

Configurable control system PNOZmulti Configurable safety relays PNOZmulti Mini

pilz

Configuration guide



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March 2012

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System description

System description

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System description

Overview

1.1

Configurable control systems PNOZmulti

Configurable control system PNOZmulti

The configurable control system PNOZmulti bridges the gap between classic safety relays and programmable control systems. The control system PNOZmulti is multi-functional, freely configurable and tailor-made for use in many areas of engineering.

Configurable safety relays PNOZmulti Mini

PNOZmulti Mini has the application features of the classic PNOZmulti. New features include a compact design of just 45 mm width and simple diagnostics via a display.

Modular design

- ▶ The configurable control systems PNOZmulti/PNOZmulti Mini consist of a base unit and various expansion modules. The type of base unit determines which expansion modules may be connected (see section entitled "System expansion").
- ▶ 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 control 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 up to PL e of EN ISO 13849-1 and SIL CL 3 of EN IEC 62061.

- ▶ 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.

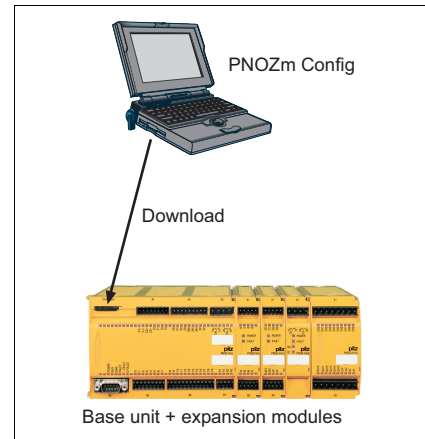
Inputs

- ▶ Units in the configurable control system PNOZmulti have semiconductor inputs for safety-related and standard applications.
- ▶ The inputs for standard applications can also be set via the integrated interface or via fieldbus modules (e.g. PROFIBUS-DP, CANopen, ...).
- ▶ Decentralised input modules provide safe inputs for use up to IP67.
- ▶ Analogue input modules can be connected to the PNOZmulti base units (not PNOZmulti Mini), thereby providing safe analogue inputs. The input signals are converted into digital signals.
For standard applications, the exact analogue values are made available to the base unit to forward to a fieldbus.

Outputs

- ▶ Units in the configurable control system PNOZmulti have both semiconductor and relay safety outputs (depending on the unit, see section entitled "System expansion").
- ▶ 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.
- ▶ Safe semiconductor outputs with advanced fault detection can also be configured for the base units PNOZmulti Mini. These single-channel semiconductor outputs can be used to achieve a higher level of safety.
- ▶ The relay safety outputs are suitable for less frequent operations, but they have a higher breaking capacity and can be used for AC applications.

- ▶ The outputs for standard applications can also be evaluated via the integrated interface or via fieldbus modules (e.g. PROFIBUS-DP, CANopen, ...).



System description

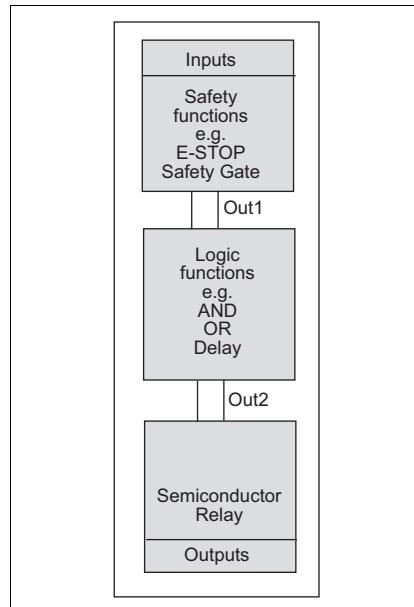
Hardware

Structure of the configurable control system

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

- ▶ Inputs
- ▶ Relay outputs
- ▶ Safe semiconductor outputs
- ▶ Auxiliary outputs
- ▶ Cascading input
- ▶ Cascading output

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



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
- ▶ Enabling switches
- ▶ Two-hand buttons
- ▶ Safety gates
- ▶ Light curtains
- ▶ Light beam devices
- ▶ Speeds
- ▶ Analogue input signals
- ▶ Pressure sensitive mats
- ▶ Muting
- ▶ Mechanical presses
- ▶ Standstill
- ▶ Furnaces

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. Detailed information can be found in the document entitled "Special Applications".

Applications in furnaces

The base unit PNOZ m3p is designed to monitor and control furnaces. Detailed information can be found in the document entitled "Special Applications".

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

Interfaces

The base unit has an interface to

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

Depending on the unit type, the base units PNOZmulti will have a serial RS232 interface or 2 Ethernet interfaces.

The base units PNOZmulti Mini have a USB interface to download the project and to read the error stack.

A communication module can be connected to the base units PNOZmulti Mini to exchange data via RS232 or Ethernet.

System description Software

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

- ▶ A project or diagnostic configuration can be created in multiple languages.

Procedure

- ▶ First of all, the hardware configuration is created in the PNOZmulti Configurator. This means it is necessary to state which units will be used in the safety system. Each unit is given a resource label.
- ▶ When all the units are selected, the circuit diagram is created in the user program. The circuit diagram describes the application for which the safety system is to be used. It is here that you determine which inputs are assigned to which safety-related or standard functions.
- ▶ The inputs and/or the results of the safety-related or standard functions can be linked through logic functions. The results of the logic functions or the results of the safety-related or standard functions are channelled to the outputs on the PNOZmulti units.
- ▶ The circuit diagram is generated on a graphical interface. Symbols are provided for the safety-related or standard functions, logic functions and the various output types. These are simply dragged on to a workspace, configured and interconnected.
- ▶ Frequently used parts of the circuit diagram can be combined into macros and reused.
- ▶ 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 communications interface or via a chip card reader.
- ▶ After downloading, a test must be performed to check that the safety devices function correctly.

System description

System expansion

Introduction

The maximum system expansion is limited only by the maximum permitted number of expansion modules that can be connected.

Positioning of units

- ▶ Only one base unit may be used.
- ▶ Expansion modules may be connected to the left and right, depending on the base unit type.
- ▶ The maximum number per type is given in the tables below.

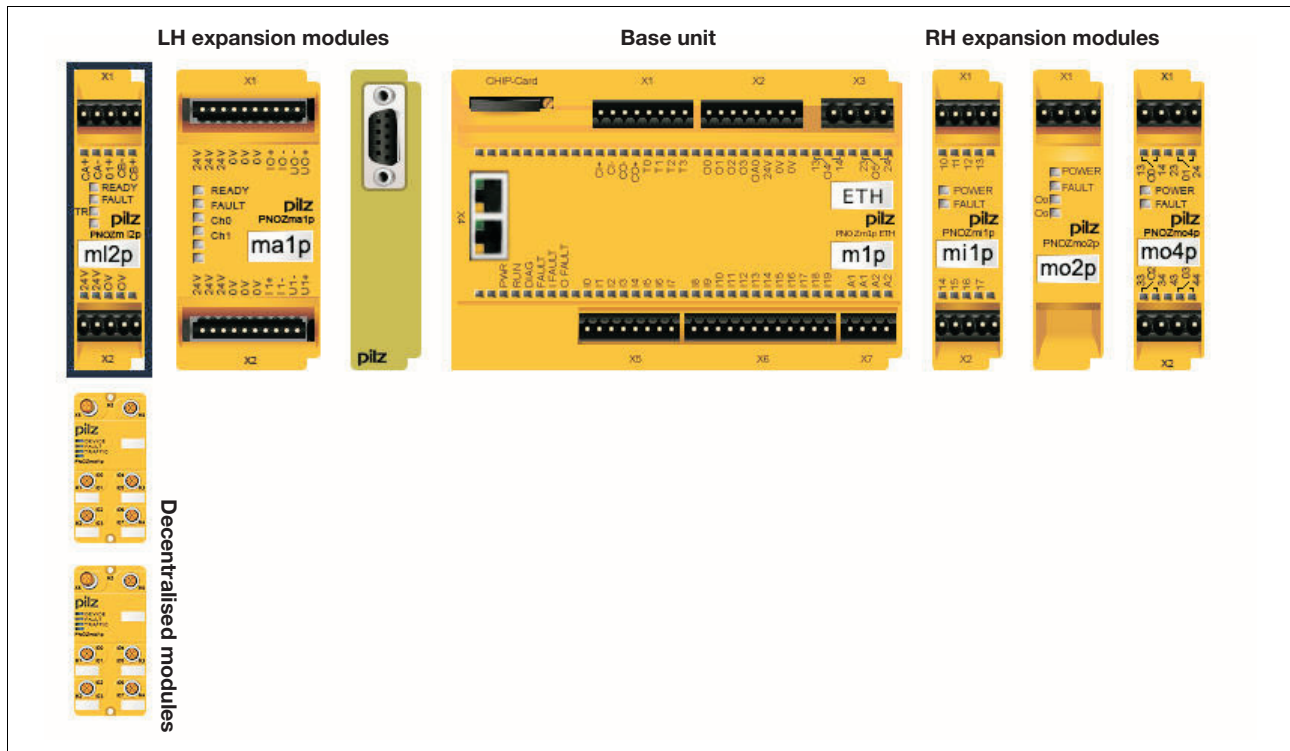
- ▶ The position of the expansion modules is defined in the PNOZmulti Configurator.
- ▶ Expansion modules for safety-related and standard applications may be combined as required. However, if expansion modules of the same function are combined into groups it makes things clearer and simplifies the wiring.

PNOZmulti

Maximum system expansion:

- ▶ Right of the base unit:
 - 8 expansion modules
- ▶ Left of the base unit
 - 4 expansion modules and
 - 1 fieldbus module
- ▶ Connectable to the link module PNOZ ml2p:
 - 4 decentralised modules per link module (max. 16 decentralised modules)

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



System description

System expansion

System expansion depends on the base units:

Expansion modules		Slot	PNOZ m0p (ETH)	PNOZ m1p (ETH)	PNOZ m2p (ETH)	PNOZ m3p (ETH)
			Number of connectable modules			
Analogue input modules		Left	-	4	4	4
PNOZ ma1p	Analogue input module					
Link modules		Left	4	4	4	4
PNOZ ml1p	To connect 2 base units					
PNOZ ml2p	To connect a base unit to up to 4 decentralised modules PDP67 (see below)					
Decentralised modules (connectable to the link module PNOZ ml2p)		Left	16	16	16	16
PDP67 F 8DI ION	IP67, 8 safe inputs					
PDP67 F 8DI ION HP	IP67, 8 safe inputs					
Input modules		Right	-	8	8	8
PNOZ mi1p	8 safe inputs					
PNOZ mi2p	8 inputs for standard applications					
Output modules		Right	-	6	6	6
PNOZ mo1p	4 safe semiconductor outputs					
PNOZ mo2p	2 safe relay outputs					
PNOZ mo3p	2 safe 2-pole semiconductor outputs					
PNOZ mo4p	4 safe relay outputs					
PNOZ mo5p	4 safe, diverse relay outputs					
Output modules for standard applications		Right	-	8	8	8
PNOZ mc1p	16 semiconductor outputs for standard applications					
Speed monitors		Right	-	4	4	4
PNOZ ms1p	Monitoring of 2 axes Connectable encoders: Proximity switch, incremental encoder Sin/Cos, TTL					
PNOZ ms2p HTL	Monitoring of 2 axes Connectable encoders: Proximity switch, incremental encoder HTL					
PNOZ ms2p TTL	Monitoring of 2 axes Connectable encoders: Proximity switch, incremental encoder Sin/Cos, TTL					
PNOZ ms3p HTL	Monitoring of 2 axes Connectable encoders: Incremental encoder HTL					
PNOZ ms3p TTL	Monitoring of 2 axes Connectable encoders: Incremental encoder Sin/Cos, TTL					
PNOZ ms4p	Monitoring of 1 axis Connectable encoders: Incremental encoder Sin/Cos, TTL, HTL					

System description

System expansion

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

System description

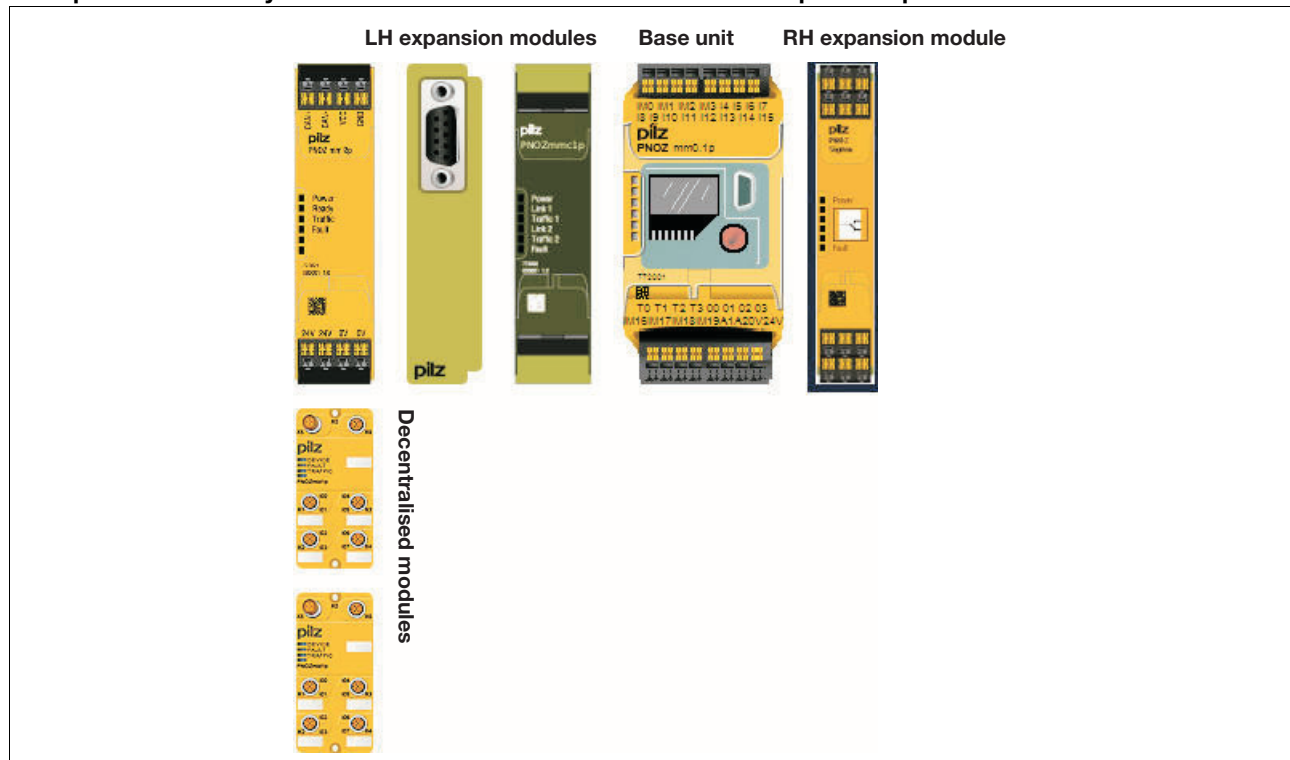
System expansion

PNOZmulti Mini

Maximum system expansion:

- ▶ Left of the base unit
 - 1 fieldbus module
 - and
 - 1 communication module
 - and
 - 4 link modules
- ▶ Right of the base unit:
 - 1 PNOZsigma expansion module (+1)
- ▶ Connectable to the link module PNOZ mml2p:
 - 4 decentralised modules per link module (max. 16 decentralised modules)

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



System description

System expansion

System expansion depends on the base units:

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

System description

Diagnostics

1.1

The PNOZmulti has many options for diagnostics and fault detection:

- ▶ LEDs on the base unit and expansion modules
- ▶ Diagnostic data via the communication interface and via a fieldbus
- ▶ Error stack

Only for base units PNOZmulti

- ▶ Diagnostic word in the PNOZmulti Configurator
- ▶ Expanded diagnostic options using a visualisation system, e.g. PMImicro diag

Only for base units PNOZmulti Mini

- ▶ Display messages can be configured in the PNOZmulti Configurator

Note

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

LEDs on the base unit and expansion modules

The LEDs signal

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

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

RS232/Ethernet interface

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

Diagnostic data

The diagnostic data can be called up via the RS232/Ethernet interface or via a connected fieldbus.

All base units that have an Ethernet interface also support Modbus/TCP. The diagnostic data may only be used for non-safety purposes, e.g. visualisation.

Diagnostic data on the configurable control system PNOZmulti 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 communication.
- ▶ Data in table form:
This is structured data (arranged in tables and segments) from the PNOZmulti, as it could also be read via a fieldbus module:
 - Configuration
 - Status of the inputs and outputs
 - LED status
 - Diagnostic word
 - Element types

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

An expanded diagnostic configuration can be created in the PNOZmulti Configurator. The diagnostic configuration enables appropriate event messages to be displayed in the case of:

- ▶ Errors in or on the PNOZmulti:
Contains the event messages that are triggered when there are errors in or on the PNOZmulti (error stack)
 - ▶ Change in 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 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). Finally the diagnostic configuration is downloaded to the PNOZmulti and to the display unit.

The diagnostic configuration is described in detail in the PNOZmulti Configurator's online help.

System description

Diagnostics

Error stack

The error stack on the PNOZmulti contains important information for diagnostics and troubleshooting. The error stack can be read out by the PNOZmulti Configurator. It contains messages and help texts 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 Ethernet or serial interface on the base unit
- ▶ Via a connected fieldbus

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

- ▶ Operating states (e.g. switch operated)
- ▶ Error messages (e.g. monitoring time elapsed)

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

System description

Safety

1.1

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.

- ▶ The PNOZ m2p base unit is designed for applications on mechanical presses. Please refer to the safety guidelines in the document entitled "Safety solutions for presses".
- ▶ The base unit PNOZ m3p is designed to control and monitor furnaces. Please also refer to the safety guidelines in the document entitled "PNOZmulti Special Applications" and in the online help.

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 (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 configurable control system PNOZmulti for use on E-STOP equipment and safety circuits, in accordance with EN 60204-1 (VDE 0113-1) and IEC 60204-1.
- ▶ The units' intended use depends on the individual unit and is therefore explained in the chapter entitled "Products".



Installation

Installation

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Installation

Control cabinet installation

1.2

Please note during installation:

- ▶ The unit should be installed in a control cabinet with a protection type of at least IP54.
- ▶ Fit the control system to a horizontal mounting rail. The venting slots must face upwards and downwards. If other mounting positions are used there will be insufficient ventilation.
- ▶ Use the notch on the rear of the unit to attach it to a mounting rail.
- ▶ In environments exposed to heavy vibration, the unit should be secured against lateral movement by using a fixing element (e.g. retaining bracket or end angle).
- ▶ To comply with EMC requirements, the mounting rail must have a low

impedance connection to the control cabinet housing.

- ▶ The coated versions of the PNOZ-multi units are suitable for use where there are increased environmental requirements on temperature and humidity. Please refer to the technical details.

Positioning of units

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

- ▶ Install the expansion module in the position in which it is configured in the PNOZmulti Configurator.

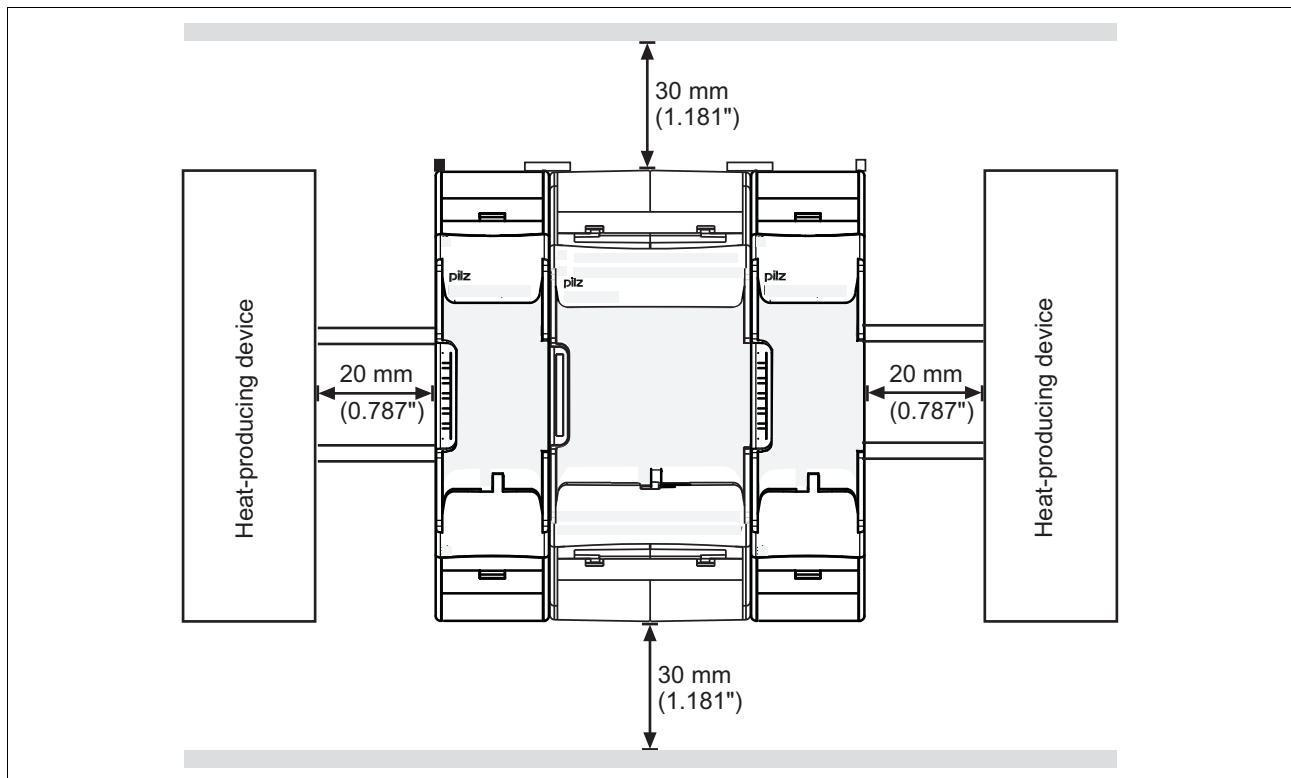
For module selection please refer to the online help for the PNOZmulti Configurator

Mounting distances

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

The ambient temperature of the product in the control cabinet must not exceed the figure stated in the technical details, otherwise air conditioning will be required.

Mounting distances:



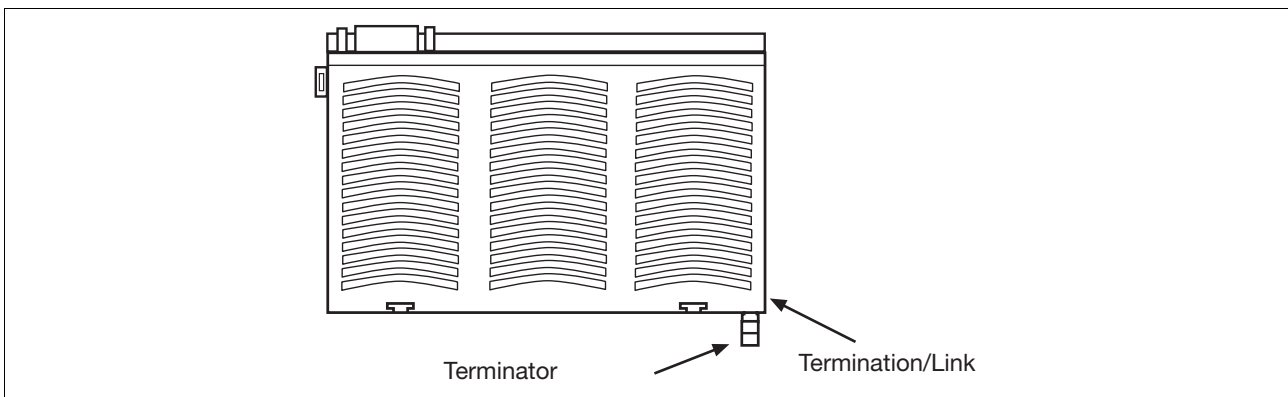
Installation

Install the control system PNOZmulti

Install base unit without expansion modules

When installed on its own, a base unit from the configurable control system PNOZmulti must be fitted with a terminator:

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



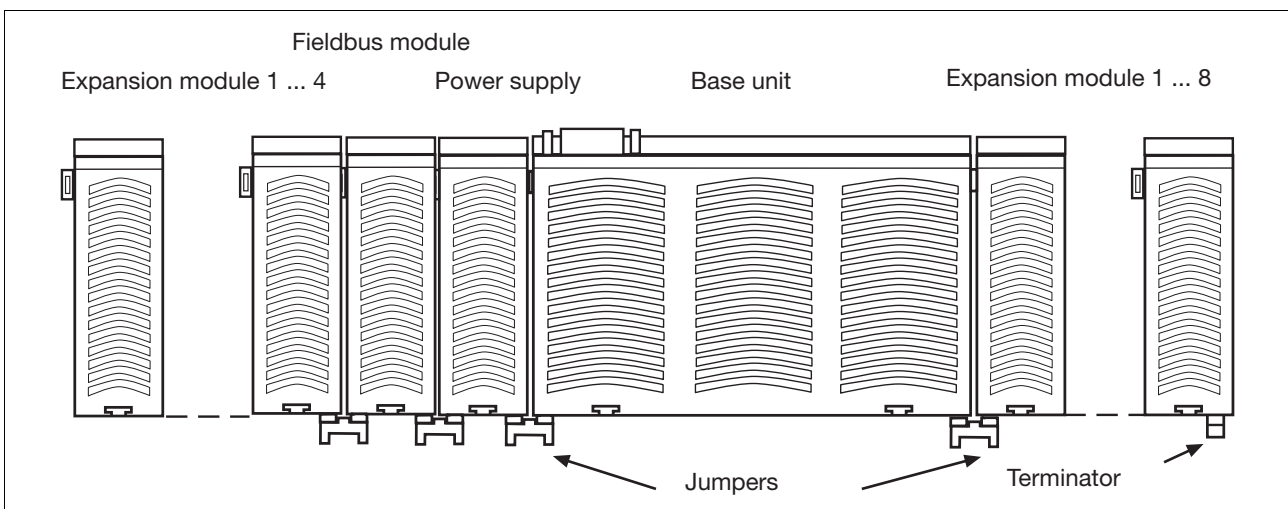
Connect the base unit and expansion modules

The modules are linked via jumpers. There are 2 pin connectors on the rear of the base unit.

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

- ▶ Ensure that no terminator is connected.
- ▶ Connect the base unit, the expansion modules and the fieldbus module using the jumpers supplied.

- ▶ The terminator must be fitted to the last expansion module to the right of the base unit.
- ▶ A terminator must not be fitted to the last expansion module to the left of the base unit.



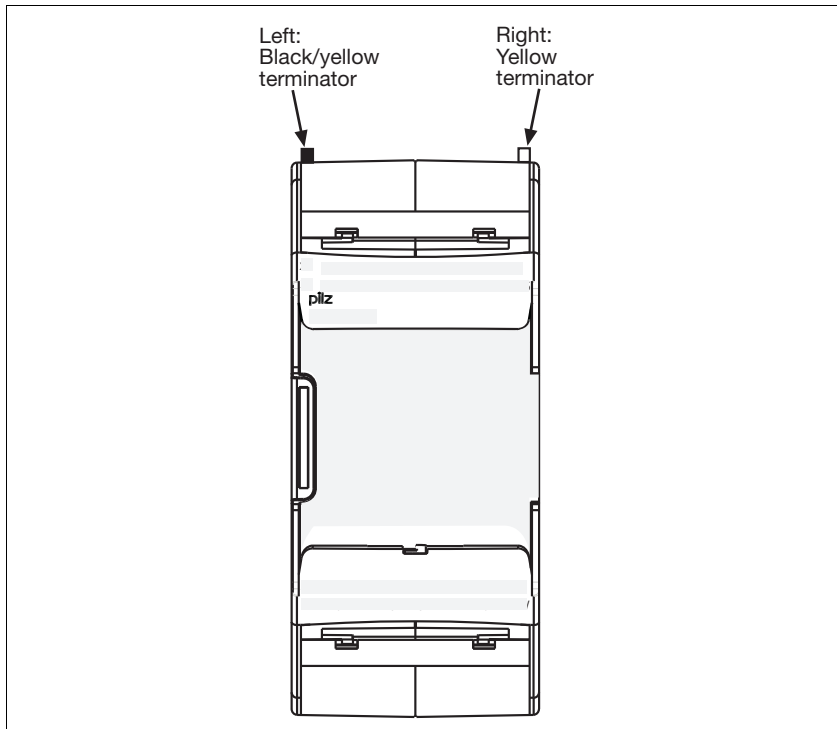
Installation

Install the control system PNOZmulti Mini

Install base unit without expansion modules

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

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



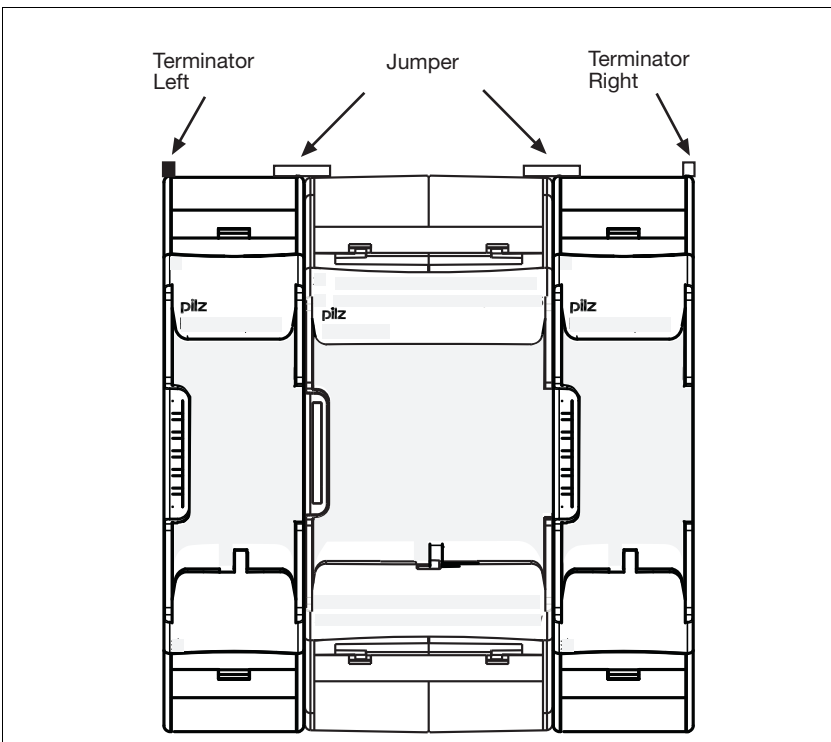
Installation

Install the control system PNOZmulti Mini

Connect the base unit and expansion modules

The modules are linked via jumpers.

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



Electrical installation

Electrical installation

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Electrical installation

General requirements

For the electrical installation, please also refer to the PNOZmulti Installation Manual.

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

The base units from the configurable control system PNOZmulti require a 24 VDC supply. The connected expansion modules can be supplied with voltage from the base unit via the jumpers.

Different expansion modules (e.g. link modules and analogue input) must be supplied separately (information is

available in the expansion module's operating manual).

WARNING!

Risk of electrocution!

Safe electrical isolation must be ensured for the external power supply that generates the supply voltage. Failure to do so could result in electric shock.

The power supplies must comply with EN 60950-1:2006/A11:2009, EN 61558-2-6:11/1997.

To achieve the lowest possible residual ripple ($< \pm 1.2$ V), we recommend that you install a three-phase bridge rectifier or regulated supply. Protect the external power supply by fitting a fuse between the external power supply and the control system. The size of the fuse will depend on the specification of the external power supply, the cable cross section and on local and national regulations.

Earthing

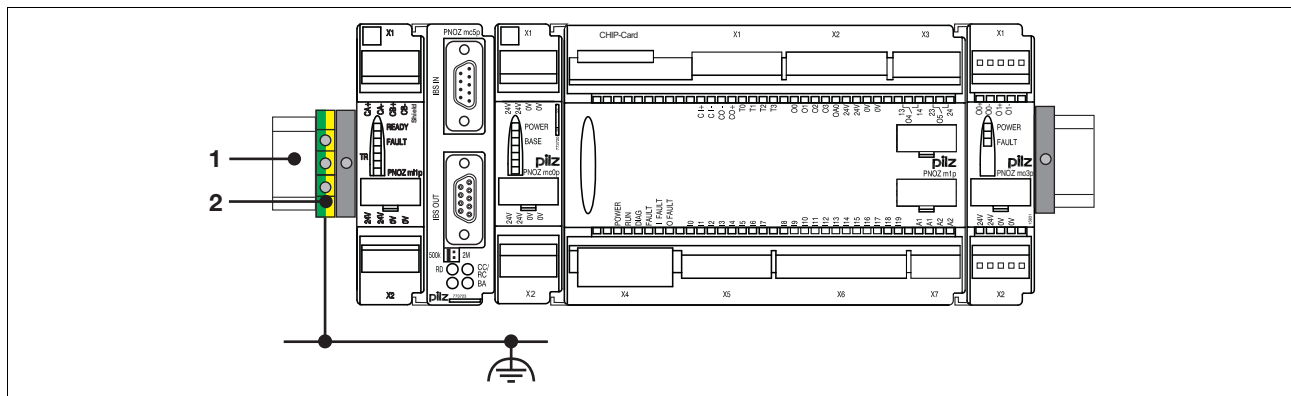
When units from the configurable control system PNOZmulti are attached to the mounting rail, earthing springs establish the electrical contact between the units' functional earth and the mounting rail. There is no earthing spring on the PNOZmulti Mini. Any connection required to the mounting rail must be established externally (e.g. with the link modules PNOZ mml1p, PNOZ mml2p).

- ▶ Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.

The mounting rail must be properly earthed to ensure interference-free operation in accordance with EMC regulations.

INFORMATION

For earthing, please also refer to the information in the Installation Manual. Earthing the mounting rail



Key:

- ▶ 1: Mounting rail
- ▶ 2: Earthing terminal

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 spring loaded connection or screw connection.
- ▶ 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.

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 arm-band.

Configuration and wiring Inputs

Connection options

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

- ▶ E-STOP pushbuttons
- ▶ Safety gate limit switches
- ▶ Two-hand pushbuttons
- ▶ Reset buttons
- ▶ Light beam device, light curtain
- ▶ Pressure sensitive mats
- ▶ Enabling switches
- ▶ Operating mode selector switches
- ▶ Proximity switches
- ▶ Incremental encoders
- ▶ Foot switches
- ▶ Key switches
- ▶ Limit switches
- ▶ Pushbuttons
- ▶ Encoders or transducers 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 pressure sensitive mats and safe edges

The application with pressure sensitive mats is described in detail in the configuration guide "PNOZmulti 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

1.3

Switch type	Application	Description	Switch symbol	Timing diagram
1	E-STOP Safety gate Enabling switch Foot switch	Safety contacts: 1 N/C Without switch on/off time		
2	E-STOP Safety gate Foot switch	Safety contacts: 1 N/C 1 N/O Without switch on/off time		
2 - Simultaneity	E-STOP Safety gate Foot switch	Safety contacts: 1 N/C 1 N/O With switch on/off time 3 s		
3	E-STOP Safety gate Safety gate with interlock Light curtain Enabling switch Foot switch	Safety contacts: 2 N/C Without switch on/off time		
3 - Simultaneity	E-STOP Safety gate Light curtain Enabling switch Foot switch	Safety contacts: 2 N/C With switch on/off time 3 s		
4	Safety gate	Safety contacts: 2 N/C 1 N/O Without switch on/off time		
4 - Simultaneity	Safety gate	Safety contacts: 2 N/C 1 N/O With switch on/off time 3 s		
5	Safety gate	Safety contacts: 3 N/C Without switch on/off time		

Configuration and wiring Inputs

Switch type	Application	Description	Switch symbol	Timing diagram
5 - Simultaneity	Safety gate	Safety contacts: 3 N/C with switch on/off time 3s		
6	Two-hand pushbutton	Safety contacts: 2 C/O with simultaneity monitoring 0.5 s, no monitoring of switch off time		
7	Two-hand pushbutton Without test pulses can only be used up to Category 1 of EN 954-1	Safety contacts: 2 N/O with simultaneity monitoring 0.5 s, no monitoring of switch off time		
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	Pushbutton Key switch Limit switch	Safety contacts: 1 N/C		
17	Pushbutton Key switch Limit switch	Safety contacts: 1 N/O		

Configuration and wiring Inputs

1.3

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 types

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

- ▶ Automatic reset
- ▶ Manual reset
- ▶ Monitored reset

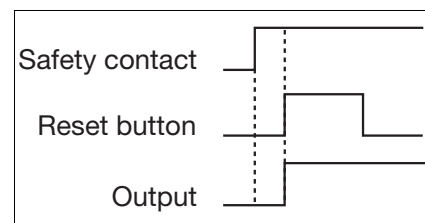
For a manual and monitored reset, the reset button can also be configured as a standard input.

