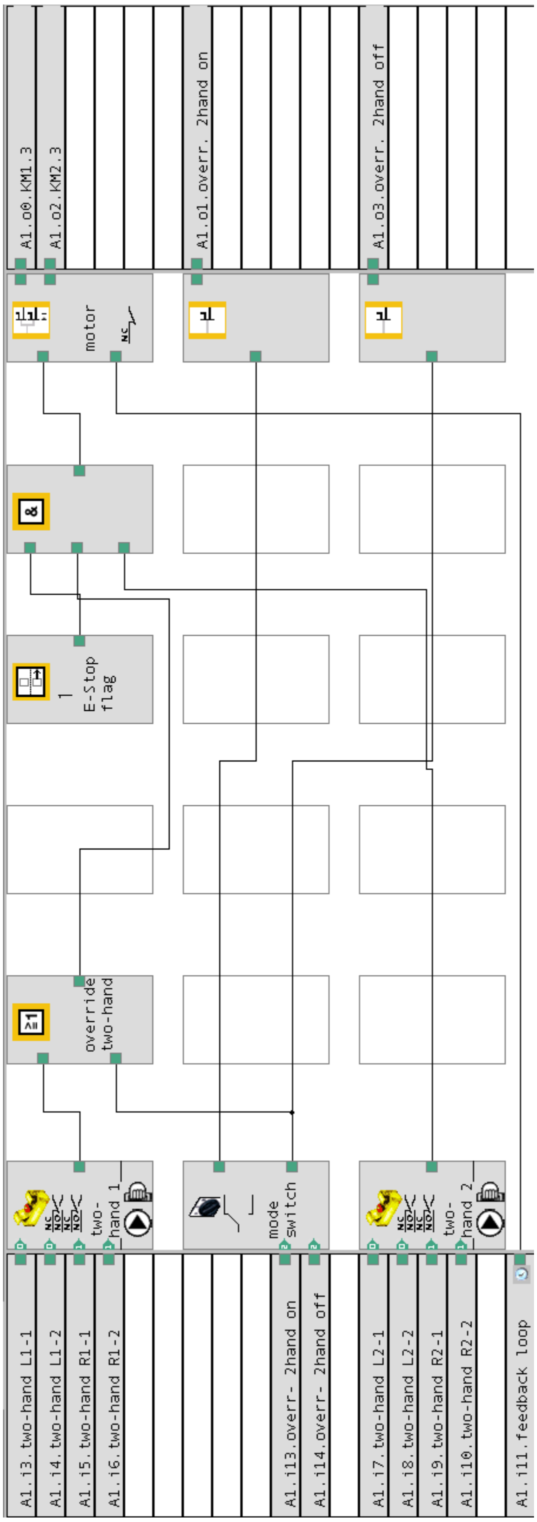
Two-hand with override, Category 4, EN 954-1



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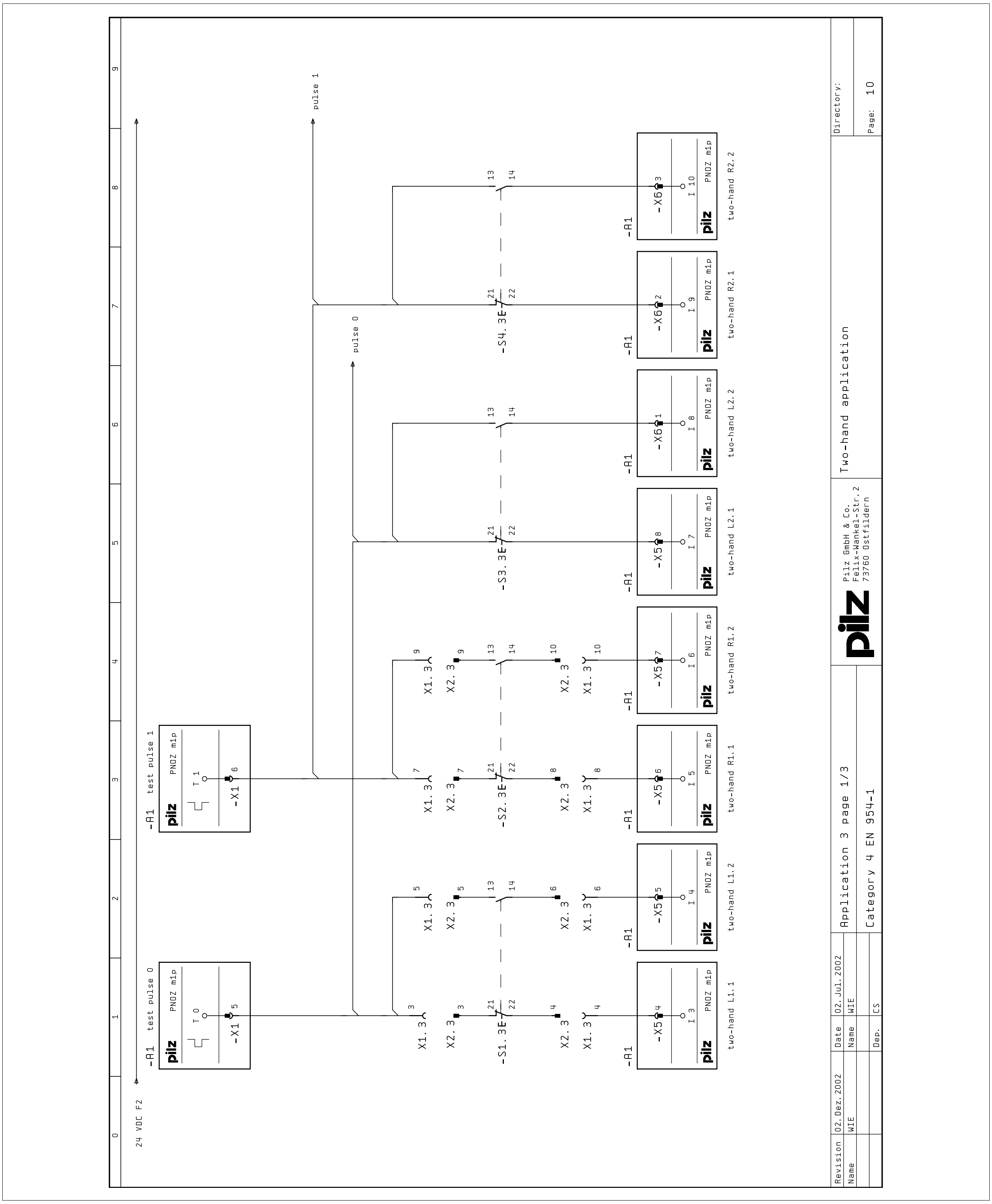
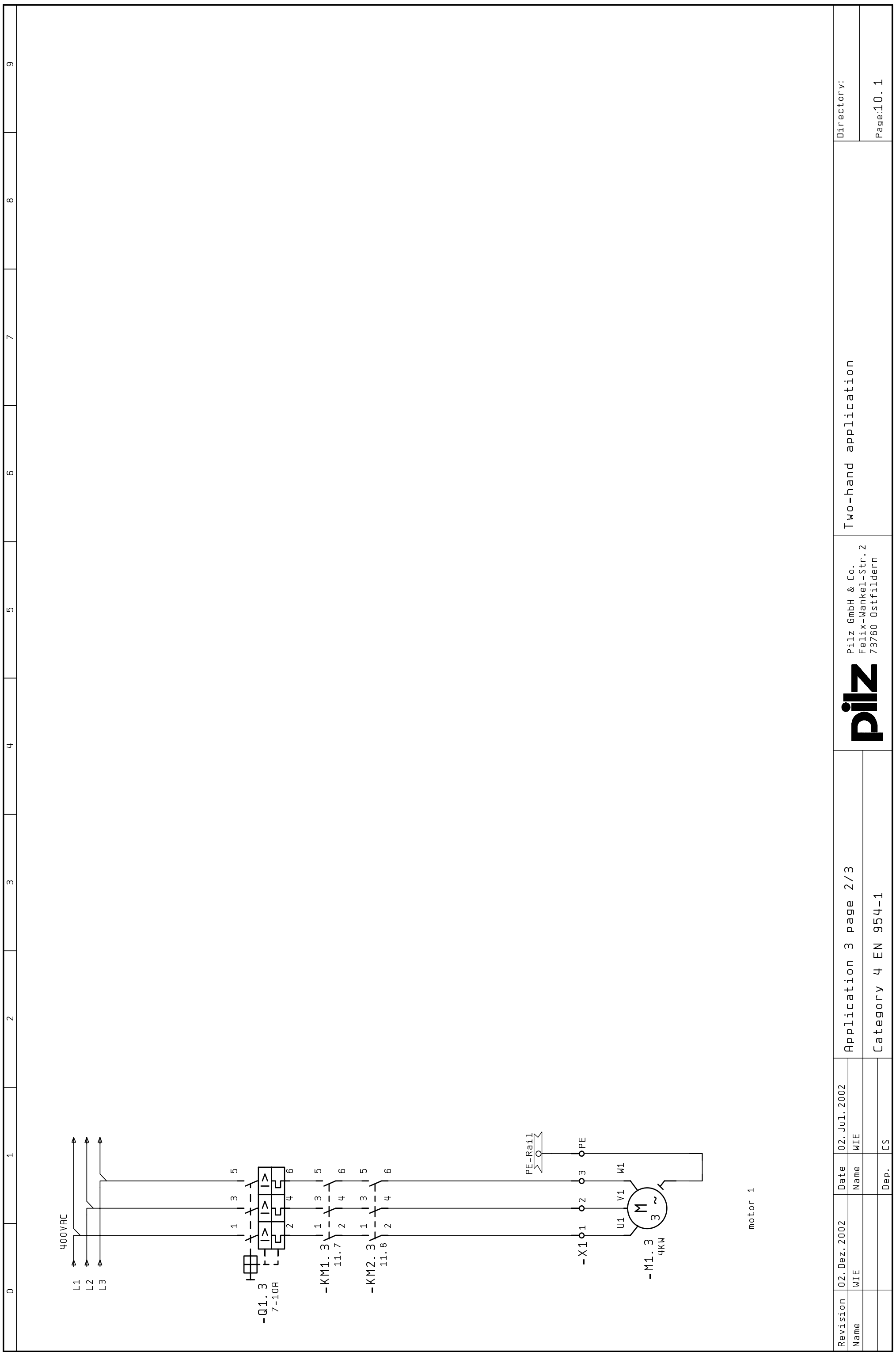
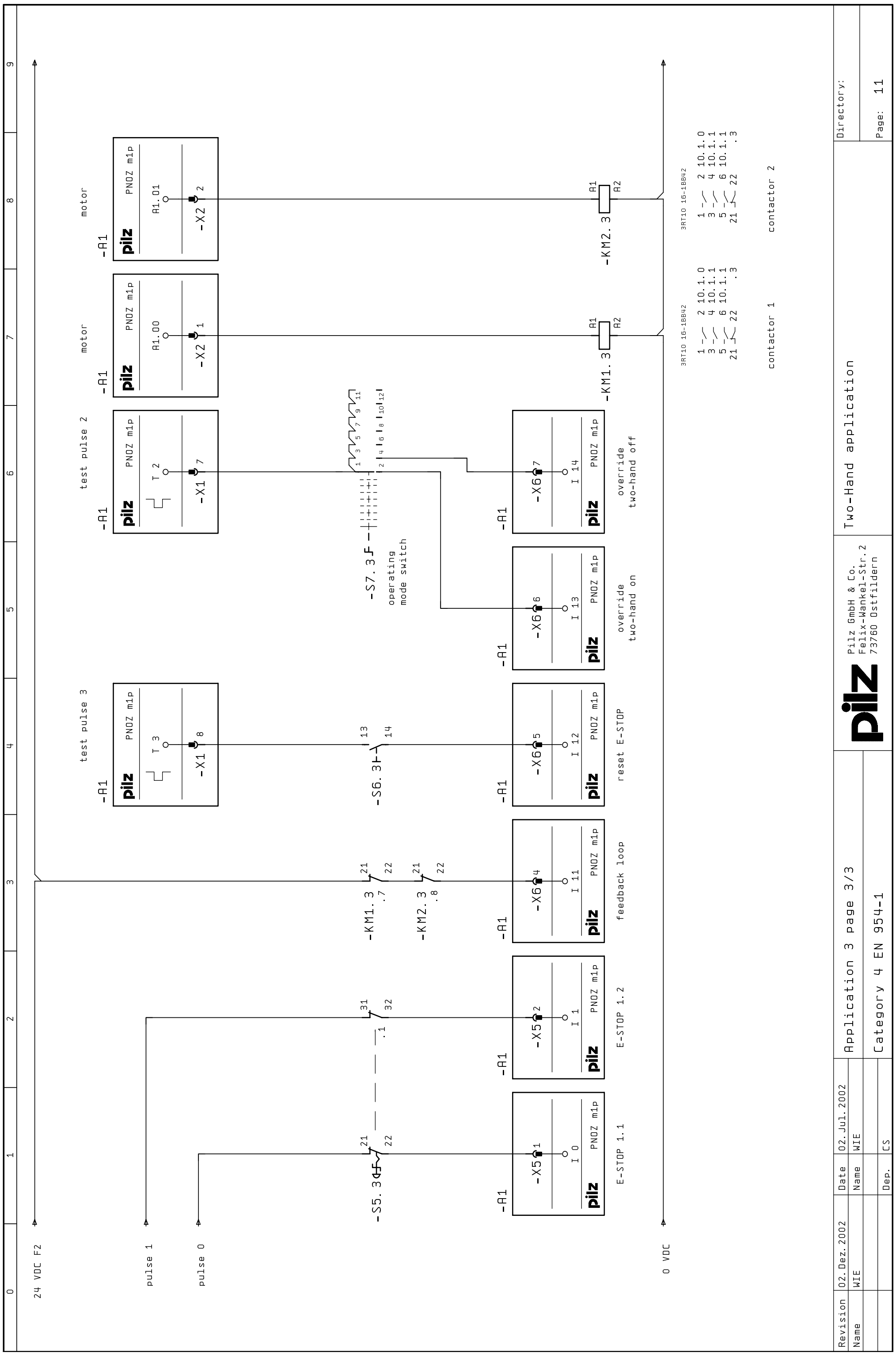
Two-hand with override, Category 4, EN 954-1



Two-hand with override, Category 4, EN 954-1



Two-hand with override, Category 4, EN 954-1



Star-delta start-up, Category B, EN 954-1

Features

- 1 reset module
- 2 logic connections
- 3 semiconductor outputs
- 1 instantaneous load shutdown
- 2 load shutdowns with a 5 s delay

Description

When the motor is switched on, after a 5 second delay it is possible to switch between a star and a delta connection. A high signal at input A1.i4 selects a star connection, a high signal at input A1.i5 selects a delta connection.

Feedback loop

The feedback loop is not used.

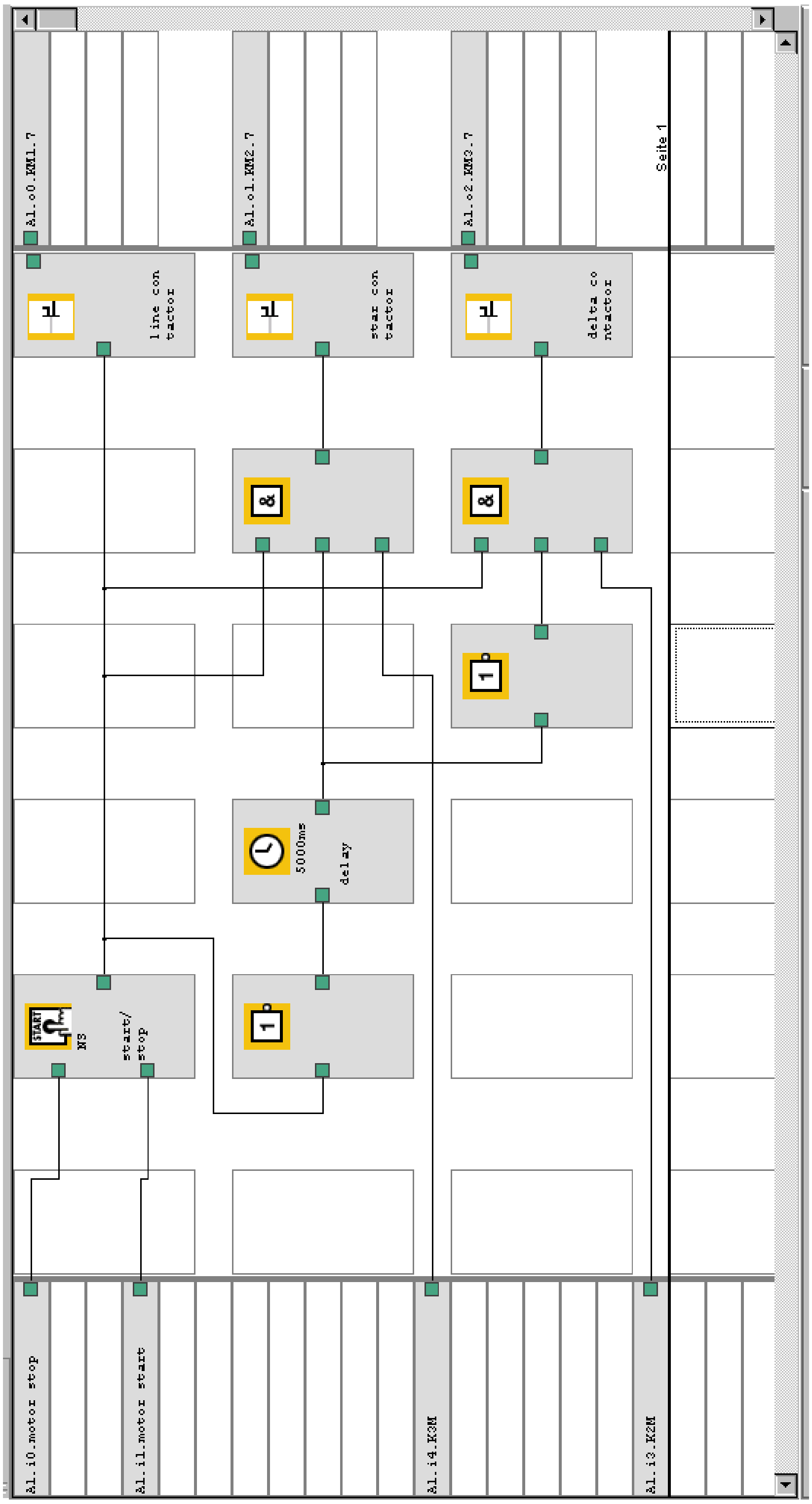
Reset

The PNOZ m1p is ready for operation once supply voltage is applied. If there is a high signal at input A1.i0, the application can be activated through a signal change from low to high at input A1.i1.

Configuration

- 1 reset element
  - Non-monitored reset
- 1 delay element
  - 5000 ms
- 2 AND elements
  - 3 inputs
- 2 negation elements
  - 1 input
- 3 outputs
  - Safety output, semiconductor type
  - Single-pole

Star-delta start-up, Category B, EN 954-1



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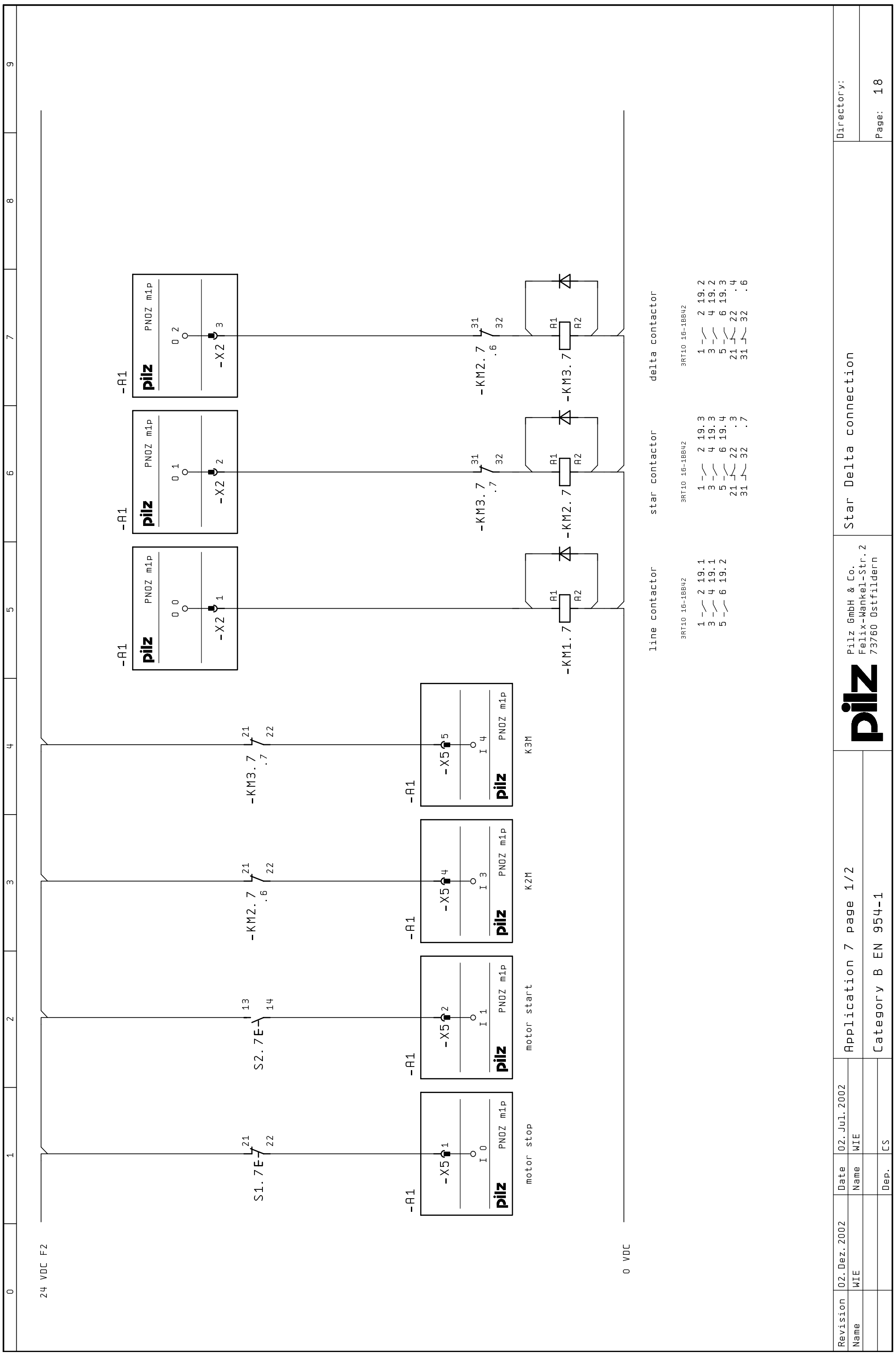
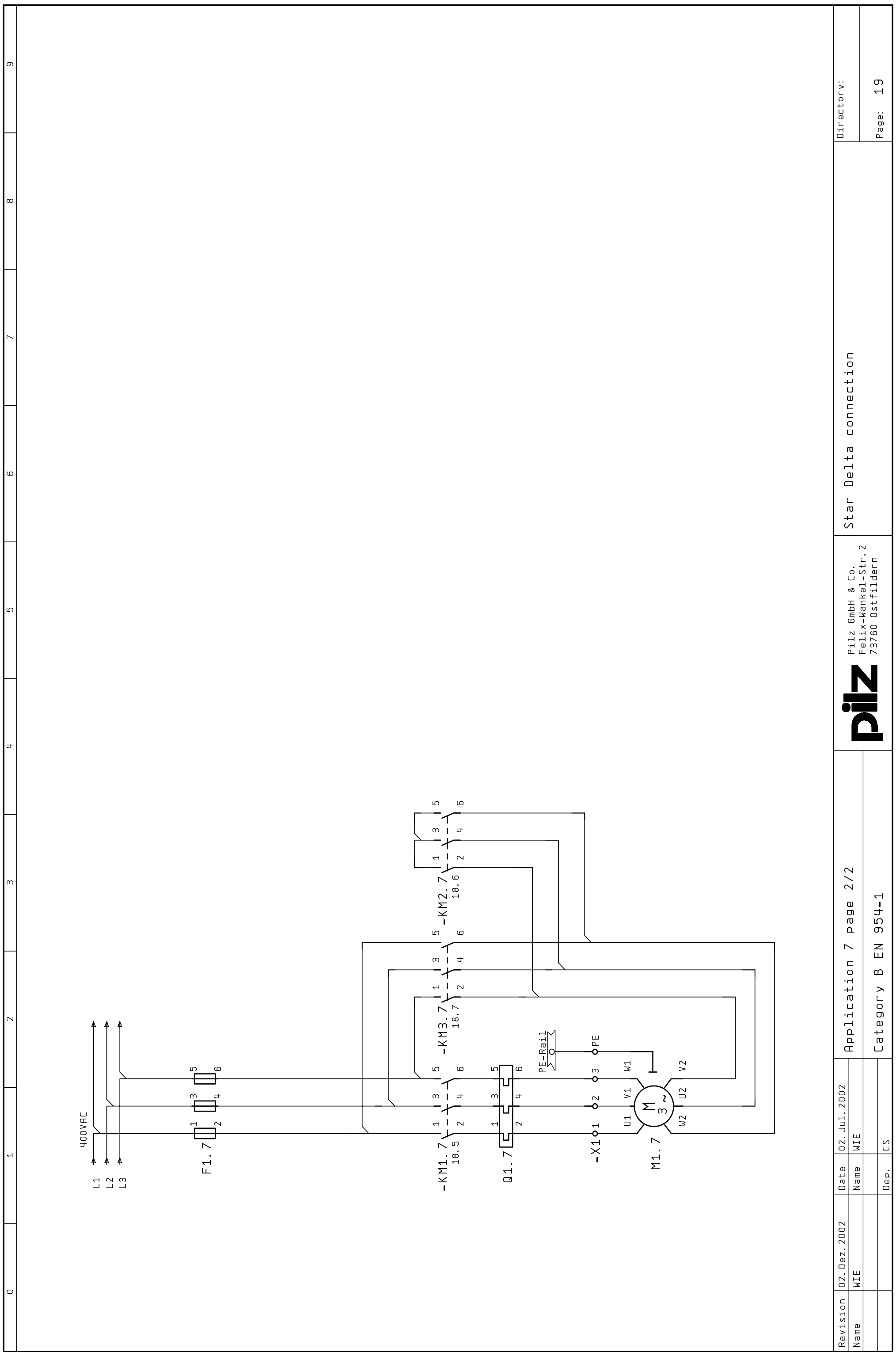
Star-delta start-up, Category B, EN 954-1



3.0

Star-delta start-up, Category B, EN 954-1



Motor ON/OFF, Category B, EN 954-1

Features

- 1 E-STOP button
- 1 logic connection
- 2 instantaneous load shutdowns

Description

A motor can be switched on or off if the E-STOP button has not been operated. Pressing the E-STOP button stops the motor immediately.

Feedback circuit

The feedback loop is not used.

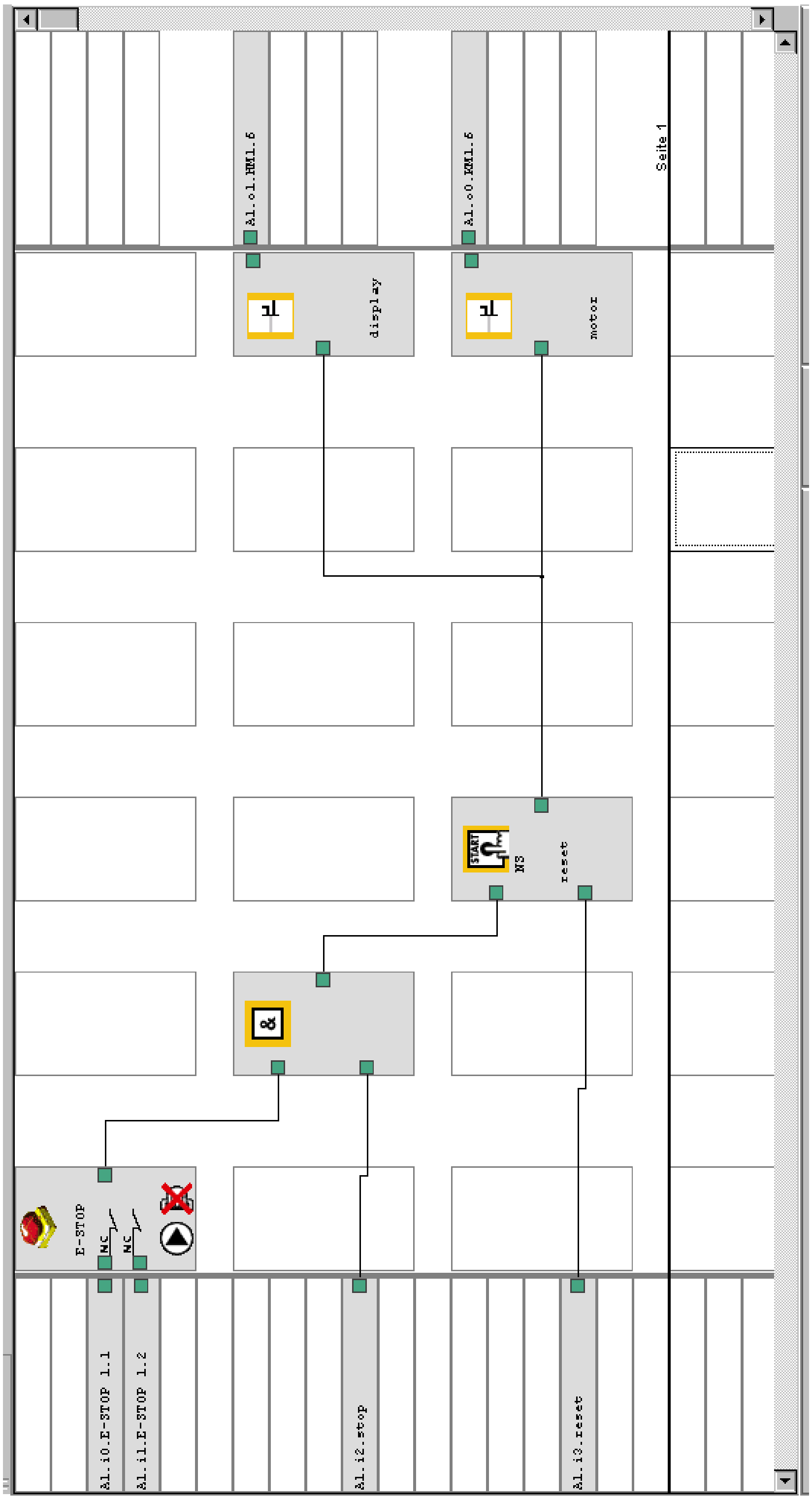
Reset

If the E-STOP button has not been operated and there is a high signal at input A1.i2, the application can be activated through a pulse edge at input A1.i3.

Configuration

- E-STOP
  - Switch type 3 (2 N/C)
  - Automatic reset
- AND element
  - 2 inputs
- Reset element
  - 2 inputs
- 2 outputs
  - Safety output, semiconductor type
  - Single-pole

Motor ON/OFF, Category B, EN 954-1



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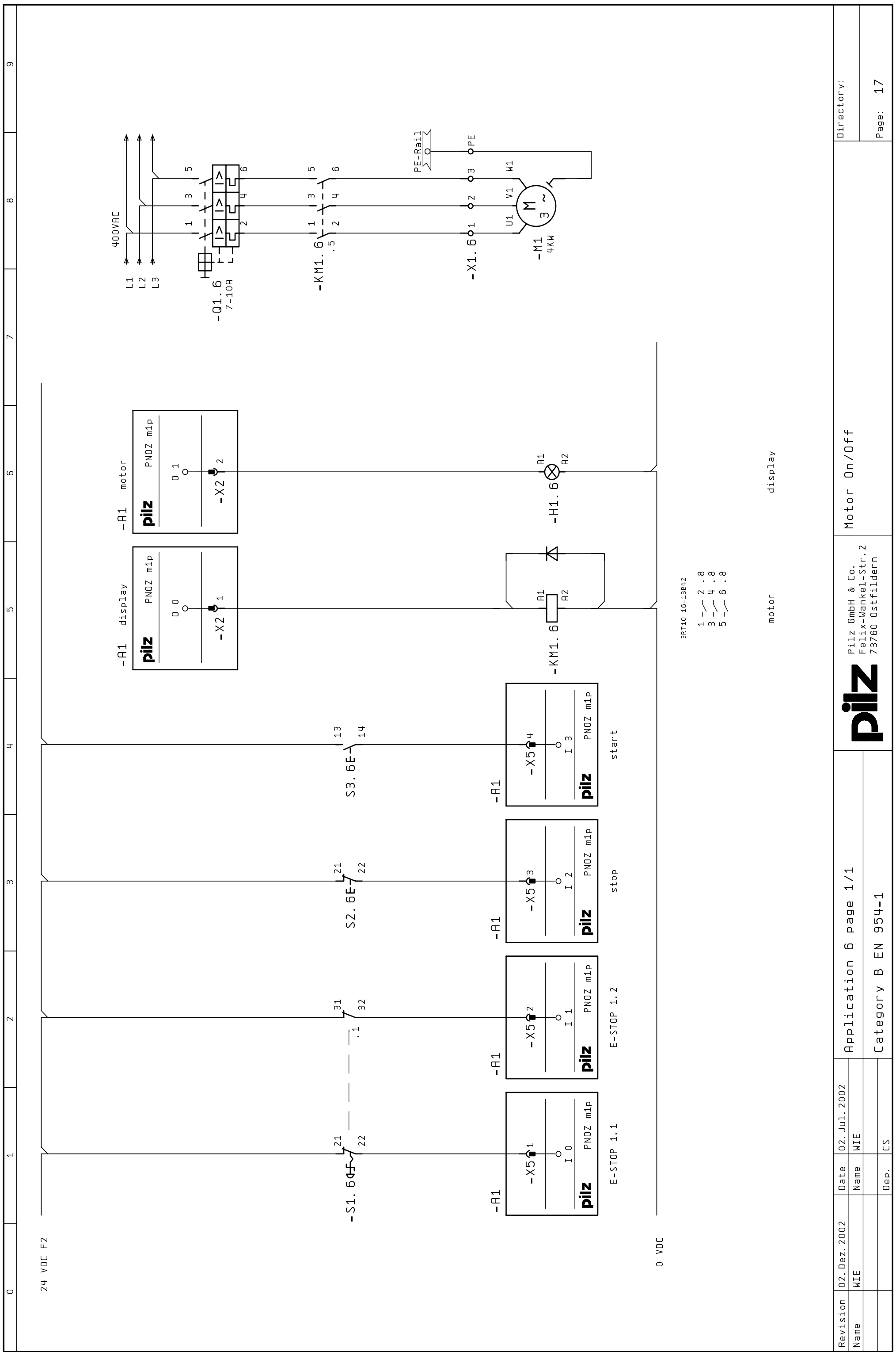
Motor ON/OFF, Category B, EN 954-1



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Accessories

Contents	Page

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Software, chip card

Description	Order no.
Tool Kit, chip card	
Tool Kit in carry case, consisting of: PNOZmulti Configurator software and manual, German (773 000), chip card and set of 10 labels, chip card reader, programming cable, magnetic safety switch, 5 m connection cable, bracket	779 000
Chip card, 8 kByte, x 1	779 201
Chip card, 8 kByte, x 10	779 200
Chip card, 32 kByte, x 1	779 211
Chip card, 32 kByte, x 10	779 212
Chip card holder	779 240
Chip card reader	779 230
Labels for chip card, x 10	779 250
Software, licences	
PNOZmulti Configurator, software on CD plus manual	773 000
PNOZmulti Configurator, software on CD	773 000D
PNOZmulti Configurator, Basic Licence	773 010B
PNOZmulti Configurator, User Licence	773 010K
PNOZmulti Configurator, Project Licence	773 010G
PNOZmulti Configurator, Multi User Licence	773 010M
PNOZmulti Configurator, Basic Upgrade Licence	773 010U
PNOZmulti Configurator, User Upgrade Licence	773 010V
PNOZmulti Configurator, Project Upgrade Licence	773 010W
PNOZmulti Configurator, Multi User Upgrade Licence	773 010N
PNOZmulti Configurator, Time Limited Licence, 2 months	773 010S
PNOZmulti Configurator, Time Limited Licence, 3 months	773 010R
PNOZmulti Configurator, Time Limited Licence, 4 months	773 010Q
PNOZmulti Service Tool, Basic Licence	773 011B
PNOZmulti Service Tool, User Licence	773 011K
PNOZmulti Service Tool, Project Licence	773 011G
PNOZmulti Service Tool, Multi User Licence	773 011M
PNOZmulti Service Tool, Basic Upgrade Licence	773 011U
PNOZmulti Service Tool, User Upgrade Licence	73 011V
PNOZmulti Service Tool, Project Upgrade Licence	773 011W
PNOZmulti Service Tool, Multi User Upgrade Licence	773 011N

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Cable, adapter

Name	Order no.
Cable, adapter	
PNOZ msi1Ap adapter and cable, 25-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p	773 840
PNOZ msi1Ap adapter and cable, 25-pin, 5,0 m for PNOZ ms1p/PNOZ ms2p	773 844
PNOZ msi1Bp adapter and cable, 25-pin, 2,5 m for PNOZ ms1p/PNOZ ms2p	773 841
PNOZ msi1Bp adapter and cable, 25-pin, 5,0 m for PNOZ ms1p/PNOZ ms2p	773 839
PNOZ msi3Ap adapter and cable, 15-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p	773 842
PNOZ msi3Bp adapter and cable, 15-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p	773 843
PNOZ msi5p adapter and cable, Bos/Rex, 15-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p	773 857
PNOZ msi5p adapter and cable, Bos/Rex, 15-pin, 1.5 m for PNOZ ms1p/PNOZ ms2p	773 858
PNOZ msi6p adapter and cable, Elau, 9-pin, 7.5 m for PNOZ ms2p	773 859
PNOZ msi6p adapter and cable, Elau, 9-pin, 2.5 m for PNOZ ms2p	773 860
PNOZ msi6p adapter and cable, Elau, 9-pin, 1.5 m for PNOZ ms2p	773 861
PNOZ msi7p adapter and cable, SEW, 15-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p	773 864
PNOZ msi7p adapter and cable, SEW, 15-pin, 1.5 m for PNOZ ms1p/PNOZ ms2p	773 865
PNOZ msi8p adapter and cable, Lenze, 9-pin, 2.5 m for PNOZ ms1p/PNOZ ms2p	773 862
PNOZ msi8p adapter and cable, Lenze, 9-pin, 1.5 m for PNOZ ms1p/PNOZ ms2p	773 863
PNOZ msi9p adapter cable, 5.0 m for PNOZ ms1p/PNOZ ms2p	773 856
PNOZ msi10p adapter cable, 2.5 m for PNOZ ms1p/PNOZ ms2p	773 854
PNOZ msi11p adapter cable, 1.5 m for PNOZ ms1p/PNOZ ms2p	773 855
PNOZ msi S09 9-pin adapter for PNOZ ms1p/PNOZ ms2p, connector set	773 870
PNOZ msi S15 15-pin adapter for PNOZ ms1p/PNOZ ms2p, connector set	773 871
PNOZ msi S25 25-pin adapter for PNOZ ms1p/PNOZ ms2p, connector set	773 872

Connectors, terminals

Description	Order no.
Terminator, jumper	
Terminator	779 110
Terminator, coated version	779 112
Jumper	774 639
Jumper, coated version	774 640
Connection terminals	
1 set of cage clamp terminals for PNOZ m0p, PNOZ m1p, PNOZ m2p	783 100
1 set of screw terminals for PNOZ m0p, PNOZ m1p, PNOZ m2p	793 100
1 set of cage clamp terminals for PNOZ mi1p, PNOZ mi2p, PNOZ ml1p, PNOZ mc0p	783 400
1 set of screw terminals for PNOZ mi1p, PNOZ mi2p, PNOZ ml1p, PNOZ mc0p	793 400
1 set of cage clamp terminals for PNOZ mo1p	783 400
1 set of screw terminals for PNOZ mo1p	793 400
1 set of cage clamp terminals for PNOZ mo2p	783 520
1 set of screw terminals for PNOZ mo2p	793 520
1 set of cage clamp terminals for PNOZ mo3p	783 400
1 set of screw terminals for PNOZ mo3p	793 400
1 set of cage clamp terminals for PNOZ mo4p	783 536
1 set of screw terminals for PNOZ mo4p	793 536
1 set of cage clamp terminals for PNOZ mc1p, PNOZ ma1p	783 700
1 set of screw terminals for PNOZ mc1p, PNOZ ma1p	793 700
1 set of cage clamp terminals for PNOZ ms1p, PNOZ ms2p	783 800
1 set of screw terminals for PNOZ ms1p, PNOZ ms2p	793 800

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Connectors, terminals

Order reference

Order reference

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Products		

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Products
Alphabetically by type

Type		Features			Order no.	Page
PNOZ m0p		Base unit			773 110	2.2-2
PNOZ m1p		Base unit			773 100	2.2-11
PNOZ m1p coated version		Base unit			773 105	2.2-20
PNOZ m2p		Base unit			773 120	2.2-29
PNOZ ma1p		Expansion module		2 analogue inputs	773 812	2.3-2
PNOZ mc0p	24 VDC			Power supply for fieldbus modules	773 720	2.3-64
PNOZ mc1p		Expansion module		2 semiconductor outputs, standard	773 700	2.3-68
PNOZ mc1p coated version		Expansion module		2 semiconductor outputs, standard	773 705	2.3-72
PNOZ mc3p		Expansion module		Fieldbus module, PROFI-BUS-DP	773 721	2.3-77
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PNOZ mc6p		Expansion module		Fieldbus module, CAN-open	773 724	2.3-97
PNOZ mc6p coated version		Expansion module		Fieldbus module, CAN-open	773 727	2.3-101
PNOZ mc7p		Expansion module		Fieldbus module, CC-Link	773 726	2.3-105
PNOZ mc8p		Expansion module		Fieldbus module, Ethernet IP, Modbus TCP	773 730	2.3-109
PNOZ mc9p		Expansion module		Fieldbus module, PROFI-NET IO	773 731	2.3-113
PNOZ mi1p		Expansion module		8 inputs	773 400	2.3-8
PNOZ mi1p		1 set of cage clamp terminals			783 400	2.3-64
PNOZ mi1p		1 set of screw termi-nals			793 400	2.3-64
PNOZ mi1p coated version		Expansion module		8 inputs	773 405	2.3-13
PNOZ mi2p		Expansion module		8 standard inputs	773 410	2.3-18
PNOZ ml1p		Expansion module			773 540	2.3-117
PNOZ mli1p		Cable	5 m	With screw terminals	773 890	2.3-117
PNOZ mli1p		Cable	10 m	With screw terminals	773 891	2.3-117
PNOZ mli1p		Cable	50 m	With screw terminals	773 892	2.3-117
PNOZ mli1p		Cable	5 m	With cage clamp terminals	773 893	2.3-117
PNOZ mli1p		Cable	10 m	With cage clamp terminals	773 894	2.3-117
PNOZ mli1p		Cable	50 m	With cage clamp terminals	773 895	2.3-117
PNOZ mo1p		Expansion module		2 or 4 semiconductor out-puts, safe	773 500	2.3-22
PNOZ mo1p coated version		Expansion module		2 semiconductor outputs, safe	773 505	2.3-28
PNOZ mo2p		Expansion module		1 or 2 relay outputs, posi-tive-guided	773 520	2.3-34
PNOZ mo2p coated version		Expansion module		1 or 2 relay outputs, posi-tive-guided	773 525	2.3-40
PNOZ mo3p		Expansion module		2 dual-pole semiconductor outputs, safe	773 510	2.3-46

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PNOZ mo4p	Expansion module	2 or 4 relay outputs, positive-guided	773 536	2.3-52
PNOZ mo4p coated version	Expansion module	2 or 4 relay outputs, positive-guided	773 537	2.3-58
PNOZ ms1p	Expansion module	Speed monitor	773 800	2.3-124
PNOZ ms2p	Expansion module	Speed monitor	773 810	2.3-131
PNOZmulti Configurator	Software	CD and manual	773 000	2.5-2
PNOZmulti Configurator	Software	User Licence	773 010K	2.5-2
PNOZmulti Configurator	Software	Basic Upgrade Licence	773 010U	2.5-2
PNOZmulti Configurator	Software	User Upgrade Licence	773 010V	2.5-2
PNOZmulti Configurator	Software	Time Limited Licence, 3 months	773 010R	2.5-2
PNOZmulti Configurator	Software	CD	773 000D	2.5-2
PNOZmulti Configurator	Software	Basic Licence	773 010B	2.5-2
PNOZmulti Configurator	Software	Project Licence	773 010G	2.5-2
PNOZmulti Configurator	Software	Project Upgrade Licence	773 010W	2.5-2
PNOZmulti Configurator	Software	Time Limited Licence, 2 months	773 010S	2.5-2
PNOZmulti Configurator	Software	Time Limited Licence, 4 months	773 010Q	2.5-2

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Numerically by order number

Order no.	Type		Features		Page
773 000	PNOZmulti Configurator		Software	CD and manual	2.5-2
773 000D	PNOZmulti Configurator		Software	CD	2.5-2
773 010B	PNOZmulti Configurator		Software	Basic Licence	2.5-2
773 010G	PNOZmulti Configurator		Software	Project Licence	2.5-2
773 010K	PNOZmulti Configurator		Software	User Licence	2.5-2
773 010Q	PNOZmulti Configurator		Software	Time Limited Licence, 4 months	2.5-2
773 010R	PNOZmulti Configurator		Software	Time Limited Licence, 3 months	2.5-2
773 010S	PNOZmulti Configurator		Software	Time Limited Licence, 2 months	2.5-2
773 010U	PNOZmulti Configurator		Software	Basic Upgrade Licence	2.5-2
773 010V	PNOZmulti Configurator		Software	User Upgrade Licence	2.5-2
773 010W	PNOZmulti Configurator		Software	Project Upgrade Licence	2.5-2
773 100	PNOZ m1p		Base unit		2.2-11
773 105	PNOZ m1p coated version		Base unit		2.2-20
773 110	PNOZ m0p		Base unit		2.2-2
773 120	PNOZ m2p		Base unit		2.2-29
773 400	PNOZ mi1p		Expansion module	8 inputs	2.3-8
773 405	PNOZ mi1p coated version		Expansion module	8 inputs	2.3-13
773 410	PNOZ mi2p		Expansion module	8 standard inputs	2.3-18
773 500	PNOZ mo1p		Expansion module	2 or 4 semiconductor outputs, safe	2.3-22
773 505	PNOZ mo1p coated version		Expansion module	2 semiconductor outputs, safe	2.3-28
773 510	PNOZ mo3p		Expansion module	2 dual-pole semiconductor outputs, safe	2.3-46
773 520	PNOZ mo2p		Expansion module	1 or 2 relay outputs, positive-guided	2.3-34
773 525	PNOZ mo2p coated version		Expansion module	1 or 2 relay outputs, positive-guided	2.3-40
773 536	PNOZ mo4p		Expansion module	2 or 4 relay outputs, positive-guided	2.3-52
773 537	PNOZ mo4p coated version		Expansion module	2 or 4 relay outputs, positive-guided	2.3-58
773 540	PNOZ ml1p		Expansion module		2.3-117
773 700	PNOZ mc1p		Expansion module	2 semiconductor outputs, standard	2.3-68
773 705	PNOZ mc1p coated version		Expansion module	2 semiconductor outputs, standard	2.3-72
773 720	PNOZ mc0p	24 VDC		Power supply for fieldbus modules	2.3-64
773 721	PNOZ mc3p		Expansion module	Fieldbus module, PROFIBUS-DP	2.3-77
773 722	PNOZ mc4p		Expansion module	Fieldbus module, DeviceNet	2.3-81

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Products
Numerically by order number

Order no.	Type	Features			Page
773 723	PNOZ mc5p	Expansion module		Fieldbus module, INTER-BUS	2.3-89
773 724	PNOZ mc6p	Expansion module		Fieldbus module, CAN-open	2.3-97
773 726	PNOZ mc7p	Expansion module		Fieldbus module, CC-Link	2.3-105
773 727	PNOZ mc6p coated version	Expansion module		Fieldbus module, CAN-open	2.3-101
773 728	PNOZ mc5.1p	Expansion module		Fieldbus module, INTER-BUS FO	2.3-93
773 729	PNOZ mc4p coated version	Expansion module		Fieldbus module, Device-Net	2.3-85
773 730	PNOZ mc8p	Expansion module		Fieldbus module, Ethernet IP, Modbus TCP	2.3-109
773 731	PNOZ mc9p	Expansion module		Fieldbus module, PROFI-NET IO	2.3-113
773 800	PNOZ ms1p	Expansion module		Speed monitor	2.3-124
773 810	PNOZ ms2p	Expansion module		Speed monitor	2.3-131
773 812	PNOZ ma1p	Expansion module		2 analogue inputs	2.3-2
773 890	PNOZ mli1p	Cable	5 m	With screw terminals	2.3-117
773 891	PNOZ mli1p	Cable	10 m	With screw terminals	2.3-117
773 892	PNOZ mli1p	Cable	50 m	With screw terminals	2.3-117
773 893	PNOZ mli1p	Cable	5 m	With cage clamp terminals	2.3-117
773 894	PNOZ mli1p	Cable	10 m	With cage clamp terminals	2.3-117
773 895	PNOZ mli1p	Cable	50 m	With cage clamp terminals	2.3-117
783 400	PNOZ mi1p	1 set of cage clamp terminals			2.3-117
793 400	PNOZ mi1p	1 set of screw terminals			2.3-117

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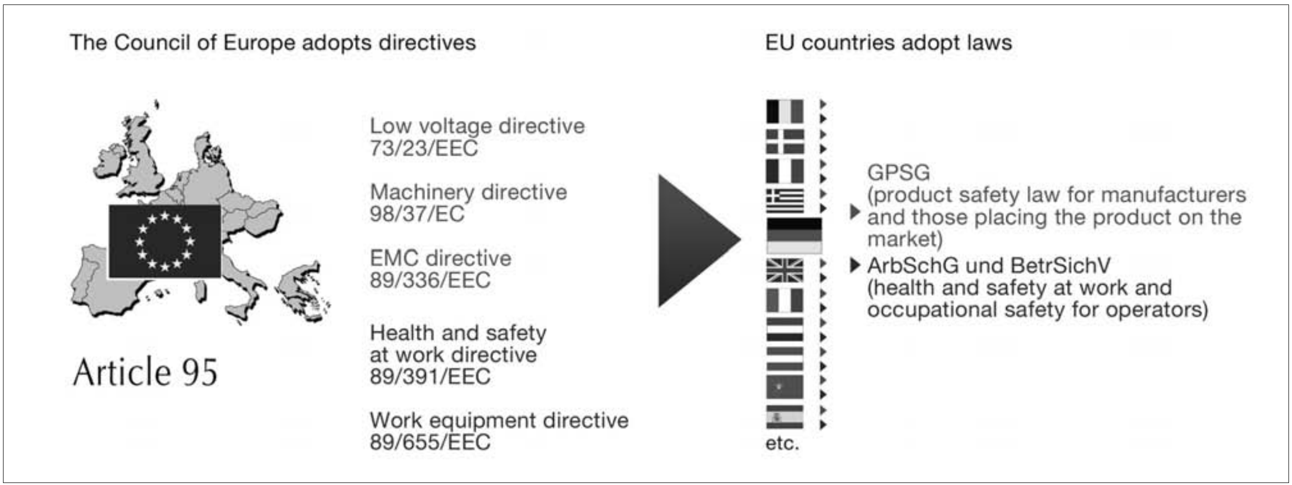
Standards and directives	

European directives and position of the standards in Europe



Incorporation of the directives into domestic law (using Germany as an example)

European directives

The concept of a single European internal market in terms of the "New Approach" can be traced right back to the start of the 70s: The low voltage directive is the first piece of European legislation to take into account the approach towards harmonisation of a common single market.