- ▶ 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

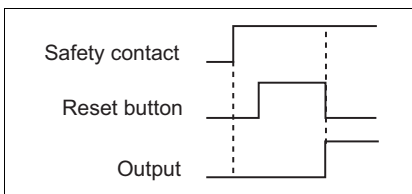
A N/O contact on the reset input generates the reset signal. The reset button must be operated after the safety switch has closed. The output on the input element is set to "1" when the reset button is operated.



Configuration and wiring Inputs

► 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.



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.

Test pulses that are used for the safety mat may not be reused for other purposes.

Please refer to the certificate showing approved pressure sensitive protective devices for details of the base unit versions from which the pressure sensitive mat/safe edge function is supported.

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.

Configuration and wiring

Logic elements

1.3

The functions on the PNOZmulti devices are configured using the PNOZ-multi Configurator.

Logic elements affect the state of the function elements. Logic elements include:

- ▶ Logic connections e.g. AND, OR
- ▶ Time elements
- ▶ Event counters
- ▶ Speed monitors
- ▶ Reset elements
- ▶ Connection point
- ▶ Press elements
- ▶ Muting
- ▶ Burner element

Logic elements can be linked with

- ▶ the outputs on the function elements
- ▶ other logic elements
- ▶ the inputs on the output elements

Speed monitor

The speed monitor logic element serves to configure the speed monitor PNOZ ms.... The speed monitors monitor

- ▶ Standstill
- ▶ Overspeed
- ▶ Direction of rotation

The following input devices can be evaluated:

- ▶ Incremental encoders (TTL and Sin-Cos)
- ▶ Proximity switches (only PNOZ ms1p and PNOZ ms2p)

The following can be configured in the PNOZmulti Configurator:

- ▶ Maximum 4 speed monitors
- ▶ Maximum 2 independent axes per speed monitor (not on PNOZ ms4p)

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 document entitled "Safety solutions for presses". It contains safety 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".

Burner element

The burner logic element is designed to control and monitor furnaces (automatic burner control system).

The following can be monitored:

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

The following can be controlled:

- ▶ Safety valves
- ▶ Ignition valves
- ▶ Vent valve
- ▶ Ignition
- ▶ External compound controller
- ▶ Combustion air blower

The following oil and gas burner types can be controlled and 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
- ▶ Slave burner with indirect ignition and joint flame monitoring
- ▶ Slave burner with indirect ignition and separate flame monitoring

To control and monitor furnaces (PNOZ m3p only), please refer to the document entitled "PNOZmulti Special Applications" and the online help for the PNOZmulti Configurator.

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 towards all other circuits in the safety system.

Single-channel, redundant or diverse relay outputs are available. The redundant outputs are suitable for applications with a higher level of safety. The diverse outputs are designed to control the safety valves on a burner. (For wiring options, please see the chapter entitled "Products").

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 "Products").

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. The number of inputs can be extended to 128.
- ▶ 24 virtual inputs for standard functions which are transmitted via the serial interface. The number of inputs can be extended to 128.
- ▶ 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

Usage

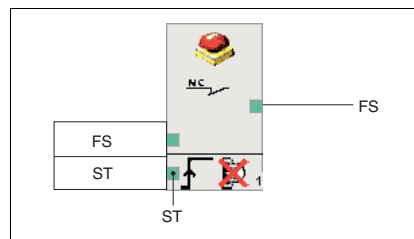
Inputs and outputs for standard functions must not be used for safety-related applications.

Examples in the PNOZmulti Configurator

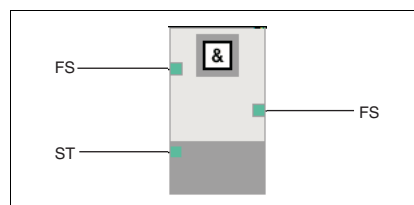
ST: Input or output for standard functions

FS: Input or output for safety functions

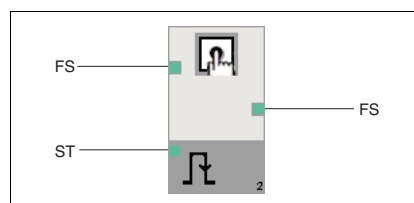
- ▶ Reset button on function elements



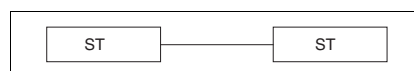
- ▶ AND connection



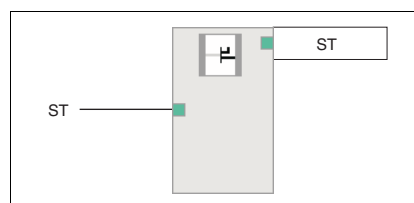
- ▶ Acknowledgement on reset element



- ▶ Direct connection of inputs and outputs for standard functions



- ▶ Input for driving an output for standard functions



Configuration and wiring Ethernet interfaces

The base units PNOZ ... ETH have two Ethernet interfaces to

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

Information on diagnostics via the Ethernet interfaces can be found in the document entitled "PNOZmulti communication interfaces".

The connection to Ethernet is made via the two 8-pin RJ45 sockets. The Ethernet interface is configured in the PNOZmulti Configurator and is described in the online help for the PNOZmulti Configurator.

System requirements

- ▶ PNOZmulti Configurator: From Version 6.4.0

Please contact Pilz if you have an older version.

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.

INFORMATION

The connected subscribers must support the autosensing/autonegotiation function. If not, the communication partner must be set permanently to "10 Mbit/s, half duplex".

The switch's automatic crossover function means there is no need to dis-

tinguish on the connection cable between patch cable (uncrossed data line connection) and crossover cable (crossover data line connection). The switch automatically creates the correct data line connection internally. Patch cable can therefore be used as the connection cable for both end devices and cascading.

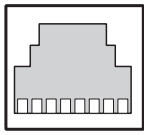
Both Ethernet interfaces use RJ45 technology.

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)

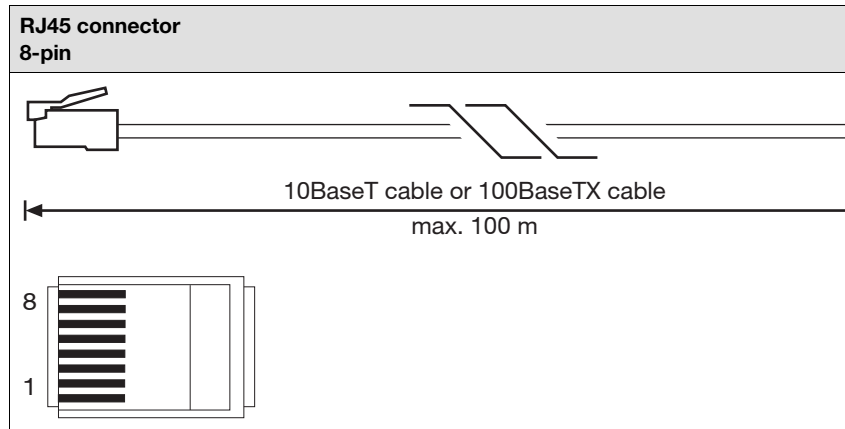
Interface assignment

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.

Configuration and wiring

Ethernet interfaces

RJ45 connection cable



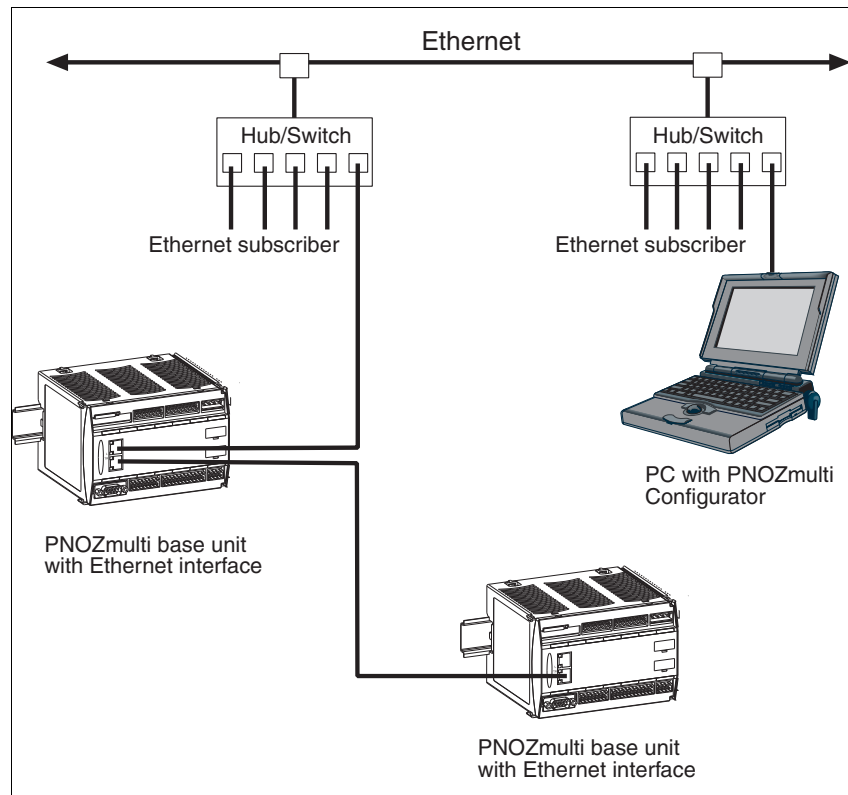
NOTICE

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.

Configuration and wiring Ethernet interfaces

Process data exchange

The RJ45 interfaces on the internal autosensing switch enable process data to be exchanged with other Ethernet subscribers within a network. A base unit with Ethernet interface can also be connected to Ethernet via a hub (hub or switch).



Configuration and wiring

Connection of base units

Connection via the link interface Safe Link

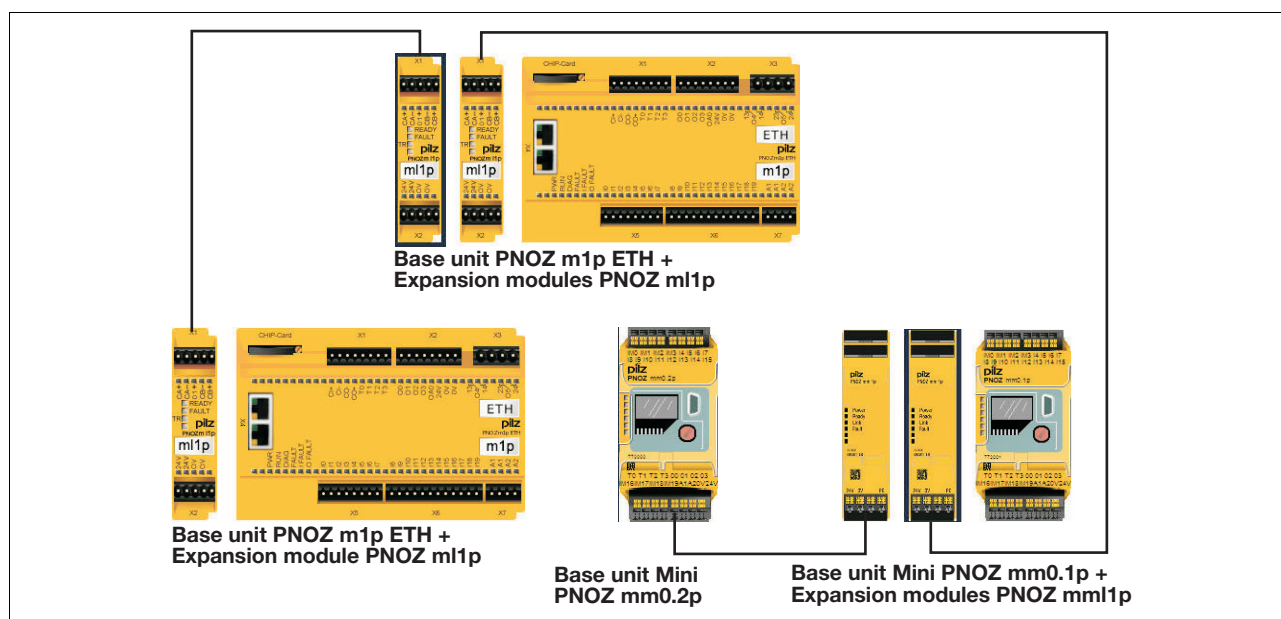
For safe data exchange two or more configurable control systems PNOZ-multi can be connected to each other.

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

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

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

Example: Connection of 4 base units



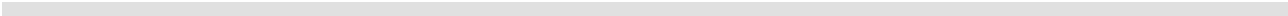
Connection options

The following base units can be interconnected:

	PNOZ m0p (ETH)	PNOZ m1p/2p/3p (ETH) + PNOZ m1p	PNOZ mm0p	PNOZ mm0.1p + PNOZ mml1p	PNOZ mm0.2p
PNOZ m0p (ETH)	x	x		x	x
PNOZ m1p/2p/3p (ETH) + PNOZ m1p	x	x		x	x
PNOZ mm0p					
PNOZ mm0.1p + PNOZ mml1p	x	x		x	x
PNOZ mm0.2p	x	x		x	x

Connection via the cascading inputs and outputs

Please refer to the PNOZmulti Installation Manual for details of how to network base units via the cascading inputs and outputs.



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Selection guide

Selection guide

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Fieldbus modules PNOZmulti	2.1-4
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Expansion modules PNOZmulti Mini	2.1-6
Fieldbus modules PNOZmulti Mini	2.1-7

Selection guide

Base units PNOZmulti

Type	Inputs Safe	Outputs Semi-conductor Safe	Outputs Semi-conductor Standard	Outputs Relay Safe	Interface	Housing width in mm	Special features
PNOZ m0p	20	4	1	2	RS232	135	Non-expandable, muting function, analogue input module connectable
PNOZ m0p ETH	20	4	1	2	Ethernet	135	Non-expandable, muting function, analogue input module connectable
PNOZ m1p	20	4	1	2	RS232	135	Muting function, analogue input module connectable, also available as a coated version for increased environmental requirements
PNOZ m1p ETH	20	4	1	2	Ethernet	135	Muting function, analogue input module connectable, also available as a coated version for increased environmental requirements
PNOZ m2p	20	4	1	2	RS232	135	For press applications, muting function, analogue input module connectable
PNOZ m2p ETH	20	4	1	2	Ethernet	135	For press applications, muting function, analogue input module connectable
PNOZ m3p	20	4	1	2	RS232	135	To control and monitor furnaces, muting function, analogue input module connectable
PNOZ m3p ETH	20	4	1	2	Ethernet	135	To control and monitor furnaces, muting function, analogue input module connectable

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

Selection guide

Expansion modules PNOZmulti

Type	Housing width in mm	Features
PNOZ ma1p	45	Analogue input module, 2 safe analogue inputs
PNOZ mc1p	45	16 outputs for standard applications, also available as a coated version for increased environmental requirements
PNOZ mi1p	22,5	8 inputs for safety functions
PNOZ mi2p	22,5	8 inputs for standard functions
PNOZ ml1p	22,5	Link module to connect 2 base units, 32 virtual inputs, 32 virtual outputs
PNOZ ml2p	22,5	Link module to connect decentralised I/O modules
PNOZ mo1p	22,5	4 safe semiconductor outputs
PNOZ mo2p	22,5	2 safe relay outputs
PNOZ mo3p	22,5	2 dual-pole, safe semiconductor outputs
PNOZ mo4p	22,5	4 safe relay outputs
PNOZ mo5p	22,5	4 safe, diverse relay outputs
PNOZ ms1p	45	Muting function, analogue input module connectable, also available as a coated version for increased environmental requirements
PNOZ ms2p TTL	45	Speed monitor, monitoring of 2 axes, proximity switch and incremental encoder (TTL, Sin/Cos) connectable
PNOZ ms2p HTL	45	Speed monitor, monitoring of 2 axes, proximity switch and incremental encoder (HTL) connectable
PNOZ ms3p TTL	45	Speed monitor, monitoring of 2 axes, incremental encoder (TTL, Sin/Cos) connectable, function to deactivate speed monitoring
PNOZ ms3p HTL	45	Speed monitor, monitoring of 2 axes, incremental encoder (HTL) connectable, function to deactivate speed monitoring
PNOZ ms4p	45	Speed monitor, monitoring of 1 axis, incremental encoder (HTL, TTL, Sin/Cos) connectable, function to deactivate speed monitoring

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

Selection guide

Fieldbus modules PNOZmulti

Type	Housing width in mm	Fieldbus
PNOZ mc2p	22,5	EtherCAT
PNOZ mc3p	22,5	PROFIBUS-DP
PNOZ mc4p	22,5	DeviceNet
PNOZ mc5p	22,5	Interbus
PNOZ mc5.1p	22,5	Interbus fibre-optic cable
PNOZ mc6p	22,5	CANopen
PNOZ mc7p	22,5	CC-Link
PNOZ mc8p	22,5	Ethernet IP/Modbus TCP
PNOZ mc9p	22,5	PROFINET

Selection guide

Base units PNOZmulti Mini

Type	Inputs Safe	Out- puts Semi- con- ductor Safe	Out- puts Semi- con- ductor Stand- ard	Out- puts Relay Safe	Housing width in mm	Special features
PNOZ mm0p	12 +*8	4	4+*8	-	45	Non-expandable, display
PNOZ mm0.1p	12 +*8	4	4+*8	-	45	Display
PNOZ mm0.2p	12 +*8	4	4+*8	-	45	Display, integrated interface to connect 2 base units

*The inputs/outputs can either be configured as safe inputs **or** as outputs for standard applications.

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

Selection guide

Expansion modules PNOZmulti Mini

Type	Housing width in mm	Features
PNOZmmc1p	22,5	Communication module, 2 Ethernet interfaces
PNOZmmc2p	22,5	Communication module, serial RS232 interface
PNOZ mml1p	22,5	Link module to connect 2 base units, 32 virtual inputs, 32 virtual outputs
PNOZ mml2p	22,5	Link module to connect decentralised I/O modules

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

Selection guide

Fieldbus modules PNOZmulti Mini

Type	Housing width in mm	Fieldbus
PNOZ mmc3p	22,5	PROFIBUS-DP
PNOZ mmc4p	22,5	DeviceNet
PNOZ mmc6p	22,5	CANopen
PNOZ mmc7p	22,5	CC-Link

Base units PNOZmulti

Base units PNOZmulti

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Base units PNOZmulti	
PNOZ m0p (ETH)	2.2-2
PNOZ m1p (ETH)	2.2-16
PNOZ m2p (ETH)	2.2-31
PNOZ m3p (ETH)	2.2-45

Base units PNOZmulti





PNOZ m0p (ETH)



Base unit from the configurable control system PNOZmulti

2.2

Approvals

	PNOZ m0p
	◆
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Positive-guided relay outputs:
 - 2 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ Semiconductor outputs:
 - 4 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
 - 1 auxiliary output
- ▶ 4 test pulse outputs
- ▶ 1 cascading input and output; can also be used as a standard output
- ▶ 20 inputs for connecting, for example:
 - E-STOP pushbuttons
 - Two-hand buttons
 - Safety gate limit switches
 - Reset buttons
 - Light beam devices
 - Scanner
 - Enabling switches
 - PSEN
 - Operating mode selector switch
 - Pressure sensitive mats
- ▶ Muting function
- ▶ LED for:
 - Diagnostics
 - Supply voltage
 - Output circuits
 - Input circuits
- ▶ Monitors shorts across the inputs through test pulse outputs
- ▶ Monitoring of shorts between the safety outputs
- ▶ Integrated interfaces:
 - **PNOZ m0p**: Serial interface RS232
 - **PNOZ m0p ETH**: 2 Ethernet interfaces
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)

Unit description

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ 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).

System requirements

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

Safety features

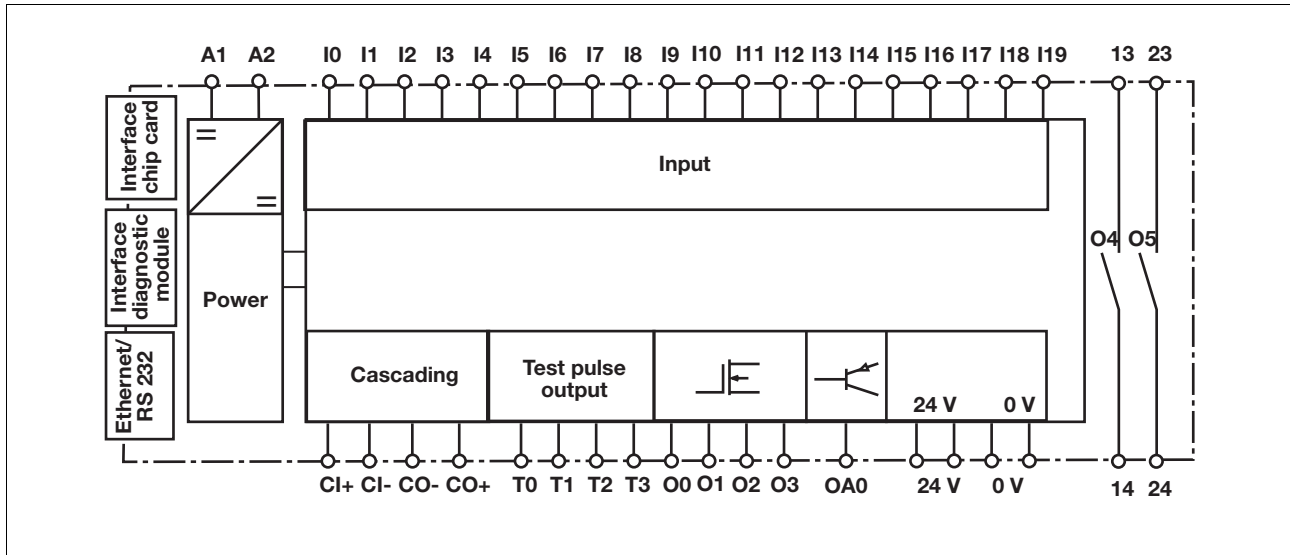
The relay conforms to the following safety criteria:

- ▶ 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 PNOZmulti

PNOZ m0p (ETH)

Block diagram



Base units PNOZmulti PNOZ m0p (ETH)

Function description

The function of the inputs and outputs on the control system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 micro-controllers that monitor each other.

They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly. The LEDs on the base unit and expansion modules indicate the status of the configurable control system PNOZmulti.

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

The product **PNOZ m0pETH** has two Ethernet interfaces, the product **PNOZ m0p** has one serial interface to

- ▶ Project download
- ▶ Read the diagnostic data
- ▶ Set virtual inputs for standard functions
- ▶ Read virtual outputs for standard functions.

Information on diagnostics via the interfaces can be found in the document "PNOZmulti communication interfaces".

The connection to Ethernet is made via the two 8-pin RJ45 sockets.

The Ethernet interface is configured in the PNOZmulti Configurator and is described in the online help for the PNOZmulti Configurator.

Wiring

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

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 output to delete a project from the base unit (see online help for the PNOZmulti Configurator).
- ▶ 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.
- ▶ The control system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with 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 3 A.
- ▶ Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- ▶ Test pulse outputs are also used to supply safety mats that trigger a short circuit. Test pulses that are used for the safety mat may not be reused for other purposes.

Base units PNOZmulti PNOZ m0p (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 semiconductor outputs are not used		

► Connection examples for the input circuit

Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
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 PNOZmulti PNOZ m0p (ETH)

- Connection examples for semiconductor outputs

Redundant output		
Single output		

- Connection examples for relay outputs

Redundant output		
Single output		

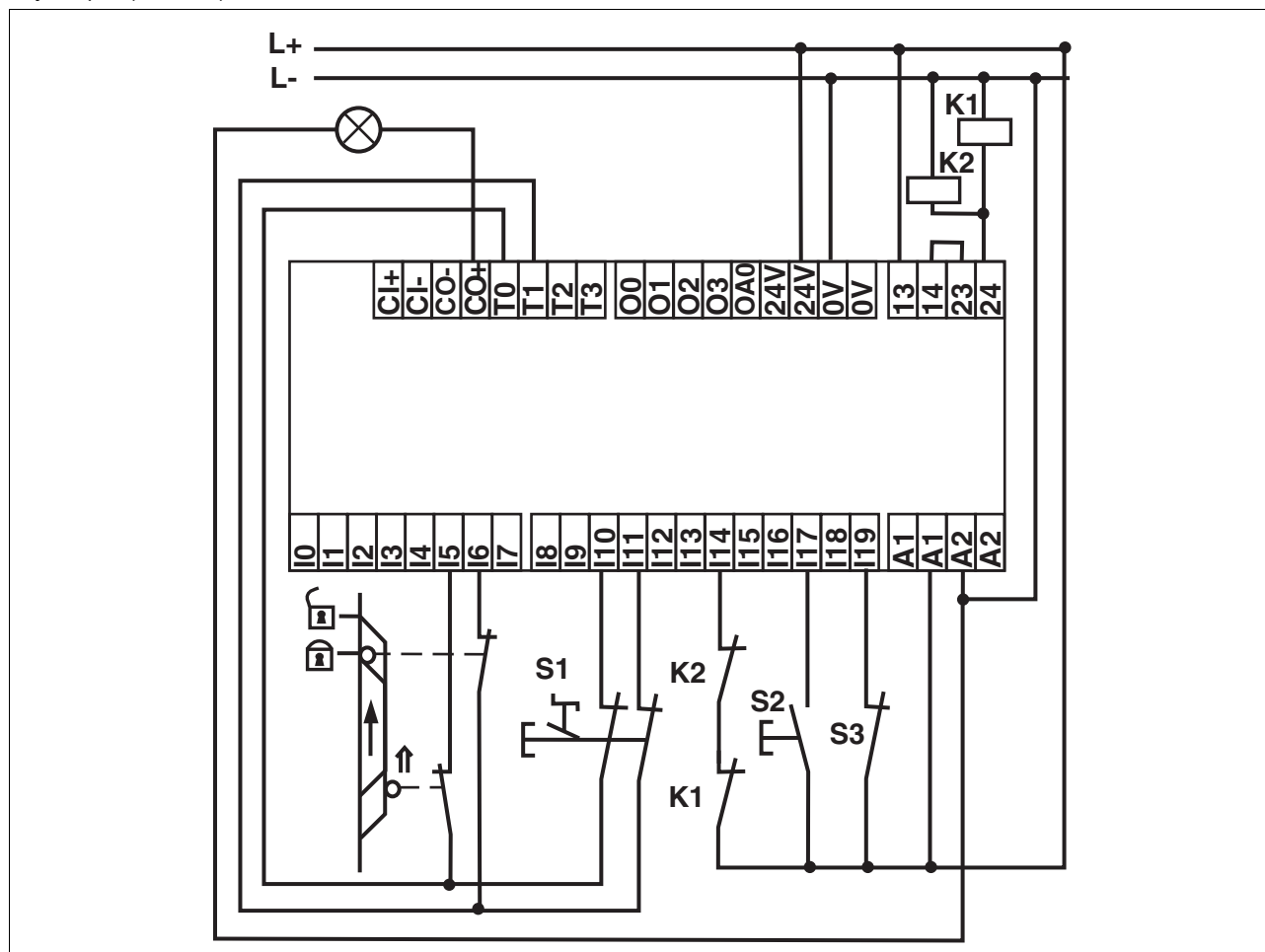
- Connection examples for feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

Base units PNOZmulti PNOZ m0p (ETH)

Connection example

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

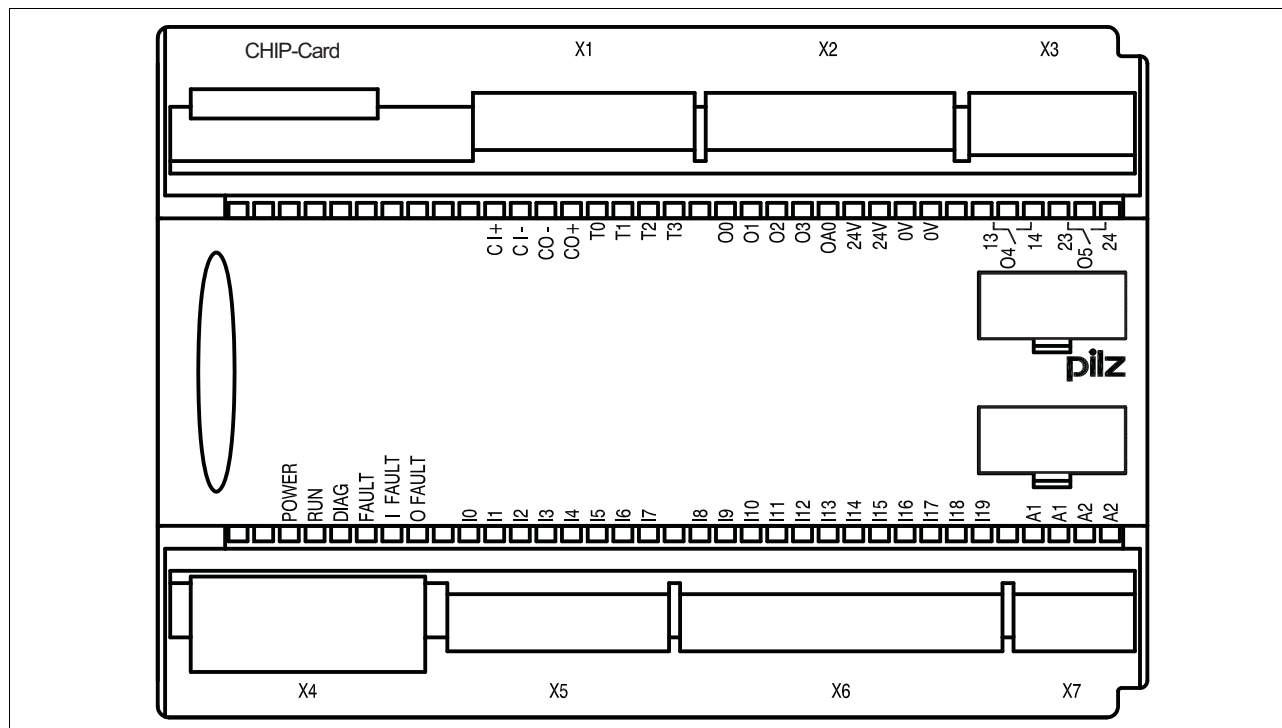


Base units PNOZmulti

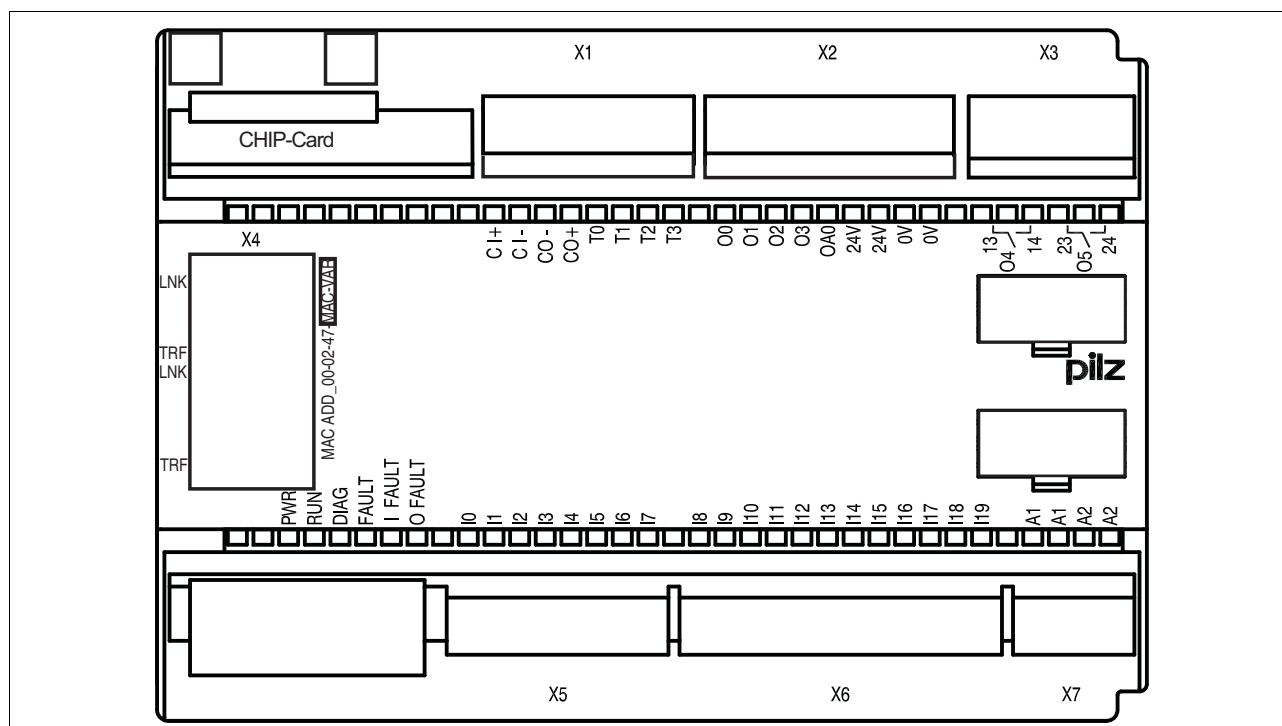
PNOZ m0p (ETH)

Terminal configuration

PNOZ m0p



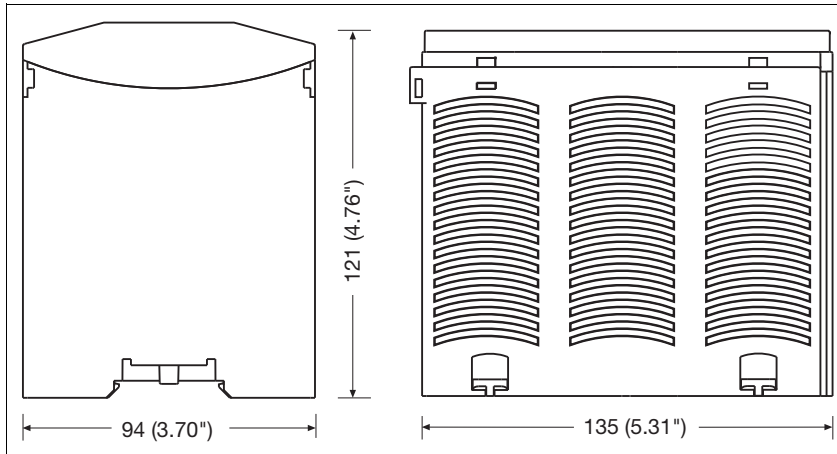
PNOZ m0p ETH



Base units PNOZmulti

PNOZ m0p (ETH)

Dimensions



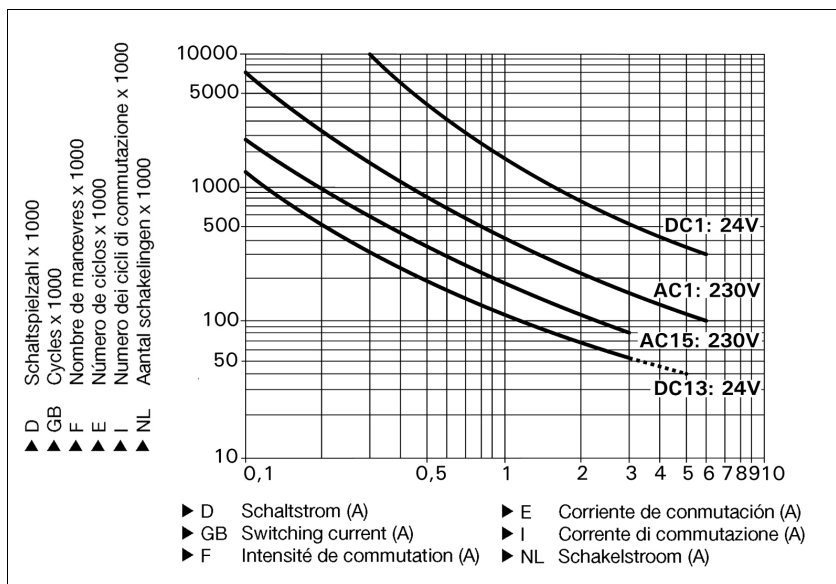
Base units PNOZmulti PNOZ m0p (ETH)

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Service life graph

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



Example

- Inductive load: 0,2 A
- Utilisation category: AC15
- Contact service life: 1,000,000 cycles

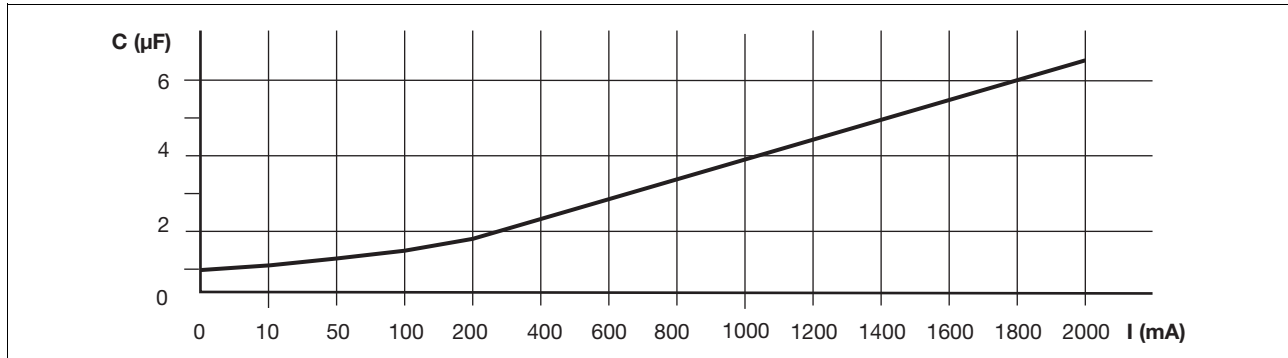
Provided the application requires fewer than 1,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

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

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

Base units PNOZmulti PNOZ m0p (ETH)

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 No. 773110 9.0 W No. 773113
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
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
Maximum input delay	4 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	24 V
current	2 A
power	48 W
Max. capacitive load	1 μF
External supply voltage	24.0 V
Voltage tolerance	-15 %/+20 %

Base units PNOZmulti PNOZ m0p (ETH)

Semiconductor outputs	
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 at 2 A
Relay outputs	
Number	2
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	6.0 A, 1440 VA
Safety contacts: DC1 at 24 V	6.0 A, 144 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	3.0 A, 690 W
Safety contacts: DC13 at 24 V (6 cycles/min)	3.0 A, 72 W
Airgap creepage between relay contacts	3 mm
relay contacts and other safe circuits	5.5 mm
External contact fuse protection ($I_k = 1 \text{ kA}$) to EN 60947-5-1	
Blow-out fuse, quick	6 A
Blow-out fuse, slow	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	6 A
Switch-off delay	50 ms
Auxiliary outputs	
Number	1
Switching capability	
voltage	24 V
current	0.50 A
power	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 at 0.5 A
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	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30 , EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	250 V

Base units PNOZmulti

PNOZ m0p (ETH)

Environmental data	
Rated impulse withstand voltage	6.00 kV
Shock stress	
EN 60068-2-27	15g 11 ms
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	1.0 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 mm ² , 22 - 14 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 0.75 mm ² , 22 - 20 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 0.75 mm ² , 22 - 20 AWG
Relay outputs:	
1 core flexible	0.5 - 2.5 mm ² , 22 - 12 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 1.25 mm ² , 22 - 16 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 1.25 mm ² , 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 mm ² , 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	499 g No. 773110 518 g No. 773113

No. stands for order number.