Products that are covered by one or more of the following directives have to apply a CE-mark, i.e. the product must be accompanied by a declaration of conformity. With a declaration of conformity the manufacturer confirms that his product meets all the requirements of the European directives that relate to his product. This means he can launch and sell his product within the scope of the EU without consideration of any national regulations.

- Lifts
  95/16/EC
- Construction products
  89/106/EEC
- Pressure equipment directive
  97/23/EC
- EMC directive
  89/336/EEC
- ATEX
  94/9/EC
- Appliances burning gaseous fuels
  90/396/EEC
- Machinery directive
  98/37/EC
- Medical device directive
  93/42/EEC
- Low voltage directive
  73/23/EEC
- Personal protective equipment
  89/686/EEC
- Safety of toys directive
  88/378/EEC

The directives are addressed to member states, who are obliged to incorporate the European directives into domestic law. In Germany this is normally achieved through the device safety law.

Position of the standards in Europe

The legal status of standards is constantly under discussion. Inside Europe, i.e. within the scope of the European directives that are subject to the CE-
makring obligation, a manufacturer is not bound by standards or other specifications. He simply needs to comply with the health and safety requirements of the directive(s). The associated benefits of a division between standards and legislation are obvious: It is easier for legislators to agree on the essential requirements than on technical details. Also, the directives do not regularly have to be adapted to the state of technology; member states can use their own legal system for incorporation and manufacturers are free to select the ways in which they implement the requirements of the directive.

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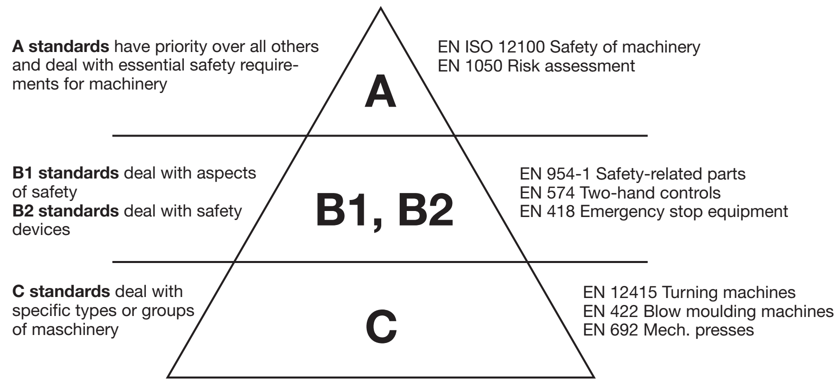
European directives and position of the standards in Europe



Standards pyramid

So what are the benefits of applying the standards? With so-called harmonised standards with presumption of conformity, there is a shifting of the burden of proof, i.e. if manufacturers apply these standards, it is presumed that they will also comply with the specific requirements of the European directives. The regulatory authorities would therefore need to prove that a manufacturer did not meet the legal requirements.

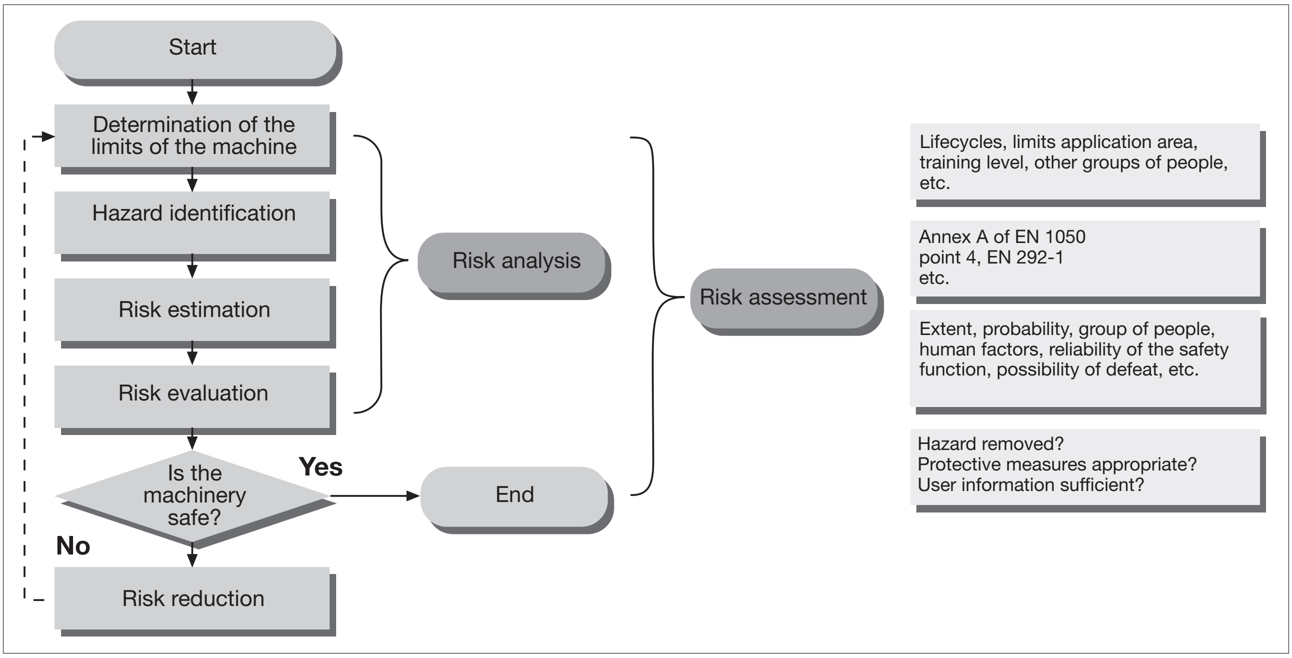
However, should a manufacturer deviate from the harmonised standards, he himself must prove how he has met the essential safety requirements. This is generally done via a hazard analysis. In practice one would endeavour to apply the harmonised standards, unless the products concerned are highly innovative and no harmonised standards yet exist. The standards for which this “presumption effect” applies can be researched in the Official Journal of the EU (e.g. on the Internet). Standards in Europe are subdivided into what are termed A, B, and C standards.

Risk analysis

Risk assessment

Under the terms of the machinery directive, a machine manufacturer must assess the hazards in order to identify all the hazards that apply to his machine. He must then design and construct the machine to take account of his assessment. This requirement also applies to operators who act as manufacturers under the terms of the machinery directive. For example, this may occur with machines that are interlinked or for machinery that has been upgraded and substantially modified.
EN 1050 contains "Principles for risk assessment" on machinery. These approaches can be called upon as part of a comprehensive analysis. EN 954-1 expands on
EN 1050 with regard to the assessment of safety-related parts of control systems.

The hazards emanating from a machine may be many and varied, so for example, it is necessary to consider not just mechanical hazards through crushing and shearing, but also thermal and electrical hazards and hazards from radiation. Risk reduction is therefore an iterative process, i.e. it is carried out before and during the planning phase and after completion of the plant or machine.



Iterative process in accordance with EN 1050

Legal regulations outside Europe and standards for functional safety

Legal regulations outside Europe

The situation is somewhat different in the USA: people there are mainly familiar with two types of standards: ANSI (American National Standards Institute) and OSHA (Occupational Safety and Health Administration).

OSHA standards are published by the state and compliance is mandatory. ANSI standards, on the other hand, are developed by private organisations and their application is generally not absolutely essential. However, ANSI standards can still be found included as part of a contract. Beyond that ANSI standards are being taken over by OSHA. You can also still come across the NFPA (National Fire Protection Association), which developed NFPA 79 as a counterpart to EN 60204-1, for example. OSHA standards can be compared with the European directives. Unlike the European directives, OSHA standards are more involved with formulating technical specifications than abstract requirements.

The legal basis in the USA can be seen as a mix of product standards, fire codes (NFPA), electrical codes (NEC) and national laws. Local government bodies have the authority to monitor that these codes are being enforced and implemented.

Russia and the CIS states have implemented GOST-R certification for some years now, in other words, technical devices that fall within a specific product area must undergo a certain certification process. Machinery and any corresponding technical accessories undergo a type approval test through a European notified body, for example. This test is generally recognised by a Russian-based approvals body. From the point of view of safety, the same requirements apply as in Europe.

China, on the other hand, has introduced CCC certification. Similar to the position in Russia, technical products are subject to mandatory certification through a national approvals body in China. In addition, production sites are inspected. If a technical device falls with the scope of the product list, which is subdivided into 19 categories, certification is mandatory, otherwise it will be necessary to supply a type of “declaration of no objection” from a national notified body.

Japan is currently in a transition period: The plan is for Japan to adopt the European “new approach” – in other words, to keep standards and legislation separate. At the moment the international ISO and IEC standards are being directly incorporated into national legislation, which is why people are currently confronted with frequent amendments to laws and lengthy implementation periods.

Standards for functional safety

Different standards may be called upon to observe functional safety on control systems, depending on the application. In the area of machine safety, EN 954-1 is the main standard named for safety-related control systems. Irrespective of the technology, this applies for the whole chain from the sensor to the actuator. The risk graphs and corresponding risk parameters can be used to estimate the potential risk for danger zones on machinery. The category is then established without the use of risk-reducing measures.

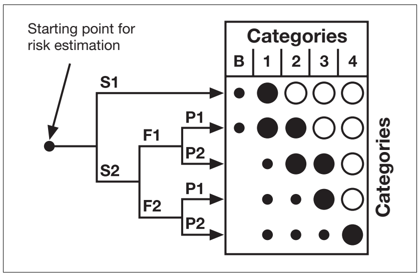
Risk parameters and categories in accordance with EN 954-1

Risk parameters

S = Severity of injury:
1 = Slight (normally reversible) injury
2 = Serious (normally irreversible) injury including death

F = Frequency and/or exposure time to the hazard:?
1 = Seldom to quite often and/or the exposure time is short
2 = Frequent to continuous and/or the exposure time is long

P = Possibility of avoiding the hazard:
1 = Possible under specific conditions
2 = Scarcely possible



Risk graph from EN 954

Categories in accordance with EN 954-1

The control system requirements derived from the risk graph are specified as follows:

Category B

Basic category with no special requirements = “good industrial standard”

Category 1

Safety-related parts must be designed and constructed using well-tried components and well-tried safety principles.

Well-tried means: the components have been widely used in the past with successful results in similar applications, or they have been manufactured using principles that demonstrate its suitability and reliability for safety-related applications.

Example: safety switch with forced-opening contacts.

Well-tried safety principles are circuits that are constructed in such a way that certain faults can be avoided by the appropriate arrangement or layout of components.

Example: avoiding a short circuit through appropriate separation, avoiding component failures that result from over-dimensioning, using the failsafe principle (on switching off).

Note: The occurrence of a fault can lead to the loss of the safety function.

Category 2

Safety-related parts of control systems must be designed so that their safety function(s) are checked at suitable intervals by the machine control system. The safety function(s) must be checked: at the machine start-up and prior to the initiation of any hazardous situation; periodically during operation, if the risk assessment and the kind of operation show that it is necessary.

The initiation of this check may be automatic or manual. Automatically, for example, the check may be initiated by a signal generated from a control system at suitable intervals. The automatic test should be provided by preference. The decision about the type of test depends on the risk assessment and the judgement of the end user or machine builder. If no fault is detected, operation may be approved as a result of the test. If a fault is detected, an output must be generated to initiate appropriate control action. A second, independent shutdown route is required for this.

Notes: In some cases Category 2 is not applicable because the checking of the safety function cannot be applied to all components and devices. Moreover, the cost involved in implementing Category 2 correctly may be considerable, so that it may make better economic sense to implement a different category.

In general Category 2 can be realised with electronic techniques. The system behaviour allows the occurrence of a fault to lead to the loss of the safety function between checks; the loss of the safety function is detected by the check.

Category 3

Safety-related parts of control systems must be designed so that a single fault in any of these parts does not lead to the loss of the safety function. Whenever reasonably practicable, the single fault shall be detected at or before the next demand upon the safety function.

This does not mean that all faults will be detected. The accumulation of undetected faults can lead to an unintended output signal and a hazardous situation at the machine.

Category 4

Safety-related parts of control systems must be designed so that a single fault in any of these parts does not lead to a loss of the safety function; the single fault must be detected at or before the next demand upon the safety functions (e.g. immediately at switch on, at the end of a machine operating cycle).
If this detection is not possible, then an accumulation of faults shall not lead to a loss of the safety function.

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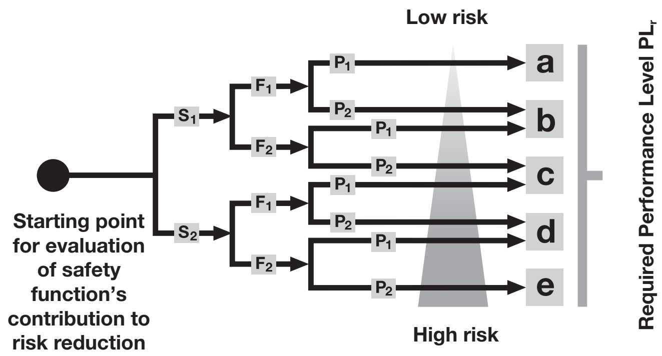
Safety-related parts of control systems - General principles for design in accordance with EN ISO 13849-1

Determination of the required Performance Level (PL_r)

- **S – Severity of injury**
  - S_1 = Slight (normally reversible injury)
  - S_2 = Serious (normally irreversible injury, including death)
- **F – Frequency and/or exposure to a hazard**
  - F_1 = Seldom to less often and/or the exposure time is short
  - F_2 = Frequent to continuous and/or the exposure time is long
- **P – Possibility of avoiding the hazard or limiting the harm**
  - P_1 = Possible under specific conditions
  - P_2 = Scarcely possible



Safety-related parts of control systems – General principles for design in accordance with EN ISO 13849-1

As the successor standard to EN 954-1, EN ISO 13849-1 is based on the familiar categories. Equally, it examines complete safety functions, including all the components involved in their design. EN ISO 13849-1 goes beyond the qualitative approach of EN 954-1 to include a quantitative assessment of the safety functions. A performance level (PL) is used for this, building upon the categories.

Components/devices require the following safety parameters:

- Category (structural requirement)
- PL: Performance level
- MTTFd: Mean time to dangerous failure Mean Time To Dangerous Failure)
- DC: Diagnostic coverage Diagnostic Coverage)
- CCF: Common cause failure Common Cause Failure)

The standard describes how to calculate the performance level (PL) for safety-related parts of control systems, based on designated architectures. EN ISO 13849-1 refers any deviations to IEC 61508.

Risk assessment in accordance with EN ISO 13849-1

Risk assessment is an iterative process, i.e. it will need to be carried out more than once. The risk must be estimated and the performance level defined for each hazard on which the risk is to be reduced through control measures. The risk is estimated through consideration of the severity of injury (S), the frequency and duration of exposure to the hazard (F) and the possibility of avoiding or limiting the harm (P).

Parameters S, F and P are used on the risk graph to determine the required performance level (PL_r) for a safety function. The selection of parameters is no different to the procedure used in EN 954-1 (1996). However, the result is no longer a category but a PL.

Safety-related parts of control systems - General principles for design in accordance with EN ISO 13849-1

Performance level

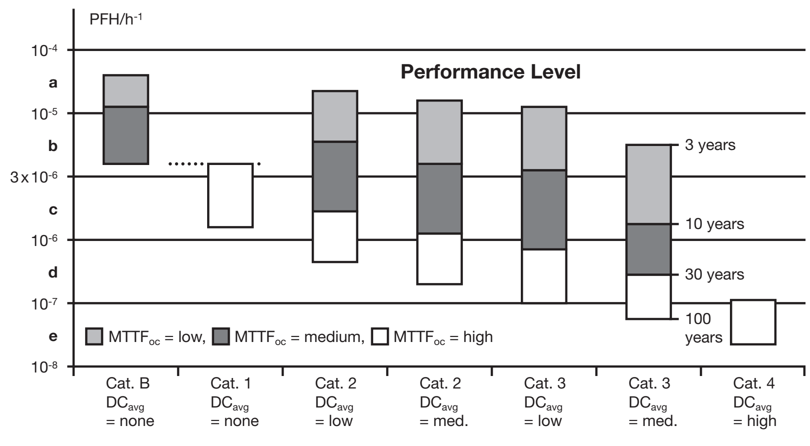
The performance level (PL) classifies 5 levels of probability of failure. The table shows the relationship between PL and the probability of dangerous failure per hour (PFHD).

Performance Levels (PL) in accordance with EN ISO 13849-1	Probability of a dangerous failure per hour [1/h]
a	$10^{-5} < PFH < 10^{-4}$
b	$3 \times 10^{-6} < PFH < 10^{-5}$
c	$10^{-6} < PFH < 3 \times 10^{-6}$
d	$10^{-7} < PFH < 10^{-6}$
e	$10^{-8} < PFH < 10^{-7}$

Once the required PL has been established, the PL achieved by the safety function (SRP/CL) is calculated. To do this the SRP/CL can be divided into logical blocks, such as input, logic solving and output for example.

When using a designated architecture or an architecture of similar structure, the achieved PL can be calculated graphically using the bar chart. To do this the architecture of the SRP/CL in divided into categories. $MTTF_D$ and DC_{avg} are also required. From Category 2 onwards, the CCF will also need to be examined. A component's $MTTF_D$ value is usually provided by the manufacturer. The standard provides tables and check lists for calculating the other values.

Relationship between categories DC, $MTTF_d$ and PL



It is also possible to calculate the achieved PL of an SRP/CL. The probability of dangerous failure of all the blocks that combine to form the safety function is added up:

$$PFH_{System} = PFH_{Input} + PFH_{Logic} + PFH_{Output}$$

The PL achieved by an SRP/CL must be at least as high as the PL required by the safety function. If this condition is not met, the safety function must be implemented differently.

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2007-02

Functional safety and legal position of EN/IEC 61508

Functional safety with ?EN/IEC 61508?

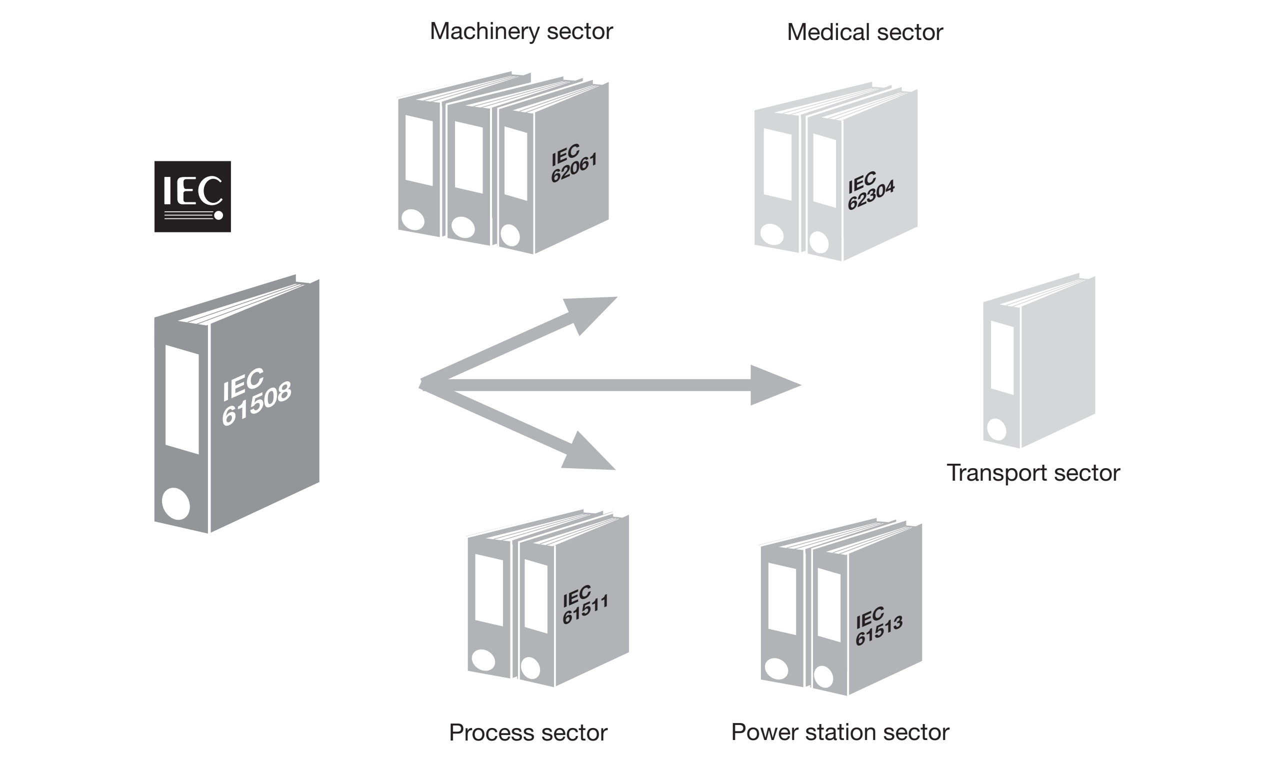
EN/IEC 61508 is regarded as a generic safety standard, which deals with the functional safety of electrical, electronic and programmable electronic systems, irrespective of the application.

One of the main tasks of EN/IEC 61508 is to serve as a basis for the development of application-oriented standards. Standards' committees are currently busy in the areas of machine safety with EN/IEC 62061, and process safety with EN/IEC 61511. Also under revision is EN 954, the standard harmonised under the scope of the machinery directive, which in future will be listed as EN ISO 13849.

These sector-specific standards are intended to continue the principle approaches of EN/IEC 61508 and to implement the requirements for the relevant application area in a suitably practical manner.

What is the legal status ?of EN/IEC 61508?

As EN/IEC 61508 is not listed in the Official Journal of the European Communities for implementation as a European directive, it lacks the so-called "presumption effect": so if the standard is used on its own, a control system designer cannot presume that the relevant requirements of the specific European directive have been met.



Sector standards from EN/IEC 61508

Functional safety in accordance with EN/IEC 62061

Risk assessment and determination of required Safety Integrity Level (SIL)

Consequences	S	Class Cl 3-4	5-7	8-10	11-13	14-15	Frequency and duration	Fr	Probability of hzd. event	Pr	Avoidance	P
Death, losing an eye or arm	4	**SIL 2**	**SIL 2**	**SIL 2**	**SIL 3**	**SIL 3**	≤ 1 hour	5	Very high	5		
Permanent, losing fingers	3		**OM**	**SIL 1**	**SIL 2**	**SIL 3**	> 1 h – ≤ 1 day	5	Likely	4		
Reversible, medical attention	2			**OM**	**SIL 1**	**SIL 2**	> 1 day – ≤ 2 wks	4	Possible	3	Impossible	5
Reversible, first aid	1				**OM**	**SIL 1**	> 2 wks – ≤ 1 year	3	Rarely	2	Possible	3
							> 1 year	2	Negligible	1	Likely	1

☐ AM = Other measures recommended

Functional safety of safety-related electrical, electronic and programmable electronic control systems in accordance with EN/IEC 62061

EN/IEC 62061 represents a sector-specific standard under EN/IEC 61508. It describes the implementation of safety-related electrical control systems on machinery and examines the overall lifecycle from the concept phase through to decommissioning. Quantitative and qualitative examinations of the safety functions form the basis.

Risk estimation is an iterative process, i.e. it will need to be carried out more than once. The risk must be assessed and the SIL defined for each hazard on which the risk is to be reduced through control measures. The risk is estimated through consideration of the severity of injury (Se), the frequency and duration of exposure to the hazard (Fr), probability of occurrence of a hazardous event (Pr) and the possibility of avoiding or limiting the harm (Av).

The required SIL is assigned using the table above, where Cl = Fr + Pr + Av.

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Functional safety in accordance with EN/IEC 62061

Safety Integrity Level (SIL) in accordance with EN IEC 62061	Probability of a dangerous failure per hour [1/h]
No special safety requirement	10^{-5} < PFH < 10^{-4}
1 (1 failure in 100 000 h)	3×10^{-6} < PFH < 10^{-5}
1 (1 failure in 100 000 h)	10^{-6} < PFH < 3×10^{-6}
2 (1 failure in 1 000 000 h)	10^{-7} < PFH < 10^{-6}
3 (1 failure in 10 000 000 h)	10^{-8} < PFH < 10^{-7}

SIL assignment

The safety integrity level (SIL) classifies three levels of probability of failure. The table shows the relationship between SIL and the probability of dangerous failure per hour (PFH_D).

The SRECS (safety-related electrical control system) is divided into subsystems. The subsystems are assigned to actual devices.

The probability of a dangerous failure is calculated by adding the probabilities of failure of all the subsystems of the SRECS:

$PFH_D = PFH_{D1} + ... + PFH_{Dn}$

The selection or design of the SRECS must always meet the following minimum requirements:

Requirements for hardware safety integrity, comprising

- Architectural constraints for hardware safety integrity
- Requirements for the probability of dangerous random hardware failures

plus requirements for systematic safety integrity, comprising

- Requirements for avoidance of failures and
- Requirements for the control of systematic failures.

The following parameters are required in assessing hardware safety integrity:

λD: Dangerous failure rate

T1: Proof test
T2: Diagnostic test interval
DC: Diagnostic coverage
β: Common cause failure

The calculated probability of failure (PFH_D) of each SRECS must be less than the probability of failure required by the safety function. The required probability of failure, depending on the SIL, can be taken from the table. If this condition is not met, the safety function must be implemented differently.

The achieved SIL can only be as high as the lowest SILCL (SIL Claim Limit) of a subsystem involved in performing the safety function.

Safe failure fraction (SFF)	Hardware fault tolerance 0	Hardware fault tolerance 1	Hardware fault tolerance 2
< 60 %	Not allowed	SIL 1	SIL 2
60 % – < 90 %	SIL 1	SIL 2	SIL 3
90 % – < 99 %	SIL 2	SIL 3	SIL 3
99 %	SIL 3	SIL 3	SIL 3

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Services, concepts and solutions

We are happy to advise you, in the configuration phase or during commissioning.

Plant assessment
Analysis and assessment of the safety-related condition of your plant and machinery. Presentation of basic proposals for improvement.

Risk assessment
Assessment of the hazards and risks on plant and machinery, based on norms and standards.

Safety concept
Based on the risk analysis, appropriate protective measures can be selected and a safety concept drawn up.

Safety design
Pilz undertakes all the tasks required to implement a project: component selection, preparation of circuit diagrams, programming, control cabinet, installation, commissioning.

CE services
Co-ordination and implementation of all the activities necessary for the CE conformity of plant and machinery.

Safety sign-off
All the relevant safety-related documents are examined, check lists are created and the plant and machinery checked.

Technical support
Our engineers can support you in the selection, use and application of our products. They are in constant contact with customers from the widest range of areas and industrial sectors and are happy to answer your queries at any time.

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Data sheets

Expansion modules
PNOZ ms3p

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

Approvals

	PNOZ ms3p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

- Monitoring of 2 independent axes
- Connection per axis
  - 1 incremental encoder
- Measured variables:
  - Standstill
  - Speed (8 values can be set)
  - Direction of rotation
- Axis types, reset mode can be selected in the PNOZmulti Configurator
- Status indicators for
  - Supply voltage
  - Incremental encoder
  - Axis status, standstill and excess speed
  - Faults on the system
- Incremental encoder connection technology:
  RJ-45 female connector
- Function to deactivate speed monitoring
- Galvanic isolation between the connections X1, X12 and X22
- Max. 4 speed monitors can be connected to the base unit

Unit description

The expansion module monitors standstill, speed and direction of rotation up to Category 3 of EN 954-1.

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

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

System requirements

- PNOZmulti Configurator: From Version 6.1.0
- Base unit PNOZ m1p: From Version 5.7
- Base unit PNOZ m2p: From Version 2.7

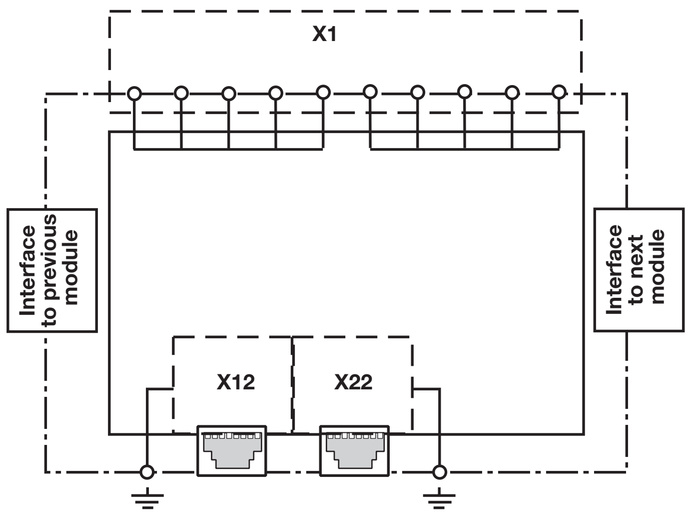
Please contact Pilz if you have an older version.

Safety features

The relay conforms to the following safety criteria:

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

Block diagram



Expansion modules
PNOZ ms3p

Function description

The speed monitor can independently monitor two axes for standstill, speed and direction of rotation. The speed monitor signals the status of the monitored values to the base unit. Depending on the safety circuit loaded, the values can be transferred from the base unit, e.g. to a relay output on the safety system. Incremental encoders can be used to record the values.
The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

Wiring

- Only incremental encoders with a differential output of the following type are permitted
  - Sin/Cos
  - TTL (RS 422)
  - HTL (24 V)
- Please note the values stated in the technical details

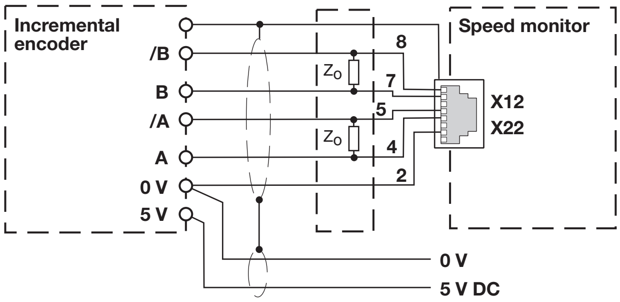
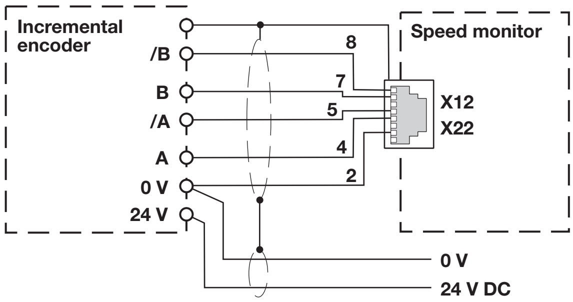
Follow the instructions below when connecting the incremental encoder:
- The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- Only use shielded cables for all connections
- Always connect 0 V on the incremental encoder and speed monitor.
- Position the terminating resistors on the signal lines as close as possible to the input on the speed monitor.

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

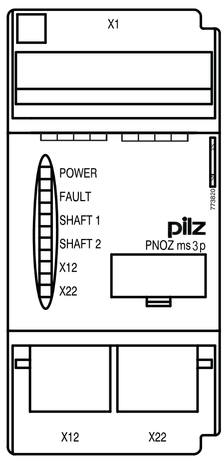
Expansion modules
PNOZ ms3p

Preparing for operation

- Incremental encoders

Encoder type 1 Vss, 5 V-TTL Terminate incremental encoder with Z_o = 120 Ohm	
Encoder type 24 V-HTL Do **not** terminate incremental encoder with Z_o = 120 Ohm	

Terminal configuration

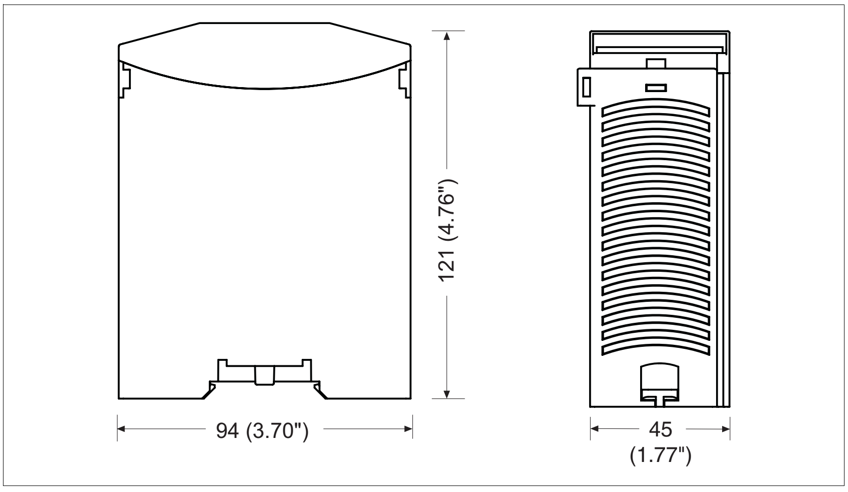


Expansion modules
PNOZ ms3p

Installation

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

Dimensions



Expansion modules
PNOZ ms3p

Notice

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

Technical details	
Electrical data	
Supply voltage U_B DC	
	5 V
Power consumption at U_B DC	
	1.0 W
Residual ripple DC	**5 %**
Status display	**LED**
Times	
Configurable switch-off delay	**0 - 2,500 ms**
Response time	
f>100 Hz: configurable switch-off delay + switch-off delay on base unit	**10 ms**
f<100 Hz: configurable switch-off delay + switch-off delay on base unit	**10 ms**
Supply interruption before de-energisation	**20 ms**
Incremental encoder input	
Number of inputs	**2**
Phase position for the differential signals A,/A and B,/B	**90° ±30°**
Overload protection	**-30 - 30 V**
Input resistance	**10 kOhm**
Input's frequency range	**0 - 500 kHz**
Configurable monitoring frequency	
without hysteresis	**0,1 Hz - 500 kHz**
with hysteresis	**0,2 Hz - 500 kHz**
Connection type (incremental encoder)	**RJ-45-socket, 8-pin**
Environmental data	
Airgap creepage in accordance with **VDE 0110-1**	
Climatic suitability	**DIN IEC 60068-2-3**
EMC	**EN 60947-5-1**
Vibration to **EN 60068-2-6**	
Frequency	**10 - 55 Hz**
Amplitude	**0.35 mm**
Climatic suitability	**DIN IEC 60068-2-3**
Ambient temperature	**0 - 60 °C**
Storage temperature	**-25 - 70 °C**
Mechanical data	
Protection type	
Mounting (e.g. cabinet)	**IP54**
Housing	**IP20**
Terminals	**IP20**
DIN rail	
Top hat rail	**35 x 7.5 EN 50022**
Recess width	**27 mm**
Housing material	
Housing	**PPO UL 94 V0**
Front	**ABS UL 94 V0**
Dimensions	
Height	**94.0 mm**
Width	**45.0 mm**
Depth	**121.0 mm**
Weight	**220 g**

Expansion modules
PNOZ ms3p

Order reference			

Type	Features		Order no.
PNOZ ms3p	Expansion module	Speed monitor	773 820

Expansion modules
PNOZ ms4p

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

Approvals

	PNOZ ms4p
c UL us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

- Monitoring of 1 axis
- Connection: 1 incremental encoder
- Measured variables:
  - Standstill
  - Speed (16 values can be set)
  - Direction of rotation
- Axis types, reset mode can be selected in the PNOZmulti Configurator
- Status indicators for
  - Supply voltage
  - Incremental encoders
  - Axis status, standstill and excess speed
  - Faults on the system
- Incremental encoder connection technology:
  RJ-45 female connector
- Function to deactivate speed monitoring
- Galvanic isolation between the connections X1 and X12
- Max. 4 speed monitors can be connected to the base unit

Unit description

The expansion module monitors standstill, speed and direction of rotation up to Category 3 of EN 954-1.

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

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

System requirements

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

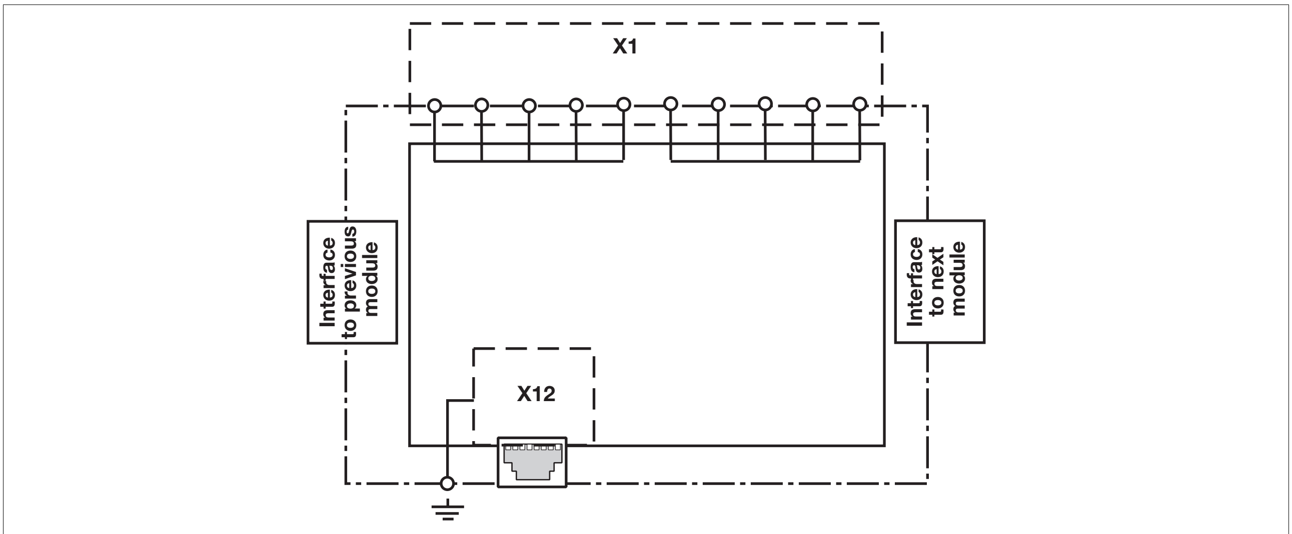
Please contact Pilz if you have an older version.

Safety features

The relay conforms to the following safety criteria:

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

Block diagram



Expansion modules
PNOZ ms4p

Function description

The speed monitor can monitor an axis for standstill, speed and direction of rotation. The speed monitor signals the status of the monitored values to the base unit. Depending on the safety circuit loaded, the values can be transferred from the base unit, e.g. to a relay output on the safety system. Incremental encoders can be used to record the values.
The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

Wiring

- Only incremental encoders with a differential output of the following type are permitted
  - Sin/Cos
  - TTL (RS 422)
  - HTL (24 V)
- Please note the values stated in the technical details

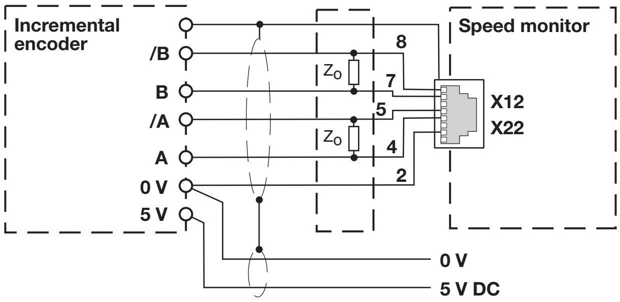
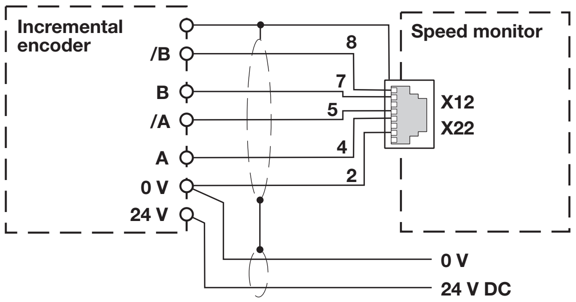
Follow the instructions below when connecting the incremental encoder:
- The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- The incremental encoder on connector X12 monitors the axis.
- Only use shielded cables for all connections
- Always connect 0 V on the incremental encoder and speed monitor.
- Position the terminating resistors on the signal lines as close as possible to the input on the speed monitor.

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

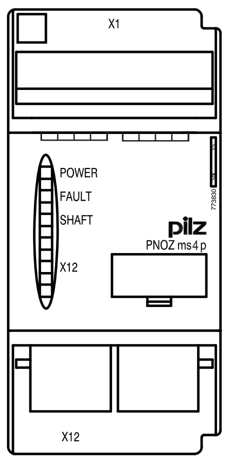
Expansion modules
PNOZ ms4p

Preparing for operation

- Incremental encoders

Encoder type 1 Vss, 5 V-TTL Terminate incremental encoder with Z_o = 120 Ohm	
Encoder type 24 V-HTL Do **not** terminate incremental encoder with Z_o = 120 Ohm	

Terminal configuration

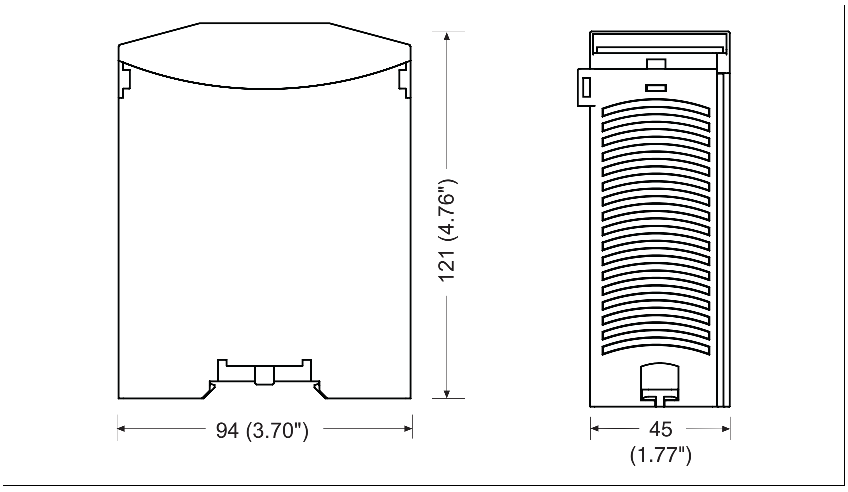


Expansion modules
PNOZ ms4p

Installation

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

Dimensions



Expansion modules
PNOZ ms4p

Notice

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

Technical details	
Electrical data	
Supply voltage U_B DC	**5 V**
Power consumption at U_B DC	**1.0 W**
Residual ripple DC	**5 %**
Status display	**LED**
Times	
Configurable switch-off delay	**0 - 2,500 ms**
Response time	
f>100 Hz: configurable switch-off delay + switch-off delay on base unit *	**10 ms**
f<100 Hz: configurable switch-off delay + switch-off delay on base unit *	**10 ms**
Supply interruption before de-energisation	**20 ms**
Incremental encoder input	
Number of inputs	**1**
Phase position for the differential signals A,/A and B,/B	**90° ±30°**
Overload protection	**-30 - 30 V**
Input resistance	**10 kOhm**
Input's frequency range	**0 - 500 kHz**
Configurable monitoring frequency	
without hysteresis	**0,1 Hz - 500 kHz**
with hysteresis	**0,2 Hz - 500 kHz**
Connection type (incremental encoder)	**RJ-45-socket, 8-pin**
Environmental data	
Airgap creepage in accordance with **VDE 0110-1**	
Climatic suitability	**DIN IEC 60068-2-3**
EMC	**EN 60947-5-1**
Vibration to **EN 60068-2-6**	
Frequency	**10 - 55 Hz**
Amplitude	**0.35 mm**
Climatic suitability	**DIN IEC 60068-2-3**
Ambient temperature	**0 - 60 °C**
Storage temperature	**-25 - 70 °C**
Mechanical data	
Protection type	
Mounting (e.g. cabinet)	**IP54**
Housing	**IP20**
Terminals	**IP20**
DIN rail	
Top hat rail	**35 x 7.5 EN 50022**
Recess width	**27 mm**
Housing material	
Housing	**PPO UL 94 V0**
Front	**ABS UL 94 V0**
Dimensions	
Height	**94.0 mm**
Width	**45.0 mm**
Depth	**121.0 mm**
Weight	**220 g**

Expansion modules
PNOZ ms4p

Order reference			
Type	**Features**		**Order no.**
PNOZ ms4p	Expansion module	Speed monitor	773 831

Base units
PNOZ m3p

Base units from the PNOZmulti modular safety system

Approvals

	PNOZ m3p
TÜV SÜDDEUTSCHLAND	◆

Unit features

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

Unit description

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

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

The unit is designed to control and monitor furnaces in accordance with the standards:

- EN 298: Automatic gas burner control systems for gas burners and gas burning appliances with or without fans
- EN 12953-7: Shell boilers
- EN 12952-8: Water-tube boilers and auxiliary installations
- EN 50156-1: Electrical equipment for furnaces
- EN 61508: SIL 3: Functional safety of safety-related electrical/electronic/programmable electronic systems
- EN 230: Automatic burner control systems for oil burners
- EN 267: Automatic forced draught burners for liquid fuels (draft)
- EN 298: Automatic gas burner control systems for gas burners and gas burning appliances with or without fans
- EN 676: Automatic forced draught burners for gaseous fuels
- EN 746-2: Industrial thermoprocessing equipment
- EN 1643: Valve proving systems for automatic shut-off valves for gas burners and gas appliances

These include:
Monitoring of:

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

And control of:

- Safety valves
- Ignition valves
- Exhaust valve
- Ignition
- External compound controller
- Combustion air blower

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
- Slave burner with direct ignition

Base units
PNOZ m3p

- Slave burner with indirect ignition and joint flame monitoring
- Slave burner with indirect ignition and separate flame monitoring

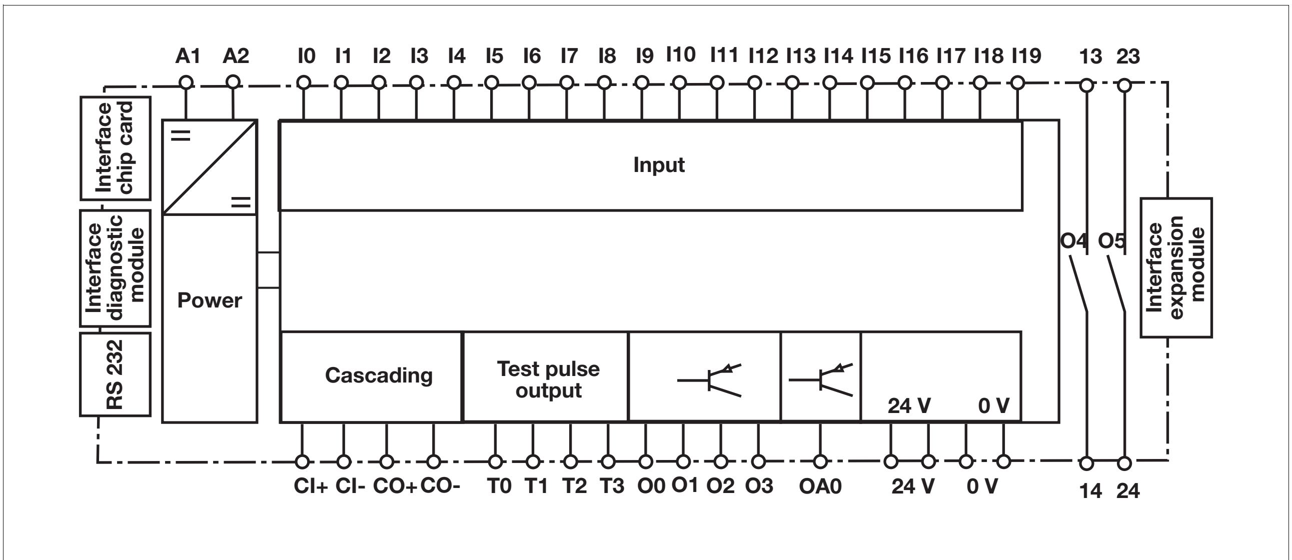
Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see Accessories chapter).