Base units PNOZmulti

PNOZ m0p (ETH)

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
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Logic

CPU		PL e (Cat. 4)	Cat. 4	SIL CL 3	4.90E-09	20
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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 beam device	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
cascading inputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	3.10E-10	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
cascading outputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	4.91E-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

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.
If the service life graphs are not accessible, the stated PFH value can be

used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

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

INFORMATION

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

The standards current on **2010-10** apply.

Order reference

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

Base units PNOZmulti

PNOZ m0p (ETH)

Order reference: Accessories

Product Type	Features	Order no.
Set spring terminals	1 set of spring-loaded terminals	783 100
Set screw terminals	1 set of screw terminals	793 100

Order reference: Terminator, jumper

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

Base units PNOZmulti





PNOZ m1p (ETH)



Base unit from the configurable control system PNOZmulti

2.2

Approvals

	PNOZ m1p
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Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Positive-guided relay outputs:
 - 2 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ Semiconductor outputs:
 - 4 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
 - 1 auxiliary output
- ▶ 4 test pulse outputs
- ▶ 1 cascading input and output; can also be used as a standard output
- ▶ 20 inputs for connecting, for example:
 - E-STOP pushbuttons
 - Two-hand buttons
 - Safety gate limit switches
 - Reset buttons
 - Light beam devices
 - Scanner
 - Enabling switches
 - PSEN
 - Operating mode selector switch
 - Pressure sensitive mats
- ▶ Muting function
- ▶ LED for:
 - Diagnostics
 - Supply voltage
 - Output circuits
 - Input circuits
- ▶ Monitors shorts across the inputs through test pulse outputs
- ▶ Monitoring of shorts between the safety outputs
- ▶ Expansion modules can be connected (please refer to the section entitled "System Expansion" for details of the type and number that can be connected)
- ▶ Integrated interfaces:
 - **PNOZ m1p**: Serial interface RS232
 - **PNOZ m1p ETH**: 2 Ethernet interfaces
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)

- ▶ Coated version: Increased environmental requirements

Unit description

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ E-STOP equipment
 - ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1
- The coated version of the product **PNOZ m1p** is suitable for use where there are increased environmental requirements (see Technical Details).

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).

System requirements

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

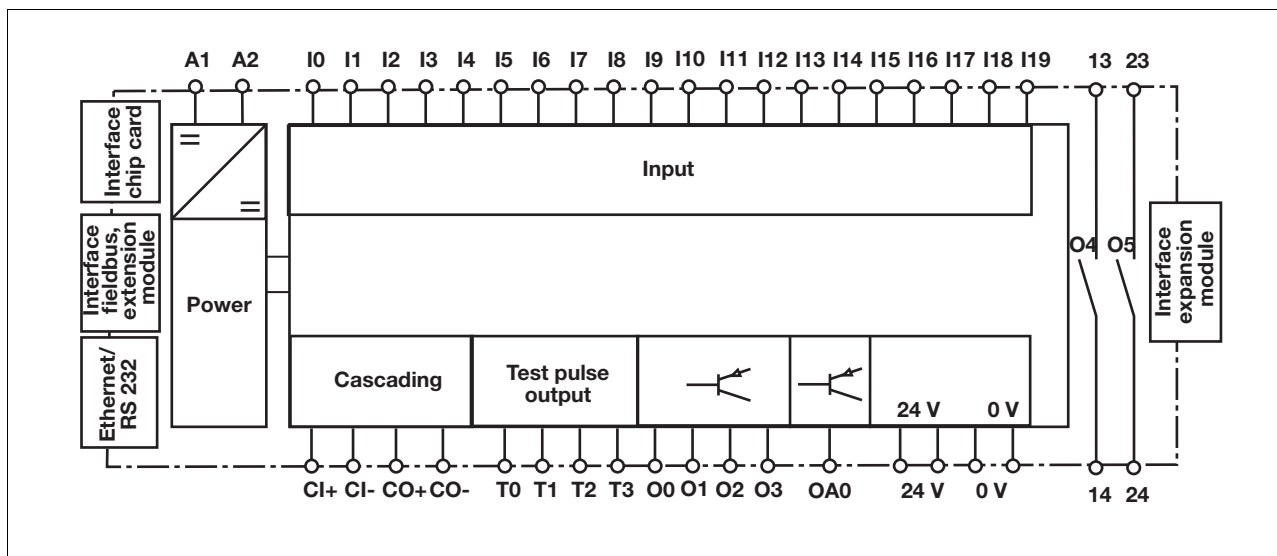
Safety features

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 PNOZmulti PNOZ m1p (ETH)

Block diagram



Function description

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

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

Interfaces

The product **PNOZ m1pETH** has two Ethernet interfaces, the product **PNOZ m1p** has one serial interface to

- ▶ Project download
- ▶ Read the diagnostic data
- ▶ Set virtual inputs for standard functions
- ▶ Read virtual outputs for standard functions.

Information on diagnostics via the interfaces can be found in the document "PNOZmulti communication interfaces".

The connection to Ethernet is made via the two 8-pin RJ45 sockets. The Ethernet interface is configured in the PNOZmulti Configurator and is described in the online help for the PNOZmulti Configurator.

Wiring

The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a safety function and the outputs that are to switch this safety function. 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 output to delete a project from the base unit (see online help for the PNOZmulti Configurator).

- ▶ 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.
- ▶ The control system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with 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 3 A.
- ▶ Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.

Base units PNOZmulti PNOZ m1p (ETH)

- ▶ Test pulse outputs are also used to supply safety mats that trigger a short circuit.
Test pulses that are used for the safety mat may not be reused for other purposes.

Base units PNOZmulti 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 semiconductor outputs are not used		

2.2

► Connection examples for the input circuit

Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
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 PNOZmulti PNOZ m1p (ETH)

- Connection examples for semiconductor outputs

Redundant output		
Single output		

- Connection examples for relay outputs

Redundant output		
Single output		

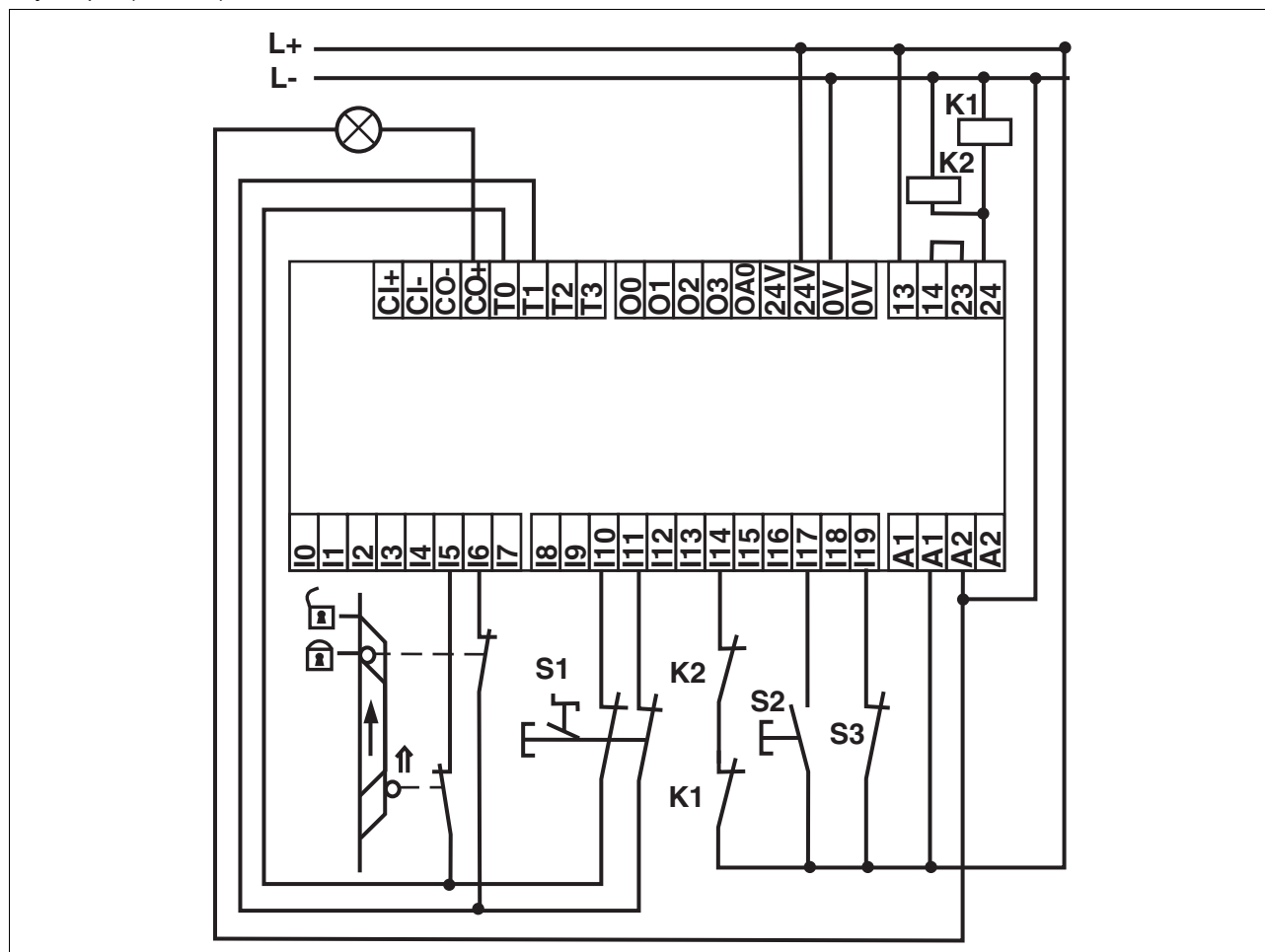
- Connection examples for feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

Base units PNOZmulti PNOZ m1p (ETH)

Connection example

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

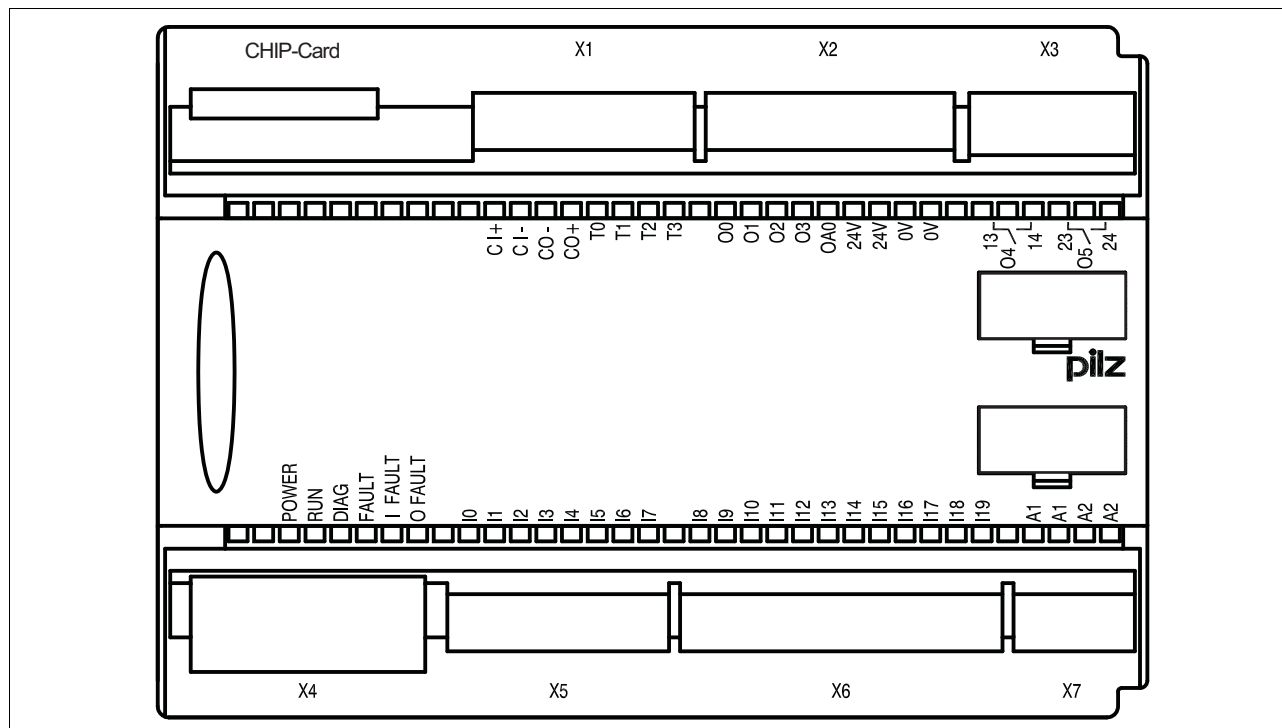


Base units PNOZmulti

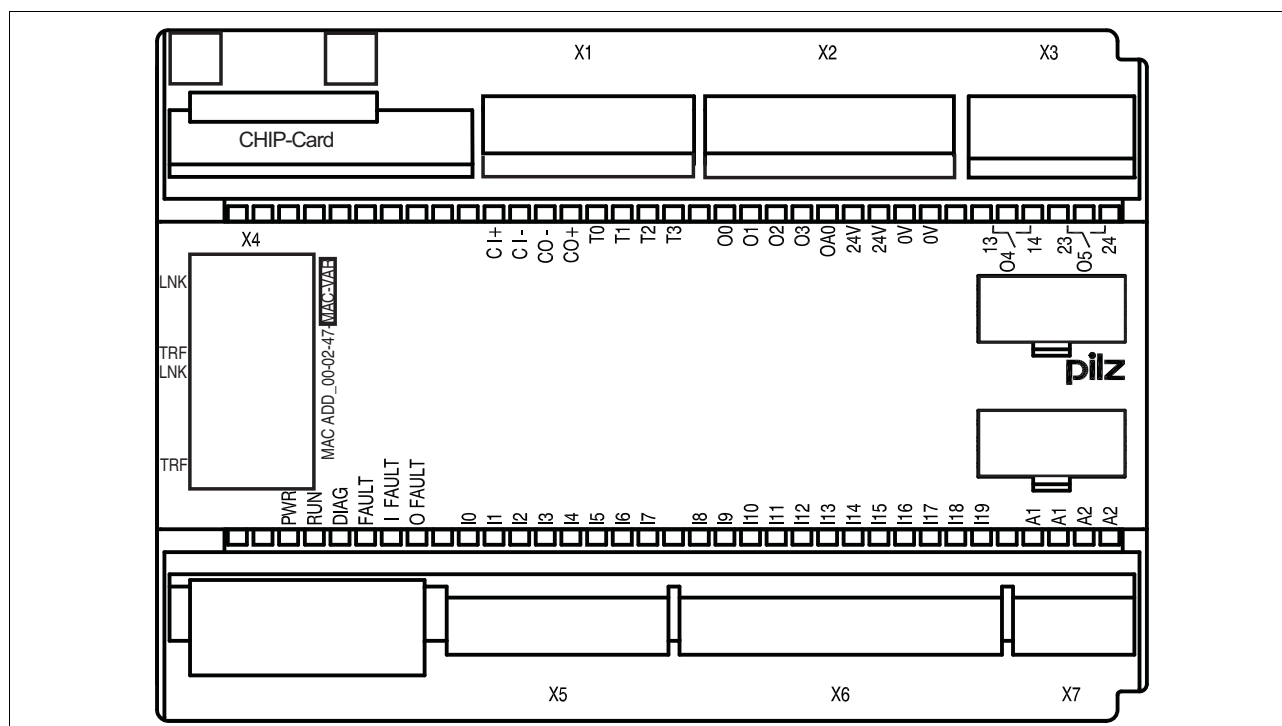
PNOZ m1p (ETH)

Terminal configuration

PNOZ m1p

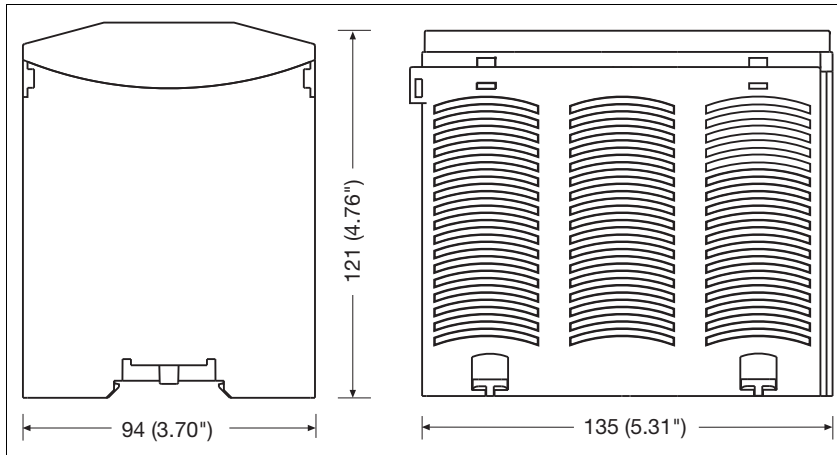


PNOZ m1p ETH



Base units PNOZmulti PNOZ m1p (ETH)

Dimensions



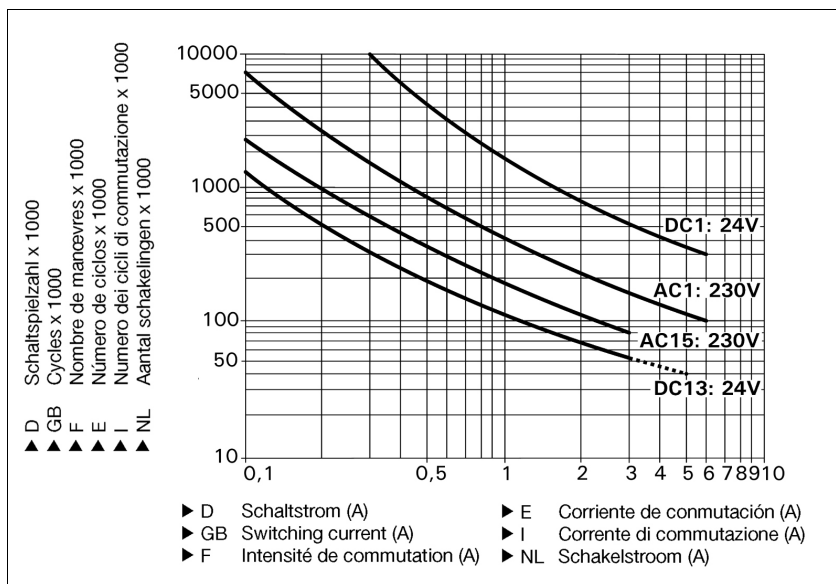
Base units PNOZmulti PNOZ m1p (ETH)

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Service life graph

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



Example

- Inductive load: 0,2 A
- Utilisation category: AC15
- Contact service life: 1,000,000 cycles

Provided the application requires fewer than 1,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

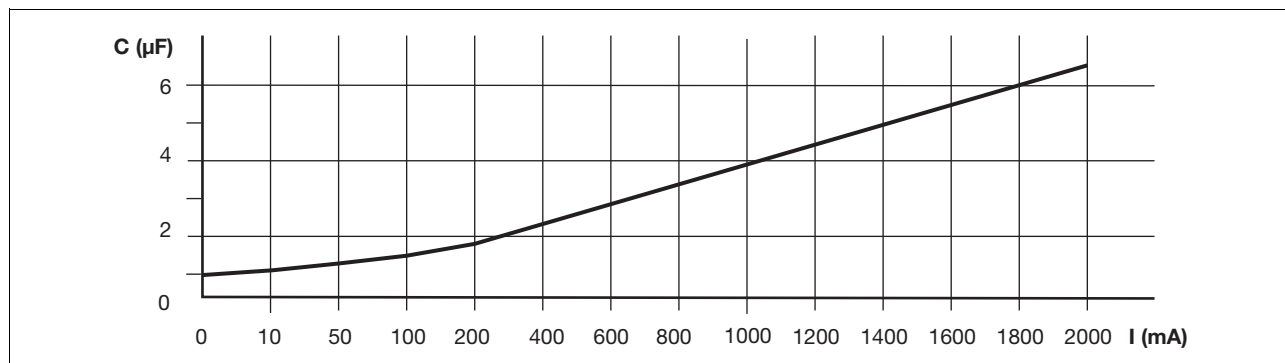
To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With contactors, use freewheel diodes for spark suppression.

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

Base units PNOZmulti

PNOZ m1p (ETH)

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



Base units PNOZmulti

PNOZ m1p (ETH)

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 No. 773100, 773105 9.0 W No. 773103, 773104
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")	$U_B > 26.4 \text{ V} : 15, U_B \leq 26.4 \text{ V} : 20$
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
Maximum input delay	4 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	24 V
current	2 A
power	48 W
Derating of coated version at an ambient temperature > 50 °C	
Voltage	24 V No. 773104, 773105
Current	1 A No. 773104, 773105
Power	24 W No. 773104, 773105
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"	$U_B - 0.5 \text{ V DC at } 2 \text{ A}$

Relay outputs

Number	2
--------	----------

Base units PNOZmulti

PNOZ m1p (ETH)

Relay outputs	
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	6.0 A, 1440 VA
Safety contacts: DC1 at 24 V	6.0 A, 144 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	3.0 A, 690 W
Safety contacts: DC13 at 24 V (6 cycles/min)	3.0 A, 72 W
Derating of coated version at an ambient temperature > 50 °C	
Safety contacts: AC1 at 240 V	4 A No. 773104, 773105, 960 W No. 773104, 773105
Safety contacts: DC1 at 24 V	4 A No. 773104, 773105, 96 W No. 773104, 773105
Airgap creepage between relay contacts	3 mm
relay contacts and other safe circuits	5.5 mm
External contact fuse protection ($I_K = 1 \text{ kA}$) to EN 60947-5-1	
Blow-out fuse, quick	6 A
Blow-out fuse, slow	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	6 A
Switch-off delay	50 ms
Auxiliary outputs	
Number	1
Switching capability	
voltage	24 V
current	0.50 A
power	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 at 0.5 A
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	
Ambient temperature	-25 - 60 °C No. 773104, 773105 0 - 60 °C No. 773100, 773103
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary (only with protective extra low voltage) No. 773104, 773105 not permitted No. 773100, 773103
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz No. 773100, 773103 5 - 500 Hz No. 773104, 773105
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	250 V
Rated impulse withstand voltage	6.00 kV

Base units PNOZmulti PNOZ m1p (ETH)

Environmental data

Corrosive gas check	
SO ₂ : concentration 10 ppm, duration 10 days, passive	DIN V 40046-36 No. 773104, 773105
H ₂ S: concentration 1 ppm, duration 10 days, passive	DIN V 40046-37 No. 773104, 773105

Shock stress	
EN 60068-2-27	15g 11 ms

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	1.0 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	499 g No. 773100 518 g No. 773103 519 g No. 773105 538 g No. 773104

No. stands for order number.

Base units PNOZmulti

PNOZ m1p (ETH)

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 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 beam device	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
cascading inputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	3.10E-10	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
cascading outputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	4.91E-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

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.
If the service life graphs are not accessible, the stated PFH value can be

used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

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

INFORMATION

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

The standards current on **2010-10** apply.

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

Base units PNOZmulti PNOZ m1p (ETH)

Order reference: Accessories

Product Type	Features	Order no.
Set spring terminals	1 set of spring-loaded terminals	783 100
Set screw terminals	1 set of screw terminals	793 100

Order reference: Connectors

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





Base units PNOZmulti

PNOZ m2p (ETH)



Base unit from the configurable control system PNOZmulti

Approvals

	PNOZ m2p
	◆
	◆
	◆
	◆

Unit features

- ▶ For applications on mechanical presses
- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Positive-guided relay outputs:
 - 2 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ Semiconductor outputs:
 - 4 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
 - 1 auxiliary output
- ▶ 4 test pulse outputs
- ▶ 1 cascading input and output; can also be used as a standard output
- ▶ 20 inputs for connecting, for example:
 - E-STOP pushbuttons
 - Two-hand buttons
 - Safety gate limit switches
 - Reset buttons
 - Light beam devices
 - Scanner
 - Enabling switches
 - PSEN
 - Operating mode selector switch
 - Pressure sensitive mats
- ▶ Muting function
- ▶ LED for:
 - Diagnostics
 - Supply voltage
 - Output circuits
 - Input circuits
- ▶ Monitors shorts across the inputs through test pulse outputs
- ▶ Monitoring of shorts between the safety outputs
- ▶ Expansion modules can be connected (please refer to the section entitled "System Expansion" for details of the type and number that can be connected)
- ▶ Integrated interfaces:
 - **PNOZ m2p**: Serial interface RS232
 - **PNOZ m2p ETH**: 2 Ethernet interfaces

- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)

Unit description

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

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ 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).

System requirements

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

Safety features

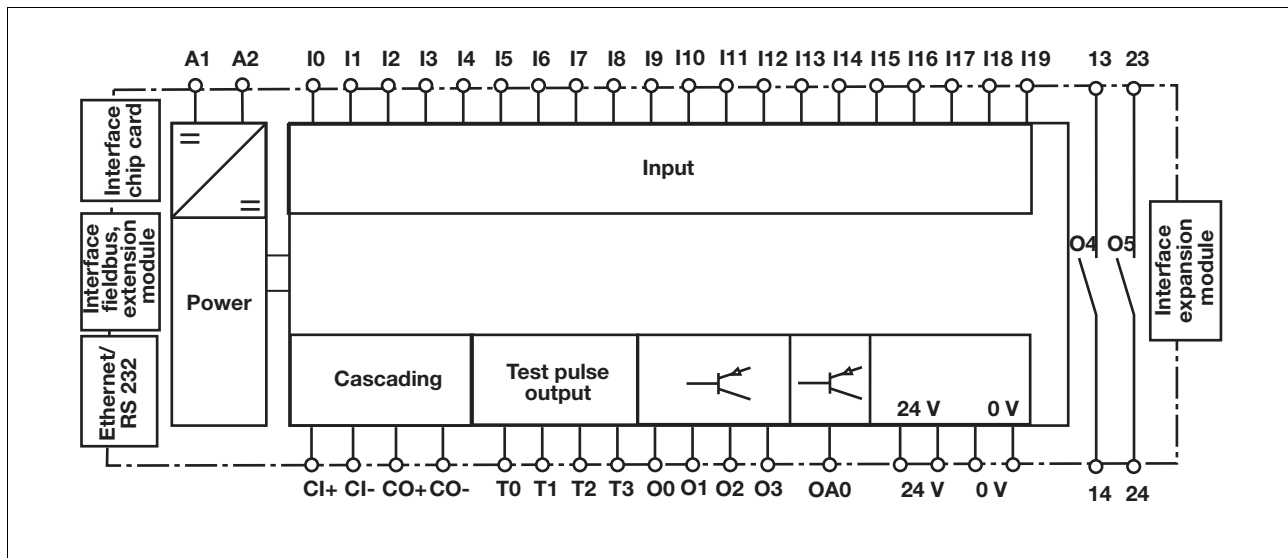
The relay conforms to the following safety criteria:

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

Base units PNOZmulti PNOZ m2p (ETH)

- ▶ 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



Function description

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

Interfaces

The product **PNOZ m2pETH** has two Ethernet interfaces, the product **PNOZ m2p** has one serial interface to

- ▶ Project download
- ▶ Read the diagnostic data
- ▶ Set virtual inputs for standard functions
- ▶ Read virtual outputs for standard functions.

Information on diagnostics via the interfaces can be found in the document "PNOZmulti communication interfaces".

The connection to Ethernet is made via the two 8-pin RJ45 sockets.

The Ethernet interface is configured in the PNOZmulti Configurator and is described in the online help for the PNOZmulti Configurator.

Base units PNOZmulti PNOZ m2p (ETH)

Wiring

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

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 output to delete a project from the base unit (see online help for the PNOZmulti Configurator).
- ▶ 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.
- ▶ The control system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with 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 3 A.
- ▶ Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- ▶ Test pulse outputs are also used to supply safety mats that trigger a short circuit. Test pulses that are used for the safety mat may not be reused for other purposes.

Base units PNOZmulti PNOZ m2p (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 semiconductor outputs are not used		

► Connection examples for the input circuit

Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
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 PNOZmulti PNOZ m2p (ETH)

- Connection examples for semiconductor outputs

Redundant output		
Single output		

2.2

- Connection examples for relay outputs

Redundant output		
Single output		

- Connection examples for feedback loop

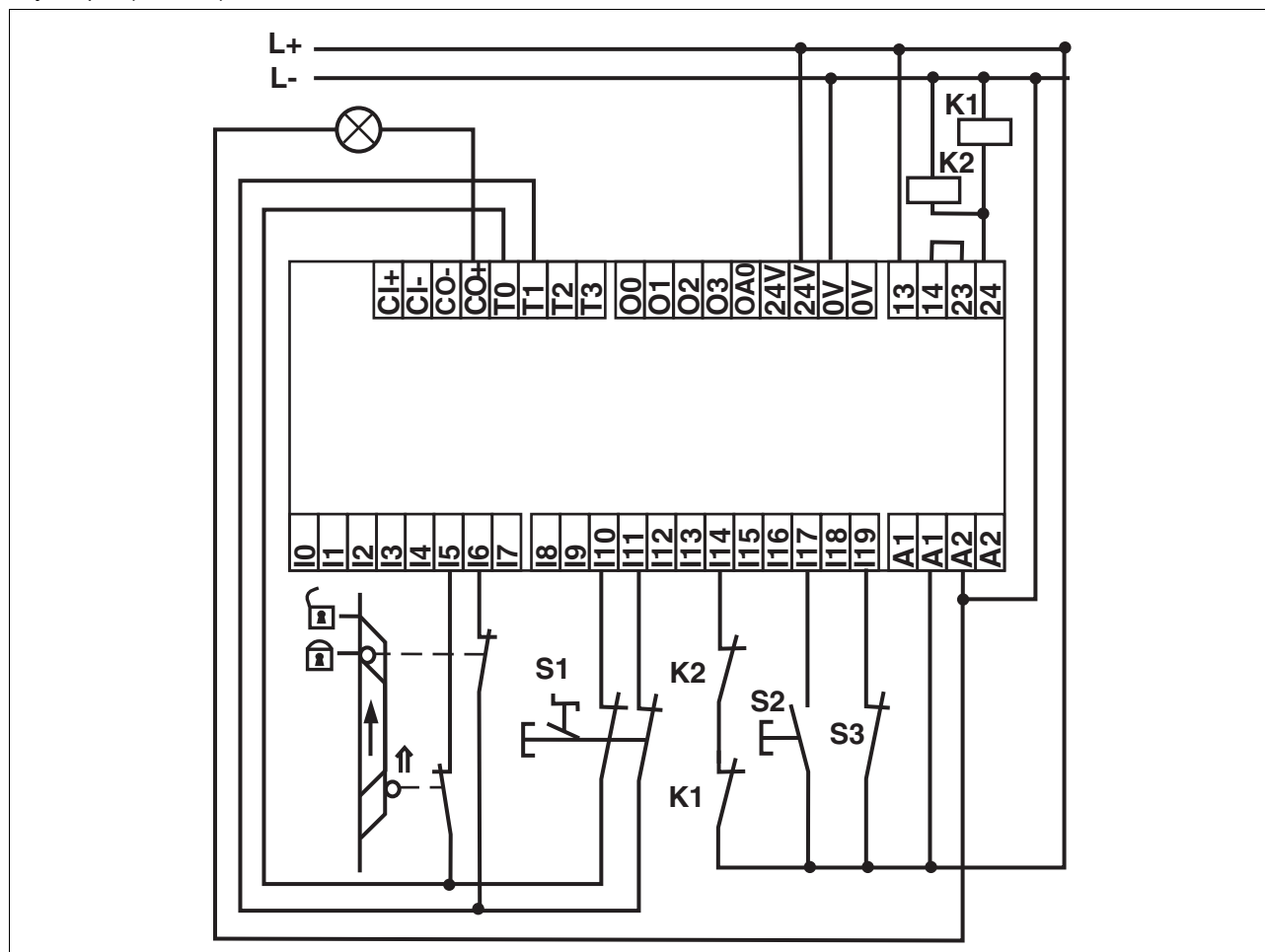
Feedback loop	Redundant output
Contacts from external contactors	

Base units PNOZmulti

PNOZ m2p (ETH)

Connection example

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

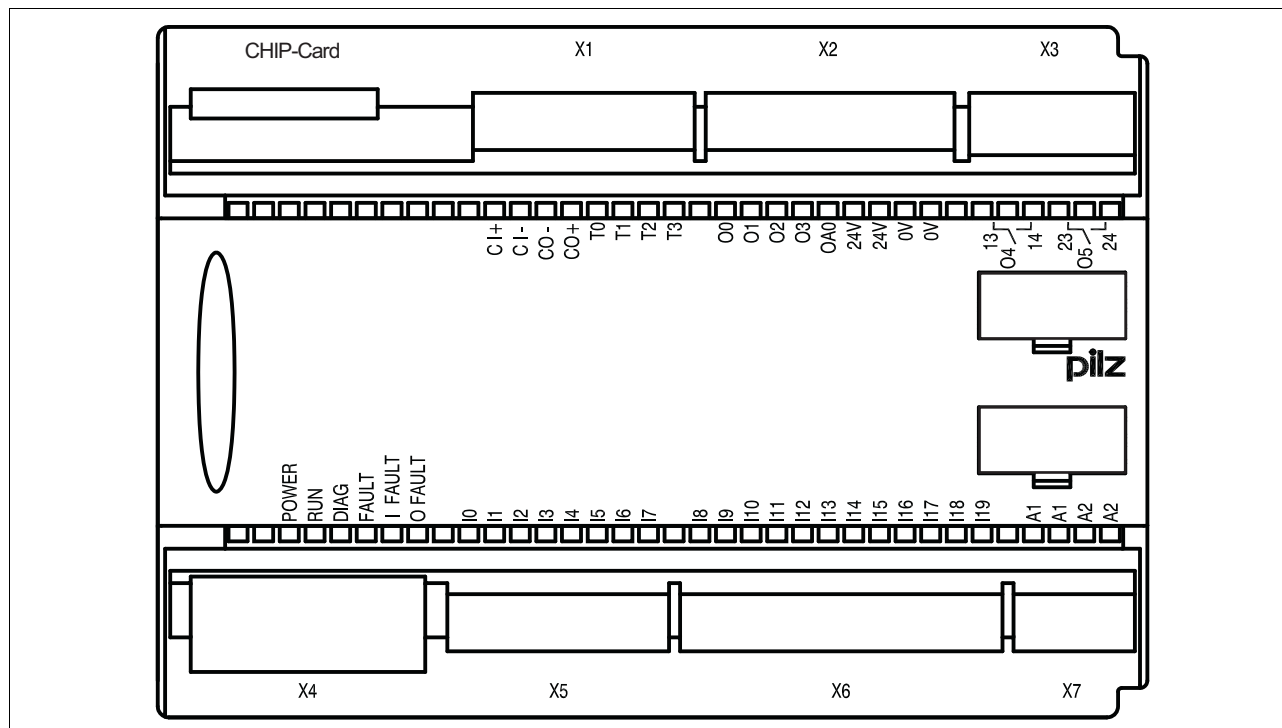


Base units PNOZmulti

PNOZ m2p (ETH)

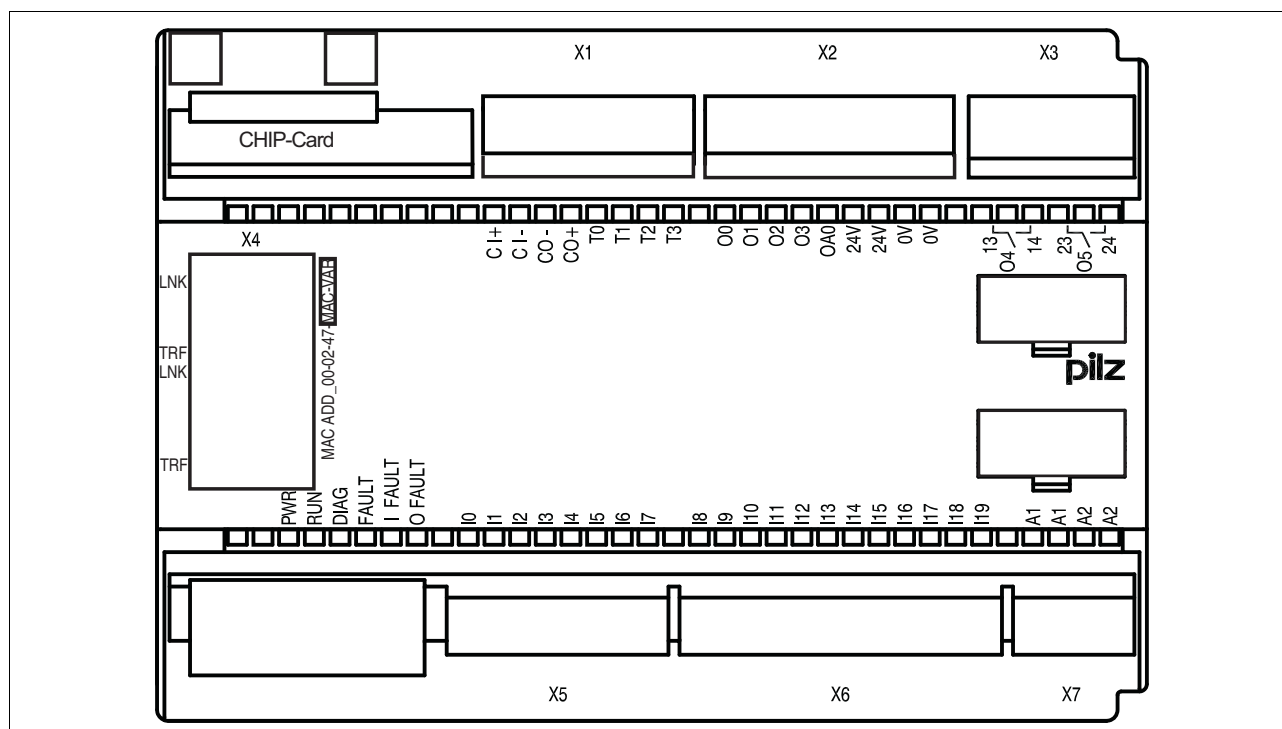
Terminal configuration

PNOZ m2p



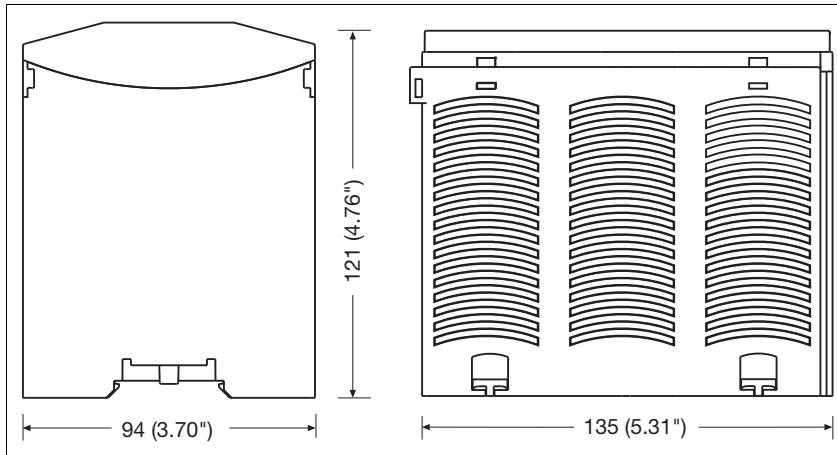
2.2

PNOZ m2p ETH



Base units PNOZmulti PNOZ m2p (ETH)

Dimensions



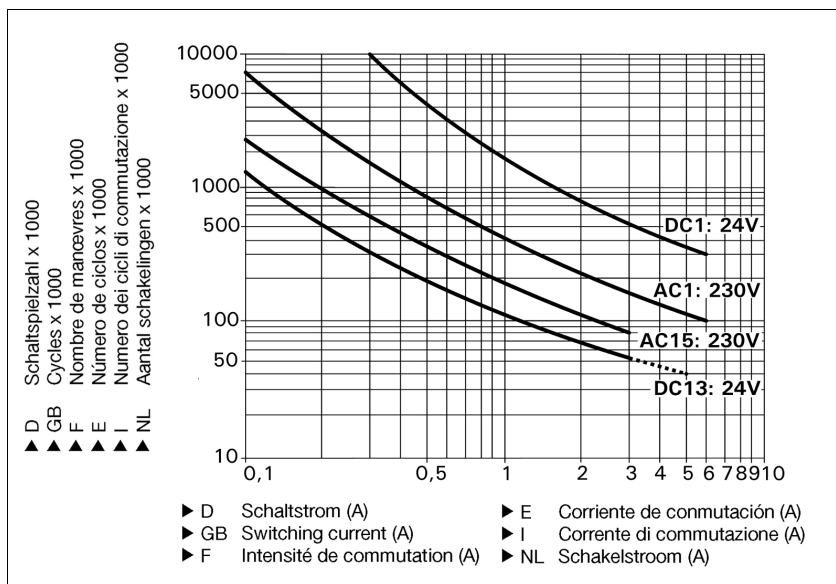
Base units PNOZmulti PNOZ m2p (ETH)

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Service life graph

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



Example

- ▶ Inductive load: 0,2 A
- ▶ Utilisation category: AC15
- ▶ Contact service life: 1,000,000 cycles

Provided the application requires fewer than 1,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

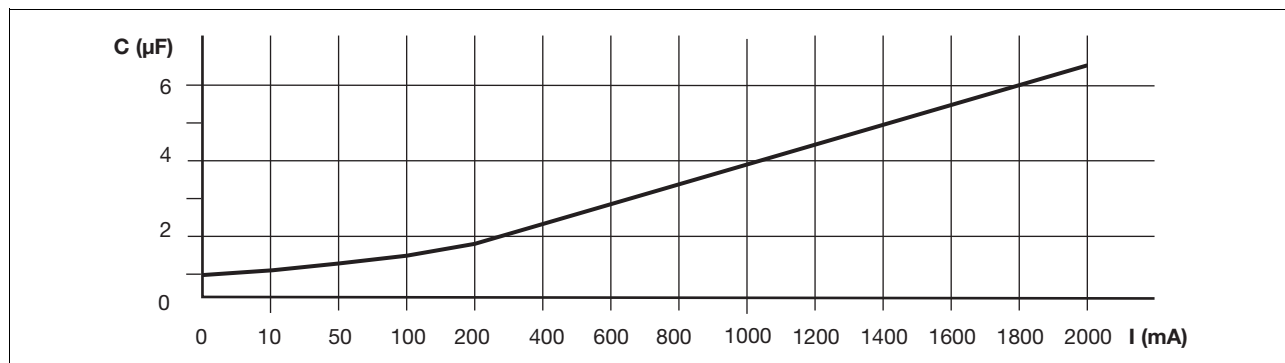
To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With contactors, use freewheel diodes for spark suppression.

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

Base units PNOZmulti

PNOZ m2p (ETH)

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



Base units PNOZmulti

PNOZ m2p (ETH)

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 No. 773120 9.0 W No. 773123
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")	$U_B > 26.4 \text{ V} : 15, U_B \leq 26.4 \text{ V} : 20$
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
Maximum input delay	4 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	24 V
current	2 A
power	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"	$U_B - 0.5 \text{ V DC at } 2 \text{ A}$
Relay outputs	
Number	2
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	6.0 A, 1440 VA
Safety contacts: DC1 at 24 V	6.0 A, 144 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	3.0 A, 690 W
Safety contacts: DC13 at 24 V (6 cycles/min)	3.0 A, 72 W

Base units PNOZmulti

PNOZ m2p (ETH)

Relay outputs	
Airgap creepage between relay contacts	3 mm
relay contacts and other safe circuits	5.5 mm
External contact fuse protection ($I_K = 1$ kA) to EN 60947-5-1	
Blow-out fuse, quick	6 A
Blow-out fuse, slow	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	6 A
Switch-off delay	50 ms
Auxiliary outputs	
Number	1
Switching capability	
voltage	24 V
current	0.50 A
power	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 at 0.5 A
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	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	250 V
Rated impulse withstand voltage	6.00 kV
Shock stress	
EN 60068-2-27	15g
	11 ms
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	1.0 km
Sum of individual cable runs at the test pulse output	40 km

Base units PNOZmulti

PNOZ m2p (ETH)

Mechanical data	
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 mm ² , 22 - 14 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 0.75 mm ² , 22 - 20 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 0.75 mm ² , 22 - 20 AWG
Relay outputs:	
1 core flexible	0.5 - 2.5 mm ² , 22 - 12 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 1.25 mm ² , 22 - 16 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 1.25 mm ² , 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 mm ² , 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	499 g No. 773120
	518 g No. 773123

No. stands for order number.

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 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 beam device	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
cascading inputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	3.10E-10	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
cascading outputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	4.91E-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

Base units PNOZmulti

PNOZ m2p (ETH)

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.

If the service life graphs are not accessible, the stated PFH value can be

used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

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

INFORMATION

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

The standards current on **2010-10** apply.

Order reference

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

Order reference: Accessories

Product Type	Features	Order no.
Set spring terminals	1 set of spring-loaded terminals	783 100
Set screw terminals	1 set of screw terminals	793 100

Order reference: Terminator, jumper

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





Base units PNOZmulti

PNOZ m3p (ETH)



Base unit from the configurable control system PNOZmulti

Approvals

	PNOZ m3p
	◆
	◆
	◆
	◆

Unit features

- ▶ Designed to monitor and control furnaces
- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Positive-guided relay outputs:
 - 2 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ Semiconductor outputs:
 - 4 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
 - 1 auxiliary output
- ▶ 4 test pulse outputs
- ▶ 1 cascading input and output; can also be used as a standard output
- ▶ 20 inputs for connecting, for example:
 - E-STOP pushbuttons
 - Two-hand buttons
 - Safety gate limit switches
 - Reset buttons
 - Light beam devices
 - Scanner
 - Enabling switches
 - PSEN
 - Operating mode selector switch
 - Pressure sensitive mats
- ▶ Muting function
- ▶ LED for:
 - Diagnostics
 - Supply voltage
 - Output circuits
 - Input circuits
- ▶ Monitors shorts across the inputs through test pulse outputs
- ▶ Monitoring of shorts between the safety outputs
- ▶ Integrated interfaces:
 - **PNOZ m3p**: Serial interface RS232
 - **PNOZ m3p ETH**: 2 Ethernet interfaces
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)

Unit description

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ E-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 thermo-processing 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

Base units PNOZmulti PNOZ m3p (ETH)

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

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).

System requirements

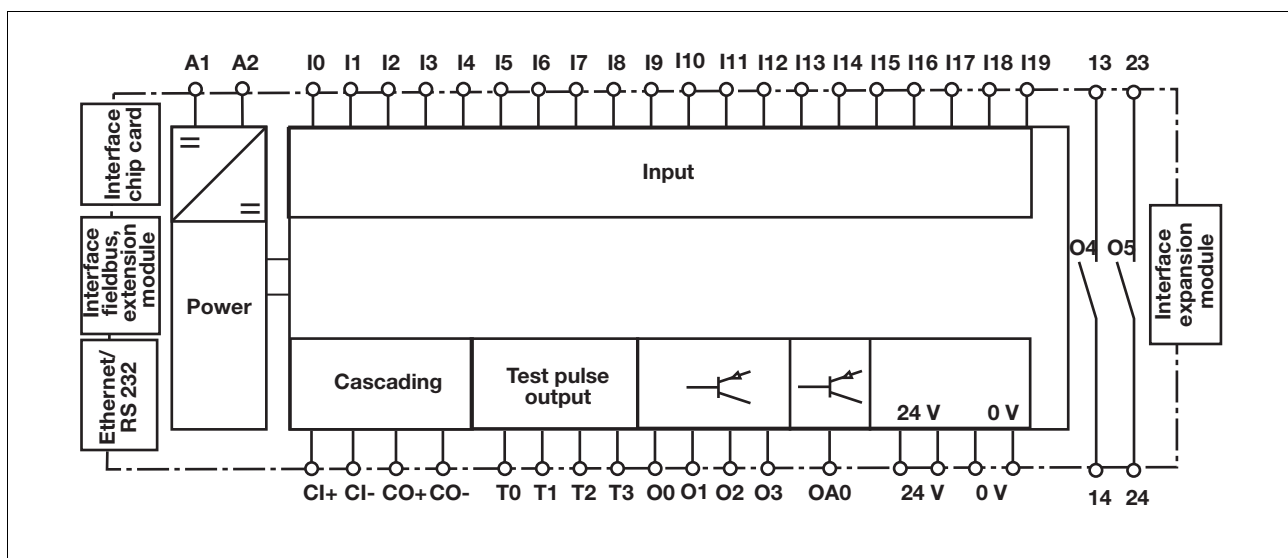
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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



Function description

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

configurable control system
PNOZmulti.

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

Base units PNOZmulti PNOZ m3p (ETH)

Interfaces

The product **PNOZ m3pETH** has two Ethernet interfaces, the product

PNOZ m3p has one serial interface to

- ▶ Project download
- ▶ Read the diagnostic data
- ▶ Set virtual inputs for standard functions
- ▶ Read virtual outputs for standard functions.

Information on diagnostics via the interfaces can be found in the document "PNOZmulti communication interfaces".

The connection to Ethernet is made via the two 8-pin RJ45 sockets.

The Ethernet interface is configured in the PNOZmulti Configurator and is described in the online help for the PNOZmulti Configurator.

Wiring

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

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 output to delete a project from the base unit (see online help for the PNOZmulti Configurator).
- ▶ 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.
- ▶ The control system and input circuits must always be supplied by a

single power supply. The power supply must meet the regulations for extra low voltages with 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 3 A.
- ▶ Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- ▶ Test pulse outputs are also used to supply safety mats that trigger a short circuit.

Test pulses that are used for the safety mat may not be reused for other purposes.

Base units PNOZmulti PNOZ m3p (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 semiconductor outputs are not used		

► Connection examples for the input circuit

Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
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 PNOZmulti PNOZ m3p (ETH)

- Connection examples for semiconductor outputs

Redundant output		
Single output		

- Connection examples for relay outputs

Redundant output		
Single output		

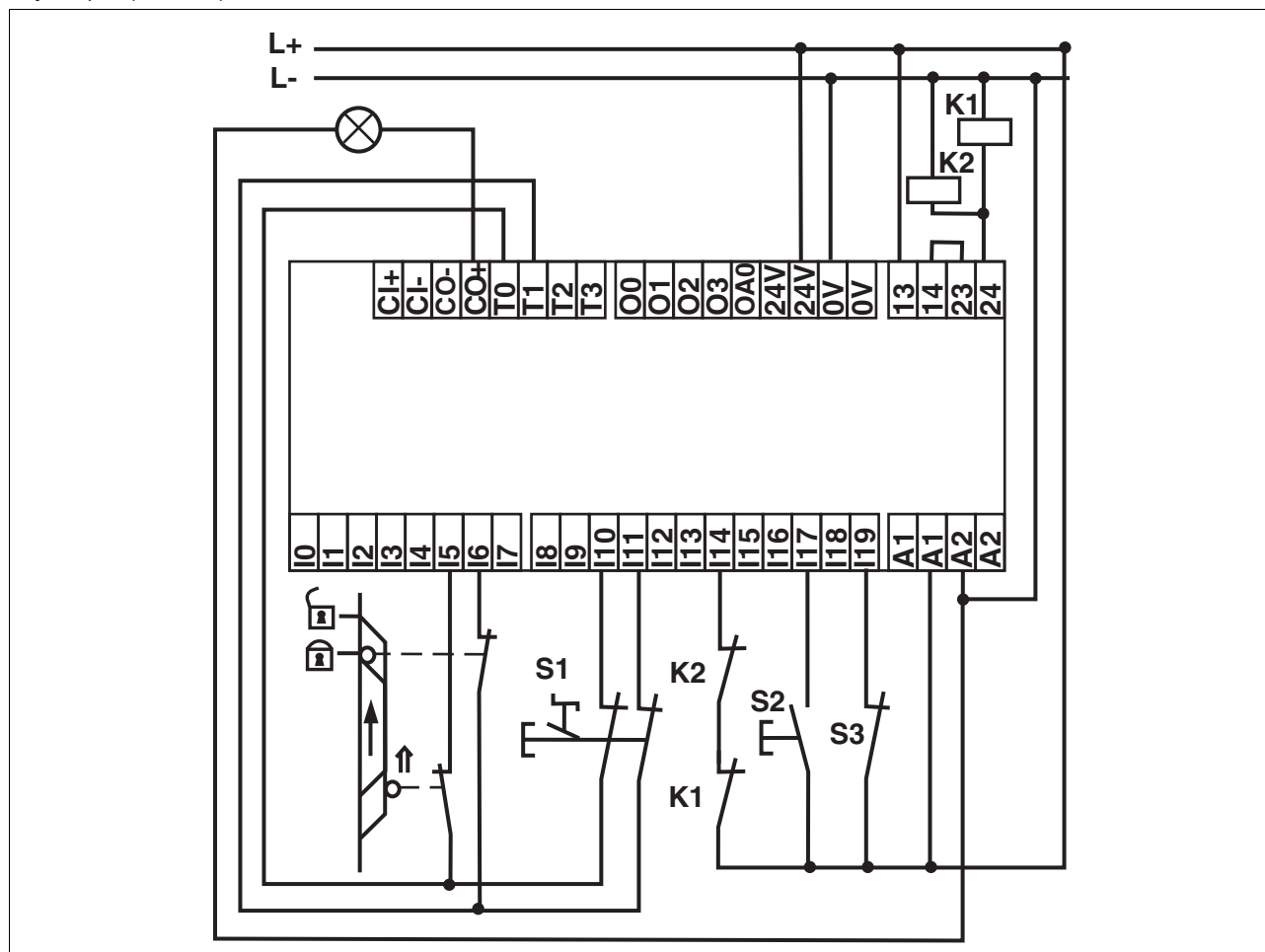
- Connection examples for feedback loop

Feedback loop	Redundant output
Contacts from external contactors	

Base units PNOZmulti PNOZ m3p (ETH)

Connection example

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

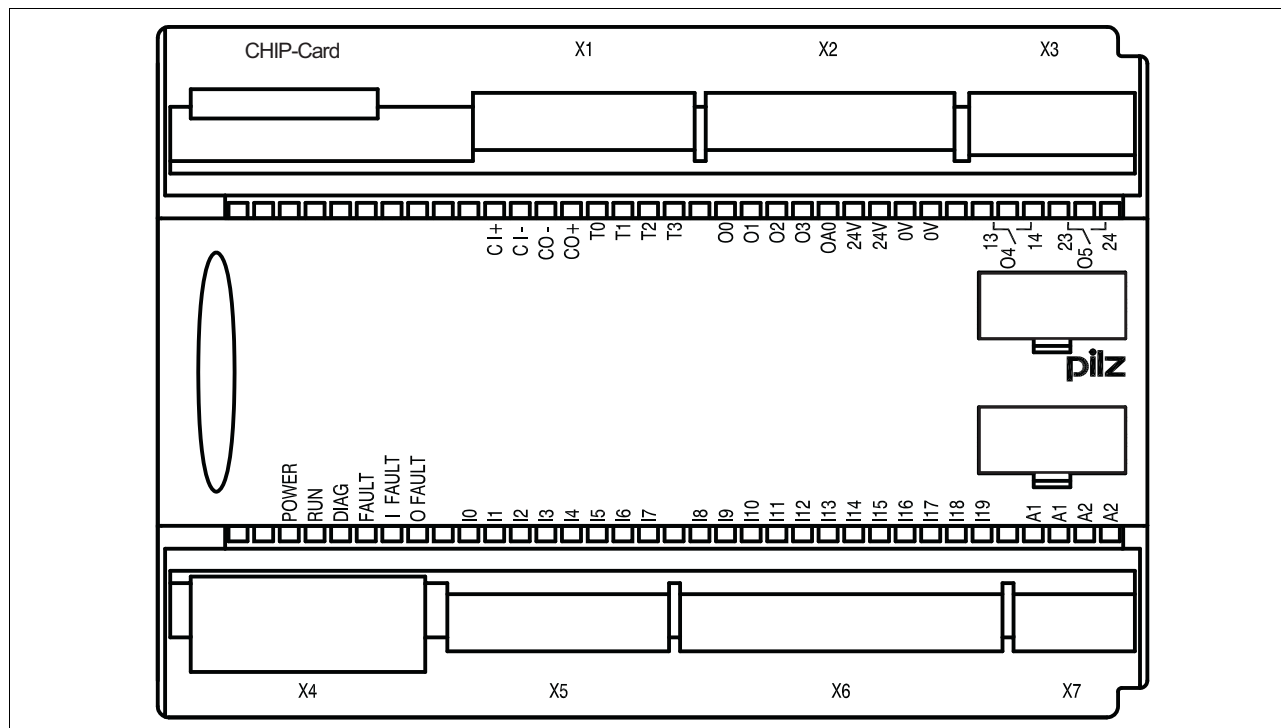


Base units PNOZmulti

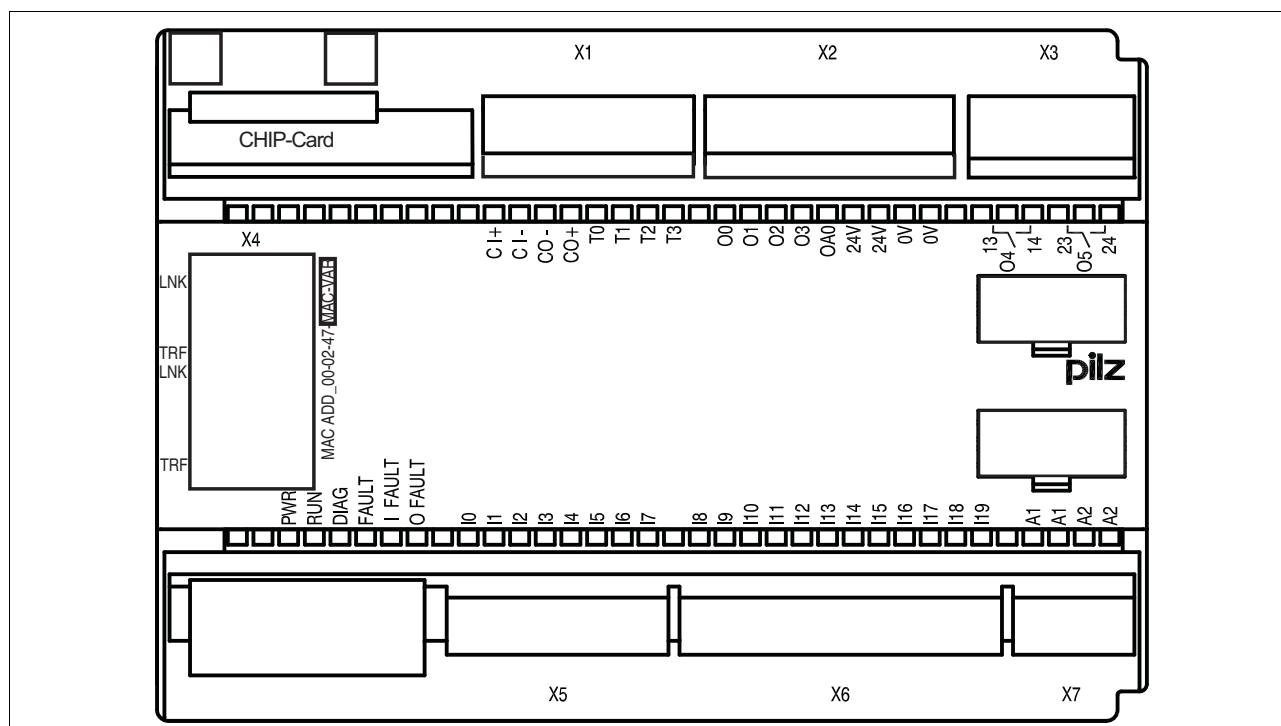
PNOZ m3p (ETH)

Terminal configuration

PNOZ m3p

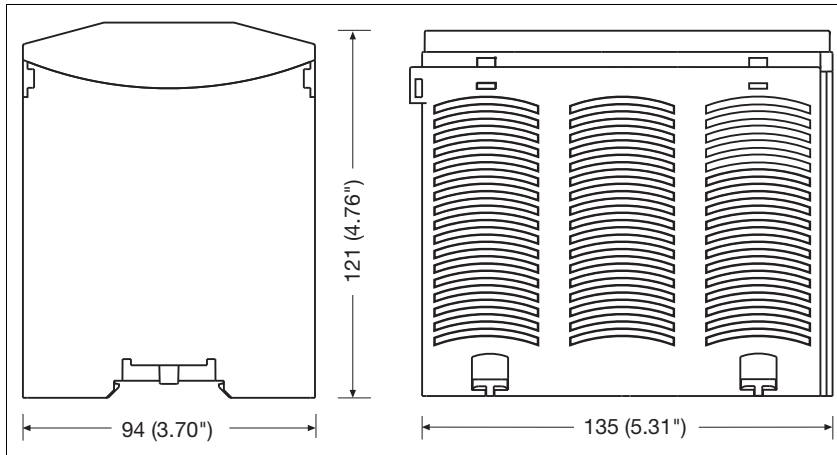


PNOZ m3p ETH



Base units PNOZmulti PNOZ m3p (ETH)

Dimensions



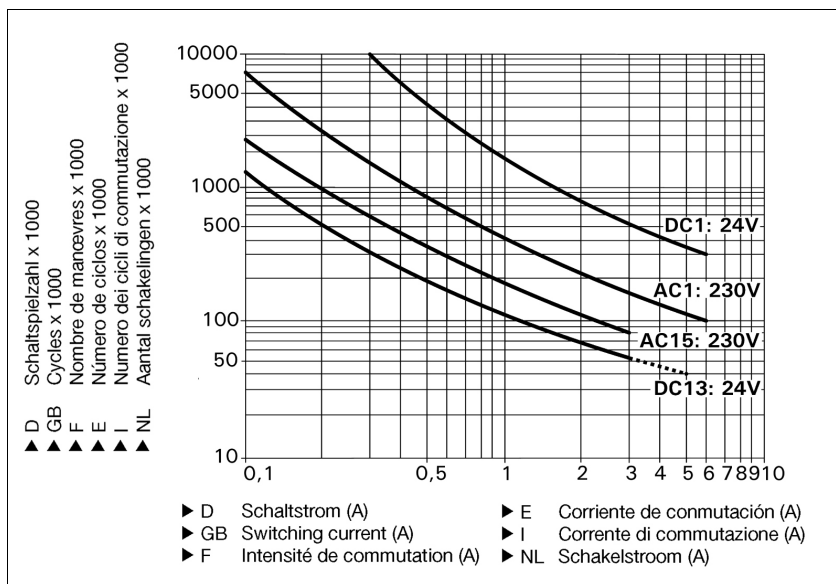
Base units PNOZmulti PNOZ m3p (ETH)

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Service life graph

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



Example

- ▶ Inductive load: 0,2 A
- ▶ Utilisation category: AC15
- ▶ Contact service life: 1,000,000 cycles

Provided the application requires fewer than 1,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

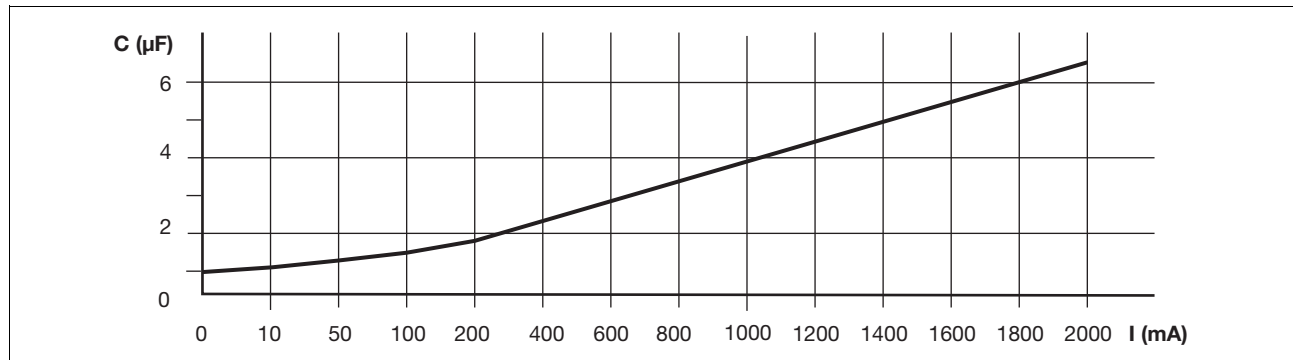
To increase the service life, sufficient spark suppression must be provided on all output contacts. With capacitive loads, any power surges that occur must be noted. With contactors, use freewheel diodes for spark suppression.

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

Base units PNOZmulti

PNOZ m3p (ETH)

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



Base units PNOZmulti PNOZ m3p (ETH)

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 No. 773125 9.0 W No. 773126
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")	$U_B > 26.4 \text{ V} : 15, U_B \leq 26.4 \text{ V} : 20$
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
Maximum input delay	4 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	24 V
current	2 A
power	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 at 2 A
Relay outputs	
Number	2
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	6.0 A, 1440 VA
Safety contacts: DC1 at 24 V	6.0 A, 144 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	3.0 A, 690 W
Safety contacts: DC13 at 24 V (6 cycles/min)	3.0 A, 72 W

Base units PNOZmulti PNOZ m3p (ETH)

Relay outputs	
Airgap creepage between relay contacts	3 mm
relay contacts and other safe circuits	5.5 mm
External contact fuse protection ($I_K = 1 \text{ kA}$) to EN 60947-5-1	
Blow-out fuse, quick	6 A
Blow-out fuse, slow	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	6 A
Switch-off delay	50 ms
Auxiliary outputs	
Number	1
Switching capability	
voltage	24 V
current	0.50 A
power	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 at 0.5 A
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	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	250 V
Rated impulse withstand voltage	6.00 kV
Shock stress	
EN 60068-2-27	15g 11 ms
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	1.0 km
Sum of individual cable runs at the test pulse output	40 km

Base units PNOZmulti

PNOZ m3p (ETH)

Mechanical data	
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 mm ² , 22 - 14 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 0.75 mm ² , 22 - 20 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 0.75 mm ² , 22 - 20 AWG
Relay outputs:	
1 core flexible	0.5 - 2.5 mm ² , 22 - 12 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 1.25 mm ² , 22 - 16 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 1.25 mm ² , 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 mm ² , 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	499 g No. 773125
	518 g No. 773126

No. stands for order number.

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 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 beam device	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
cascading inputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	3.10E-10	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
cascading outputs		PL e (Cat. 4)	Cat. 4	SIL CL 3	4.91E-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

Base units PNOZmulti

PNOZ m3p (ETH)

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.

If the service life graphs are not accessible, the stated PFH value can be

used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

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

INFORMATION

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

The standards current on **2010-10** apply.

Order reference

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

Order reference: Accessories

Product Type	Features	Order no.
Set spring terminals	1 set of spring-loaded terminals	783 100
Set screw terminals	1 set of screw terminals	793 100

Order reference: Terminator, jumper

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



Expansion modules PNOZmulti

Expansion modules PNOZmulti





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Expansion modules PNOZmulti PNOZ ma1p



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

Approvals

	PNOZ ma1p
	◆
	◆
	◆
	◆

Unit features

- ▶ 2 safe analogue inputs for current or voltage measurement
- ▶ Each input can be configured separately
- ▶ Voltage range: -10,24 ... +10.2375 V
- ▶ Current range: 0 ... 25.59 mA
- ▶ Resolution
 - Voltage measurement: 13 Bit (signed 12 Bit)
 - Current measurement: 12 Bit
- ▶ Range monitoring to monitor for wiring errors or errors in the sensor (4 range limits can be configured)
- ▶ Threshold value monitoring to monitor process variables (8 threshold values can be configured)
- ▶ Max. 4 PNOZ ma1p units can be connected to the base unit
- ▶ Exact analogue value can be passed to a fieldbus for diagnostic purposes
- ▶ LEDs for
 - Operating state
 - State of the input signals (Ch0, Ch1)
 - Error
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- ▶ Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected
- ▶ Coated version: Increased environmental requirements

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 configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

The coated version of the product **PNOZ ma1p** is suitable for use where there are increased environmental requirements (see Technical Details).