Safety features

The relay conforms to the following safety criteria:

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

Block diagram



Base units
PNOZ m3p

Function description

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

Wiring

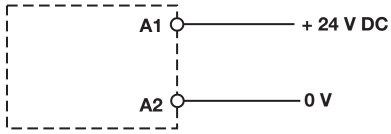
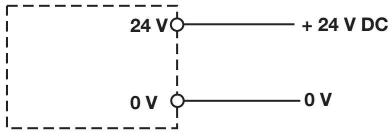
The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a particular safety function and the outputs that will switch this safety function.
Please note:

- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.
  Where test pulses are used for the safety mat, they may not be reused for other purposes.
  Safety mats are supported from Version 1.3 of the base unit.

Base units
PNOZ m3p

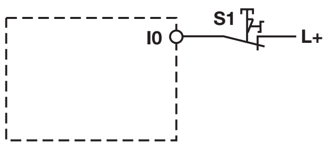
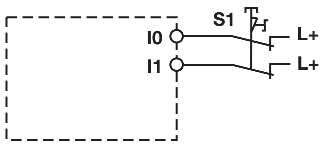
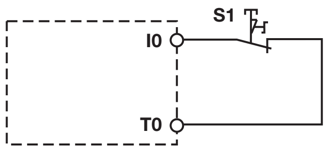
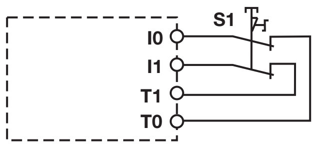
Preparing for operation

- Supply voltage

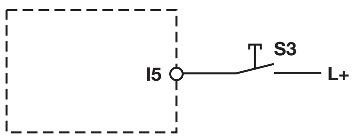
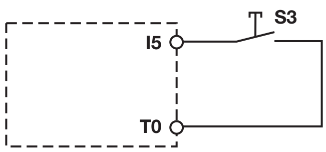
Supply voltage	AC	DC
For the safety system (connector X7)		
For the semiconductor outputs (connector X2) Must always be present, even if the semi-conductor outputs are not used		

Connection examples

- Input circuit

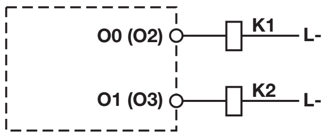
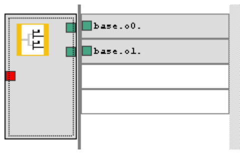
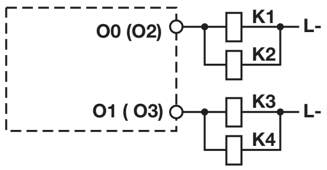
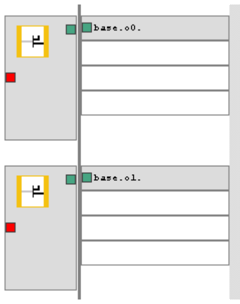
Input circuit	Single-channel	Dual-channel
E-STOP **without** detection of shorts across con-tacts		
E-STOP **with** detection of shorts across contacts		

- Reset circuit

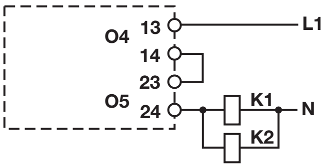
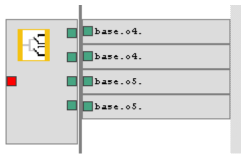
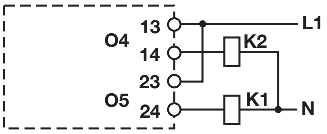
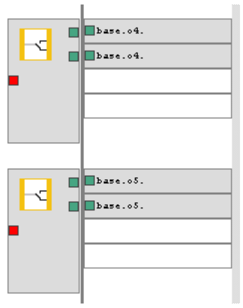
Reset circuit	Input circuit without detection of shorts across contacts	Input circuit with detection of shorts across contacts
		

Base units
PNOZ m3p

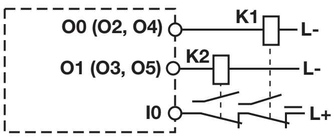
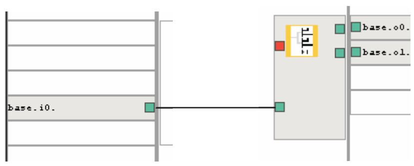
Semiconductor outputs

Redundant output		
Single output		

Relay outputs

Redundant output		
Single output		

Feedback loop

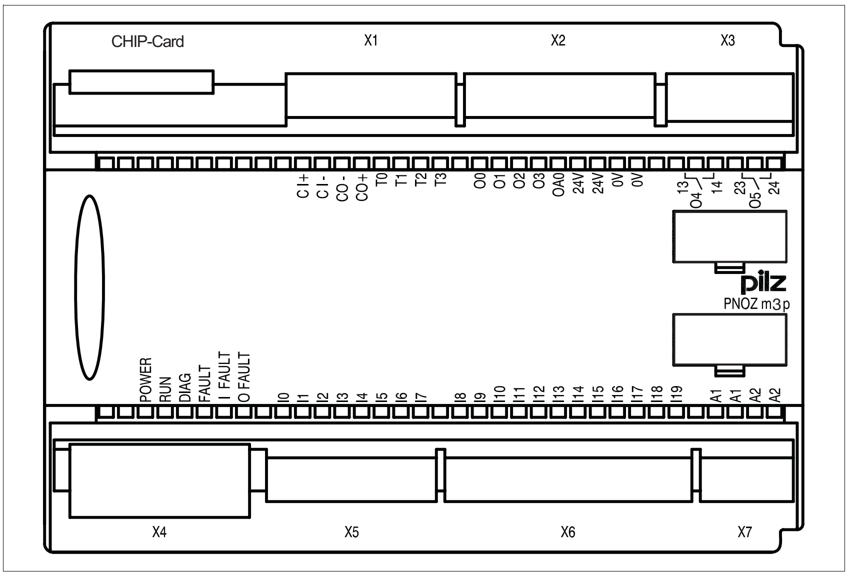
Feedback loop	Redundant output	
Contacts from external contactors		

Key

S1	E-STOP pushbutton
S3	Reset button

Base units
PNOZ m3p

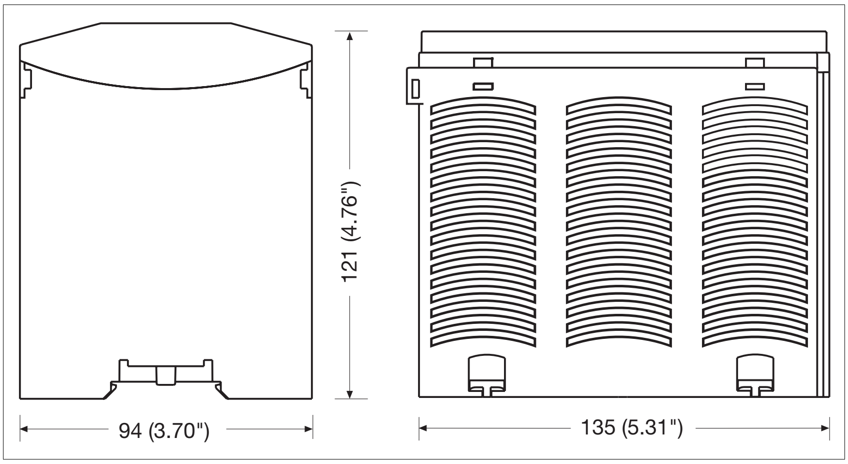
Terminal configuration



Installation

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

Dimensions

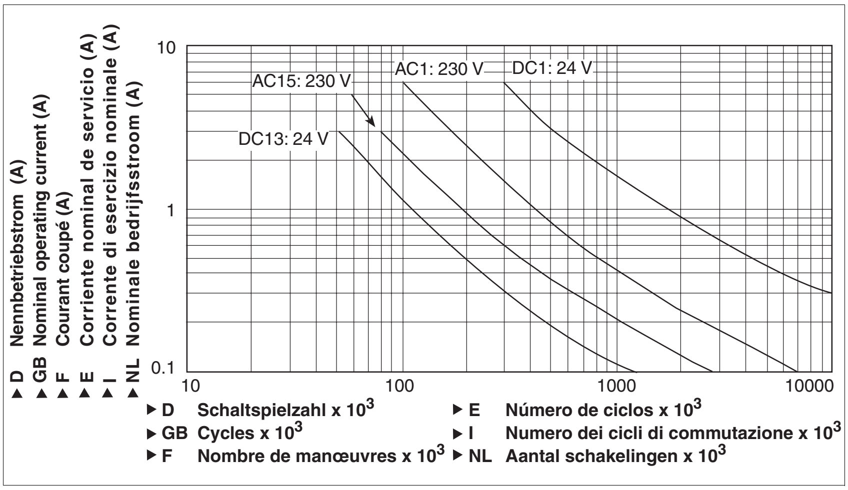


Base units
PNOZ m3p

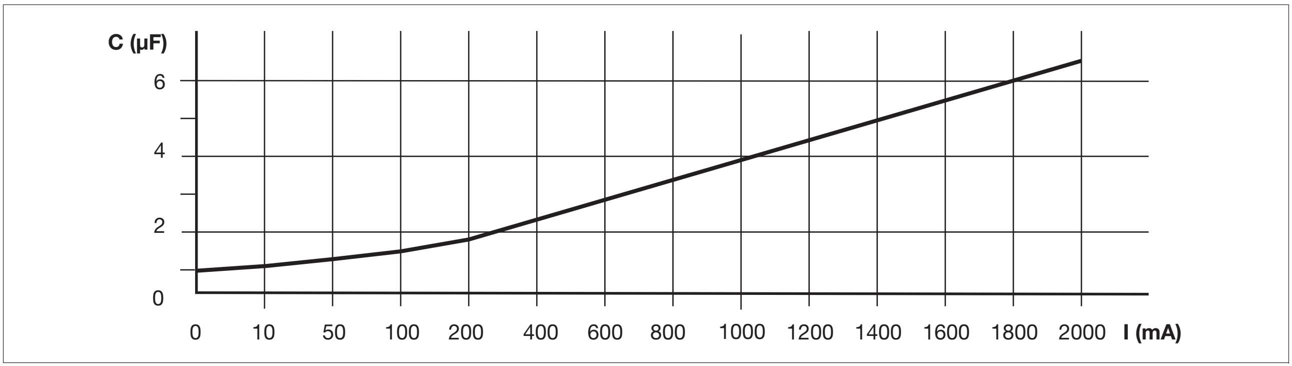
Notice

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

Service life graph



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



Technical details	
Electrical data	
Supply voltage U_B DC	**24 V**
Voltage tolerance	**-15 %/+20 %**
Power consumption at U_B DC	
without load	**8.0 W**
per expansion module	**2.50 W**
Residual ripple DC	**5 %**
Status display	**LED**
Times	
Switch-on delay	**5.00 s**
Simultaneity channel 1/2/3	**3 s**
Supply interruption before de-energisation	**20 ms**
Inputs	
Number	**20**
Max. number of live inputs in the area of max. permitted ambient temperature (see "Environmental data")	**U_B > 26.4 V : 15, U_B <= 26.4 V : 20**

Base units
PNOZ m3p

Inputs	
Voltage and current at input, reset and feedback circuit	**24.0 V**, **8.0 mA**
Galvanic isolation	**no**
Signal level at "0"	**-3 - +5 V DC**
Signal level at "1"	**15 - 30 V DC**
Min. pulse duration	**18 ms**
Pulse suppression	**0.6 ms**
Test pulse outputs	
Number of test pulse outputs	**4**
Voltage and current, **24 V**	**0.5 A**
Off time during self test	**5 ms**
Galvanic isolation	**no**
Short circuit-proof	**yes**
Semiconductor outputs	
Number for EN 954-1, Cat. 4 for EN 954-1, Cat. 3	 **2** **4**
Switching capability voltage current power	 **24 V** **2 A** **48 W**
Max. capacitive load	**1 µF**
External supply voltage	**24.0 V**
Voltage tolerance	**-15 %/+20 %**
Max. duration of off time during self test	**300 µs**
Galvanic isolation	**yes**
Short circuit-proof	**yes**
Switch-off delay	**30 ms**
Residual current at "0"	**0.5 mA**
Signal level at "1"	**UB - 0.5 V DC bei 2 A**
Relay outputs	
Number for EN 954-1, Cat. 4 for EN 954-1, Cat. 2	 **1** **2**
Utilisation category in accordance with **EN 60947-4-1** Safety contacts: AC1 at **240 V** Safety contacts: DC1 at **24 V** Utilisation category in accordance with **EN 60947-5-1** Safety contacts: AC15 at **230 V** Safety contacts: DC13 at **24 V** (6 cycles/min)	 **6.0 A**, **1440 VA** **6.0 A**, **144 W** **3.0 A**, **690 W** **3.0 A**, **72 W**
Airgap creepage between relay contacts relay contacts and other safe circuits	 **3 mm** **5.5 mm**
External contact fuse protection (I_K = 1 kA) to **EN 60947-5-1** Blow-out fuse, quick Blow-out fuse, slow Circuit breaker 24 VAC/DC, characteristic B/C	 **6 A** **6 A** **6 A**
Switch-off delay	**50 ms**
Auxiliary outputs	
Number	**1**
Switching capability voltage current power	 **24 V** **0.5 A** **12.0 W**
Galvanic isolation	**yes**
Short circuit-proof	**yes**
Residual current at "0"	**0.5 mA**
Signal level at "1"	**UB - 0.5 V DC bei 0.5 A**

Base units
PNOZ m3p

Cascading output as auxiliary output	
Number	**1**
Switching capability	
voltage	**24 V**
current	**0.2 A**
power	**4.8 W**
Galvanic isolation	**no**
Short circuit-proof	**yes**
Residual current at "0"	**0.5 mA**
Environmental data	
EMC	**EN 60947-5-1**
Vibration to **EN 60068-2-6**	
Frequency	**10 - 55 Hz**
Amplitude	**0.35 mm**
Climatic suitability	**EN 60068-2-78**
Airgap creepage in accordance with **EN 60664-1**	
Ambient temperature	**0 - 60 °C**
Storage temperature	**-25 - 70 °C**
Mechanical data	
Protection type	
Mounting (e.g. cabinet)	**IP54**
Housing	**IP20**
Terminals	**IP20**
DIN rail	
Top hat rail	**35 x 7.5 EN 50022**
Recess width	**27 mm**
Maximum cable runs	
per input	**1 km**
Sum of individual cable runs at the test pulse output	**40 km**
Housing material	
Housing	**PPO UL 94 V0**
Front	**ABS UL 94 V0**
Cross section of external conductors with screw terminals	
Power supply, inputs, auxiliary output, semiconductor outputs, test pulse outputs, cascading outputs:	
1 core flexible	**0.50 - 1.50 mm² , 22 - 14 AWG**
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.50 - 0.75 mm² , 22 - 20 AWG**
without crimp connectors or with TWIN crimp connectors	**0.50 - 0.75 mm² , 22 - 20 AWG**
Relay outputs:	
1 core flexible	**0.5 - 2.5 mm², 22 - 12 AWG**
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.50 - 1.25 mm², 22 - 16 AWG**
without crimp connectors or with TWIN crimp connectors	**0.50 - 1.25 mm², 22 - 16 AWG**
Torque setting with screw terminals	**0.25 Nm**
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	**0.50 - 1.50 mm² , 26 - 14 AWG**
Spring-loaded terminals: Terminal points per connection	**1**
Stripping length	**9 mm**
Dimensions	
Height	**94.0 mm**
Width	**135.0 mm**
Depth	**121.0 mm**
Weight	**490 g**

Base units
PNOZ m3p

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1 PL	Category	EN IEC 62061 SIL CL	PFH [1/h]	t_M [year]
Logic						
CPU		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	single-channel	PL d	Cat. 2	SIL CL 2	2.50E-09	20
SC inputs	dual-channel	PL e	Cat. 4	SIL CL 3	2.90E-10	20
SC inputs	light barrier	PL e	Cat. 4	SIL CL 3	2.50E-10	20
SC inputs	dual-channel pressure sensitive mat	PL d	Cat. 3	SIL CL 2	1.81E-09	20
Output						
SC outputs	1-pin	PL d	Cat. 2	SIL CL 2	7.00E-09	20
SC outputs	2-pin	PL e	Cat. 4	SIL CL 3	8.60E-10	20
relay outputs	single-channel	PL c	Cat. 1	-	2.90E-08	20
relay outputs	dual-channel	PL e	Cat. 4	SIL CL 3	3.00E-10	20
Bus interface						
cascading inputs		PL e	Cat. 4	SIL CL 3	3.10E-10	20
cascading outputs		PL e	Cat. 4	SIL CL 3	4.91E-10	20

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

The standards current on **2009-03** apply.

Order reference

Type	Features	Order no.
PNOZ m3p	Base unit	773 125

Expansion modules
PNOZ mo5p

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

Approvals

	PNOZ mo5p
TÜV SÜDDEUTSCHLAND	◆
BG-PRÜFZERT	◆
	◆

Unit features

- Can be configured in the PNOZmulti Configurator
- Designed to control the safety valves on a burner in accordance with EN 50156
- Positive-guided relay outputs, diverse:
  - 2 safety outputs in accordance with EN 954-1, Cat. 4
    or 4 safety outputs in accordance with EN 954-1, Cat. 2
- Status indicators
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Max. 8 expansion modules and one fieldbus module can be connected to a base unit- max. 6 of these may be expansion modules PNOZ mo5p, PNOZ mo4p, PNOZ mo2p and PNOZ mo1p.

Unit description

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

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

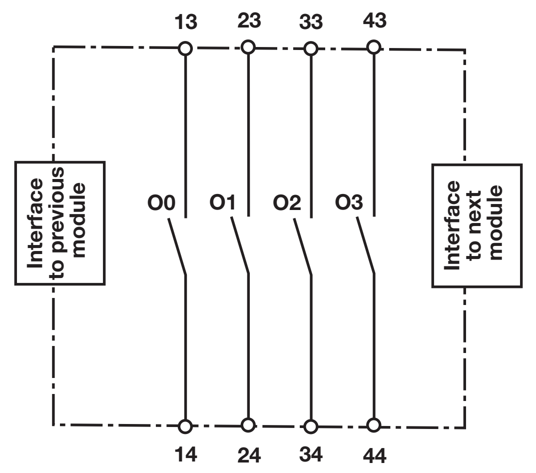
The relay outputs are diverse in design and are therefore suitable for controlling safety valves on a burner in accordance with EN 50156.