System requirements

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

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 analogue input module can be used for applications up to SIL3.

For applications in accordance with SIL2 or SIL3, input devices must be attached that are certified for SIL2 in accordance with IEC 61508. The output signal of the input device must be monitored, i.e. actual and set value must be compared with one another. In the event of a deviation, a reaction must occur that the PNOZmulti recognises and to which it reacts.

▶ 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.

Expansion modules PNOZmulti PNOZ ma1p

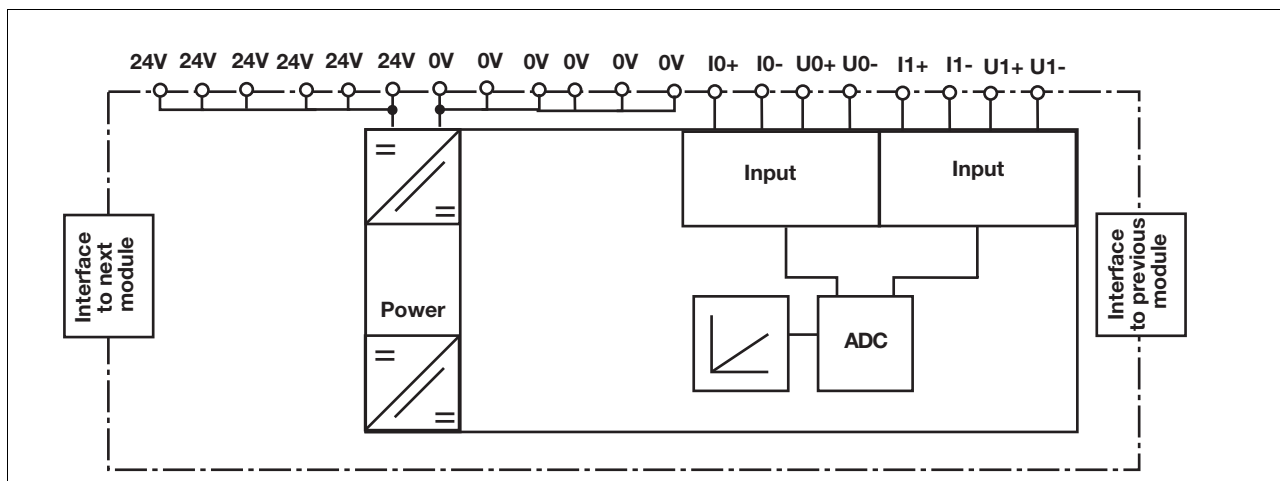
► SIL3 applications:

If the analogue input module is to be used for SIL3 applications, both inputs must be configured. They

will then be combined to form a SIL3 input. To do this, connect a suitable encoder 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.

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.

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

► Range monitoring

With range monitoring you can define the permitted value range. You can define up to 4 range limits (e.g. < 3 mA monitored for open circuit; I > 21 mA monitored for 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.

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.

INFORMATION

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

Expansion modules PNOZmulti PNOZ ma1p

Wiring

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

Note:

- ▶ Information given in the "Technical details" must be followed.
- ▶ The power supply that feeds the expansion module and the input devices 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 encoder can be supplied.
- ▶ Use shielded, twisted pair cable for the connections on the input current circuits.
- ▶ Separate the supply voltage cable from the analogue input current lines.
- ▶ If the analogue input module is used to measure current, the voltage inputs must be short-circuited.

- ▶ **For transducers located outside the control cabinet:** Where the cable enters the control cabinet, the cable shield **must** be connected to the earth potential over a wide surface area and with low impedance (connect in star).

NOTICE

If the analogue input module is used to measure voltage, both inputs must be wired.

Preparing for operation

- ▶ Connection to transducer (SIL2 or SIL3)

2.3

Example for current measurement	
SIL2 application	
SIL3 application	

Please note:

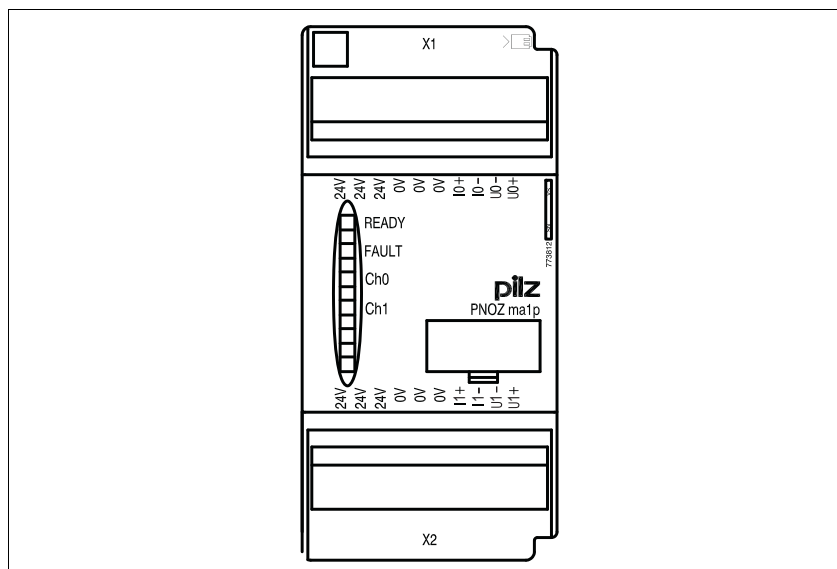
- ▶ The transducers are SIL2 certified
- ▶ The voltage supply to the input device is optional
- ▶ With current measurement, the voltage inputs U+ - U- must be short-circuited.

Expansion modules PNOZmulti PNOZ ma1p

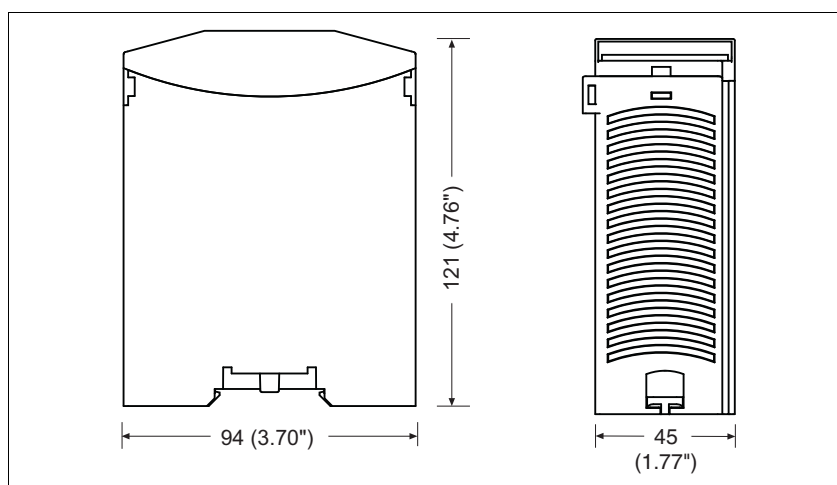
Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ ma1p

Technical details

Electrical data

Supply voltage	
Supply voltage U_B DC	24 V
Voltage tolerance	-15 %/+20 %
Residual ripple DC	5 %

Times

Switch-on delay	5.00 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 case of a potential module error	1.5 %
Max. voltage between the I0 and I1 inputs during current or voltage measurement	30 V
Analogue input filter	first order, RC filter
Cutoff frequency	80 Hz
Filter time constant	2.0 ms
Galvanic isolation	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 resistance (current input)	100.000 Ohm
Max. continuous current	50 mA

Voltage measurement

Signal range	-10.2400 - 10.2375 V
Value range	-4096 - 4095 d
Resolution	13 Bit (signed 12 Bit)
Value of least significant bit (LSB)	5 mV
Input resistance (voltage input)	290 kOhm
Max. continuous voltage	-30 - 30 V

Environmental data

Ambient temperature	-25 - 60 °C No. 773813 0 - 60 °C No. 773812
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary No. 773813 not permitted No. 773812
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz No. 773812
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms

Expansion modules PNOZmulti 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 multicore or multi-core with crimp connector	0.5 - 1.5 mm ²
Torque setting with screw terminals	0.25 Nm
Spring-loaded terminals: Terminal points per connection	1
Stripping length	9 mm
Dimensions	
Height	94.0 mm
Width	45.0 mm
Depth	121.0 mm
Weight	184 g No. 773812
	190 g No. 773813

No. stands for order number.

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
analogue inputs	single-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	8.71E-09	20
analogue inputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	8.71E-09	20

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

The standards current on **2009-10** apply.

Order reference		
Product type	Features	Order no.
PNOZ ma1p	Expansion module, 2 analogue inputs	773 812
PNOZ ma1p coated version	Expansion module, 2 analogue inputs, coated version	773 813

Order reference: Accessories		
Product type	Features	Order no.
Set spring terminals	1 set of spring-loaded terminals	783 700
Set screw terminals	1 set of screw terminals	793 700

Expansion modules PNOZmulti PNOZ ma1p

Order reference: Connectors

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





Expansion modules PNOZmulti

PNOZ mi1p



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

Approvals

	PNOZ mi1p
	◆
	◆
	◆
	◆

Unit features

- ▶ 8 inputs for connecting:
 - E-STOP pushbuttons
 - Two-hand pushbuttons
 - Safety gate limit switches
 - Reset buttons
 - Light beam devices
 - Scanners
 - Enabling switches
 - PSEN
 - Operating mode selector switches
- ▶ Can be configured in the PNOZmulti Configurator
- ▶ LED for:
 - Status of PNOZmulti
- ▶ Max. 8 PNOZ mi1p units can be connected to the base unit
- ▶ Monitors shorts across the inputs through test pulse outputs
- ▶ Plug-in connection terminals (either cage clamp terminal or screw terminal)
- ▶ Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected
- ▶ Coated version: Increased environmental requirements

Unit description

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

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

The coated version of the product **PNOZ mi1p** is suitable for use where there are increased environmental requirements (see Technical Details).

System requirements

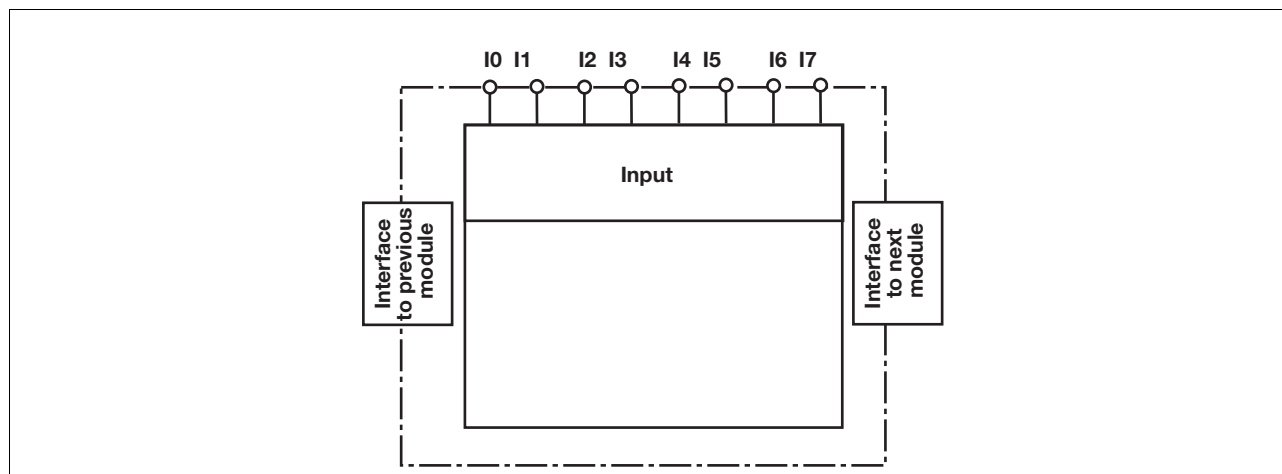
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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 PNOZmulti 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.

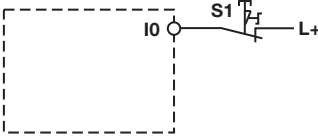
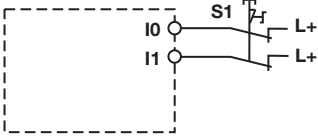
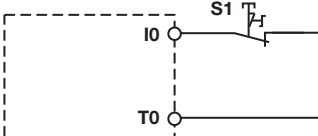
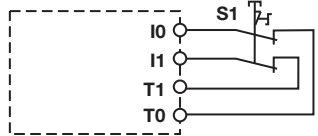
Please note:

- ▶ 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 PNOZmulti PNOZ mi1p

Preparing for operation

► Input circuit

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

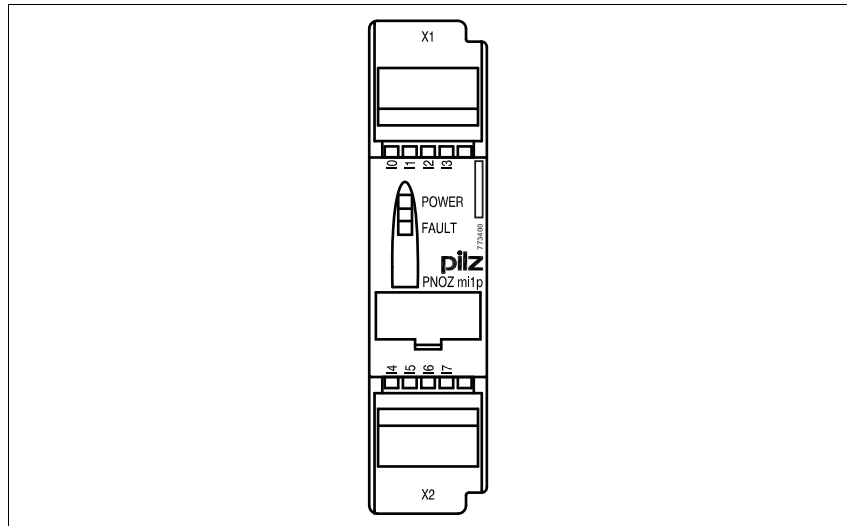
► Key

S1	E-STOP pushbutton
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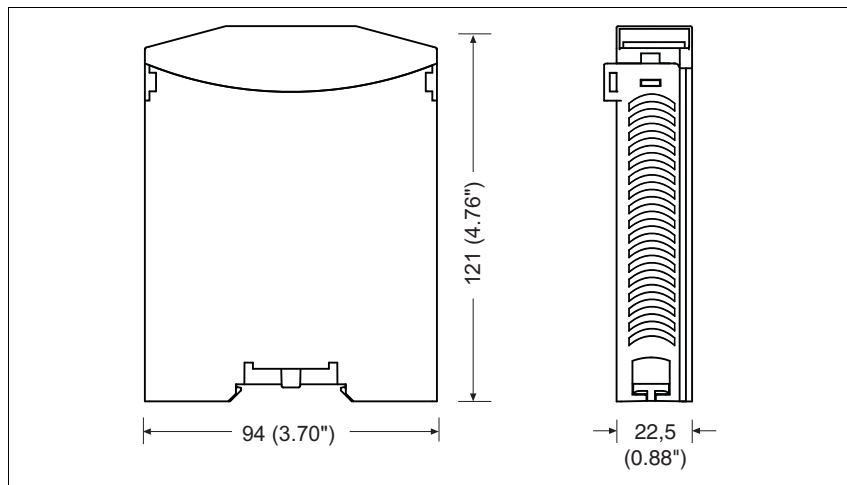
Expansion modules PNOZmulti

PNOZ mi1p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ mi1p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
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	8
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
Maximum input delay	4 ms
Environmental data	
Ambient temperature	-25 - 60 °C No. 773405 0 - 60 °C No. 773400
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary No. 773405 not permitted No. 773400
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz No. 773400 5 - 500 Hz No. 773405
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Corrosive gas check	
SO ₂ : concentration 10 ppm, duration 10 days, passive	DIN V 40046-36 No. 773405
H ₂ S: concentration 1 ppm, duration 10 days, passive	DIN V 40046-37 No. 773405
Shock stress	
EN 60068-2-27	15g 11 ms
Mechanical data	
Protection type	
Mounting (e.g. cabinet)	IP54
Housing	IP20
Terminals	IP20

Expansion modules PNOZmulti PNOZ mi1p

Mechanical data

DIN rail	
Top hat rail	35 x 7.5 EN 50022
Recess width	27 mm
Maximum cable runs per input	1.0 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 mm ² , 22 - 14 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 0.75 mm ² , 22 - 20 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 0.75 mm ² , 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 mm ² , 26 - 14 AWG
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	120 g No. 773400 123 g No. 773405

No. stands for order number.

The standards current on **2008-03** apply.

Order reference

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

Order reference: Accessories

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

Expansion modules PNOZmulti PNOZ mi1p

Order reference: Connectors

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

Expansion modules PNOZmulti

PNOZ mi2p



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

Unit features

- ▶ 8 inputs for standard functions
- ▶ Can be configured in the PNOZmulti Configurator
- ▶ LED for:
 - Status of PNOZmulti
- ▶ Max. 8 PNOZ mi1p units can be connected to the base unit
- ▶ Plug-in connection terminals (either cage clamp terminal or screw terminal)
- ▶ Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected

Unit description

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

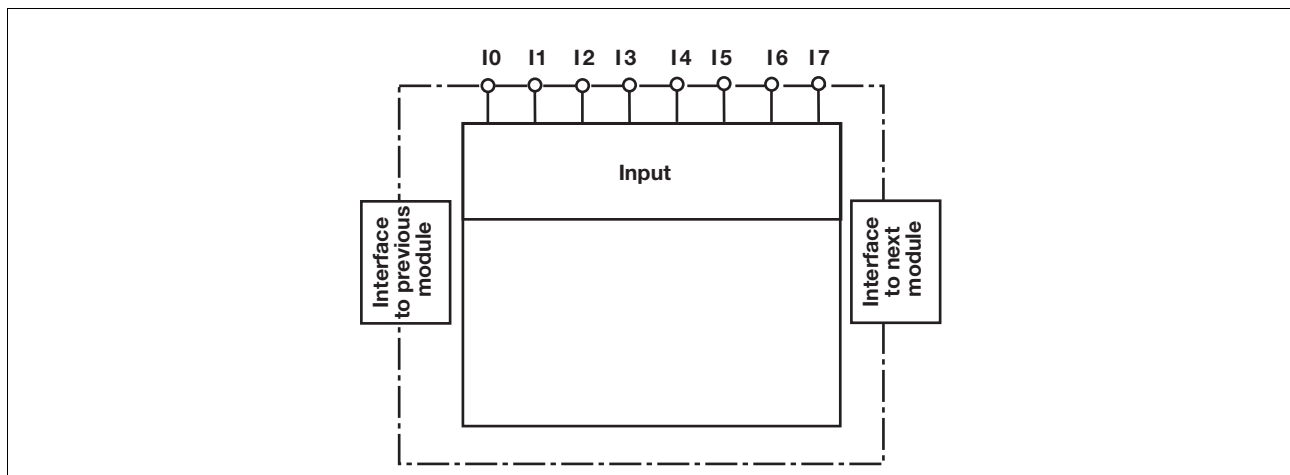
- ▶ E-STOP equipment
- ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The expansion module may only be connected to a base unit from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected) The expansion module may not be used for safety-related functions.

System requirements

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

Block diagram



Expansion modules PNOZmulti 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 out-

puts 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

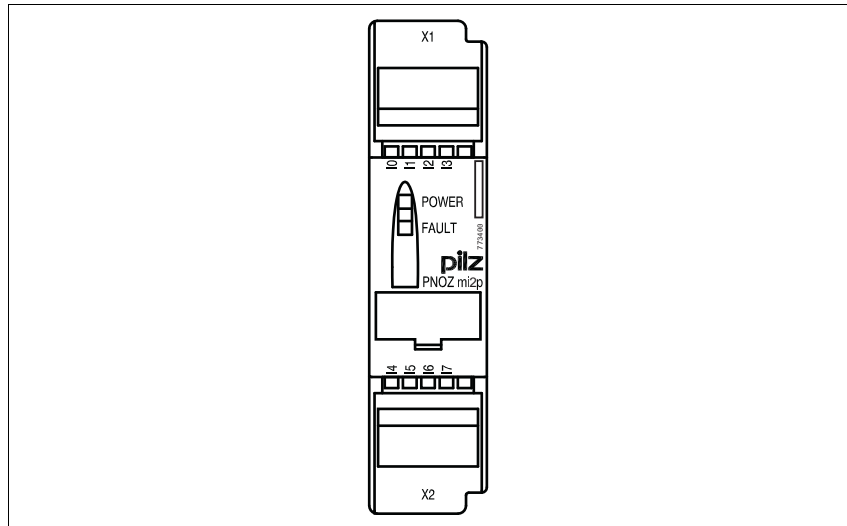
- Input circuit

Input circuit	Contact	Semiconductor
Non-safety-related		

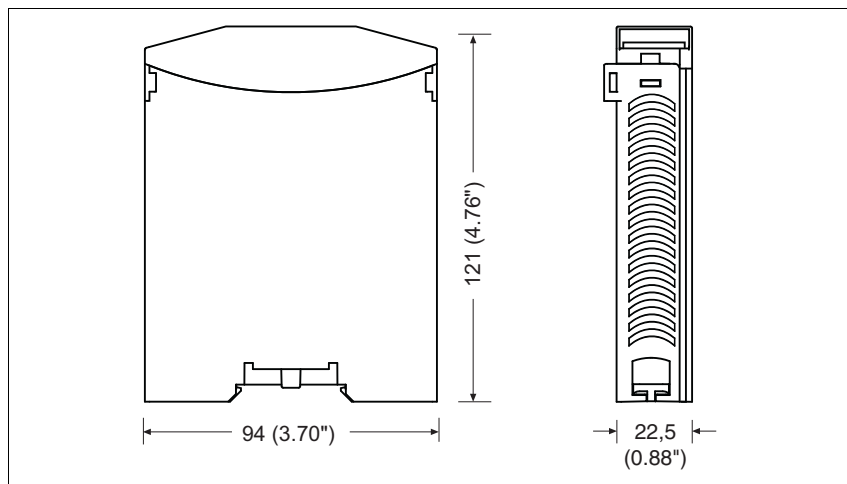
Expansion modules PNOZmulti

PNOZ mi2p

Terminal configuration



Dimensions



Expansion modules PNOZmulti PNOZ mi2p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
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	8
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
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g
	11 ms
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	1.0 km
Housing material	
Housing	PPO UL 94 V0
Front	ABS UL 94 V0

Expansion modules PNOZmulti PNOZ mi2p

Mechanical data

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

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

Stripping length

9 mm

Dimensions

Height

94.0 mm

Width

22.5 mm

Depth

121.0 mm

Weight

119 g

The standards current on **2008-03** apply.

Order reference

Product type	Features	Order no.
PNOZ mi2p	8 standard inputs	773 410

Order reference: Accessories

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

Order reference: Terminator, jumper

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





Expansion modules PNOZmulti

PNOZ mo1p



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

Approvals

	PNOZ mo1p
	◆
	◆
	◆
	◆

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
- ▶ Coated version: Increased environmental requirements

Unit description

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

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

The coated version of the product **PNOZ mo1p** is suitable for use where there are increased environmental requirements (see Technical Details).

System requirements

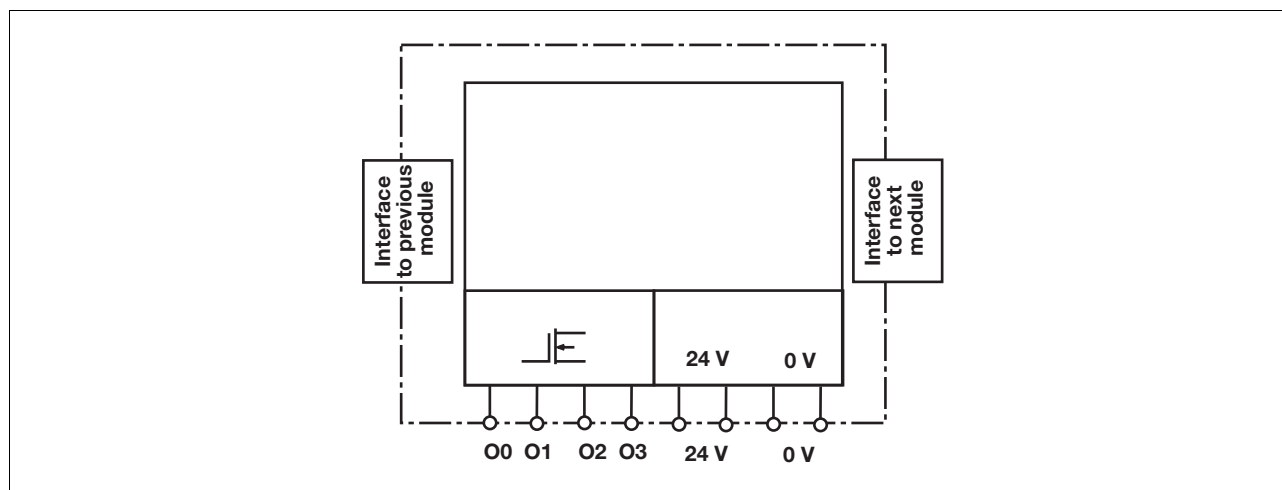
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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



Expansion modules PNOZmulti 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 PNOZmulti PNOZ mo1p

Preparing for operation

► Supply voltage

Supply voltage	AC	DC

► Semiconductor outputs

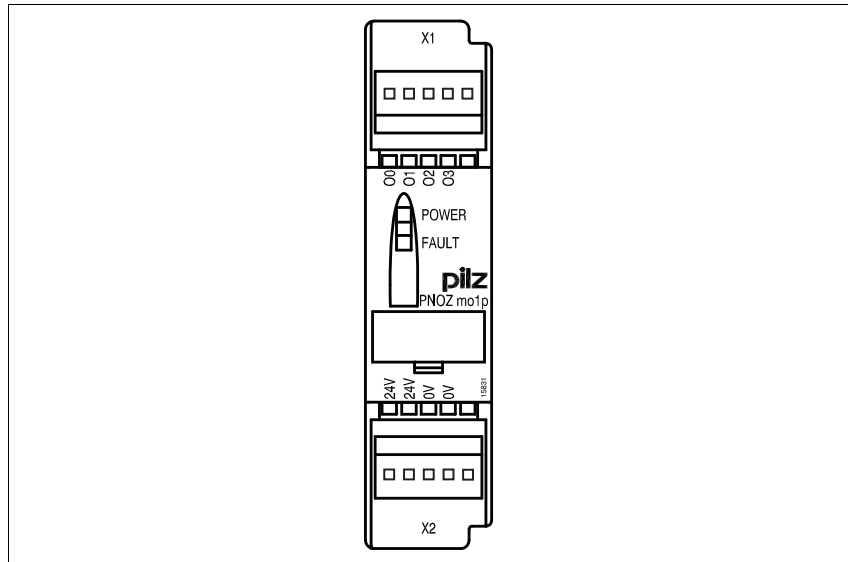
Redundant output		
Single output		

► Feedback loop

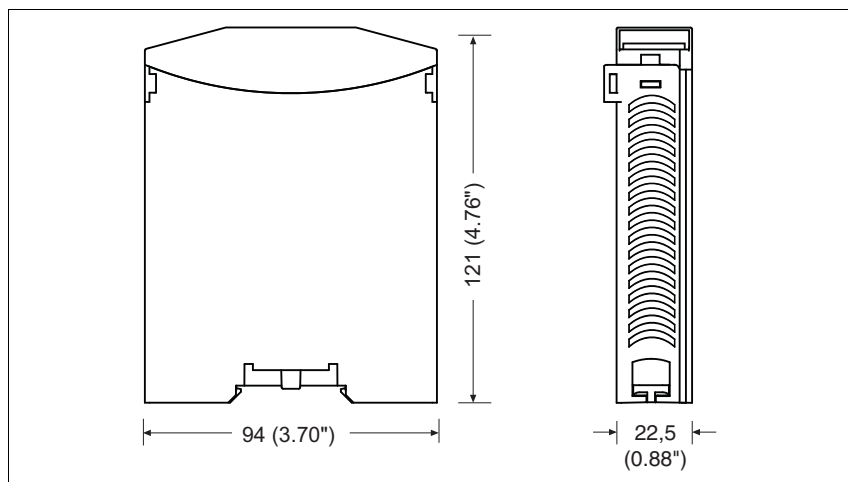
Feedback loop	Redundant output
Contacts from external contactors	

Expansion modules PNOZmulti

Terminal configuration



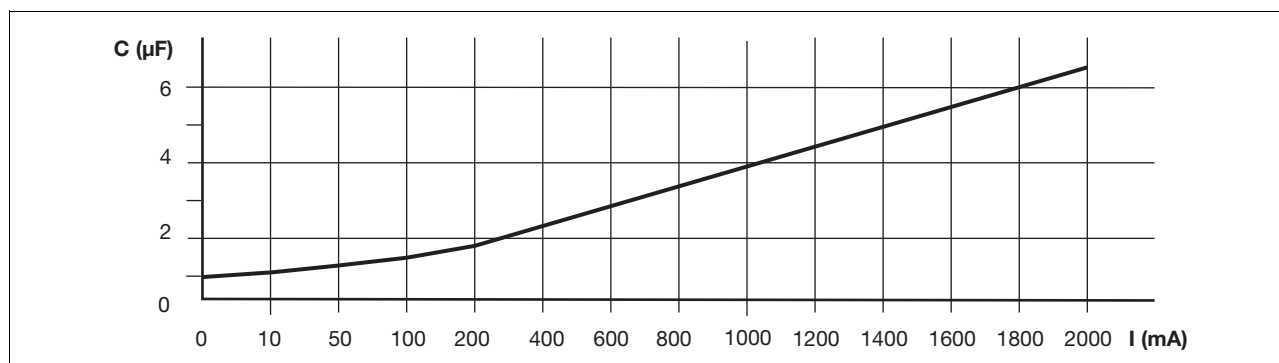
Dimensions



Expansion modules PNOZmulti

PNOZ mo1p

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



Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

2.3

Technical details

Electrical data

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED

Times

Switch-on delay	5.00 s
Supply interruption before de-energisation	20 ms

Semiconductor outputs

Number	4
Switching capability	
voltage	24 V
current	2 A
power	48 W
Derating of coated version at an ambient temperature > 50 °C	
Voltage	24 V No. 773505
Current	1 A No. 773505
Power	24 W No. 773505
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 at 2 A

Expansion modules PNOZmulti

PNOZ mo1p

Environmental data	
Ambient temperature	-25 - 60 °C No. 773505 0 - 60 °C No. 773500
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary No. 773505 not permitted No. 773500
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz No. 773500 5 - 500 Hz No. 773505
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Corrosive gas check	
SO ₂ : concentration 10 ppm, duration 10 days, passive	DIN V 40046-36 No. 773505
H ₂ S: concentration 1 ppm, duration 10 days, passive	DIN V 40046-37 No. 773505
Shock stress	
EN 60068-2-27	15g 11 ms
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	
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
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	22.5 mm
Depth	121.0 mm
Weight	154 g No. 773500 156 g No. 773505

No. stands for order number.

Expansion modules PNOZmulti PNOZ mo1p

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
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

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

The standards current on **2008-03** apply.

Order reference

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

Order reference: Accessories

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

Order reference: Connectors

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





Expansion modules PNOZmulti

PNOZ mo2p



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

Approvals

	PNOZ mo2p
	◆
	◆
	◆
	◆

Unit features

- ▶ Positive-guided relay outputs:
2 safety outputs
Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Status indicators
- ▶ Max. 6 PNOZ mo2p units can be connected to the base unit
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- ▶ Coated version:
Increased environmental requirements

Unit description

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

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ E-STOP equipment

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

The coated version of the product **PNOZ mo2p** is suitable for use where there are increased environmental requirements (see Technical Details).

System requirements

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

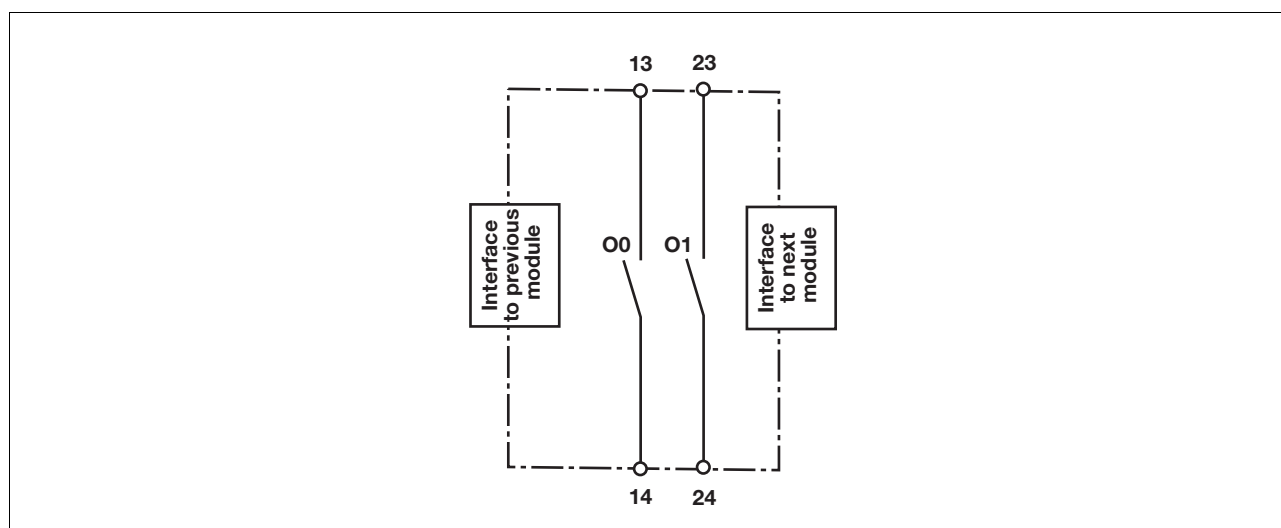
Safety features

- ▶ 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 PNOZmulti 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 PNOZmulti PNOZ mo2p

Preparing for operation

► Relay outputs

Redundant		
Single		

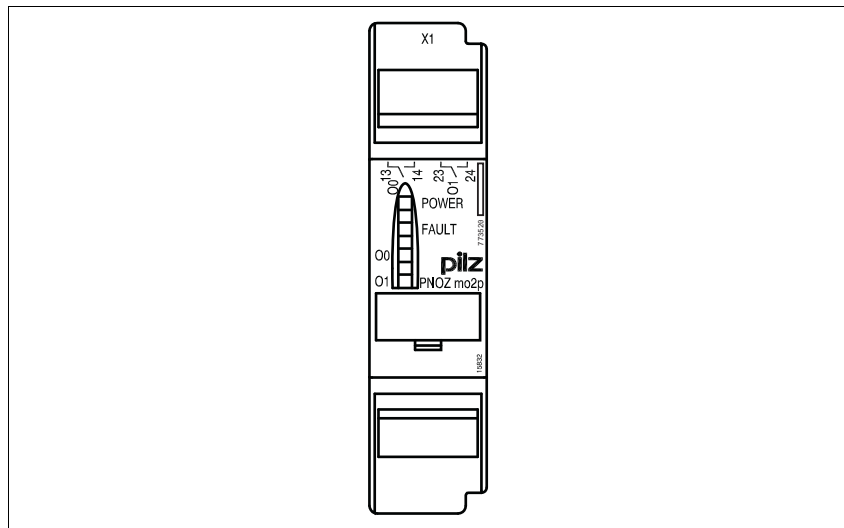
► Feedback loop

Feedback loop	Redundant output		
Contacts from external contactors	<p>The diagram illustrates a feedback loop with redundant output. It features two output channels, O0 and O1, each with two contacts (13, 14 and 23, 24). O0 contacts are connected in parallel to L1. O1 contacts are connected in parallel to N. Both channels are connected to a common load K1 and K2. The diagram also shows a feedback loop connection from the output back to the input (I0, I1) through a switch and L+.</p>	<p>The diagram shows a terminal block with two channels, each with two terminals labeled base.o0. and base.o1. The first channel is connected to L1 and N, and the second channel is connected to L1 and N. The diagram also shows a feedback loop connection from the output back to the input (I0, I1) through a switch and L+.</p>	<p>The diagram shows a terminal block with two channels, each with two terminals labeled base.o0. and base.o1. The first channel is connected to L1 and N, and the second channel is connected to L1 and N. The diagram also shows a feedback loop connection from the output back to the input (I0, I1) through a switch and L+.</p>

Expansion modules PNOZmulti

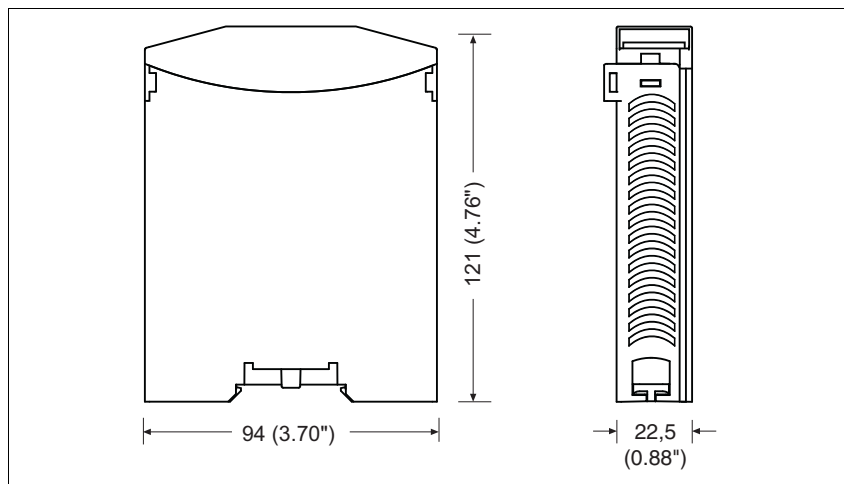
PNOZ mo2p

Terminal configuration



2.3

Dimensions



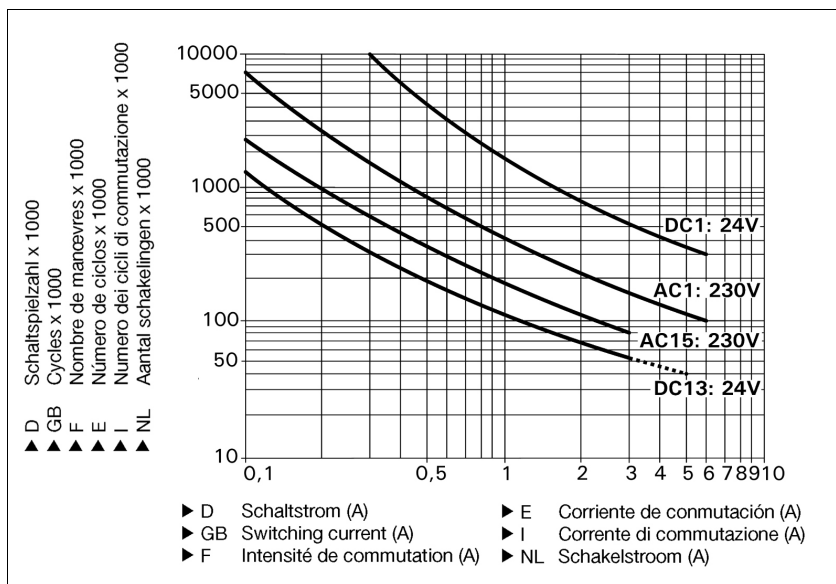
Expansion modules PNOZmulti PNOZ mo2p

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Service life graph

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



Example

- ▶ Inductive load: 0,2 A
- ▶ Utilisation category: AC15
- ▶ Contact service life: 1,000,000 cycles

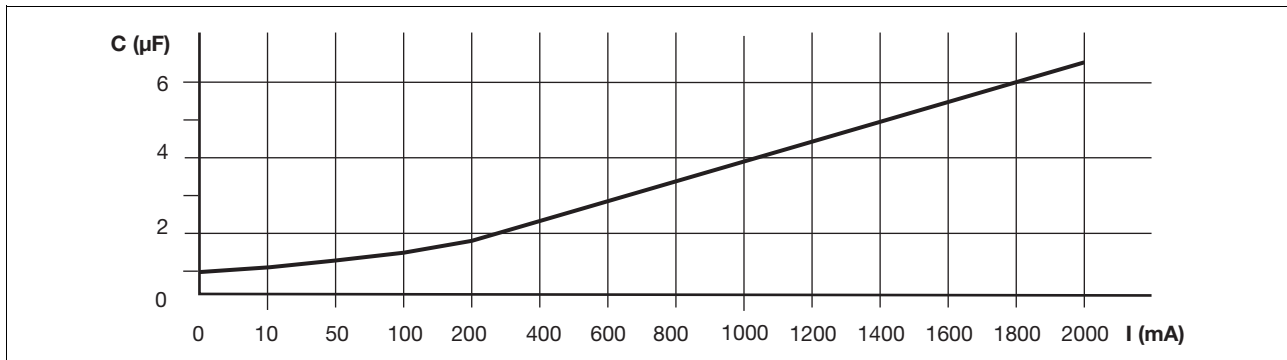
Provided the application requires fewer than 1,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

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

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

Expansion modules PNOZmulti PNOZ mo2p

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



Expansion modules PNOZmulti

PNOZ mo2p

Technical details

Electrical data

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED

Times

Switch-on delay	5.00 s
Supply interruption before de-energisation	20 ms

Relay outputs

Number	2
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	6.0 A, 1440 VA
Safety contacts: DC1 at 24 V	6.0 A, 144 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	3.0 A, 690 W
Safety contacts: DC13 at 24 V (6 cycles/min)	3.0 A, 72 W
Derating of coated version at an ambient temperature > 50 °C	
Safety contacts: AC1 at 240 V	4 A No. 773525, 960 W No. 773525
Safety contacts: DC1 at 24 V	4 A No. 773525, 96 W No. 773525
Utilisation category in accordance with EN 60947-5-1	

Airgap creepage between relay contacts	3 mm
relay contacts and other safe circuits	5.5 mm

External contact fuse protection ($I_k = 1 \text{ kA}$) to **EN 60947-5-1**

Blow-out fuse, quick	6 A
Blow-out fuse, slow	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	6 A
Switch-off delay	50 ms

Environmental data

Ambient temperature	-25 - 60 °C No. 773525 0 - 60 °C No. 773520
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Storage temperature **-25 - 70 °C**

Climatic suitability in accordance with **EN 60068-2-30, EN 60068-2-78** **93 % r. h. at 40 °C**

Condensation **temporary (only with protective extra low voltage) No. 773525 not permitted No. 773520**

EMC **EN 61131-2**

Vibration to **EN 60068-2-6**

Frequency	10 - 150 Hz
Max. acceleration	1g

Airgap creepage in accordance with **EN 61131-2**

Overvoltage category	III
Pollution degree	2

Rated insulation voltage **250 V**

Rated impulse withstand voltage **6.00 kV**

Corrosive gas check

SO₂: concentration 10 ppm, duration 10 days, passive **DIN V 40046-36 No. 773525**

H₂S: concentration 1 ppm, duration 10 days, passive **DIN V 40046-37 No. 773525**

Shock stress

EN 60068-2-27	15g 11 ms
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Expansion modules PNOZmulti PNOZ mo2p

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 mm ² , 22 - 12 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 1.25 mm ² , 22 - 16 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 1.25 mm ² , 22 - 16 AWG
Torque setting with screw terminals	0.25 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	151 g No. 773525 170 g No. 773520

No. stands for order number.

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
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

Requirement on 1-channel relay outputs for Cat. 2 in accordance with EN 954-1: An additional output switches to a safe condition in the event of an error or, if that is impossible, signals a hazardous condition.

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

The standards current on **2009-01** apply.

Expansion modules PNOZmulti PNOZ mo2p

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.

If the service life graphs are not accessible, the stated PFH value can be

used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

Order reference

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

Order reference: Accessories

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

Order reference: Connectors

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





Expansion modules PNOZmulti

PNOZ mo3p



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

Approvals

	PNOZ mo3p
	◆
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Semiconductor outputs:
 - 2 dual-pole safety outputs in accordance with 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 configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected). The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

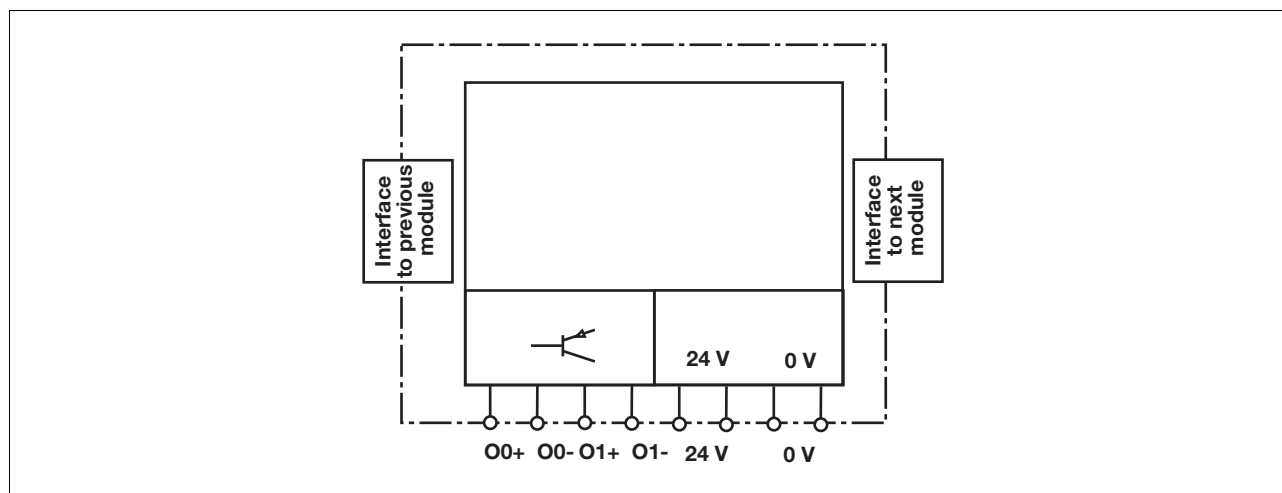
System requirements

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

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



Expansion modules PNOZmulti 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 PNOZmulti PNOZ mo3p

Preparing for operation

► Supply voltage

Supply voltage	AC	DC

► Semiconductor outputs

Redundant output		
Single output		

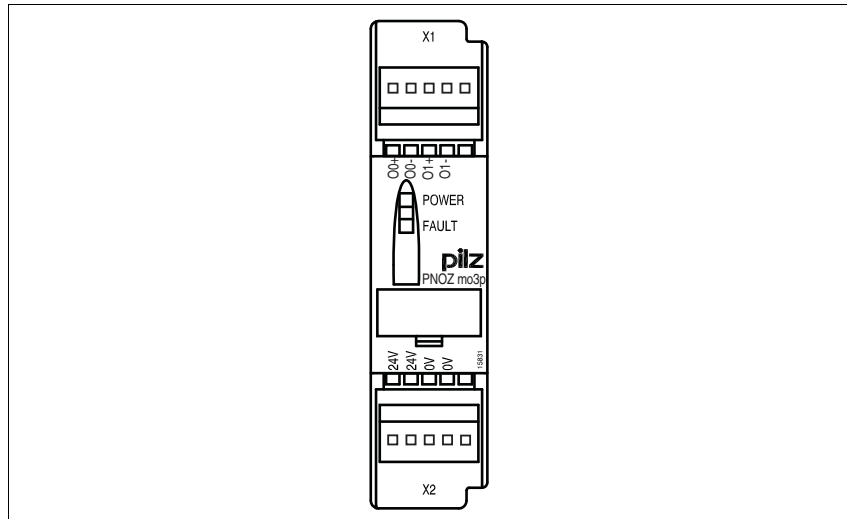
► Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

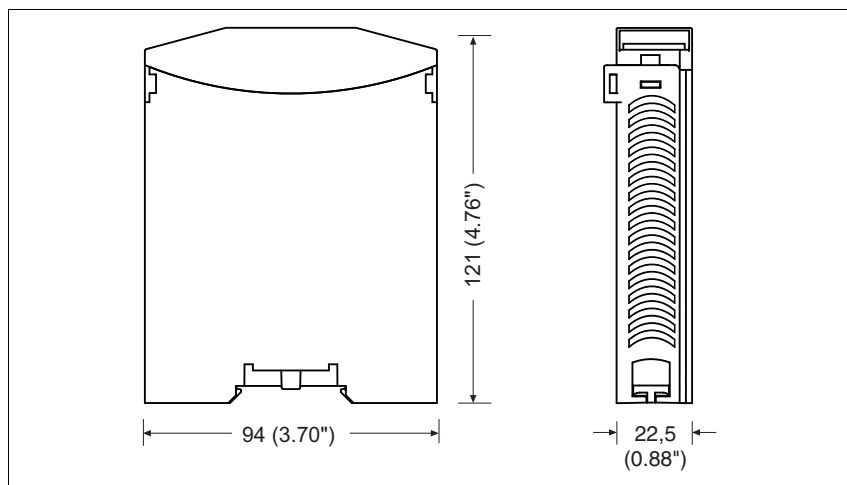
Expansion modules PNOZmulti

PNOZ mo3p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ mo3p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED
Times	
Switch-on delay	5.00 s
Supply interruption before de-energisation	20 ms
Semiconductor outputs, 2-pole	
Number	2
Switching capability	
Voltage	24 V DC
Current	2 A
Power	48 W
Galvanic isolation	yes
short circuit-proof	yes
Switch-off delay	30 ms
Residual current at "0"	0.5 mA
Signal level at "1"	2 A: UB - 0.5 V DC
Open circuit detection from	3.00 kOhm
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Rated impulse withstand voltage	4.00 kV
Shock stress	
EN 60068-2-27	15g 11 ms
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

Expansion modules PNOZmulti PNOZ mo3p

Mechanical data

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**

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 **22.5 mm**

Depth **121.0 mm**

Weight **127 g**

2.3

No. stands for order number.

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
SC outputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	1.74E-09	20

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

The standards current on **2008-03** apply.

Order reference

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

Order reference: Accessories

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

Expansion modules PNOZmulti

PNOZ mo3p

Order reference: Terminator, jumper

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





Expansion modules PNOZmulti

PNOZ mo4p



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

Approvals

	PNOZ mo4p
	◆
	◆
	◆
	◆

Unit features

- ▶ Positive-guided relay outputs:
4 safety outputs
Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Status indicators
- ▶ Max. 6 PNOZ mo4p units can be connected to the base unit
- ▶ Coated version:
Increased environmental requirements

Unit description

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ E-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 configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)

The coated version of the product **PNOZ mo4p** is suitable for use where there are increased environmental requirements (see Technical Details).

System requirements

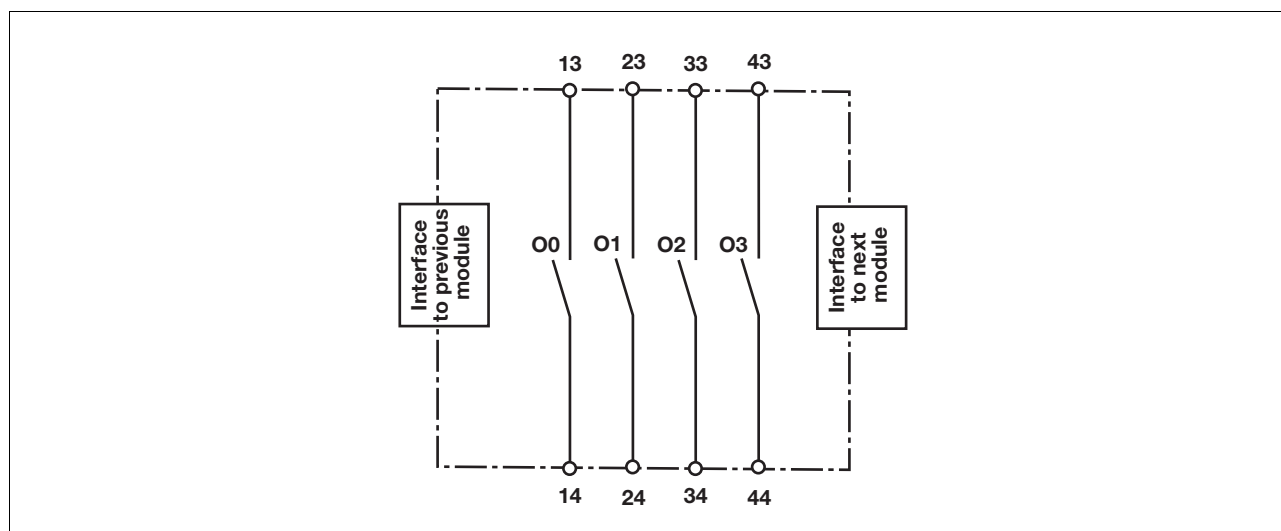
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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



Expansion modules PNOZmulti 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 PNOZmulti

PNOZ mo4p

Preparing for operation

► Relay outputs

Redundant		
Single		

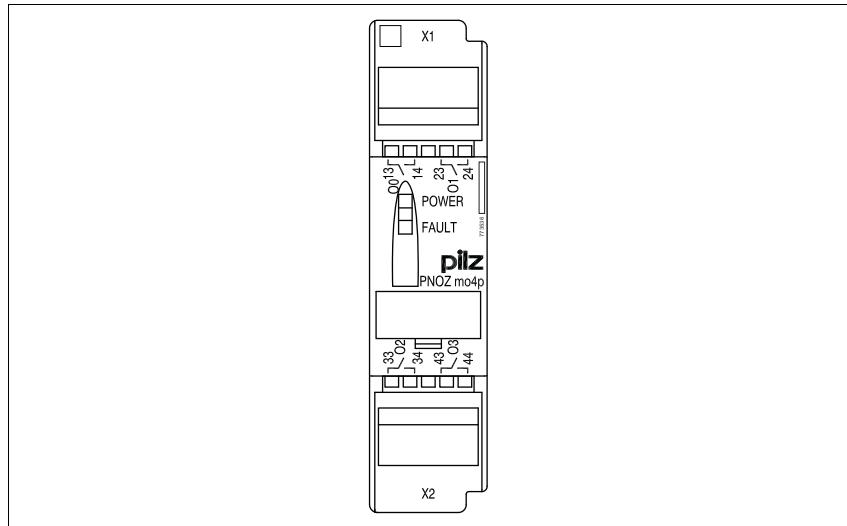
► Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors	<p>The diagram shows a feedback loop (IO) connected to L+ and L1. The output channels O0 (2) and O1 (3) are connected to a common terminal N through two relays, K1 and K2, in parallel.</p>	<p>The diagram shows a terminal block with a feedback loop (IO) connected to L+ and L1. The output channels O0 (2) and O1 (3) are connected to a common terminal N through two relays, K1 and K2, in parallel.</p>

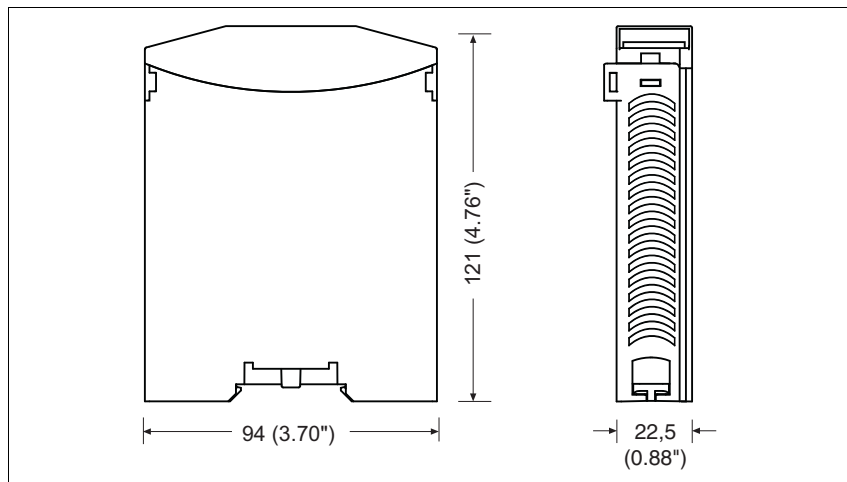
Expansion modules PNOZmulti

PNOZ mo4p

Terminal configuration



Dimensions



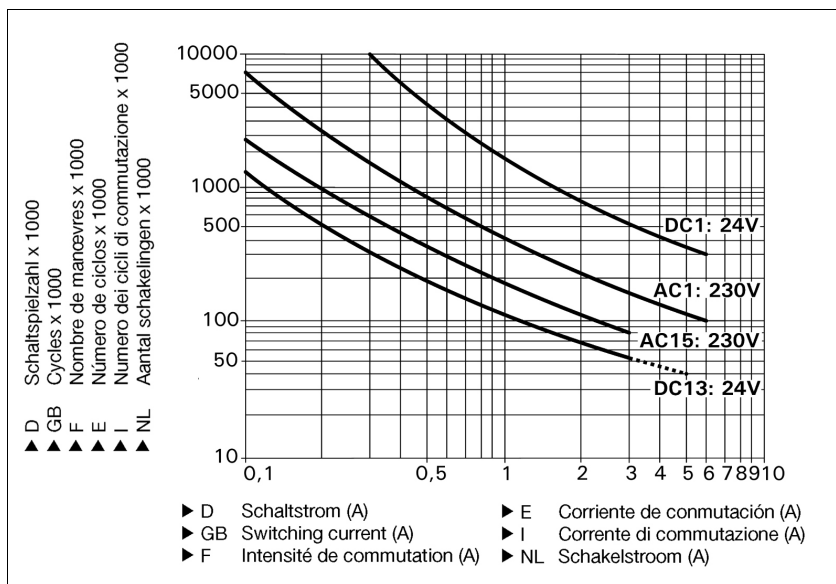
Expansion modules PNOZmulti PNOZ mo4p

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Service life graph

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



Example

- Inductive load: 0,2 A
- Utilisation category: AC15
- Contact service life: 1,000,000 cycles

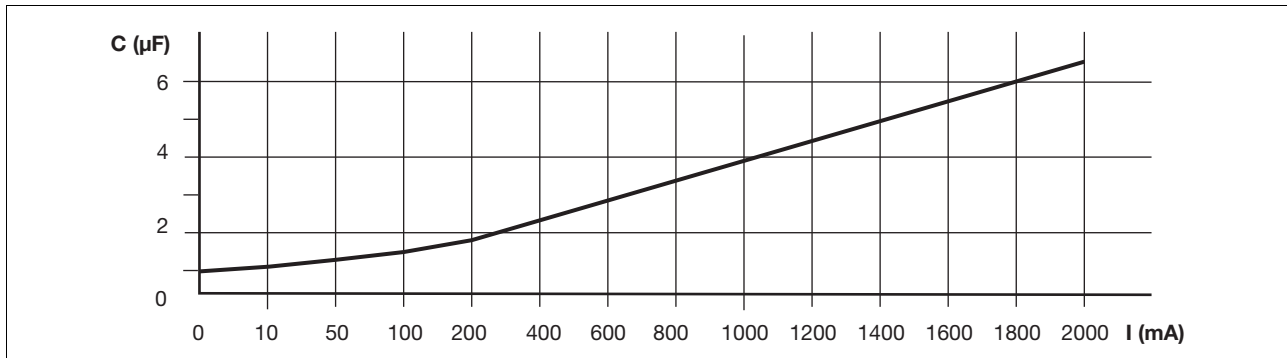
Provided the application requires fewer than 1,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

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

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

Expansion modules PNOZmulti PNOZ mo4p

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



Expansion modules PNOZmulti PNOZ mo4p

Technical details

Electrical data

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED

Times

Switch-on delay	5.00 s
Supply interruption before de-energisation	20 ms

Relay outputs

Number	4
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	6.0 A, 1440 VA
Safety contacts: DC1 at 24 V	6.0 A, 144 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	3.0 A, 690 W
Safety contacts: DC13 at 24 V (6 cycles/min)	3.0 A, 72 W
Derating of coated version at an ambient temperature > 50 °C	
Safety contacts: AC1 at 240 V	2 A No. 773537, 480 W No. 773537
Safety contacts: DC1 at 24 V	2 A No. 773537, 48 W No. 773537
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V No. 773537	2 A No. 773537, 460 W No. 773537
Safety contacts: DC13 at 24 V No. 773537 (6 cycles/min)	2 A No. 773537, 48 W No. 773537
Max. permitted total current of relay outputs at an ambient temperature of > 50 °C	12 A No. 773536
Airgap creepage between relay contacts	3 mm
relay contacts and other safe circuits	5.5 mm
External contact fuse protection ($I_K = 1 \text{ kA}$) to EN 60947-5-1	
Blow-out fuse, quick	6 A
Blow-out fuse, slow	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	6 A
Switch-off delay	50 ms

Environmental data

Ambient temperature	-25 - 60 °C No. 773537 0 - 60 °C No. 773536
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary (only with protective extra low voltage) No. 773537 not permitted No. 773536
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz No. 773536 5 - 500 Hz No. 773537
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	250 V
Rated impulse withstand voltage	6.00 kV

Expansion modules PNOZmulti PNOZ mo4p

Environmental data	
Corrosive gas check	
SO ₂ : concentration 10 ppm, duration 10 days, passive	DIN V 40046-36 No. 773537
H ₂ S: concentration 1 ppm, duration 10 days, passive	DIN V 40046-37 No. 773537
Shock stress	
EN 60068-2-27	15g 11 ms
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 mm ² , 22 - 12 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 1.25 mm ² , 22 - 16 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 1.25 mm ² , 22 - 16 AWG
Torque setting with screw terminals	0.25 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	204 g No. 773536 215 g No. 773537

No. stands for order number.

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
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

Requirement on 1-channel relay outputs for Cat. 2 in accordance with EN 954-1: An additional output switches to a safe condition in the event of an error or, if that is impossible, signals a hazardous condition.

Expansion modules PNOZmulti PNOZ mo4p

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

The standards current on **2009-01** apply.

It is essential to consider the relay's service life graphs. The relay outputs' safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.
If the service life graphs are not accessible, the stated PFH value can be

used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

Order reference

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

Order reference: Accessories

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

Order reference: Connectors

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





Expansion modules PNOZmulti

PNOZ mo5p



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

Approvals

	PNOZ mo5p
	◆
	◆
	◆
	◆

Unit features

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

Unit description

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

The coated version of the product **PNOZ mo5p** is suitable for use where there are increased environmental requirements (see Technical Details).

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

The relay outputs are diverse in design and so are also suitable for controlling safety valves on a burner in accordance with EN 50156.

System requirements

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

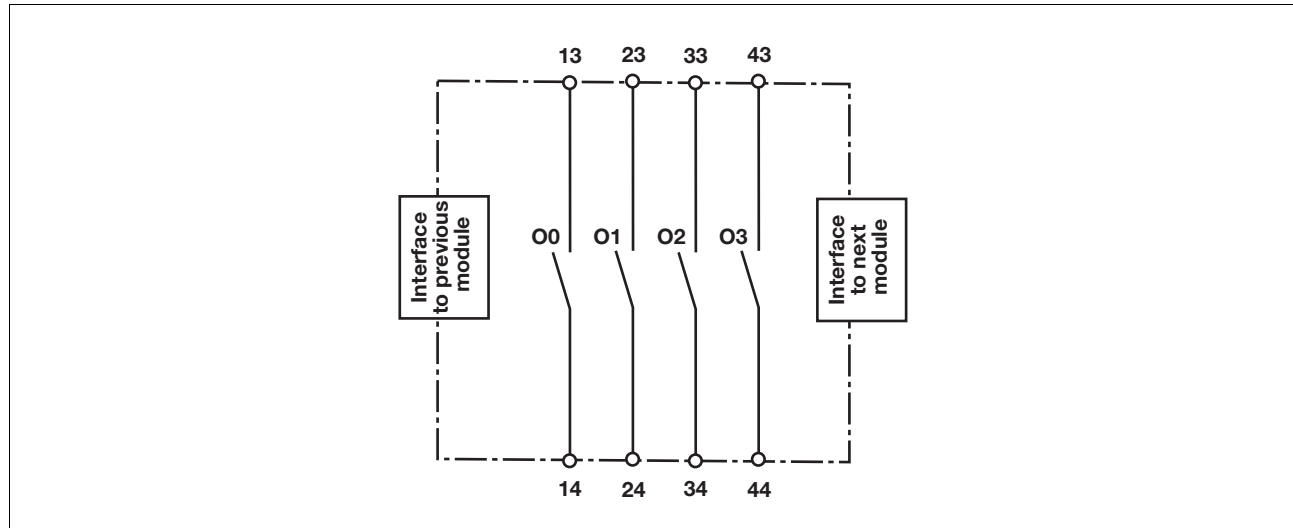
Safety features

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 relays are diverse in design.

Expansion modules PNOZmulti PNOZ mo5p

Block diagram



Expansion modules PNOZmulti 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 PNOZmulti PNOZ mo5p

Preparing for operation

► Relay outputs

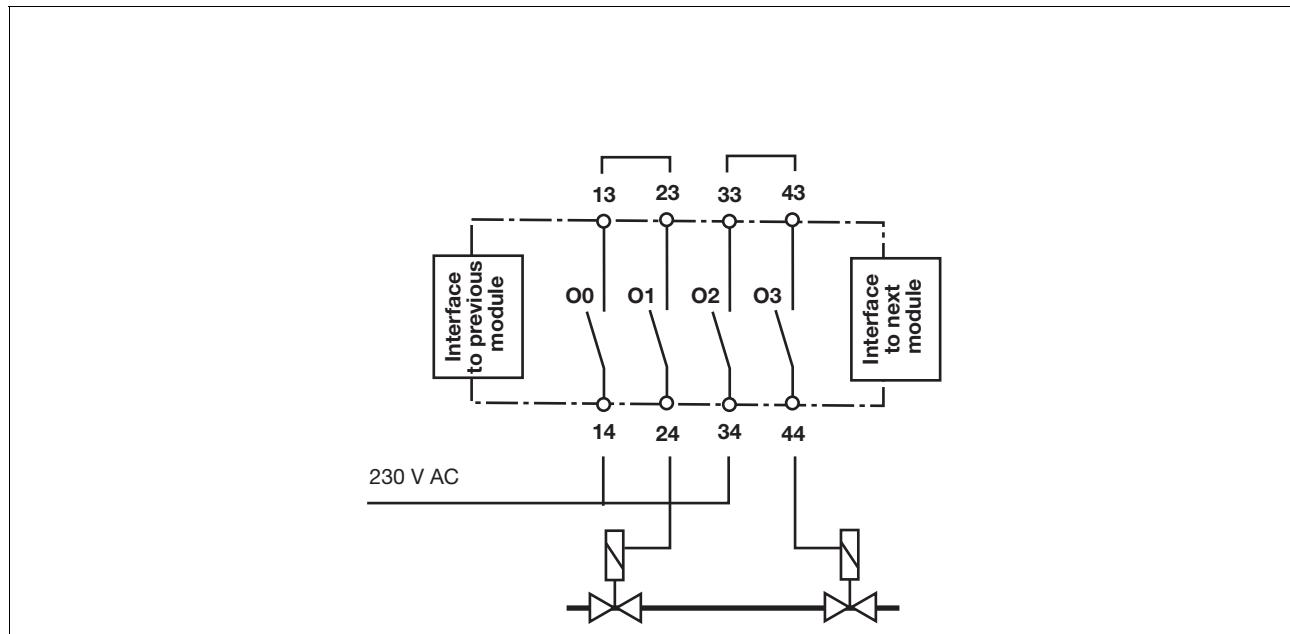
Redundant		
Single		

► Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

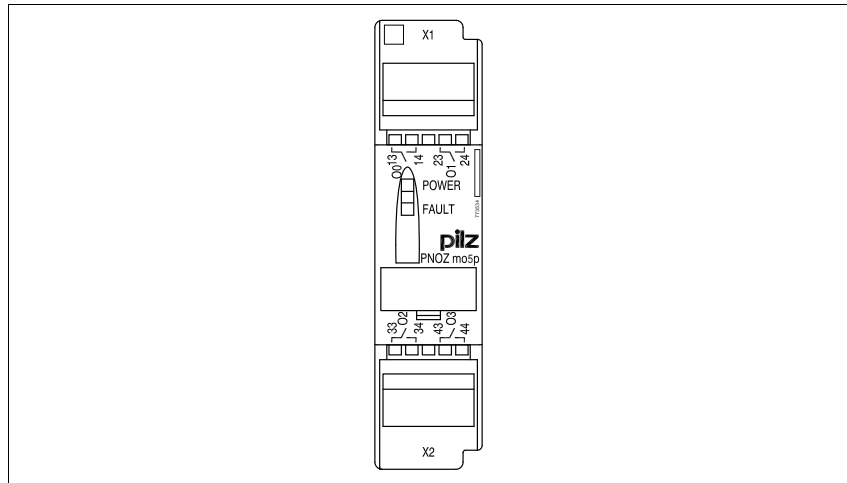
Expansion modules PNOZmulti PNOZ mo5p

- Connection for safety valves on a burner in accordance with EN 50156

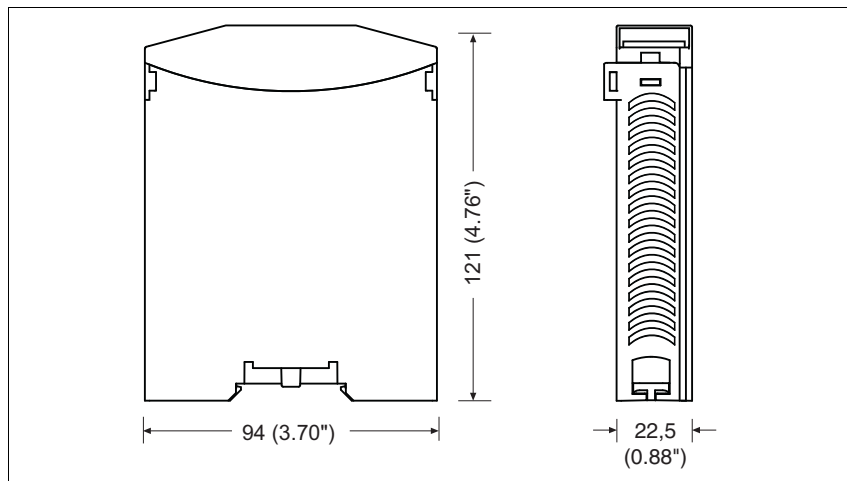


Expansion modules PNOZmulti PNOZ mo5p

Terminal configuration



Dimensions



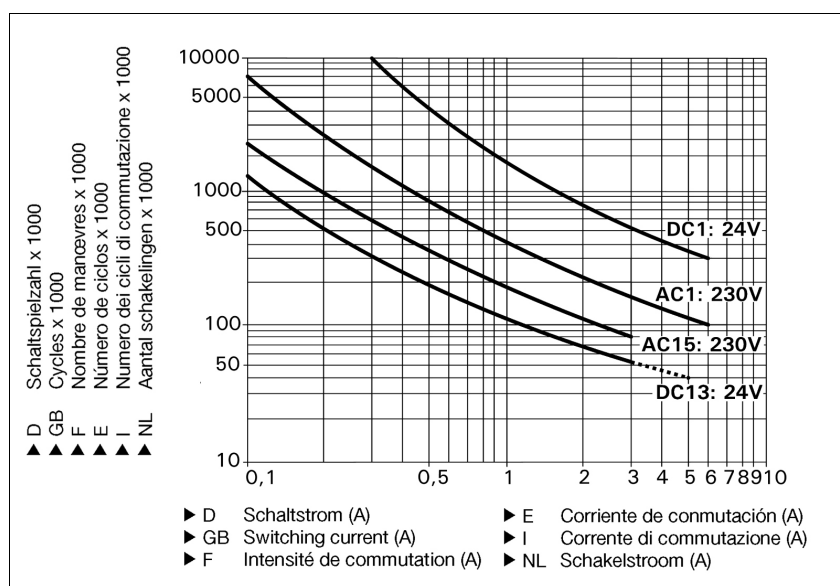
Expansion modules PNOZmulti PNOZ mo5p

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Service life graph

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



Example

- Inductive load: 0,2 A
- Utilisation category: AC15
- Contact service life: 1,000,000 cycles

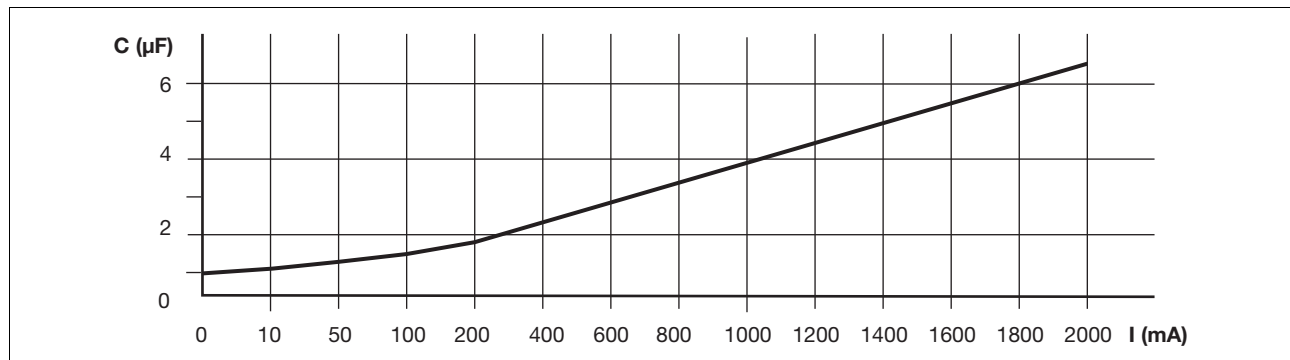
Provided the application requires fewer than 1,000,000 cycles, the PFH value (see technical details) can be used in the calculation.