Safety features

The relay conforms to the following safety criteria:

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

Block diagram



Expansion modules
PNOZ mo5p

Function description

The expansion module provides additional relay outputs.
The function of the outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.
The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

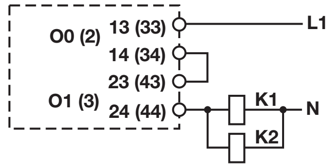
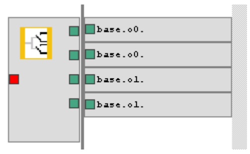
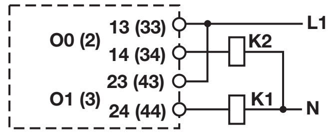
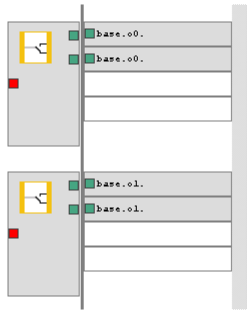
Wiring

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

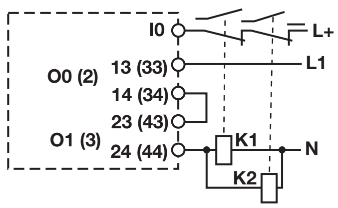
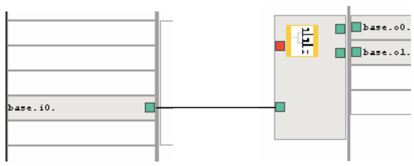
Expansion modules
PNOZ mo5p

Preparing for operation

- Relay outputs

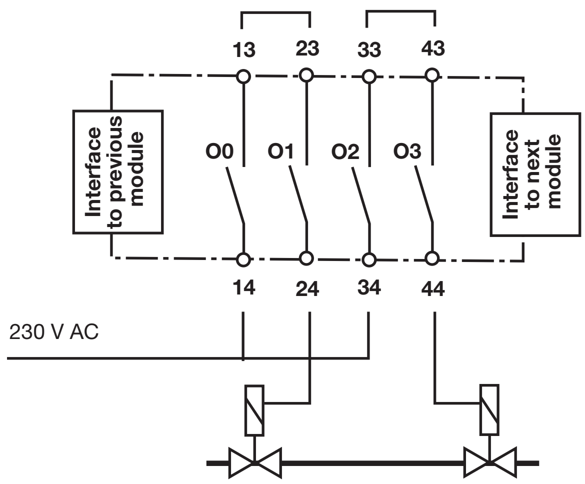
Redundant		
Single		

- Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

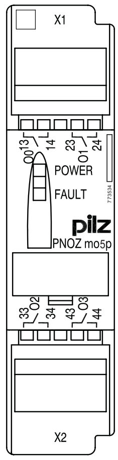
Expansion modules
PNOZ mo5p

- Connection for safety valves on a burner in accordance with EN 50156



Expansion modules
PNOZ mo5p

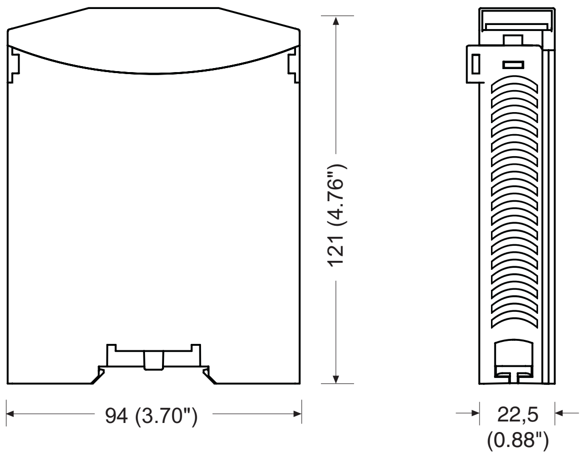
Terminal configuration



Installation

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

Dimensions

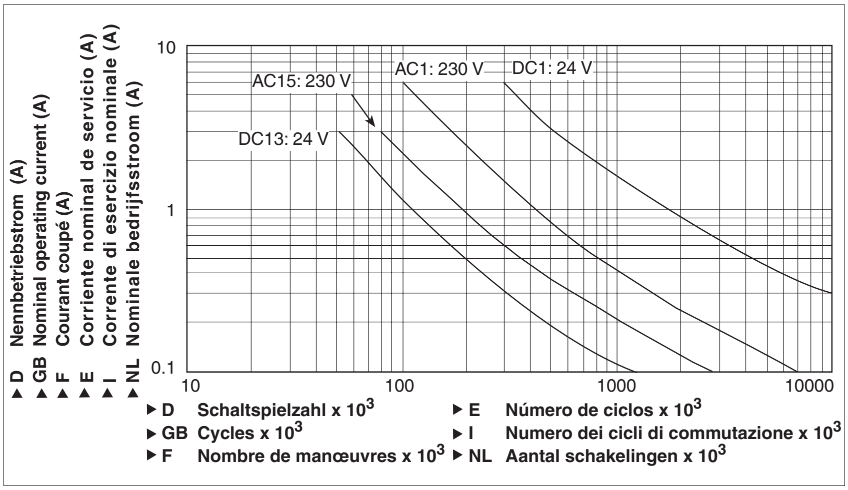


Expansion modules

PNOZ mo5p

Notice

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



Technical details	
Electrical data	
Supply voltage U_B DC	**5 V**
Power consumption at U_B DC without load	 **3.5 W**
Status display	**LED**
Times	
Switch-on delay	**5.00 s**
Supply interruption before de-energisation	**20 ms**
Relay outputs	
Number for EN 954-1, Cat. 4 for EN 954-1, Cat. 2	 **2** **4**
Utilisation category in accordance with **EN 60947-4-1** Safety contacts: AC1 at **240 V** Safety contacts: DC1 at **24 V** Utilisation category in accordance with **EN 60947-5-1** Safety contacts: AC15 at **230 V** Safety contacts: DC13 at **24 V** (6 cycles/min)	 **1.5 A**, **360 VA** **6.0 A**, **144 W** **0.6 A**, **138 W** **0.4 A**, **9 W**
Airgap creepage between relay contacts relay contacts and other safe circuits	 **3 mm** **5.5 mm**
External contact fuse protection (I_K = 1 kA) to **EN 60947-5-1** Blow-out fuse, quick Blow-out fuse, slow Circuit breaker 24 VAC/DC, characteristic B/C	 **6 A** **6 A** **6 A**
Switch-off delay	**50 ms**
Environmental data	
EMC	**EN 60947-5-1**
Vibration to **EN 60068-2-6** Frequency Amplitude	 **10 - 55 Hz** **0.35 mm**
Climatic suitability	**EN 60068-2-78**
Ambient temperature	**0 - 60 °C**
Storage temperature	**-25 - 70 °C**

Expansion modules
PNOZ mo5p

Mechanical data	
Protection type	
Mounting (e.g. cabinet)	**IP54**
Housing	**IP20**
Terminals	**IP20**
DIN rail	
Top hat rail	**35 x 7.5 EN 50022**
Recess width	**27 mm**
Housing material	
Housing	**PPO UL 94 V0**
Front	**ABS UL 94 V0**
Cross section of external conductors with screw terminals	
Relay outputs:	
1 core flexible	**0.5 - 2.5 mm², 22 - 12 AWG**
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.50 - 1.25 mm², 22 - 16 AWG**
without crimp connectors or with TWIN crimp connectors	**0.50 - 1.25 mm², 22 - 16 AWG**
Torque setting with screw terminals	**0.40 - 0.50 Nm**
Spring-loaded terminals: Terminal points per connection	**1**
Stripping length	**9 mm**
Dimensions	
Height	**94.0 mm**
Width	**22.5 mm**
Depth	**121.0 mm**
Weight	**170 g**

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1 PL	Category	EN IEC 62061 SIL CL	PFH [1/h]	t_M [year]
relay outputs	single-channel	**PL c**	**Cat. 1**	**-**	**2.90E-08**	**20**
relay outputs	dual-channel	**PL e**	**Cat. 4**	**SIL CL 3**	**3.00E-10**	**20**

The standards current on **2009-01** apply.

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

Order reference

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

Base units
PNOZ mm0p

Base units from the PNOZmulti modular safety system

Approvals

	PNOZ mm0p
TÜV SÜDDEUTSCHLAND	◆
BG-PRÜFZERT	◆

Unit features

- Can be configured in the PNOZmulti Configurator
- Semiconductor outputs:
  - Depending on the application, up to 4 safety outputs in accordance with EN ISO 13849-1: PL e and EN IEC 62061: SIL CL 3
- 4 test pulse outputs
- 20 inputs for connecting:
  - E-STOP pushbuttons
  - Two-hand buttons
  - Safety gate limit switches
  - Reset buttons
  - Light beam devices
  - Scanners
  - Enable switches
  - PSEN
  - Operating mode selector switches
- LED for:
  - Error messages
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Display for:
  - Error messages
  - Supply voltage status
  - Input/output status
  - Status information
  - Unit information
- Monitors shorts across the inputs through test pulse outputs
- Monitors shorts between the safety outputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)
- Rotary knob for menu control

Unit description

The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- E-STOP equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

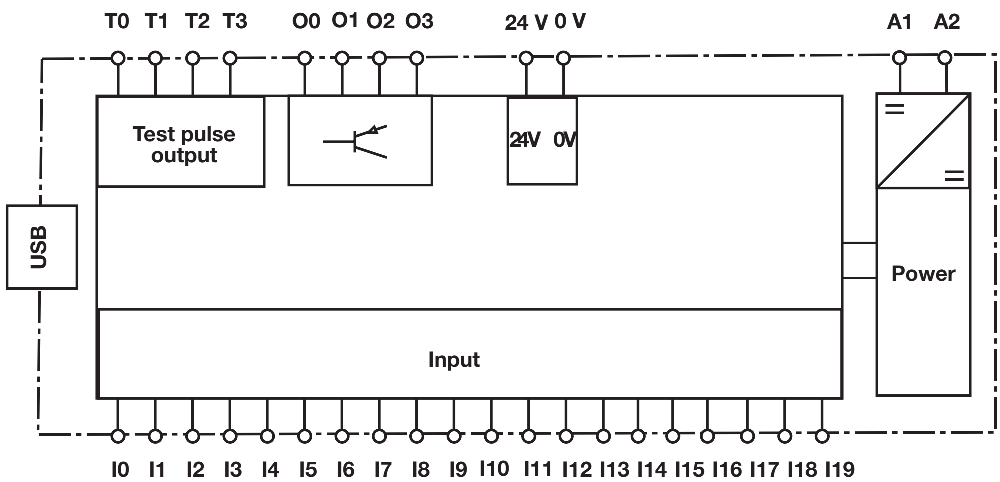
Chip card

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

Safety features

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

Block diagram



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

Base units
PNOZ mm0p

Function description

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.

Wiring

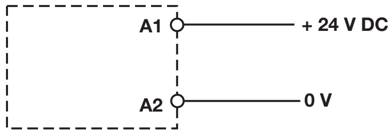
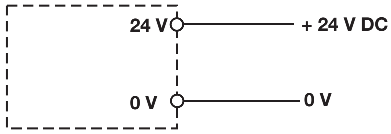
The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a particular safety function and the outputs that will switch this safety function.
Please note:

- Information given in the "Technical details" must be followed.
- Outputs O0 to O3 are semiconductor outputs
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- 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.

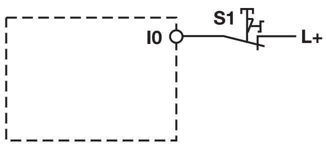
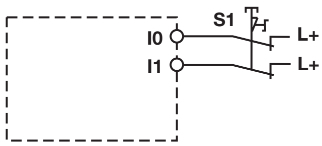
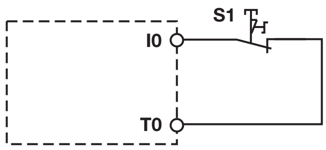
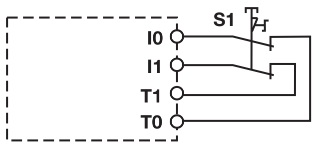
Base units
PNOZ mm0p

Preparing for operation

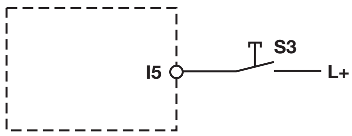
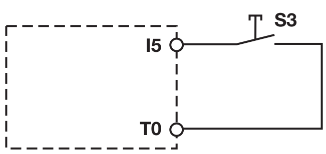
- Supply voltage

Supply voltage	AC	DC
For the safety system		
For the semiconductor outputs Must always be present, even if the semiconductor outputs are not used		

- Connection examples for the input circuit

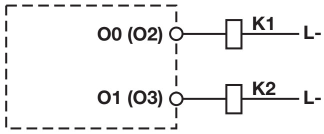
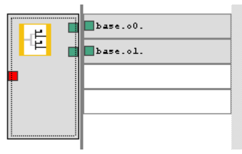
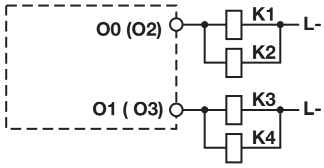
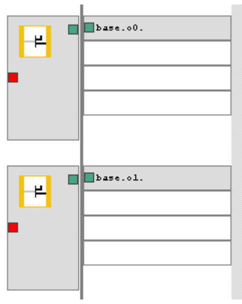
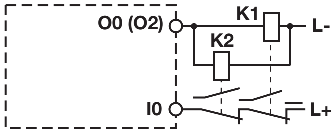
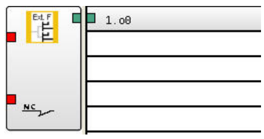
Input circuit	Single-channel	Dual-channel
Emergency stop **without** detection of shorts across contacts		
Emergency stop **with** detection of shorts across contacts		

- Connection examples for reset circuit

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

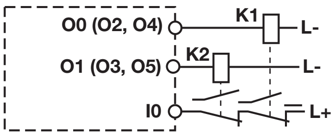
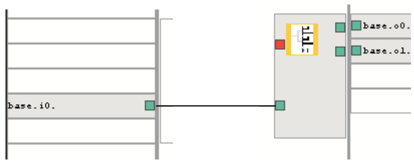
Base units
PNOZ mm0p

- Connection examples for semiconductor outputs

Redundant output		
Single output		
Single output with advanced fault detection*		

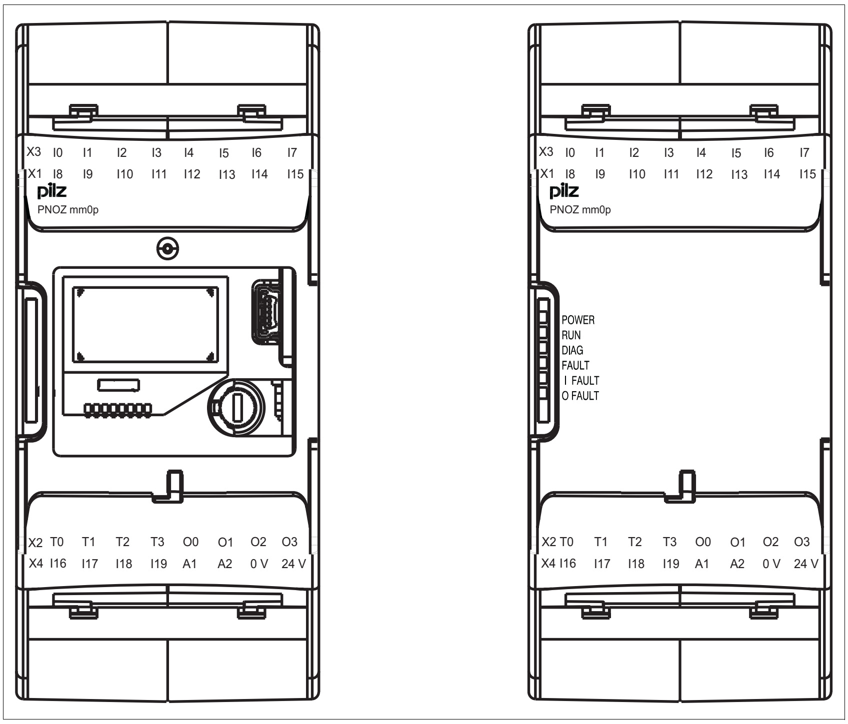
*Two loads may be connected to each safety output with advanced fault detection, even on applications in accordance with EN IEC 62061, SIL CL 3. Prerequisite: Feedback loop is connected, shorts across contacts and external power sources are excluded (e.g. through separate multicore cables). Please note 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.

- Connection examples for feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

Base units
PNOZ mm0p

Terminal configuration



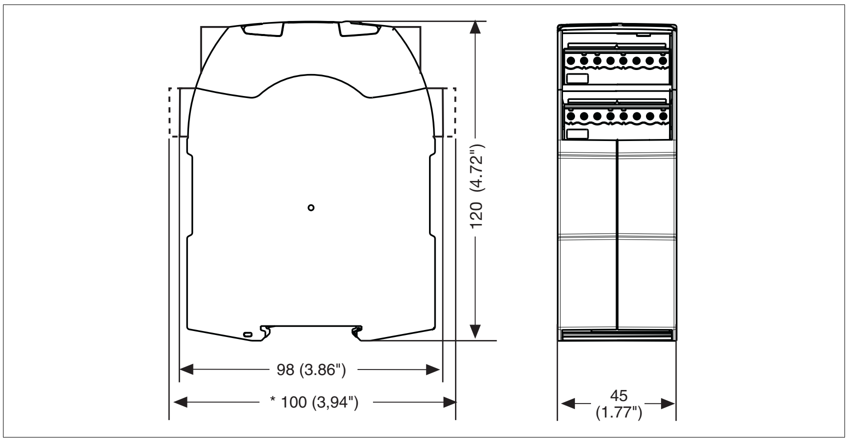
Front view with and without cover

Installation

- The unit should be installed in a control cabinet with a protection type of at least IP54.
- Use the notch on the rear of the unit to attach it to a mounting rail.
- Ensure the unit is mounted securely on a vertical mounting rail (35 mm) by using a fixing element (e.g. retaining bracket or an end angle).
- Push the unit upwards or downwards before lifting it from the mounting rail.

Dimensions

*with spring-loaded terminals

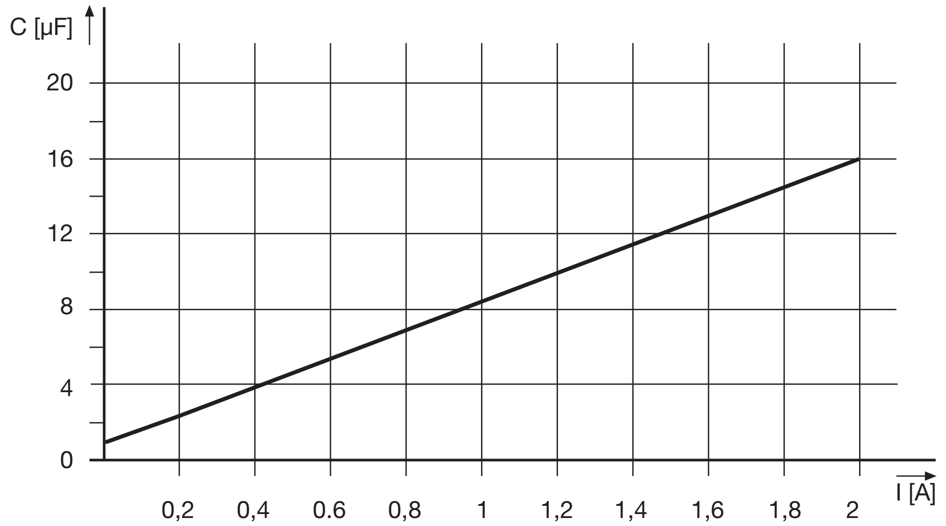


Base units
PNOZ mm0p

Notice

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

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



Technical details	
Electrical data	
Supply voltage U_B DC	**24 V**
Voltage tolerance	**-15 %/+20 %**
Power consumption at U_B DC without load	**8.0 W**
Residual ripple DC	**5 %**
Status display	**Display**, **LED**
Times	
Switch-on delay	**5.00 s**
Two-hand circuit	**0.5 s**
Supply interruption before de-energisation	**20 ms**
Inputs	
Number	**20**
Voltage and current at input, reset and feedback circuit	**24.0 V**, **6.0 mA**
Galvanic isolation	**no**
Signal level at "0"	**-3 - +5 V DC**
Signal level at "1"	**15 - 30 V DC**
Min. pulse duration	**18 ms**
Pulse suppression	**0.6 ms**

Base units
PNOZ mm0p

Test pulse outputs	
Number of test pulse outputs	**4**
Voltage and current, **24 V**	**0.1 A**
Off time during self test	**5 ms**
Galvanic isolation	**no**
Short circuit-proof	**yes**
Semiconductor outputs	
Number	**4**
Switching capability voltage current power	 **24 V** **2 A** **48 W**
Max. capacitive load	**1 µF**
External supply voltage	**24.0 V**
Voltage tolerance	**-15 %/+20 %**
Max. duration of off time during self test	**300 µs**
Galvanic isolation	**yes**
Short circuit-proof	**yes**
Switch-off delay	**30 ms**
Residual current at "0"	**0.5 mA**
Signal level at "1"	**UB - 0.5 V DC bei 2 A**
Environmental data	
EMC	**EN 55011: class A**, **EN 61000-6-2**, **EN 61000-6-4**, **EN 61496-1**
Vibration to **EN 60068-2-6** Frequency Amplitude	 **10 - 55 Hz** **0.35 mm**
Climatic suitability	**EN 60068-2-14**, **EN 60068-2-1**, **EN 60068-2-2**, **EN 60068-2-78**
Airgap creepage in accordance with **EN 61131-2**	
Ambient temperature	**0 - 60 °C**
Storage temperature	**-25 - 70 °C**
Mechanical data	
Protection type Mounting (e.g. cabinet) Housing Terminals	 **IP54** **IP20** **IP20**
DIN rail Top hat rail Recess width	 **35 x 7.5 EN 50022** **27 mm**
Maximum cable runs per input Sum of individual cable runs at the test pulse output	 **1 km** **2 km**
Housing material Housing Front	 **PC** **PC**
Cross section of external conductors with screw terminals Power supply, inputs, auxiliary output, semiconductor outputs, test pulse outputs, cascading outputs: 1 core flexible 2 core, same cross section, flexible: without crimp connectors or with TWIN crimp connectors	 **0.25 - 2.50 mm² , 24 - 12 AWG** **0.20 - 1.50 mm² , 24 - 16 AWG**
Torque setting with screw terminals	**0.50 Nm**
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	**0.20 - 2.50 mm² , 24 - 12 AWG**
Spring-loaded terminals: Terminal points per connection Stripping length	**2** **9 mm**

Base units
PNOZ mm0p

Mechanical data	
Dimensions	
Height	**100.0 mm**
Width	**45.0 mm**
Depth	**120.0 mm**
Weight	**280 g**

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	t_M [year]
Logic						
CPU		PL e (Cat. 4)	Cat. 4	SIL CL 3	1.37E-09	20
Input						
SC inputs	single-channel	PL d (Cat. 2)	Cat. 2	SIL CL 2	8.41E-10	20
SC inputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	1.75E-10	20
Output						
SC outputs	single-channel with advanced fault detection	PL e (Cat. 4)	Cat. 4	SIL CL 3	2.13E-09	20
SC outputs	single-channel	PL d (Cat. 2)	Cat. 3	SIL CL 2	2.76E-09	20
SC outputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	9.51E-10	20

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

The standards current on **2009-03** apply.

Order reference

Type	Features	Order no.
PNOZ mm0p	Base unit	772 000
Cage clamp terminals	1 set	751 008
Screw terminals	1 set	750 008
Mini USB cable	3 m	312 992
Mini USB cable	5 m	312 993

Expansion modules

PNOZ ms2p HTL

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

Approvals

	PNOZ ms2p HTL
cULus LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

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

Unit description

The expansion module may only be connected to a base unit from the PNOZmulti modular safety system.
The expansion module monitors standstill, speed and direction of rotation in accordance with EN ISO 13849-1 up to PL e and EN IEC 62061 up to SIL CL 3.
The PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
- E-STOP equipment
- Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

System requirements

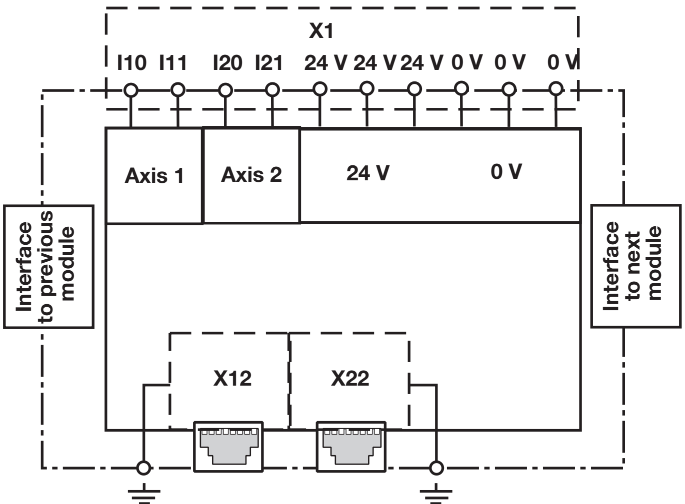
- PNOZmulti Configurator: From Version 6.4.0
- Base unit PNOZ m1p: From Version 6.0
- Base unit PNOZ m2p: From Version 3.0
- PNOZ m3p base unit from Version 1.0

Please contact Pilz if you have an older version.

Safety features

The relay conforms to the following

Block diagram



Expansion modules
PNOZ ms2p HTL

Function description

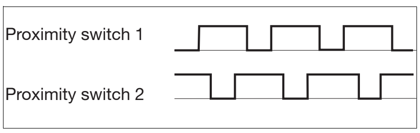
The speed monitor can independently monitor two axes for standstill, speed and direction of rotation. The speed monitor signals the status of the monitored values to the base unit. Depending on the safety circuit loaded, the values can be transferred from the base unit, e.g. to a relay output on the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

Wiring

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

Proximity switch

- Only proximity switches of type "pnp" are allowed to be used (N/O contact, switching to positive).
- The proximity switches require a 24 VDC supply.
- The proximity switches must be fitted such that at least one is always activated (provides a high signal).
- The proximity switches must be fitted so that the recorded signals overlap.



CAUTION!
Appropriate installation measures should be taken to prevent a foreign body coming between the signal input device and the proximity switch. The foreign body could cause one of the proximity switches to be constantly energised (constant high signal).
- Pay attention to the values in the technical details

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)

Incremental encoder

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

Follow the instructions below when connecting the incremental encoder:
- The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- Only use shielded cables for all connections
- Always connect 0 V on the incremental encoder and speed monitor.
- Position the terminating resistors on the signal lines as close as possible to the input on the speed monitor.

Incremental encoder and proximity switch on one axis

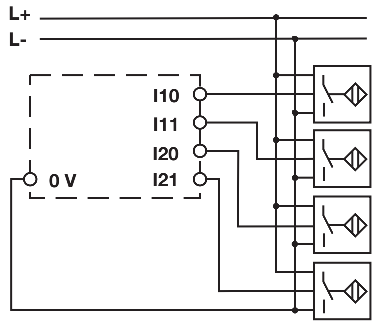
In order to increase the availability, a proximity switch and an incremental encoder can be configured on one axis for the speed monitor. That way the speed monitor can monitor 3 signals on one axis: Track A and track B of the incremental encoder and the proximity switch:
Standstill monitoring
Standstill 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 safe condition is cleared again as required (see "Signal statuses" table).
Hazards that can arise through an automatic restart must be excluded within the user program.