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

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

Expansion modules PNOZmulti PNOZ mo5p

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



Expansion modules PNOZmulti

PNOZ mo5p

Technical details	
Electrical data	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	3.5 W
Status display	LED
Times	
Switch-on delay	5.00 s
Supply interruption before de-energisation	20 ms
Relay outputs	
Number	4
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	1.5 A, 360 VA
Safety contacts: DC1 at 24 V	6.0 A, 144 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	0.6 A, 138 W
Safety contacts: DC13 at 24 V (6 cycles/min)	0.4 A, 9 W
Airgap creepage between relay contacts	3 mm
relay contacts and other safe circuits	5.5 mm
External contact fuse protection ($I_k = 1 \text{ kA}$) to EN 60947-5-1	
Blow-out fuse, quick	6 A
Blow-out fuse, slow	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	6 A
Switch-off delay	50 ms
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	250 V
Rated impulse withstand voltage	6.00 kV
Shock stress	
EN 60068-2-27	15g
	11 ms
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

Expansion modules PNOZmulti PNOZ mo5p

Mechanical data

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 198 g

No. stands for order number.

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
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

Requirement on 1-channel relay outputs for Cat. 2 in accordance with EN 954-1: An additional output switches to a safe condition in the event of an error or, if that is impossible, signals a hazardous condition.

It is essential to consider the relay's service life graphs. The relay outputs'

safety-related characteristic data is only valid if the values in the service life graphs are met.

The PFH value depends on the switching frequency and the load on the relay output.

If the service life graphs are not accessible, the stated PFH value can be

used irrespective of the switching frequency and the load, as the PFH value already considers the relay's B10d value as well as the failure rates of the other components.

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

The standards current on **2009-01** apply.

Expansion modules PNOZmulti

PNOZ mo5p

Order reference

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

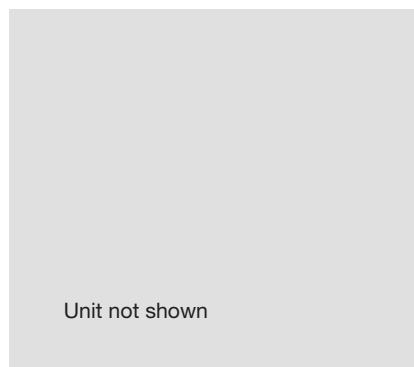
Order reference: Accessories

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

Order reference: Terminator, jumper

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

Expansion modules PNOZmulti PNOZ mc0p



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

(please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ E-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.

Power supply to supply voltage to fieldbus modules

Unit description

It may only be used to supply voltage to the following fieldbus modules:

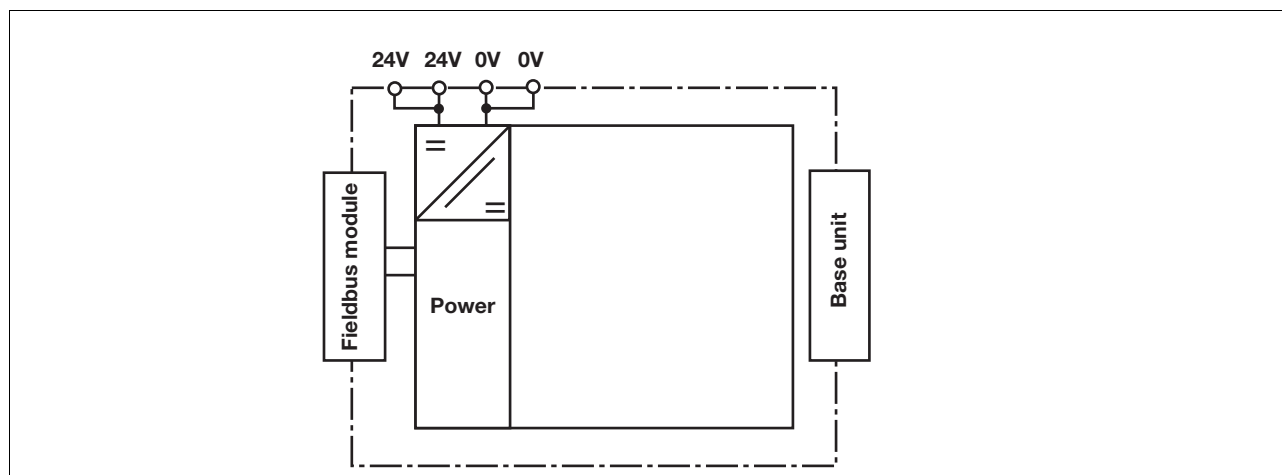
- ▶ PNOZ mc5p INTERBUS
- ▶ PNOZ mc5.1p INTERBUS LWL

The expansion module may only be connected to a base unit from the configurable control system PNOZmulti

System requirements

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

Block diagram



Expansion modules PNOZmulti

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 of the PNOZmulti Configurator.
Note:
► Information given in the "Technical details" must be followed.

Preparing for operation

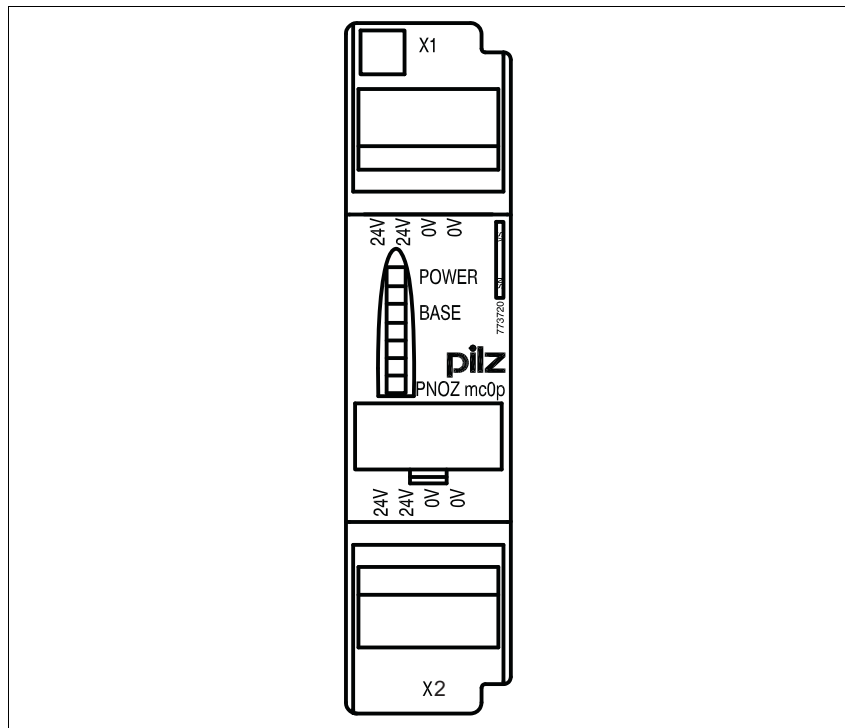
- Supply voltage

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.		

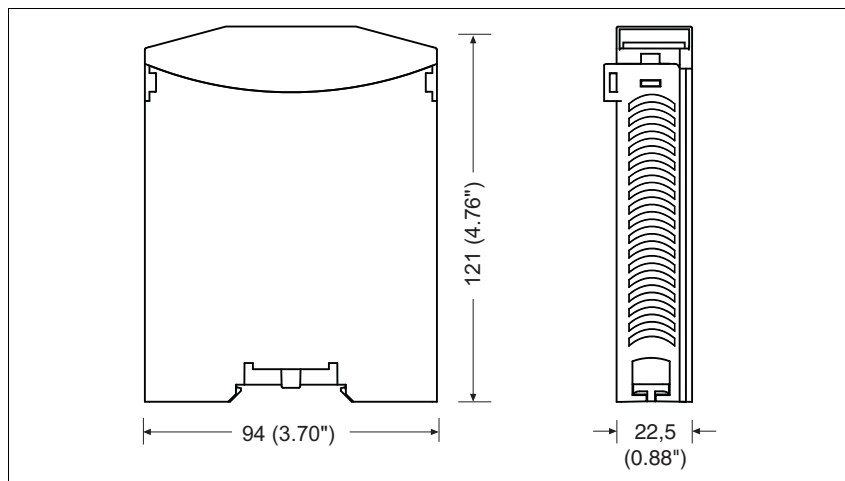
Expansion modules PNOZmulti

PNOZ mc0p

Terminal configuration



Dimensions



Expansion modules PNOZmulti PNOZ mc0p

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	
Supply interruption before de-energisation	20 ms
Environmental data	
Ambient temperature	0 - 55 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms
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	
Power supply, inputs, auxiliary output, semiconductor outputs, test pulse outputs, cascading outputs:	
1 core flexible	0.50 - 1.50 mm ² , 22 - 14 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 0.75 mm ² ,
without crimp connectors or with TWIN crimp connectors	0.50 - 0.75 mm ² ,
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 mm ² ,
Stripping length	9 mm

Expansion modules PNOZmulti PNOZ mc0p

Mechanical data

Dimensions	
Height	94.0 mm
Width	22.5 mm
Depth	121.0 mm
Weight	125 g

The standards current on **2007-05** apply.

Order reference

Product type	Features	Order no.
PNOZ mc0p	Expansion module, power supply for fieldbus modules	773 720

Order reference: Accessories

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

Order reference: Terminator, jumper

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

Expansion modules PNOZmulti

PNOZ mc1p



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

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. 8 PNOZ mc1p units can be connected to the base unit
- ▶ Coated version: Increased environmental requirements

there are increased environmental requirements (see Technical Details).

System requirements

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





Unit description

The expansion module may only be connected to a base unit from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected) The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

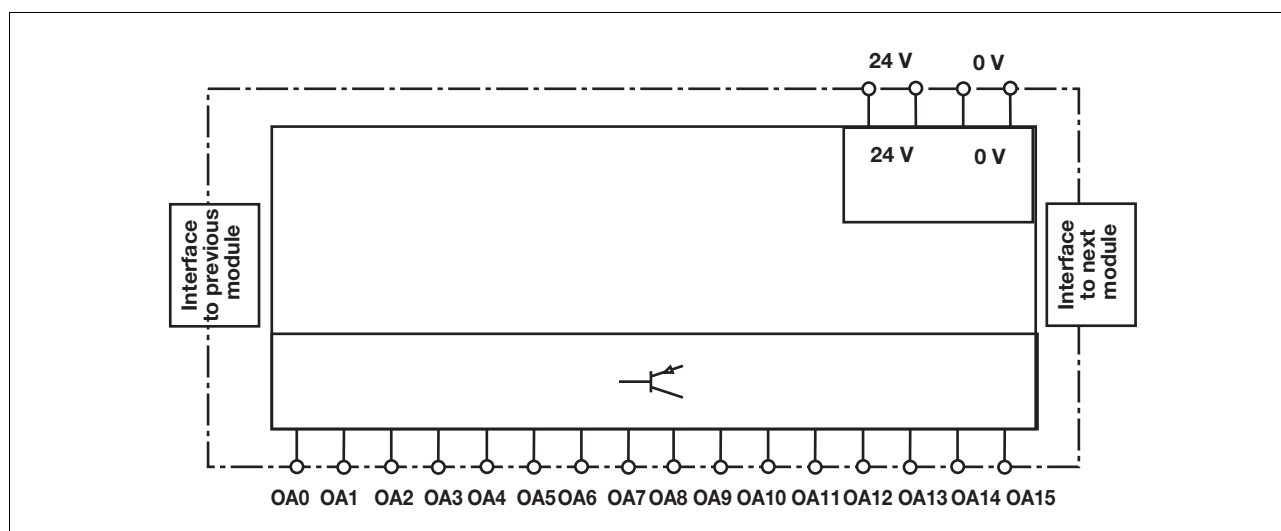
- ▶ E-STOP equipment
- ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The expansion module may not be used for safety-related functions. The coated version of the product **PNOZ mc1p** is suitable for use where

Approvals

	PNOZ mc1p
	◆
	◆
	◆
	◆

Block diagram



Expansion modules PNOZmulti 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.

Expansion modules PNOZmulti PNOZ mc1p

Preparing for operation

► Supply voltage

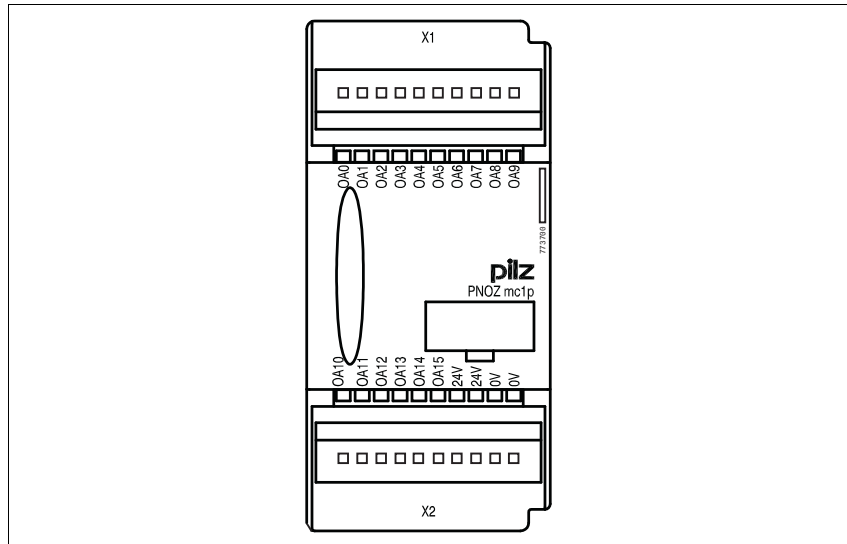
Supply voltage	AC	DC

► Semiconductor outputs

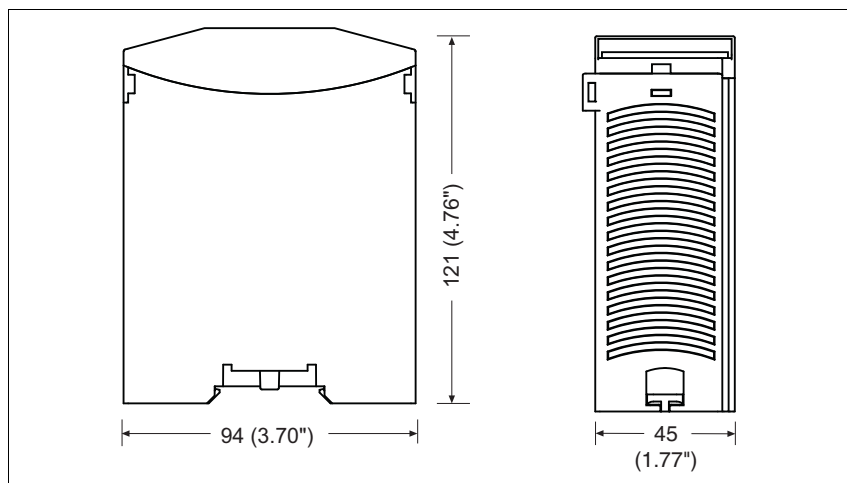
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Expansion modules PNOZmulti PNOZ mc1p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ mc1p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	0.6 W
Status display	LED
Times	
Switch-on delay	5.00 s
Supply interruption before de-energisation	20 ms
Auxiliary outputs	
Number	16
Switching capability	
voltage	24 V
current	0.50 A
power	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 at 0.5 A
Environmental data	
Ambient temperature	-25 - 60 °C No. 773705 0 - 60 °C No. 773700
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary No. 773705 not permitted No. 773700
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Corrosive gas check	
SO ₂ : concentration 10 ppm, duration 10 days, passive	DIN V 40046-36 No. 773705
H ₂ S: concentration 1 ppm, duration 10 days, passive	DIN V 40046-37 No. 773705
Shock stress	
EN 60068-2-27	15g 11 ms
Mechanical data	
Protection type	
Mounting (e.g. cabinet)	IP54
Housing	IP20
Terminals	IP20

Expansion modules PNOZmulti PNOZ mc1p

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 Power supply, inputs, auxiliary output, semiconductor outputs, test pulse outputs, cascading outputs:	
1 core flexible	0.50 - 1.50 mm ² , 22 - 14 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 0.75 mm ² , 22 - 20 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 0.75 mm ² , 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 mm ² , 26 - 14 AWG
Spring-loaded terminals: Terminal points per connection	1
Stripping length	9 mm
Dimensions	
Height	94.0 mm
Width	45.0 mm
Depth	121.0 mm
Weight	164 g No. 773700 185 g No. 773705

No. stands for order number.

The standards current on **2008-03** apply.

Order reference		
Product type	Features	Order no.
PNOZ mc1p	Expansion module, 16 semiconductor outputs, standard	773 700
PNOZ mc1p coated version	Expansion module, 16 semiconductor outputs, standard, coated version	773 705

Order reference: Accessories		
Product type	Features	Order no.
Set spring terminals	1 set of spring-loaded terminals	783 700
Set screw terminals	1 set of screw terminals	793 700





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

Expansion modules PNOZmulti PNOZ mc2p



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

Approvals

	PNOZ mc2p
	◆
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Network protocols: EtherCAT
- ▶ Supports CANopen over EtherCAT
- ▶ Status indicators for communication with EtherCAT and for errors
- ▶ 24 virtual outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus **EtherCAT**. The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- ▶ Max. 1 **PNOZ mc2p** can be connected to the base unit
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)

Unit description

The expansion module **PNOZ mc2p** is used for communication between the configurable control system PNOZmulti with EtherCAT. EtherCAT is designed for fast data exchange at field level. The expansion module **PNOZ mc2p** is a passive

EtherCAT subscriber (Slave). The basic communication functions with EtherCAT conform to the system description published by the EtherCAT 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 only be connected to a base unit from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

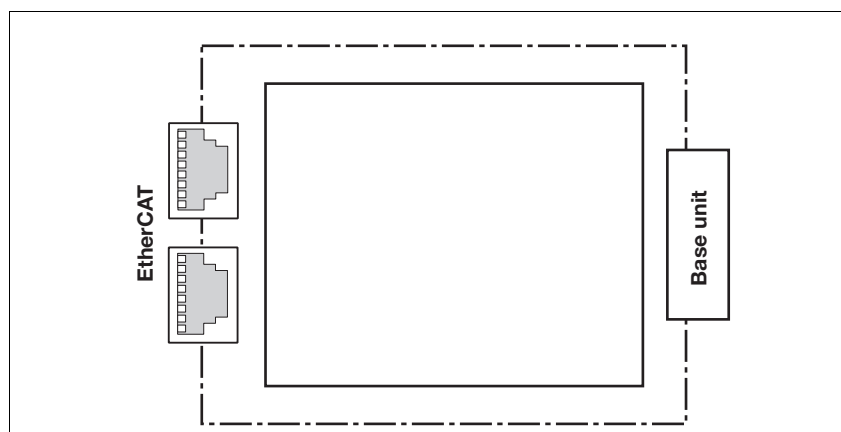
- ▶ E-STOP equipment
- ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

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

System requirements

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

Block diagram



Expansion modules PNOZmulti PNOZ mc2p

Function description

Operation

The virtual inputs and outputs that are to be transferred via EtherCAT are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module **PNOZ mc2p** are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module **PNOZ mc2p** is configured and started automatically. The connection to EtherCAT is made via the two RJ45 sockets. LEDs indicate the status of the expansion module on EtherCAT.

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

Input and output data

The data is structured as follows:

- ▶ **Input range**
The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.
- ▶ **Output range**
The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0;

the status of output o5 is stored in bit 5 of byte 0 etc.

- ▶ **Output range only: Byte 3**
Bits 0 ... 4: Status of LEDs on the PNOZmulti
 - Bit 0: OFAULT
 - Bit 1: IFAULT
 - Bit 2: FAULT
 - Bit 3: DIAG
 - Bit 4: RUN
 - Bit 5: Data is being exchanged.
- Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

2.3

Assigning the inputs/outputs in the PNOZmulti Configurator to the EtherCAT inputs/outputs

Virtual inputs on PNOZmulti Configurator	I0 ... I7	I8 ... I15	I16 ... I23
Input data EtherCAT	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7
Virtual outputs on PNOZmulti Configurator	O0 ... O7	O8 ... O15	O16 ... O23
Output data EtherCAT	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

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 EtherCAT.

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 EtherCAT:

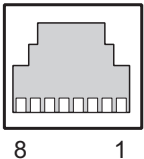
- ▶ The following minimum requirements of the connection cable and connector must be met:
 - Only use standard industrial Ethernet cable and connectors.
 - Only use double-shielded twisted pair cable and shielded RJ45 connectors (industrial connectors).

- 100BaseTX cable in accordance with the Ethernet standard (min. Category 5)
- ▶ Measures to protect against interference:
Ensure the requirements for the industrial use of EtherCAT are met, as stated in the Installation Manual published by the User Group.

CAUTION!

Only connect and disconnect the expansion module when the supply voltage is switched off.

Expansion modules PNOZmulti PNOZ mc2p

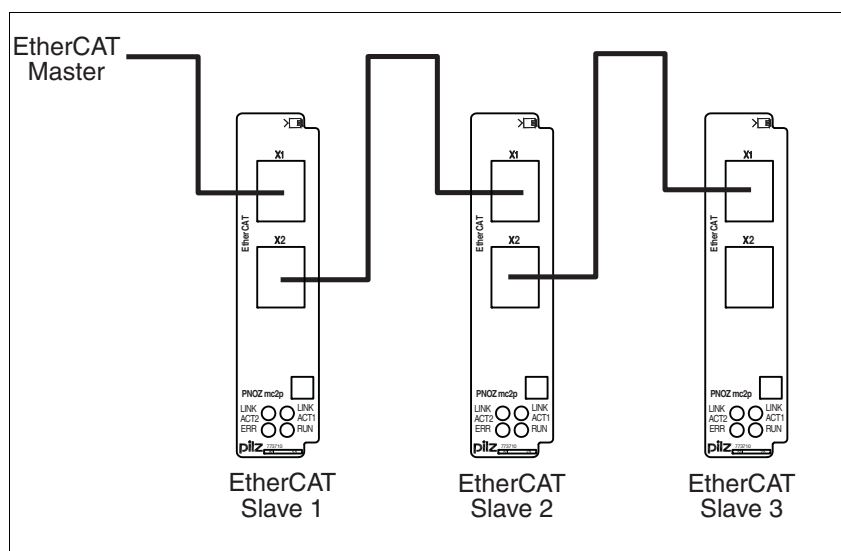
RJ45 socket 8-pin	PIN	Standard
	1	TD+ (Transmit+)
	2	TD- (Transmit-)
	3	RD+ (Receive+)
	4	n.c.
	5	n.c.
	6	RD- (Receive-)
	7	n.c.
	8	n.c.

n.c.: Not connected

Preparing for operation

- ▶ Install Device Description File
Install the *Device Description File* in your configuration software. You can only then use the **PNOZ mc2p**.
- ▶ Connect the supply voltage to the base unit:
Terminals **24 V** and **A1 (+)**: + 24 VDC
Terminals **0 V** and **A2 (-)**: 0 V

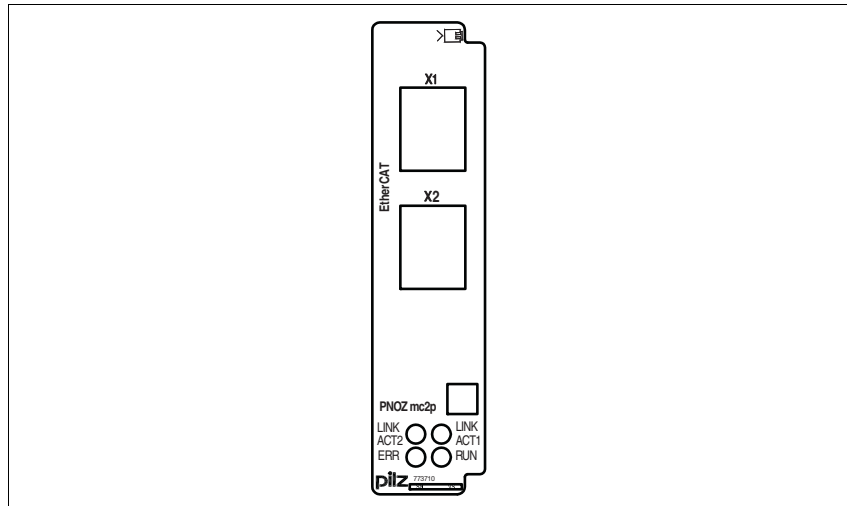
Connection example



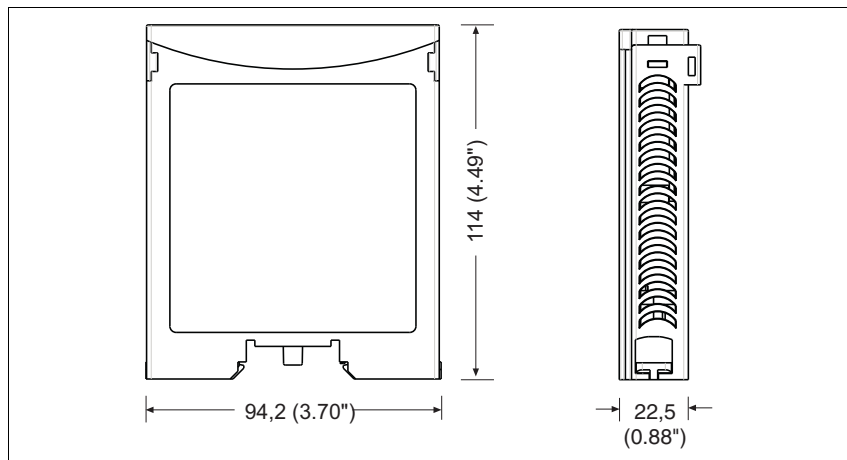
Expansion modules PNOZmulti

PNOZ mc2p

Terminal configuration



Dimensions



Expansion modules PNOZmulti PNOZ mc2p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED
Times	
Supply interruption before de-energisation	20 ms
Fieldbus interface	
Fieldbus interface	EtherCAT
Device type	Slave
Protocol	CANopen over EtherCAT
Transmission rates	100 MBit/s
Connection	RJ45
Galvanic isolation	yes
Test voltage	500 V AC
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms
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	22.5 mm
Depth	114.0 mm
Weight	140 g

The standards current on **2010-03** apply.

Expansion modules PNOZmulti PNOZ mc2p

Order reference

Product Type	Features	Order no.
PNOZ mc2p	Fieldbus module, EtherCAT	773 710

Order reference: Terminator, jumper

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





Expansion modules PNOZmulti

PNOZ mc2.1p



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

Approvals

	PNOZ mc2.1p
	◆
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Network protocols: EtherCAT
- ▶ supports CANopen over EtherCAT (DS301 V4.02-compliant)
- ▶ Status indicators for communication with EtherCAT and for errors
- ▶ The data length and the content of the PDOs can be freely configured from EtherCAT-Master (max. 148 Bytes TxPDO and 20 Bytes RxPDO). The data are described in the document entitled "Communication Interfaces".
- ▶ 24 virtual outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus **EtherCAT**. The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- ▶ Max. 1 **PNOZ mc2.1p** can be connected to the base unit
- ▶ Please refer to the chapter "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected

Unit description

The expansion module **PNOZ mc2.1p** is used for communication between

the configurable control system PNOZmulti with EtherCAT.

EtherCAT is designed for fast data exchange at field level. The expansion module **PNOZ mc2.1p** is a passive EtherCAT subscriber (Slave). The basic communication functions with EtherCAT conform to the system description published by the EtherCAT 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 only be connected to a base unit from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

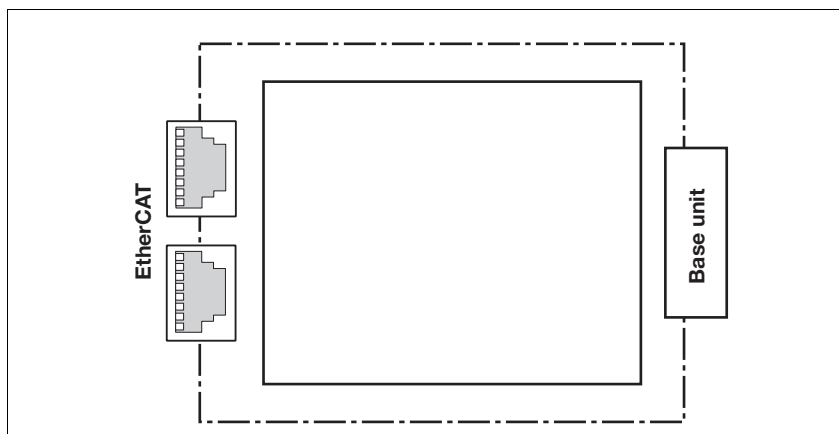
- ▶ E-STOP equipment
- ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

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

System requirements

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

Block diagram



Expansion modules PNOZmulti

PNOZ mc2.1p

Function description

Operation

The virtual inputs and outputs that are to be transferred via EtherCAT are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module **PNOZ mc2.1p** are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module **PNOZ mc2.1p** is configured and started automatically. The connection to EtherCAT is made via the two RJ45 sockets. LEDs indicate the status of the expansion module on EtherCAT.

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

Input and output data

The data is structured as follows:

- ▶ **Input range**
The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.
- ▶ **Output range**
The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0;

the status of output o5 is stored in bit 5 of byte 0 etc.

- ▶ **Output range only: Byte 3**
Bits 0 ... 4: Status of LEDs on the PNOZmulti
 - Bit 0: OFAULT
 - Bit 1: IFAULT
 - Bit 2: FAULT
 - Bit 3: DIAG
 - Bit 4: RUN
 - Bit 5: Data is being exchanged.
- Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

Assigning the inputs/outputs in the PNOZmulti Configurator to the EtherCAT inputs/outputs

Virtual inputs on PNOZmulti Configurator	I0 ... I7	I8 ... I15	I16 ... I23
Input data EtherCAT	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7
Virtual outputs on PNOZmulti Configurator	O0 ... O7	O8 ... O15	O16 ... O23
Output data EtherCAT	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

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 EtherCAT.

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 EtherCAT:

- ▶ The following minimum requirements of the connection cable and connector must be met:
 - Only use standard industrial Ethernet cable and connectors.
 - Only use double-shielded twisted pair cable and shielded RJ45 connectors (industrial connectors).

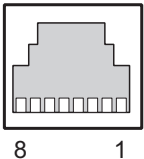
- 100BaseTX cable in accordance with the Ethernet standard (min. Category 5)
- ▶ Measures to protect against interference:
Ensure the requirements for the industrial use of EtherCAT are met, as stated in the Installation Manual published by the User Group.

CAUTION!

Only connect and disconnect the expansion module when the supply voltage is switched off.

Expansion modules PNOZmulti

PNOZ mc2.1p

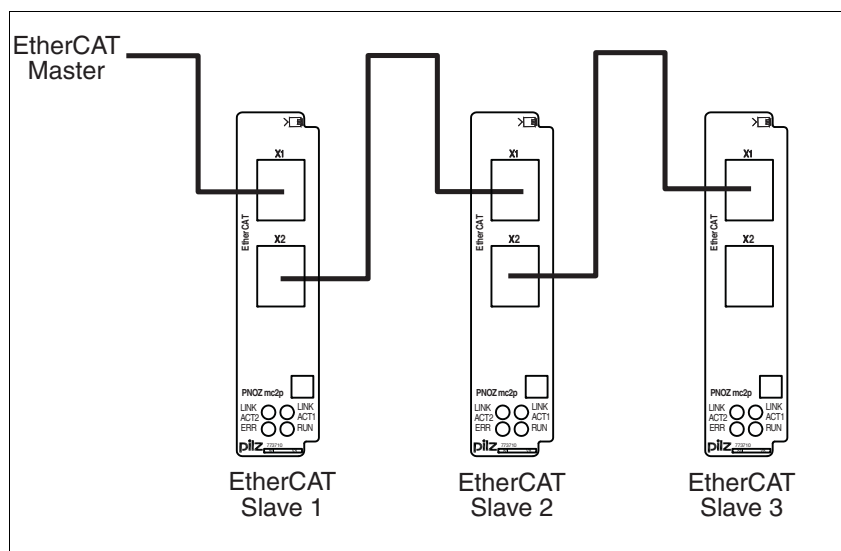
RJ45 socket 8-pin	PIN	Standard
	1	TD+ (Transmit+)
	2	TD- (Transmit-)
	3	RD+ (Receive+)
	4	n.c.
	5	n.c.
	6	RD- (Receive-)
	7	n.c.
	8	n.c.

n.c.: Not connected

Preparing for operation

- Install Device Description File
Install the *Device Description File* in your configuration software. You can only then use the **PNOZ mc2.1p**.
- Connect the supply voltage to the base unit:
Terminals **24 V** and **A1 (+)**: + 24 VDC
Terminals **0 V** and **A2 (-)**: 0 V

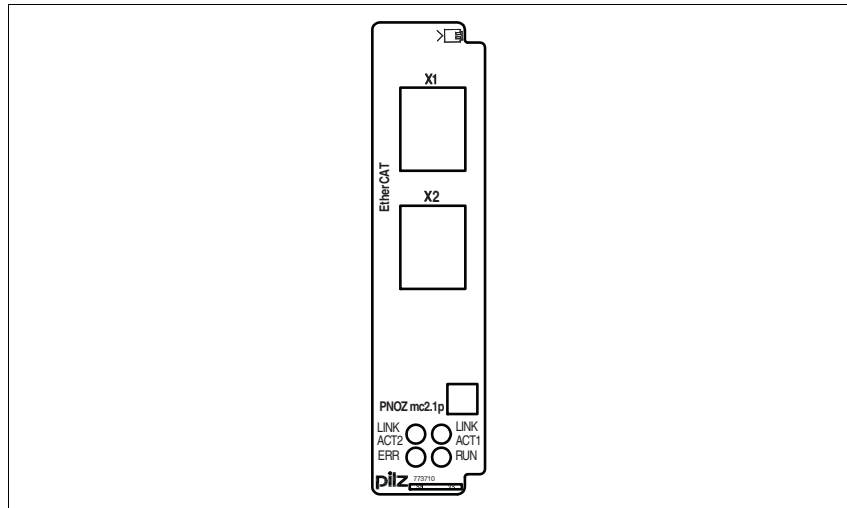
Connection example



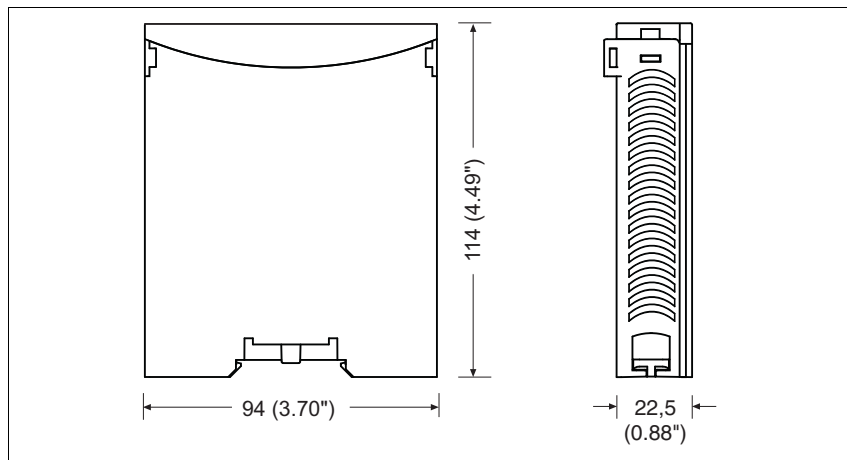
Expansion modules PNOZmulti

PNOZ mc2.1p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ mc2.1p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	1.6 W
Status display	LED
Times	
Supply interruption before de-energisation	20 ms
Fieldbus interface	
Fieldbus interface	EtherCAT
Device type	Slave
Protocol	CANopen over EtherCAT
Transmission rates	100 MBit/s
Connection	RJ45
Galvanic isolation	yes
Test voltage	500 V AC
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	25 V
Shock stress	
EN 60068-2-27	15g
	11 ms
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	22.5 mm
Depth	114.0 mm
Weight	140 g

The standards current on **2011-09** apply.