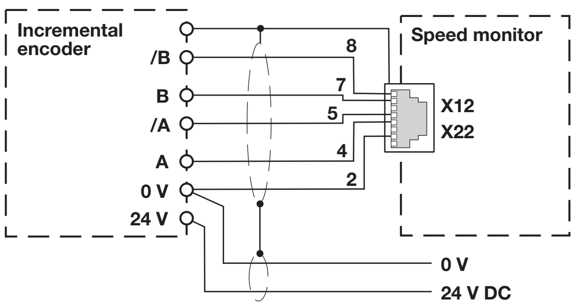
Expansion modules
PNOZ ms2p HTL

Preparing for operation

- Proximity switch

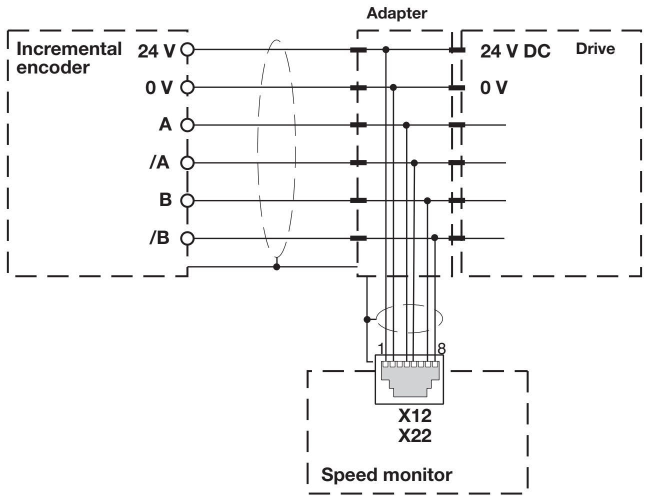
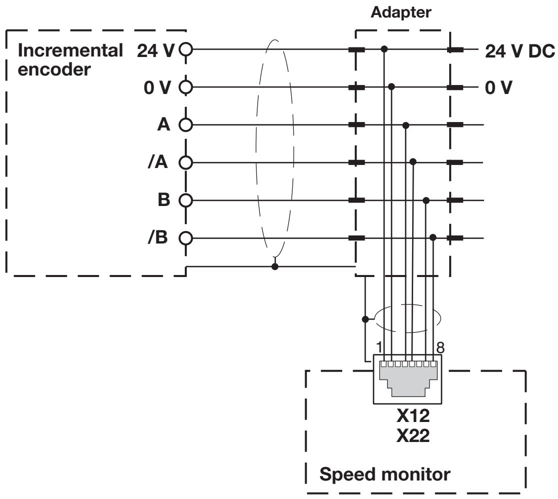


- Incremental encoder

Encoder type 24 V-HTL Do **not** terminate incremental encoder with Z_0 = 120 Ohm	

Expansion modules
PNOZ ms2p HTL

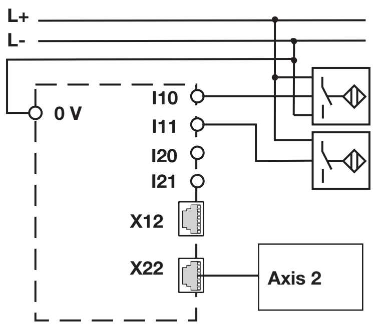
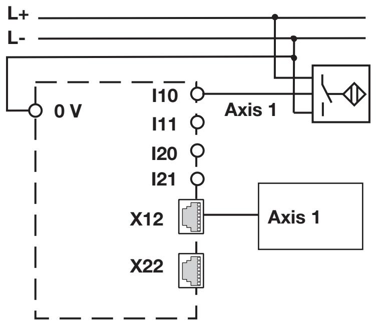
- Connect incremental encoder to the speed monitor via the adapter

Connection via adapter and drive	
Connection via adapter	

- The adapter (e.g. PNOZ msi6p) 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 also can be used without connecting to a drive.
- The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated in section 7.2.2.1 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.

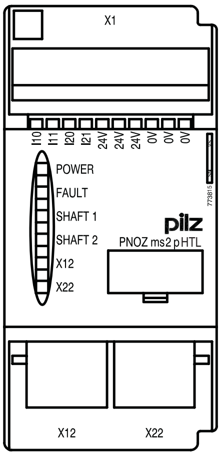
- Proximity switch and incremental encoder

Expansion modules
PNOZ ms2p HTL

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

Expansion modules
PNOZ ms2p HTL

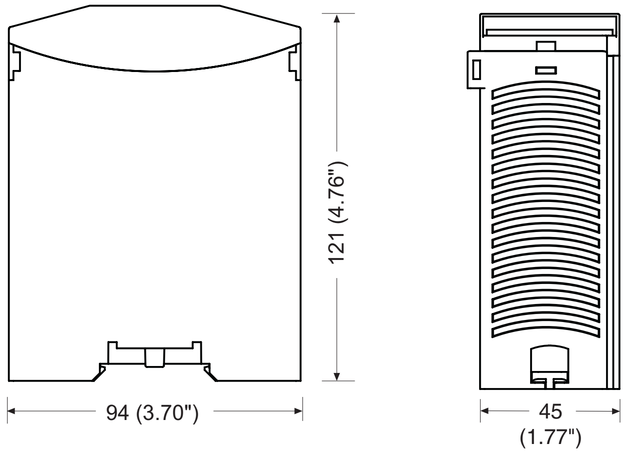
Terminal configuration



Installation

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

Dimensions



Expansion modules
PNOZ ms2p HTL

Notice

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

Technical details	
Electrical data	
Supply voltage U_B DC	
via base unit	**5 V**, **24 V**
Voltage tolerance	**-15 %/+20 %**
Power consumption at U_B DC	
via base unit	**1.0 W**
Residual ripple DC	**5 %**
Status display	**LED**
Times	
Configurable switch-off delay	**0 - 2,500 ms**
Response time	
f>100 Hz: configurable switch-off delay + switch-off delay on base unit *	**10 ms**
f<100 Hz: configurable switch-off delay + switch-off delay on base unit *	**10 ms + 1/f**
Supply interruption before de-energisation	**20 ms**
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**
Connection type	**Spring-loaded terminals, screw terminals**
Cross section of external conductors with screw terminals	
1 core flexible	**0.50 - 1.50 mm² , 22 - 14 AWG**
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.50 - 0.75 mm² , 22 - 20 AWG**
without crimp connectors or with TWIN crimp connectors	**0.50 - 0.75 mm² , 22 - 20 AWG**
Incremental encoder input	
Number of inputs	**2**
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**
Connection type (incremental encoder)	**RJ-45-socket, 8-pin**
Environmental data	
EMC	**EN 60947-5-1**
Vibration to **EN 60068-2-6**	
Frequency	**10 - 55 Hz**
Amplitude	**0.35 mm**
Climatic suitability	**EN 60068-2-78**
Airgap creepage in accordance with **EN 60664-1**	
Ambient temperature	**0 - 60 °C**
Storage temperature	**-25 - 70 °C**

Expansion modules
PNOZ ms2p HTL

Mechanical data	
Protection type	
Mounting (e.g. cabinet)	**IP54**
Housing	**IP20**
Terminals	**IP20**
DIN rail	
Top hat rail	**35 x 7.5 EN 50022**
Recess width	**27 mm**
Housing material	
Housing	**PPO UL 94 V0**
Front	**ABS UL 94 V0**
Torque setting with screw terminals	**0.25 Nm**
Dimensions	
Height	**94.0 mm**
Width	**45.0 mm**
Depth	**121.0 mm**
Weight	**220 g**

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	t_M [year]
	initiator	**PL e (Cat. 3)**	**Cat. 3**	**SIL CL 3**	**3.68E-09**	**20**
	incremental encoder	**PL e (Cat. 3)**	**Cat. 3**	**SIL CL 3**	**6.73E-09**	**20**

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

The standards current on **2009-06** apply.

Order reference

Type	Features		Order no.
PNOZ ms2p HTL	Expansion module	Speed monitor	773 815

Base units
PNOZ m1p ETH

Base units from the PNOZmulti modular safety system

Approvals

	PNOZ m1p ETH
TÜV SÜDDEUTSCHLAND	◆
BG-PRÜFZERT	◆
CCC	◆

Unit features

- Can be configured in the PNOZmulti Configurator
- 2 Ethernet interfaces
- Positive-guided relay outputs:
  - 2 safety outputs
    Depending on the application, up to PL e in accordance with EN ISO 13849-1 and up to SIL CL 3 in accordance with EN IEC 62061
- Semiconductor outputs:
  - 4 safety outputs
    Depending on the application, up to PL e in accordance with EN ISO 13849-1 and up to SIL CL 3 in accordance with EN IEC 62061
  - 1 auxiliary output
- 4 test pulse outputs
- 1 cascading input and output can also be used as standard output
- 20 inputs for connecting:
  - E-STOP pushbuttons
  - Two-hand buttons
  - Safety gate limit switch
  - Reset button
  - Light barriers
  - Scanner
  - Enable switch
  - PSEN
  - Operating mode selector switch
  - Pressure sensitive mats
- Muting function
- Connectable:
  - 8 expansion modules on the right
  - 1 fieldbus module on the left
  - 4 expansion modules on the left
- LED indicator for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to detect shorts across the inputs
- Monitoring of shorts between the safety outputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

Unit description

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

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

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).

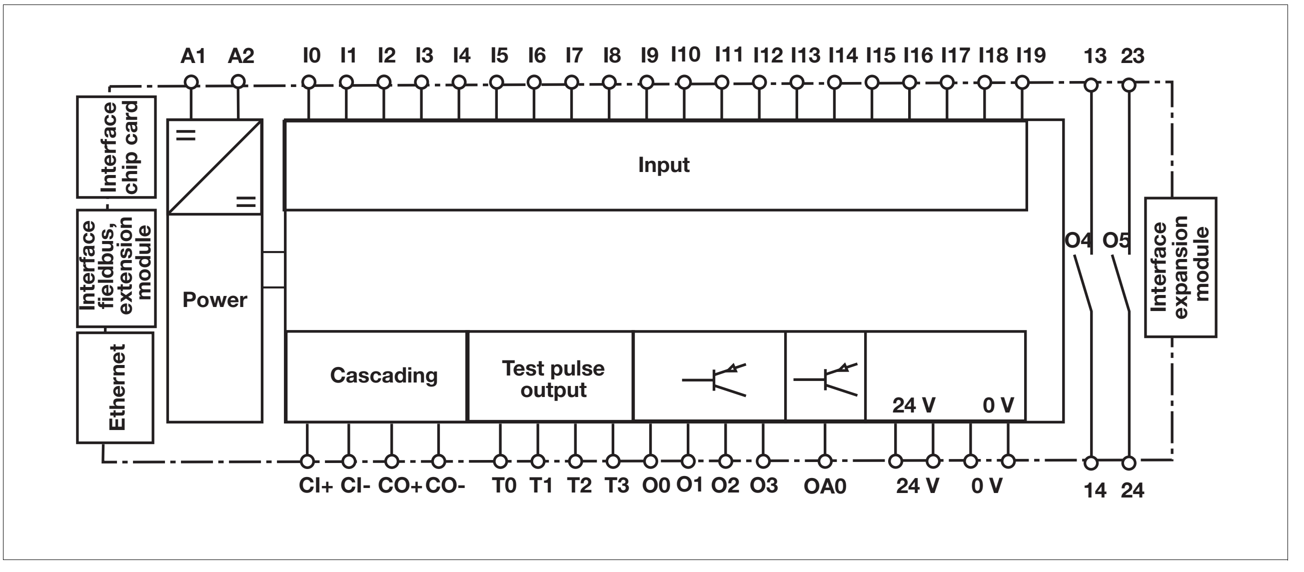
Safety features

The relay conforms to the following safety criteria:

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

Base units
PNOZ m1p ETH

Block diagram



Base units
PNOZ m1p ETH

Function description

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 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 PNOZmulti safety system.
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.
The product **PNOZ m1p ETH** has two Ethernet interfaces for
- Downloading the project
- Reading the diagnostic data
- Setting virtual inputs for standard functions
- Reading virtual outputs for standard functions.

Information on diagnostics via the Ethernet interfaces can be found in the Special Applications Technical Catalogue.
The connection to Ethernet is made via the two 8-pin RJ45 sockets.
Configuration of the Ethernet interface is performed in the PNOZmulti Configurator and is described in the online help of the PNOZmulti Configurator.

Wiring

The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a particular safety function and the outputs that will switch this safety function.
Please note:
CAUTION!
The plug-in connection terminals on the relay outputs that carry mains voltage should only be connected and disconnected when the voltage is switched off.
- Information given in the “Technical details” must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads.
  Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.
  Test pulses that are used for the safety mat may not be reused for other purposes.

Ethernet-Interfaces

RJ45 Interfaces („Ethernet“)

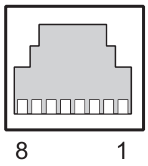
Two free switch ports are provided as Ethernet interfaces via an internal autosensing switch. The autosensing switch automatically detects whether data transfer is occurring at 10 Mbit/s or 100 Mbit/s.
The switch's automatic crossover function means there is no need to distinguish on the connection cable between patch cable (uncrossed data line connection) and crossover cable (crossover data line connection). The switch automatically creates the correct data line connection internally. It is therefore possible to use patch cable as the connection cable for both end devices and cascading.
Both Ethernet interfaces use RJ45 technology.

Requirements of the connection cable and connector

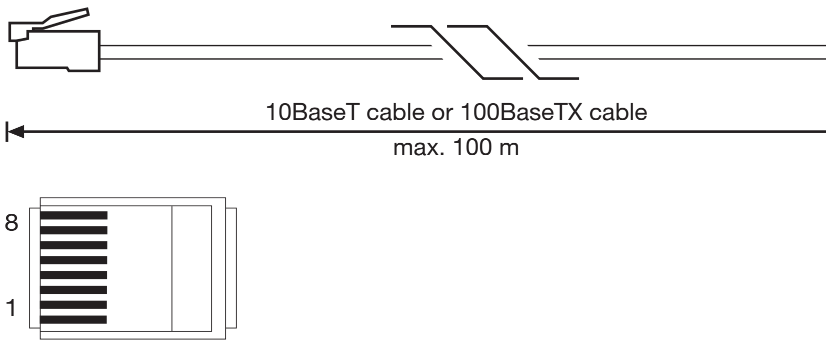
The following minimum requirements must be met:
- Ethernet standards (min. Category 5) 10BaseT or 100BaseTX
- Double-shielded twisted pair cable for industrial Ethernet use
- Shielded RJ45 connectors (industrial connectors)

Base units
PNOZ m1p ETH

Interface configuration

RJ45 socket 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 connection cable

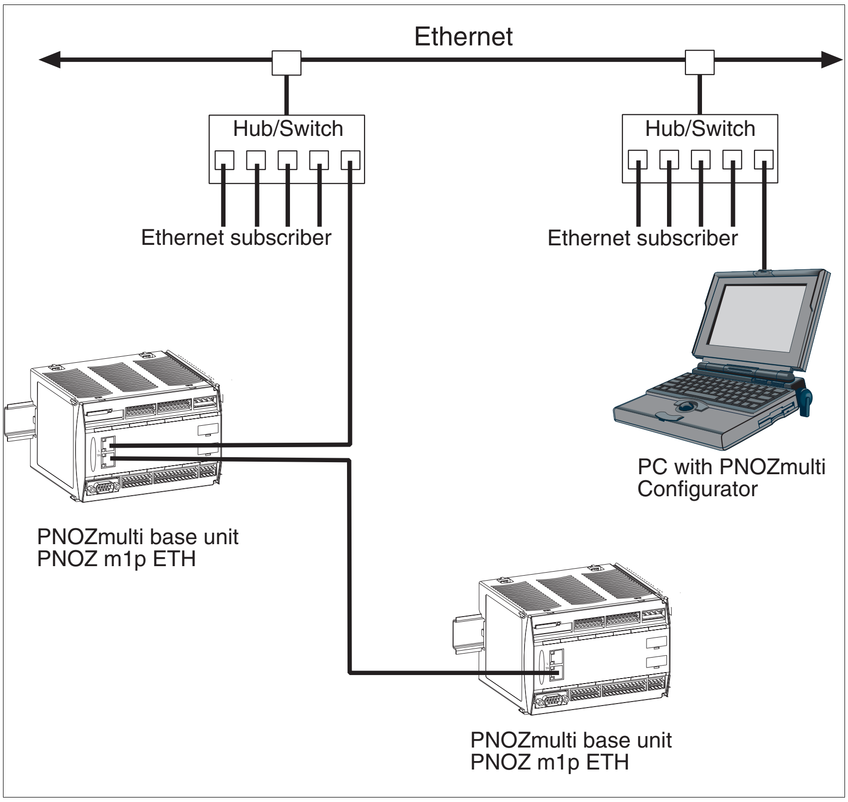
RJ45 connector 8-pin


NOTICE
With the plug-in connection please note that the data cable and connector have a limited mechanical load capacity. Appropriate design measures should be used to ensure that the plug-in connection is insensitive to increased mechanical stress (e.g. through shock, vibration). Such measures include fixed routing with strain relief, for example.

Base units
PNOZ m1p ETH

Process data exchange

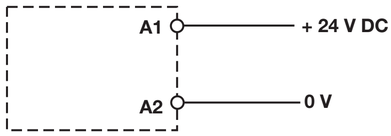
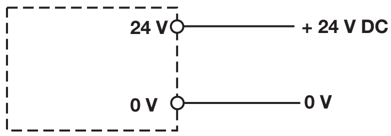
The RJ45 interfaces on the internal autosensing switch enable process data to be exchanged with other Ethernet subscribers within a network.
The product **PNOZ m1p ETH** can be connected to Ethernet via a hub (hub or switch).



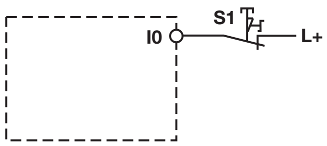
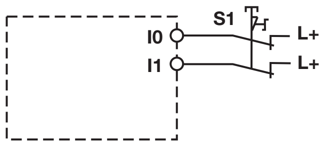
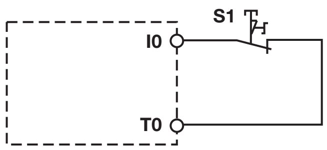
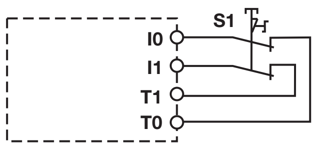
Base units
PNOZ m1p ETH

Preparing for operation

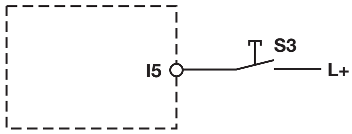
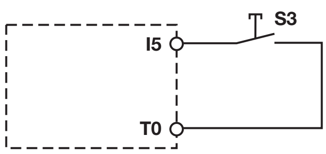
- Supply voltage

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

- Connection examples for the input circuit

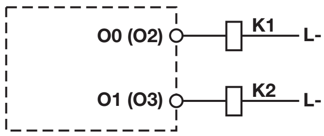
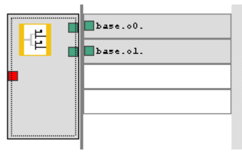
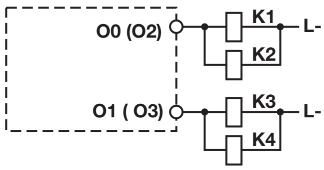
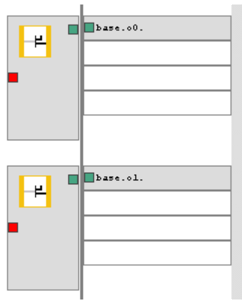
Input circuit	Single-channel	Dual-channel
E-STOP **without** detection of shorts across con-tacts		
E-STOP **with** detection of shorts across contacts		

- Connection examples for reset circuit

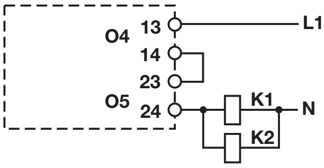
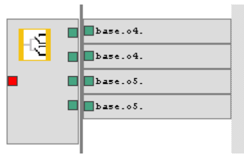
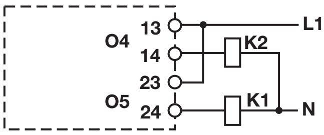
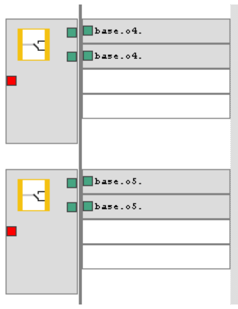
Reset circuit	Input circuit without detection of shorts across contacts	Input circuit with detection of shorts across contacts
		

Base units
PNOZ m1p ETH

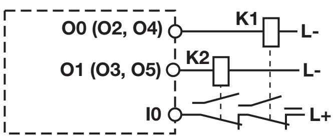
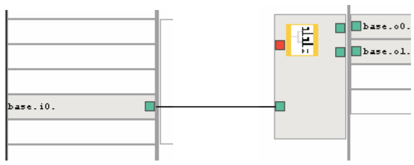
Connection examples for semiconductor outputs

Redundant output		
Single output		

Connection examples for relay outputs

Redundant output		
Single output		

Connection examples for feedback loop

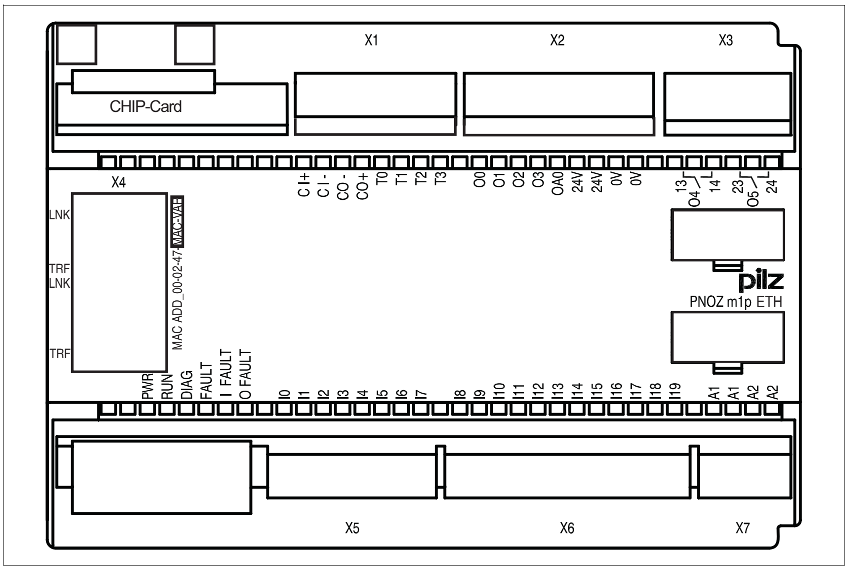
Feedback loop	Redundant output	
Contacts from external contactors		

Key

S1	E-STOP pushbutton
S3	Reset button

Base units
PNOZ m1p ETH

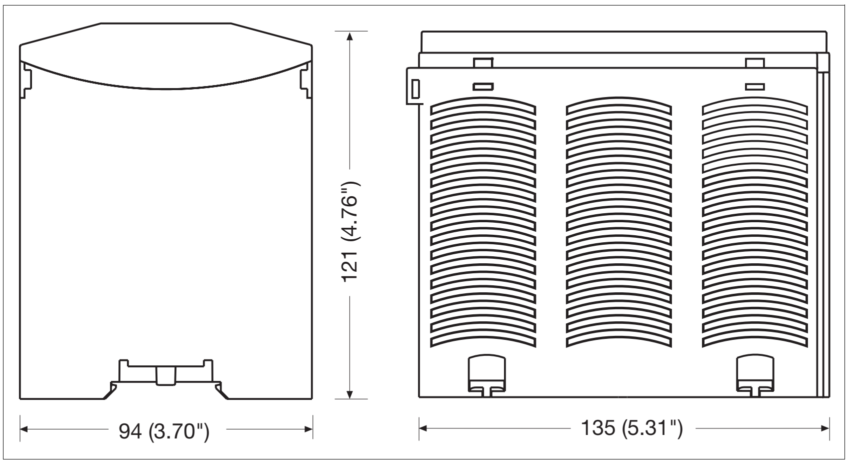
Terminal configuration



Installation

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

Dimensions



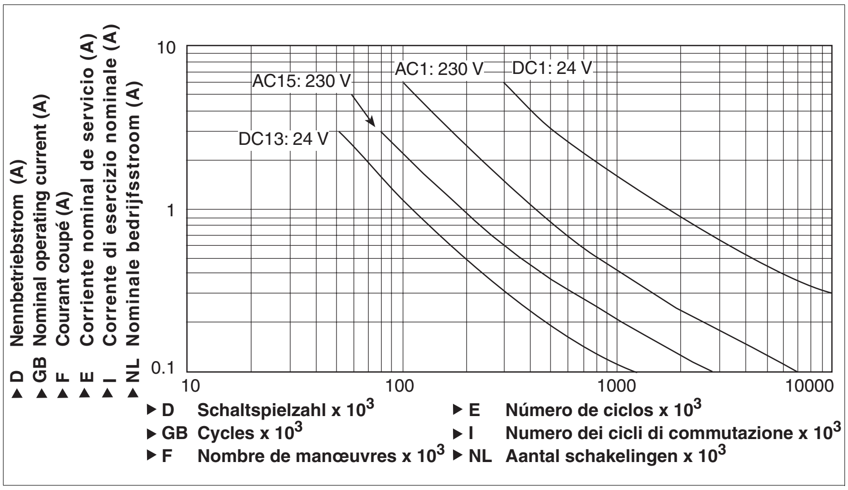
Base units

PNOZ m1p ETH

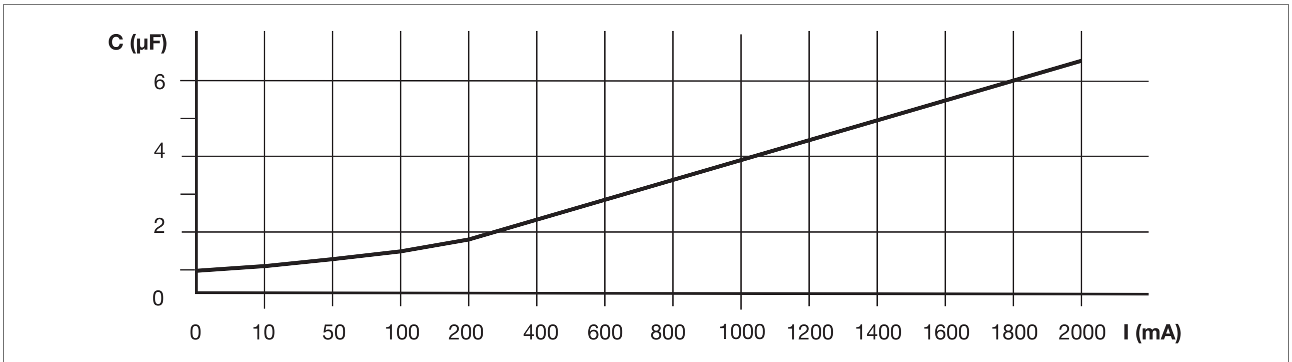
Notice

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

Service life graph



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



Technical details	
Electrical data	
Supply voltage U_B DC	**24 V**
Voltage tolerance	**-15 %/+20 %**
Power consumption at U_B DC	
without load	**9.0 W**
per expansion module	**2.50 W**
Residual ripple DC	**5 %**
Status display	**LED**
Times	
Switch-on delay	**5.00 s**
Simultaneity channel 1/2/3	**3 s**
Two-hand circuit	**0.5 s**
Supply interruption before de-energisation	**20 ms**
Inputs	
Number	**20**
Max. number of live inputs in the area of max. permitted ambient temperature (see "Environmental data")	**U_B > 26.4 V : 15**, **U_B <= 26.4 V : 20**

Base units
PNOZ m1p ETH

Inputs	
Voltage and current at input, reset and feedback circuit	**24.0 V**, **8.0 mA**
Galvanic isolation	**no**
Signal level at "0"	**-3 - +5 V DC**
Signal level at "1"	**15 - 30 V DC**
Min. pulse duration	**18 ms**
Pulse suppression	**0.6 ms**
Test pulse outputs	
Number of test pulse outputs	**4**
Voltage and current, **24 V**	**0.5 A**
Off time during self test	**5 ms**
Galvanic isolation	**no**
Short circuit-proof	**yes**
Semiconductor outputs	
Number	**4**
Switching capability voltage current power	 **24 V** **2 A** **48 W**
Max. capacitive load	**1 µF**
External supply voltage	**24.0 V**
Voltage tolerance	**-15 %/+20 %**
Max. duration of off time during self test	**300 µs**
Galvanic isolation	**yes**
Short circuit-proof	**yes**
Switch-off delay	**30 ms**
Residual current at "0"	**0.5 mA**
Signal level at "1"	**UB - 0.5 V DC bei 2 A**
Relay outputs	
Number	**2**
Utilisation category in accordance with **EN 60947-4-1** Safety contacts: AC1 at **240 V** Safety contacts: DC1 at **24 V** Utilisation category in accordance with **EN 60947-5-1** Safety contacts: AC15 at **230 V** Safety contacts: DC13 at **24 V** (6 cycles/min)	 **6.0 A**, **1440 VA** **6.0 A**, **144 W** **3.0 A**, **690 W** **3.0 A**, **72 W**
Airgap creepage between relay contacts relay contacts and other safe circuits	 **3 mm** **5.5 mm**
External contact fuse protection (I_K = 1 kA) to **EN 60947-5-1** Blow-out fuse, quick Blow-out fuse, slow Circuit breaker 24 VAC/DC, characteristic B/C	 **6 A** **6 A** **6 A**
Switch-off delay	**50 ms**
Auxiliary outputs	
Number	**1**
Switching capability voltage current power	 **24 V** **0.5 A** **12.0 W**
Galvanic isolation	**yes**
Short circuit-proof	**yes**
Residual current at "0"	**0.5 mA**
Signal level at "1"	**UB - 0.5 V DC bei 0.5 A**
Cascading output as auxiliary output	
Number	**1**

Base units
PNOZ m1p ETH

Cascading output as auxiliary output	
Switching capability	
voltage	**24 V**
current	**0.2 A**
power	**4.8 W**
Galvanic isolation	**no**
Short circuit-proof	**yes**
Residual current at "0"	**0.5 mA**
Environmental data	
EMC	**EN 60947-5-1**
Vibration to **EN 60068-2-6**	
Frequency	**10 - 55 Hz**
Amplitude	**0.35 mm**
Climatic suitability	**EN 60068-2-78**
Airgap creepage in accordance with **IEC 60664-1**	
Ambient temperature	**0 - 60 °C**
Storage temperature	**-25 - 70 °C**
Mechanical data	
Protection type	
Mounting (e.g. cabinet)	**IP54**
Housing	**IP20**
Terminals	**IP 20**
DIN rail	
Top hat rail	**35 x 7.5 EN 50022**
Recess width	**27 mm**
Maximum cable runs	
per input	**1 km**
Sum of individual cable runs at the test pulse output	**40 km**
Housing material	
Housing	**PPO UL 94 V0**
Front	**ABS UL 94 V0**
Cross section of external conductors with screw terminals	
Power supply, inputs, auxiliary output, semiconductor outputs, test pulse outputs, cascading outputs:	
1 core flexible	**0.50 - 1.50 mm² , 22 - 14 AWG**
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.50 - 0.75 mm² , 22 - 20 AWG**
without crimp connectors or with TWIN crimp connectors	**0.50 - 0.75 mm² , 22 - 20 AWG**
Relay outputs:	
1 core flexible	**0.5 - 2.5 mm², 22 - 12 AWG**
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	**0.50 - 1.25 mm², 22 - 16 AWG**
without crimp connectors or with TWIN crimp connectors	**0.50 - 1.25 mm², 22 - 16 AWG**
Torque setting with screw terminals	**0.25 Nm**
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	**0.50 - 1.50 mm² , 26 - 14 AWG**
Spring-loaded terminals: Terminal points per connection	**1**
Stripping length	**9 mm**
Dimensions	
Height	**94.0 mm**
Width	**135.0 mm**
Depth	**121.0 mm**
Weight	**520 g**

Base units
PNOZ m1p ETH

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	t_M [year]
Logic						
CPU		PL e (Cat. 4)	Cat. 4	SIL CL 3	4.90E-09	20
expansion		PL e (Cat. 4)	Cat. 4	SIL CL 3	9.20E-09	20
Input						
SC inputs	single-channel	PL d (Cat. 2)	Cat. 2	SIL CL 2	2.50E-09	20
SC inputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	2.90E-10	20
SC inputs	light barrier	PL e (Cat. 4)	Cat. 4	SIL CL 3	2.50E-10	20
SC inputs	dual-channel pressure sensitive mat	PL d (Cat. 3)	Cat. 3	SIL CL 2	1.81E-09	20
Output						
SC outputs	single-channel	PL d (Cat. 2)	Cat. 3	SIL CL 2	7.00E-09	20
SC outputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	8.60E-10	20
relay outputs	single-channel	PL c (Cat. 1)	Cat. 2	-	2.90E-08	20
relay outputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	3.00E-10	20
Bus interface						
cascading inputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	3.10E-10	20
cascading outputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	4.91E-10	20

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

The standards current on **2009-07** apply.

Order reference

Type	Features	Order No.
PNOZ m1p ETH	Base unit	773 103

Expansion modules

PNOZ ml2p

Unit not shown

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

Approvals

	PNOZ ml2p
TÜV SÜDDEUTSCHLAND	Pending
BG-PRÜFZERT	◆
CCC	◆

Unit 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

Unit description

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

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

System requirements

- PNOZmulti Configurator: from Version 7.0.0
- Base unit PNOZ m0p: from Version 3.0
- Base unit PNOZ m1p: from Version 6.0
- Base unit PNOZ m1p ETH: from Version 2.0
- Base unit PNOZ m2p: from Version 3.0
- Base unit PNOZ m3p: from Version 2.0

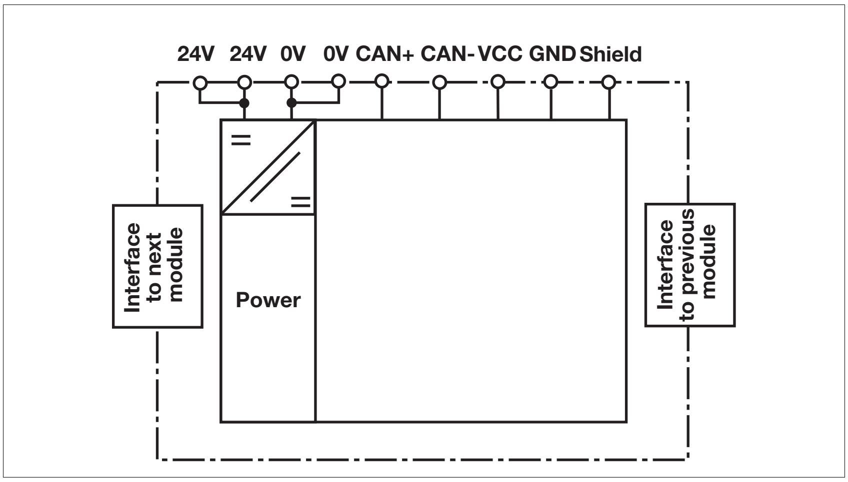
Please contact Pilz if you have an older version.

Safety features

The relay conforms to the following safety criteria:

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

Block diagram



Expansion modules
PNOZ ml2p

Function description

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

Data exchange:
- 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.

Wiring

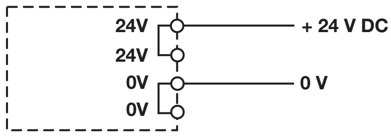
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.
Note:
- Information given in the "Technical details" must be followed.
- 2 connection terminals are available for each of the supply connections 24 V and 0 V. This means that the supply voltage can be looped through several connections.
- 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).

CAUTION!
Only connect and disconnect the expansion module when the supply voltage is switched off.

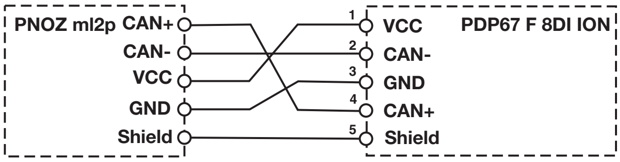
Expansion modules
PNOZ ml2p

Connection

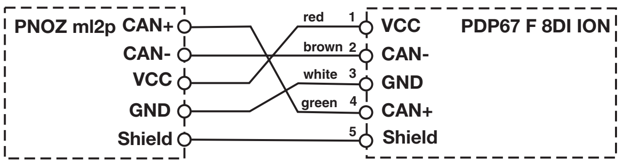
- Supply voltage

Supply voltage	AC	DC
		

- 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)

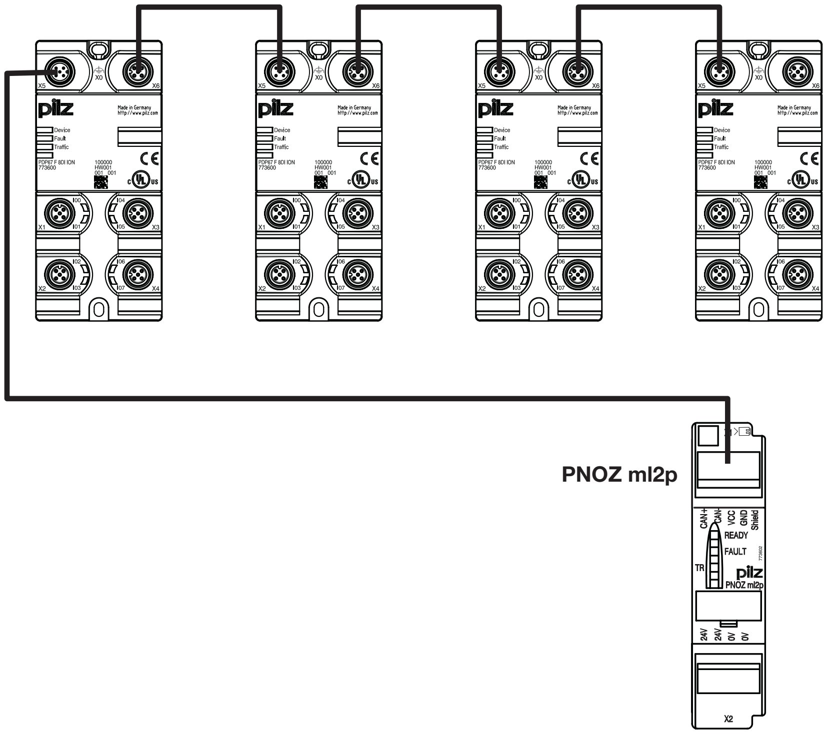


Expansion modules

PNOZ ml2p

Series connection of 4 decentralised modules

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



Expansion modules
PNOZ ml2p

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).

Guidelines for various cable types

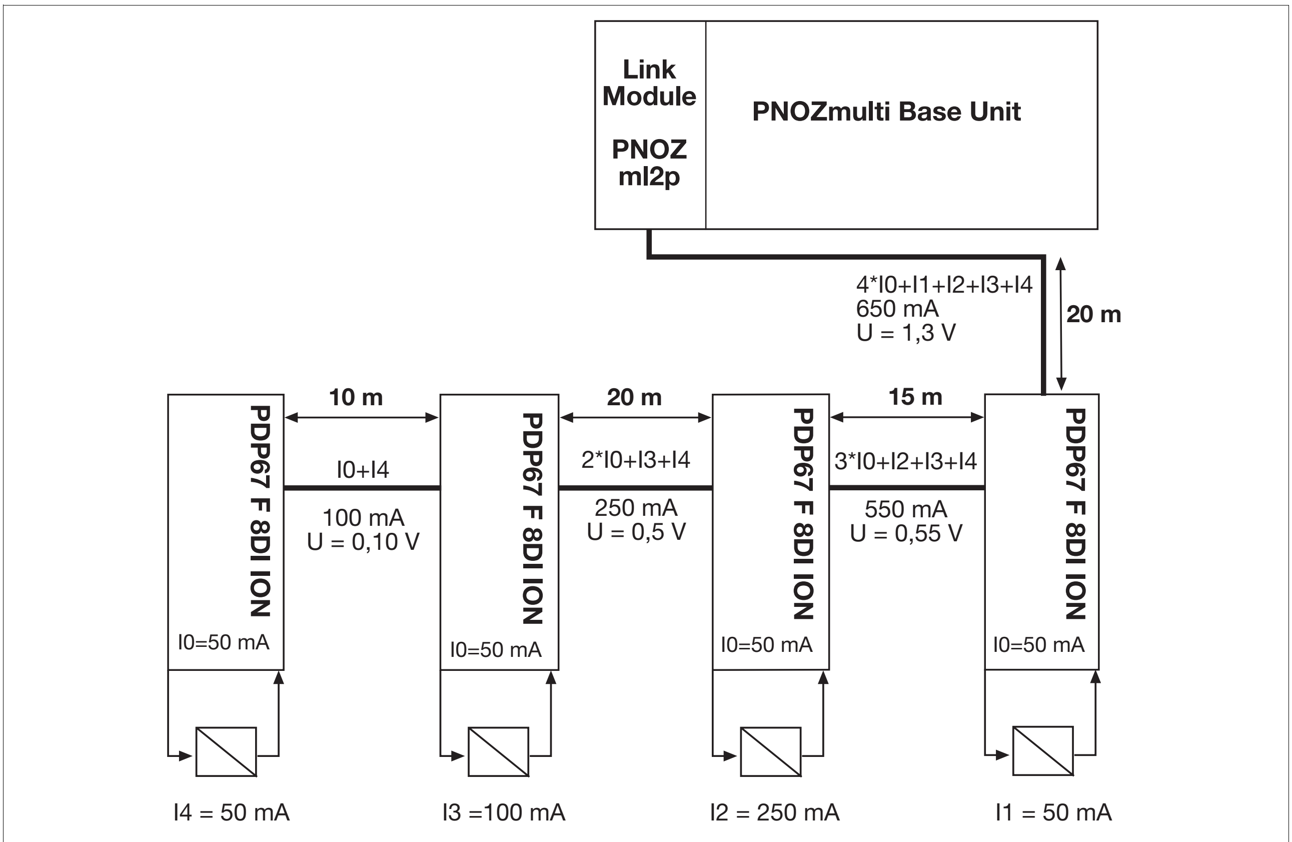
Cable type	Voltage drop per 10 m and per 100 mA
PSS SB BUSCABLE LC	0.1 V
Sensor cable 0.25 mm^2	0.15 V
Sensor cable 0.34 mm^2	0.11 V
Sensor cable 0.5 mm^2	0.07 V

Expansion modules
PNOZ ml2p

Calculation example

- 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

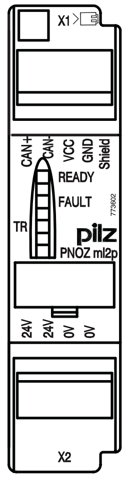
Total voltage drop from the link module PNOZ ml2p to the final PDP67 F 8DI ION:

$U_{total} = U_1 + U_2 + U_3 + U_4$

U_{total} = 1.3 V + 0.825 V + 0.5 V + 0.10 V = 2.725 V

Expansion modules
PNOZ ml2p

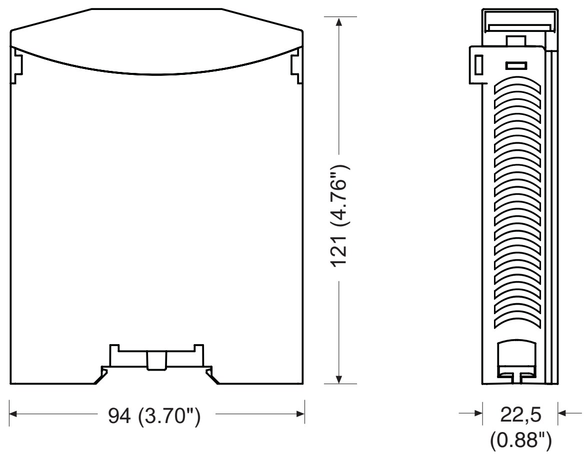
Terminal configuration



Installation

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

Dimensions



pilz

Expansion modules
PNOZ ml2p

NOTICE

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Technical details	
Electrical data	
Supply voltage U_B DC	**24 V**
Voltage tolerance	**-15 %/+20 %**
Power consumption at U_B DC without load	 **5.0 W**
Residual ripple DC	**5 %**
Status display	**LED**
Times	
Switch-on delay	**5.00 s**
Supply interruption before de-energisation	**20 ms**
Maximum input delay	**15 ms**
Switch-off delay	**35 ms**
Outputs	
Maximum output current decentralised module supply	**4 A**
Short-circuit protection of the decentralised module supply	**ja**
Environmental data	
EMC	**EN 60947-5-1**
Vibration to **EN 60068-2-6** Frequency Amplitude	 **10 - 55 Hz** **0.35 mm**
Climatic suitability	**EN 60068-2-78**
Airgap creepage in accordance with **EN 60664-1**	
Ambient temperature	**0 - 60 °C**
Storage temperature	**-25 - 70 °C**
Mechanical data	
Protection type Mounting (e.g. cabinet) Housing Terminals	 **IP54** **IP20** **IP20**
DIN rail Top hat rail Recess width	 **35 x 7.5 EN 50022** **27 mm**
Maximum cable run unscreened	**30 m**
Maximum cable run screened	**100 m**
Housing material Housing Front	 **PPO UL 94 V0** **ABS UL 94 V0**
Cross section of external conductors with screw terminals 1 core flexible 2 core, same cross section, flexible: with crimp connectors, without insulating sleeve without crimp connectors or with TWIN crimp connectors 2 core, same cross section, flexible:	 **0.50 - 1.50 mm² , 22 - 14 AWG** **0.50 - 0.75 mm² , 22 - 20 AWG** **0.50 - 0.75 mm² , 22 - 20 AWG**
Torque setting with screw terminals	**0.25 Nm**
Cross section of external conductors with spring-loaded terminals: Flexible with/without crimp connectors	**0.50 - 1.50 mm² , 26 - 14 AWG**
Spring-loaded terminals: Terminal points per connection Stripping length	**1** **9 mm**

Expansion modules
PNOZ ml2p

Mechanical data	
Dimensions	
Height	**94.0 mm**
Width	**22.5 mm**
Depth	**121.0 mm**
Weight	**120 g**

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	t_M [year]
		PL e (**Cat. 4**)	**Cat. 4**	**SIL CL 3**	**5.35E-09**	**20**

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

The standards current on **2009-12** apply.

Order reference

Type	Features		Order no.
PNOZ ml2p	Link module		773 602
Set spring term	1 set of cage clamp terminals		783 400
Set spring term	1 set of screw terminals		793 400
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, 5-pin	3 m	380 200
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 5-pin	5 m	380 201
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 5-pin	10 m	380 202
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 5-pin	30 m	380 203
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, angled M8 socket, 5-pin	3 m	380 204
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, angled M8 socket, 5-pin	5 m	380 205
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, angled M8 socket, 5-pin	10 m	380 206
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, angled M8 socket, 5-pin	30 m	380 207
PSS67 Cable M12sf M12sm	Cable, straight M12 connector, straight M12 socket, 5-pin	3 m	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 M12sf M12sm	Cable, angled M12 connector, angled M12 socket, 5-pin	3 m	380 212
PSS67 Cable M12sf M12sm	Cable, angled M12 connector, angled M12 socket, 5-pin	5 m	380 213
PSS67 Cable M12sf M12sm	Cable, angled M12 connector, angled M12 socket, 5-pin	10 m	380 214
PSS67 Cable M12sf M12sm	Cable, angled M12 connector, angled M12 socket, 5-pin	30 m	380 215
PSEN ma adapter	Adapter for connection to safety switch PSENmag		380 300
PSEN cs adapter	Adapter for connection to safety switch PSENcode		380 301
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 M12 connector	Connector, M12, straight, 4-pin		380 316
PSS67 M12 connector	Socket, M12, straight, 4-pin		380 317
PSS67 M12 connector	Connector, M12, angled, 4-pin		380 318
PSS67 M12 connector	Socket, M12, angled, 4-pin		380 319