Expansion modules PNOZmulti PNOZ mc2.1p

Order reference

Product Type	Features	Order no.
PNOZ mc2.1p	Fieldbus module, EtherCAT	773 713

Order reference: Terminator, jumper

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




Expansion modules PNOZmulti

PNOZ mc3p



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

Approvals

	PNOZ mc3p
	◆
	◆
	◆

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
- ▶ 24 virtual outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus **PROFIBUS DP**. The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- ▶ Max. 1 **PNOZ mc3p** can be connected to the base unit
- ▶ Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected

Unit description

The expansion module **PNOZ mc3p** is used for communication between the configurable control system PNOZmulti and PROFIBUS-DP. PROFIBUS-DP is designed for fast data exchange at field level. The expansion module **PNOZ mc3p** is a pas-

sive subscriber (Slave) of PROFIBUS-DP (DPV0). 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 only be connected to a base unit from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected). The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

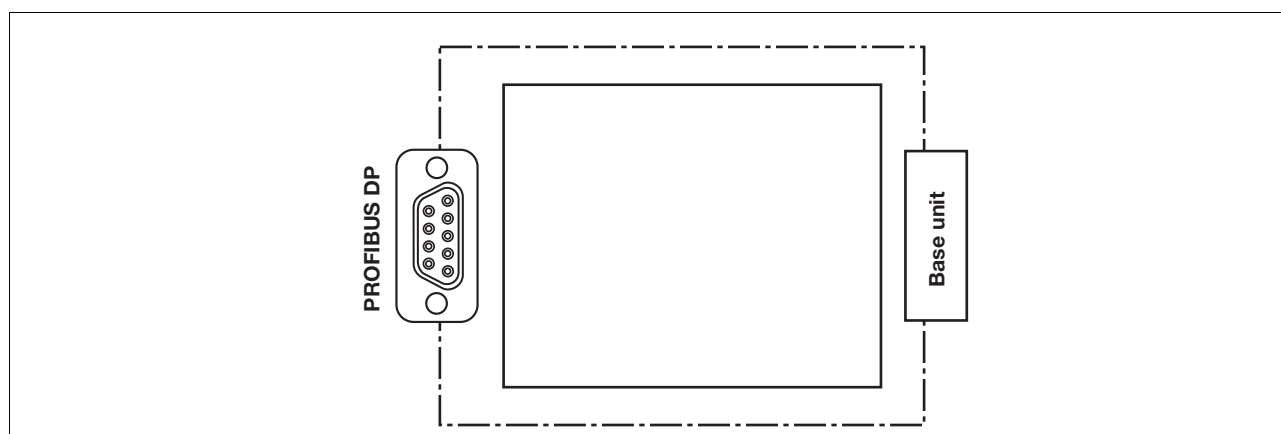
- ▶ E-STOP equipment
- ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

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

System requirements

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

Block diagram



Expansion modules PNOZmulti PNOZ mc3p

Function description

The virtual inputs and outputs that are to be transferred via PROFIBUS are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module **PNOZ mc3p** are connected via a jumper. The expansion module **PNOZ mc3p** is also supplied with voltage via this jumper. The station address is set via rotary switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module **PNOZ mc3p** is configured and started automatically.

LEDs indicate the status of the expansion module on PROFIBUS.

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

Input and output data

The data is structured as follows:

- ▶ Input range

The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.
- ▶ Output range

The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.
- ▶ Output range only: Byte 3

Bits 0 ... 4: Status of LEDs on the PNOZmulti

 - Bit 0: OFAULT
 - Bit 1: IFAULT
 - Bit 2: FAULT
 - Bit 3: DIAG
 - Bit 4: RUN

Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

Expansion modules PNOZmulti PNOZ mc3p

Assigning the inputs/outputs in the PNOZmulti Configurator to the EtherCAT inputs/outputs

Virtual inputs on PNOZmulti Configurator	I0 ... I7	I8 ... I15	I16 ... I23
Input data PROFIBUS DP	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7
Virtual outputs on PNOZmulti Configurator	O0 ... O7	O8 ... O15	O16 ... O23
Output data PROFIBUS DP	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

Wiring

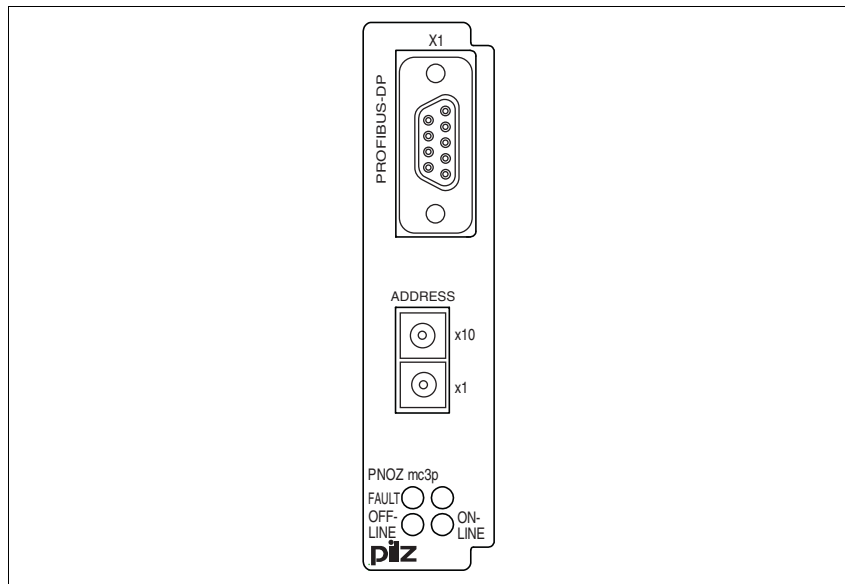
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Note:

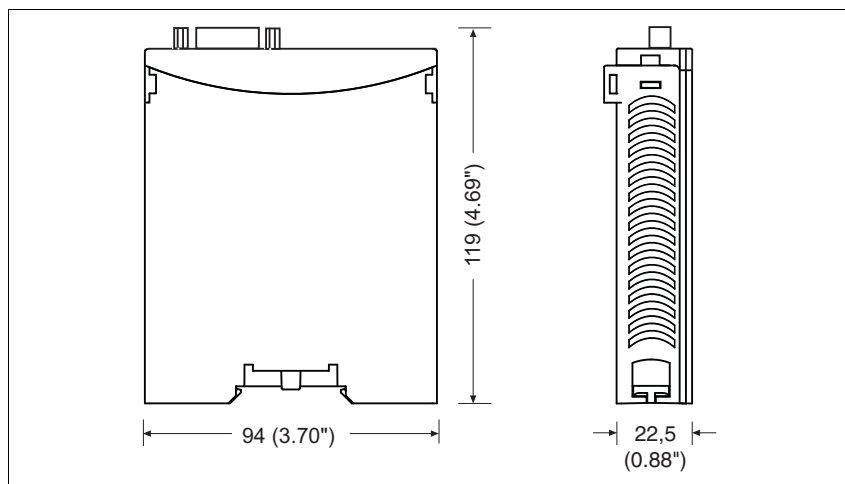
- ▶ Information given in the "Technical details" must be followed.
- ▶ Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- ▶ The power supply must meet the regulations for extra low voltages with safe separation.

Expansion modules PNOZmulti PNOZ mc3p

Terminal configuration



Dimensions



Expansion modules PNOZmulti PNOZ mc3p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED
Times	
Supply interruption before de-energisation	20 ms
Fieldbus interface	
Fieldbus interface	PROFIBUS DP
Device type	Slave
Station address	0 - 99d
Transmission rate	9.6 kBit/s - 12 MBit/s
Connection	Female 9-pin D-SUB connector
Galvanic isolation	yes
Test voltage	500 V AC
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g
	11 ms
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	22.5 mm
Depth	119.0 mm
Weight	119 g

The standards current on **2011-09** apply.

Expansion modules PNOZmulti PNOZ mc3p

Order reference

Product type	Features	Order no.
PNOZ mc3p	Fieldbus module, PROFIBUS-DP	773 732

Order reference: Terminator, jumper

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



Expansion modules PNOZmulti

PNOZ mc4p



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

Approvals

	PNOZ mc4p
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Connection for DeviceNet
- ▶ Station addresses from 0 ... 63 can be selected via DIP switches
- ▶ Status indicators for communication with DeviceNet and for errors
- ▶ Coated version:
Increased environmental requirements

Unit description

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

It connects the configurable control system PNOZmulti 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

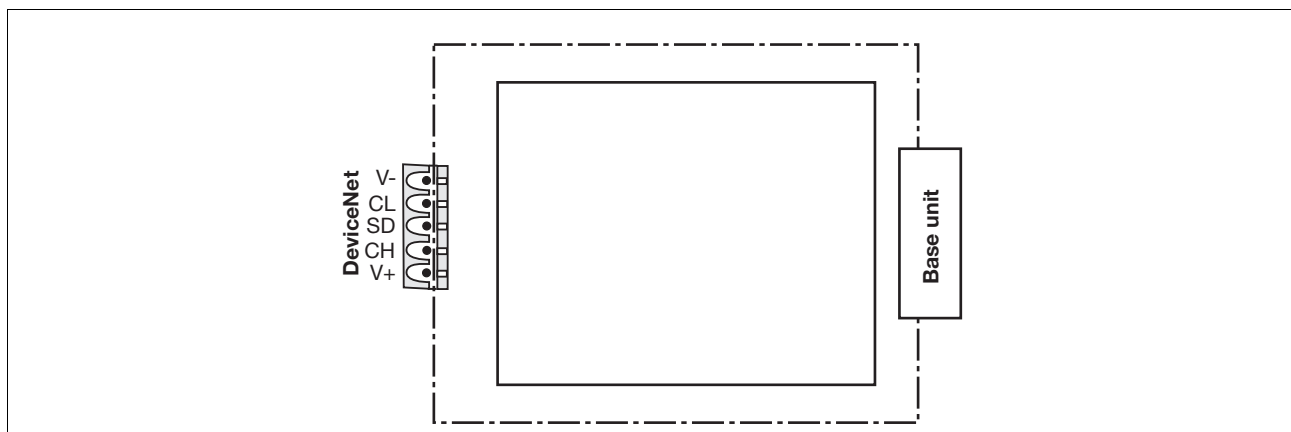
The expansion module PNOZ mc4p is used for communication between the configurable control system PNOZmulti and DeviceNet.

DeviceNet is designed for fast data exchange at field level. The expansion module PNOZ mc4p 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. The coated version of the product **PNOZ mc4p** is suitable for use where there are increased environmental requirements (see Technical Details).

System requirements

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

Block diagram



Expansion modules PNOZmulti PNOZ mc4p

Function description

The virtual inputs and outputs that are to be transferred via DeviceNet are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module **PNOZ mc4p** are connected via a jumper.

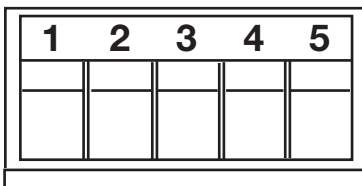
The station address and the transmission rate are set using DIP switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module **PNOZ mc4p** is configured and started automatically.

LEDs indicate the status of the expansion module on DeviceNet.

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

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



V- CL SD CH V+

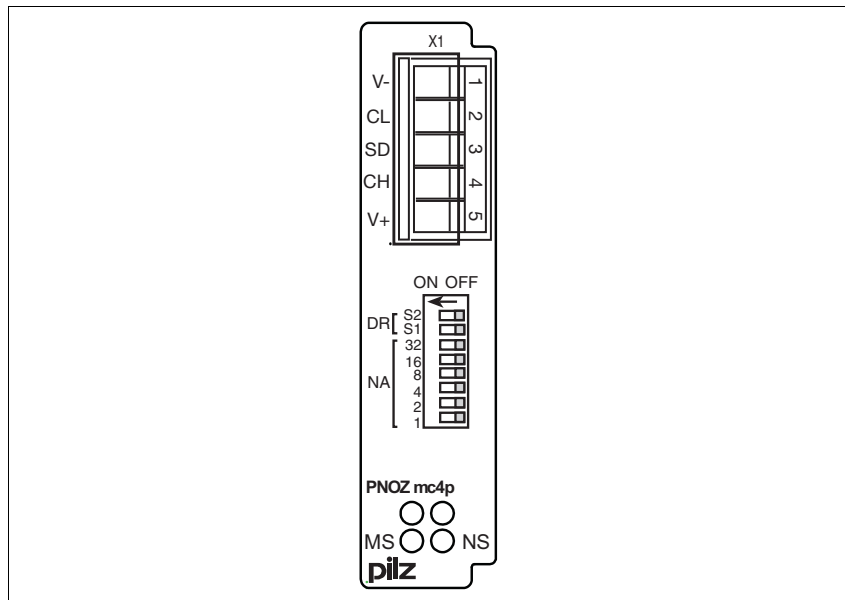
Note:

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

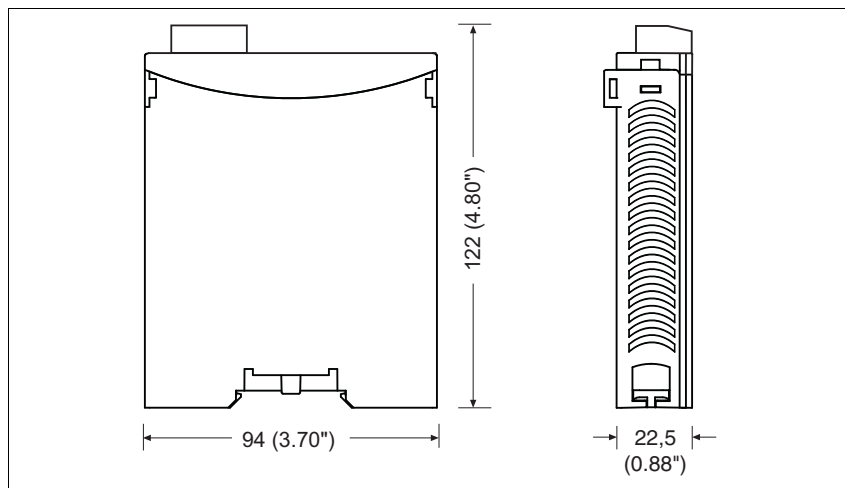
Expansion modules PNOZmulti

PNOZ mc4p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ mc4p

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

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	1.0 W No. 773711 1.6 W No. 773729

Status display	LED
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Times

Supply interruption before de-energisation	20 ms
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Fieldbus interface

Fieldbus interface	DeviceNet
External supply (DC)	24 V
Power consumption	0.75 W
Device type	Slave
Station address	0 ... 63d
Transmission rates	125 kBit/s, 250 kBit/s, 500 kBit/s
Connection	5-pin Combicon plug-in connector
Galvanic isolation	yes
Test voltage	500 V AC

Environmental data

Ambient temperature	0 - 50 °C No. 773729 0 - 60 °C No. 773711
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary No. 773729 not permitted No. 773711
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms

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

Expansion modules PNOZmulti PNOZ mc4p

Mechanical data

Dimensions	
Height	94.0 mm
Width	22.5 mm
Depth	122.0 mm
Weight	110 g No. 773711
	150 g No. 773729

No. stands for order number.

The standards current on **2010-05** apply.

Order reference

Product type	Features	Order no.
PNOZ mc4p	Fieldbus module, DeviceNet	773 711
PNOZ mc4p coated version	Fieldbus module, DeviceNet, coated version	773 729

Order reference: Connectors

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




Expansion modules PNOZmulti

PNOZ mc5p



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

Approvals

	PNOZ mc5p
	◆
	◆
	◆

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 configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)
It connects the configurable control system PNOZmulti to INTERBUS.

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits. The unit is designed for use in:

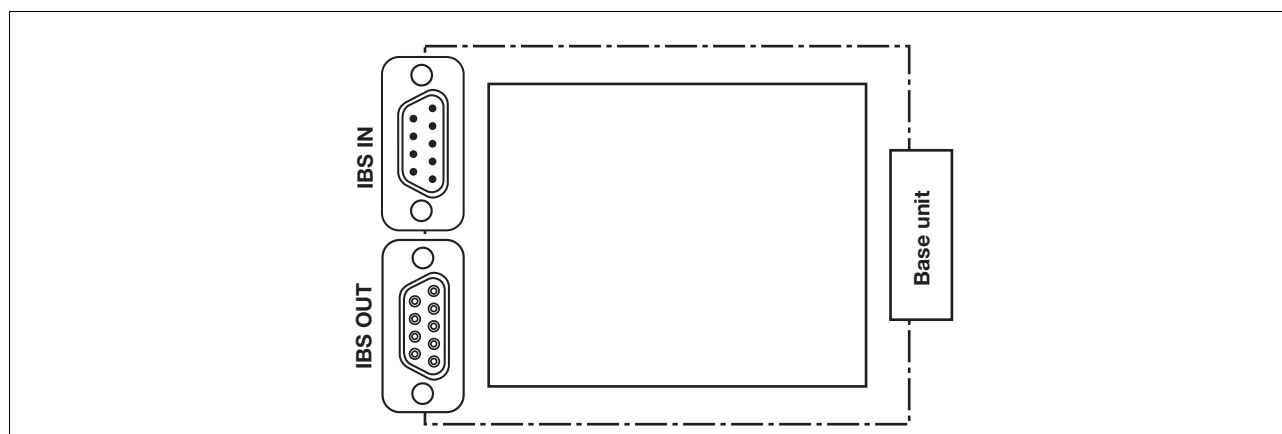
- ▶ Emergency stop equipment
- ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

The expansion module PNOZ mc5p is used for communication between the configurable control system PNOZmulti and INTERBUS. INTERBUS is designed for fast data exchange at field level. The expansion module PNOZ mc5p 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

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

Block diagram



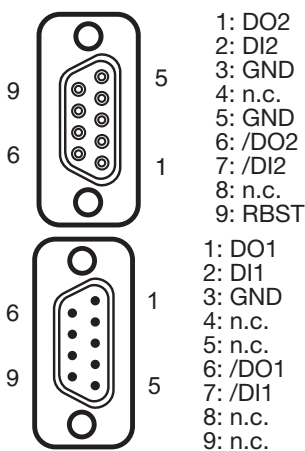
Expansion modules PNOZmulti PNOZ mc5p

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



n. c. = not connected

Note:

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

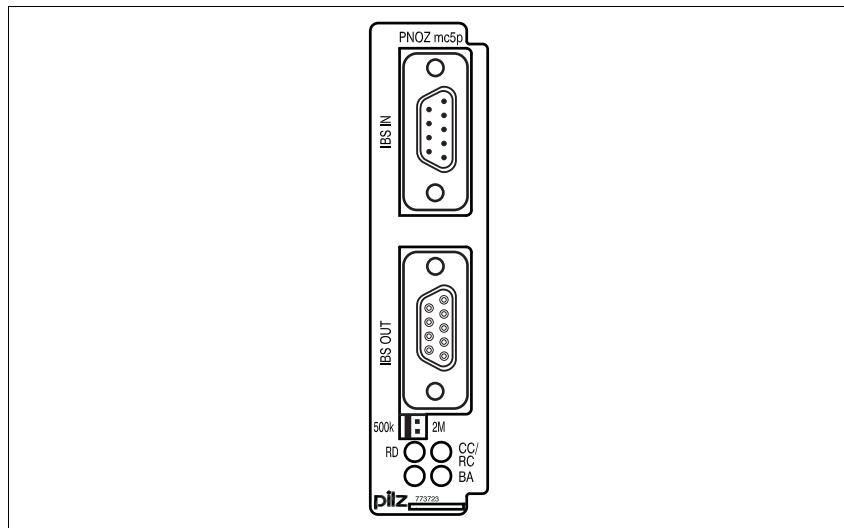
Please note the following when connecting to INTERBUS:

- ▶ Only use metal plugs or metallised plastic plugs
- ▶ Twisted pair, screened cable must be used to connect the interfaces

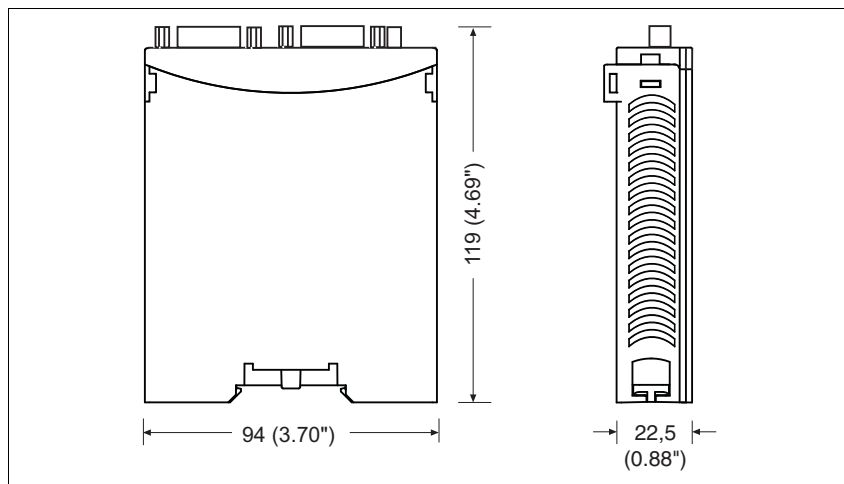
Expansion modules PNOZmulti

PNOZ mc5p

Terminal configuration



Dimensions



Expansion modules PNOZmulti PNOZ mc5p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED
Times	
Supply interruption before de-energisation	20 ms
Fieldbus interface	
Fieldbus interface	Interbus S
Device type	Slave
Transmission rates	2 MBit/s, 500 kBit/s
Connection IBS IN	Male 9-pin D-SUB connector
Connection IBS OUT	Female 9-pin D-SUB connector
Galvanic isolation	yes
Test voltage	500 V AC
Environmental data	
Ambient temperature	0 - 55 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms
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	22.5 mm
Depth	119.0 mm
Weight	155 g

The standards current on **2007-05** apply.

Expansion modules PNOZmulti

PNOZ mc5p

Order reference

Product type	Features	Order no.
PNOZ mc5p	Fieldbus module, INTERBUS	773 723

Order reference: Terminator, jumper

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

Expansion modules PNOZmulti

PNOZ mc5.1p



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

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.

- ▶ 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

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

Approvals

	PNOZ mc5.1p
	◆
	◆
	◆

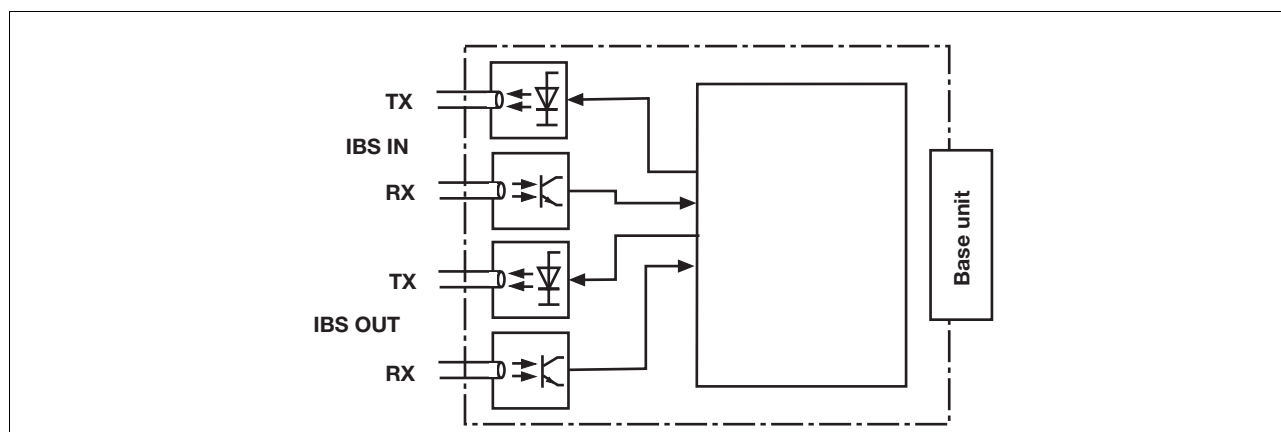
Unit description

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

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:

Block diagram



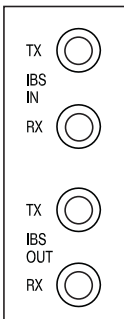
Expansion modules PNOZmulti PNOZ mc5.1p

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

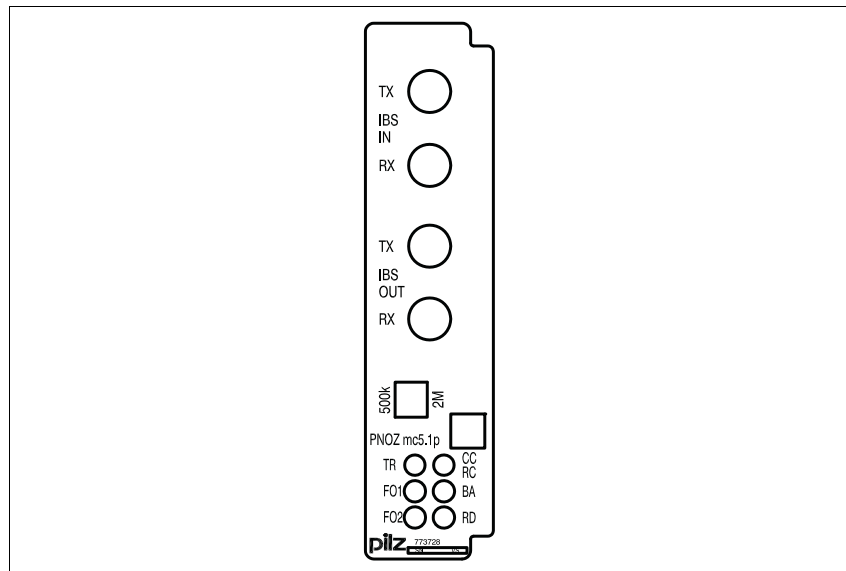
Please note:

Information given in the "Technical details" must be followed.

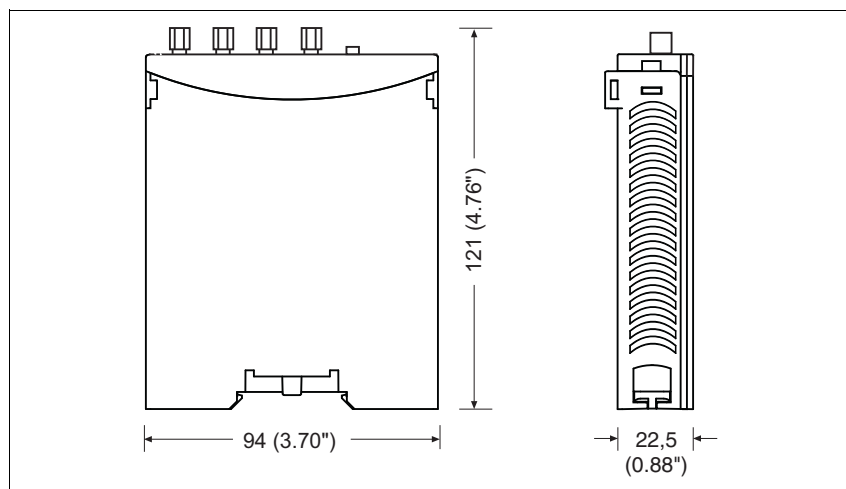
Expansion modules PNOZmulti

PNOZ mc5.1p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ mc5.1p

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

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.0 W
Status display	LED

Times

Supply interruption before de-energisation	20 ms
--	--------------

Fieldbus interface

Fieldbus interface	INTERBUS LWL
Device type	Slave
Transmission rates	2 MBit/s, 500 kBit/s
Connection	F-SMA connector

Environmental data

Ambient temperature	0 - 55 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g
	11 ms

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	22.5 mm
Depth	121.0 mm
Weight	135 g

The standards current on **2007-05** apply.

Expansion modules PNOZmulti

PNOZ mc5.1p

Order reference

Product type	Features	Order no.
PNOZ mc5.1p	Fieldbus module, INTERBUS FO	773 728

Order reference: Terminator, jumper

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




Expansion modules PNOZmulti

PNOZ mc6p, PNOZ mc6.1p



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

Approvals

	PNOZ mc6p/mc6.1p
	◆
	◆
	◆

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
- ▶ Supported protocols:
 - PNOZ mc6p:** CiA DS-301 V3.0
 - PNOZ mc6.1p:** CiA DS-301 V4.0.2
- ▶ **PNOZ mc6.1p:** Default COB-ID has been adapted for RPDO 3 (400 h) and TPDO 3 (380 h)
- ▶ 24 virtual outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus **CANopen**. The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- ▶ Max. 1 **PNOZ mc6p/mc6.1p** can be connected to the base unit
- ▶ Please refer to the document "PNOZmulti System Expansion" for the PNOZmulti base units that can be connected
- ▶ Coated version: Increased environmental requirements

Unit description

The fieldbus module **PNOZ mc6p/mc6.1p** is an expansion module of the configurable control system PNOZmulti. It is used for communication between the configurable control system PNOZmulti and CANopen. CANopen is designed for fast data exchange at field level. The expansion module **PNOZ mc6p/mc6.1p** is a passive CANopen subscriber (Slave). The basic communication functions with CANopen conform to the guidelines of the CANopen User Group (CiA, for supported protocols see Technical Details). 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 expansion module

PNOZ mc6p/mc6.1p can also be used for diagnostic and commissioning functions. Data traffic is monitored on the Master/Slave side.

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

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ E-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.

The coated version of the product **PNOZ mc6p/mc6.1p** is suitable for use where there are increased environmental requirements (see Technical Details).

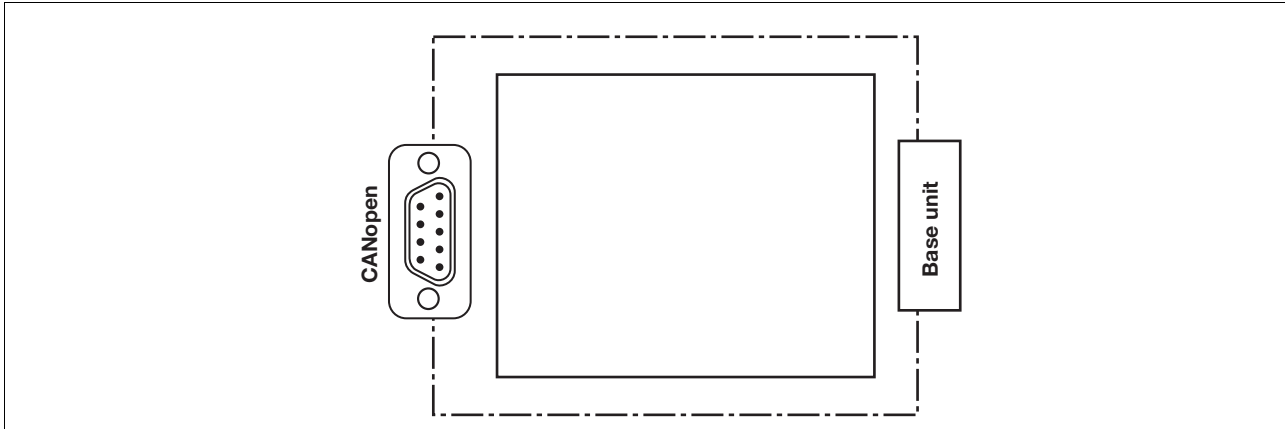
System requirements

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

Expansion modules PNOZmulti

PNOZ mc6p, PNOZ mc6.1p

Block diagram



Function description

The virtual inputs and outputs that are to be transferred via CANopen are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module **PNOZ mc6p/mc6.1p** are connected via a jumper. The fieldbus module is also supplied with voltage via this jumper. The station address and the transmission rate are set using rotary switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the fieldbus module **PNOZ mc6p/mc6.1p** is configured and started automatically.

LEDs indicate the status of the fieldbus module on CANopen.

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

The data is structured as follows:

- ▶ Input range

The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.
- ▶ Output range

The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.
- ▶ Output range only: Byte 3

Bits 0 ... 4: Status of LEDs on the PNOZmulti

 - Bit 0: OFAULT

- Bit 1: IFAULT
 - Bit 2: FAULT
 - Bit 3: DIAG
 - Bit 4: RUN
- Bit 5: Data is being exchanged.
Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

Expansion modules PNOZmulti PNOZ mc6p, PNOZ mc6.1p

Assigning the inputs/outputs in the PNOZmulti Configurator to the CANopen inputs/outputs

Virtual inputs on PNOZmulti Configurator	I0 ... I7	I8 ... I15	I16 ... I23
Input data CANopen	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7
Virtual outputs on PNOZmulti Configurator	O0 ... O7	O8 ... O15	O16 ... O23
Output data CANopen	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

Wiring

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

Note:

- Information given in the "Technical details" must be followed.

- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.
- The power supply must meet the regulations for extra low voltages with safe separation.

CAUTION!

Only connect and disconnect the expansion module when the supply voltage is switched off.

NOTICE

When installing, you must refer to the guidelines published by the CANopen User Group (CiA).

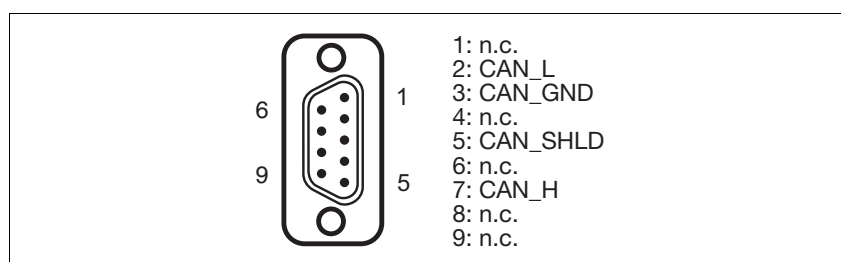
Connecting the supply voltage

Connect the supply voltage to the base unit:

- Terminal **24 V** and **A1 (+)**: + 24 VDC
- Terminal **0 V** and **A2 (-)**: 0 V

CANopen interface

The connection to CANopen is made via a male 9-pin D-Sub connector.



n.c. = not connected

Please note the following when connecting to CANopen:

- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces

CANopen termination

To minimise cable reflection and to guarantee a defined rest signal on the transmission line, CANopen must be terminated at both ends.

Expansion modules PNOZmulti

PNOZ mc6p, PNOZ mc6.1p

Preparing for operation

Setting the transmission rate



- On the upper rotary switch DR, use a small screwdriver to set the transmission rate (in the example, “3” corresponds to 50 kBit/s).

Switch setting	0	1	2	3	4	5	6	7	8	9
Transmission rate	-	10 kBit/s	20 kBit/s	50 kBit/s	125 kBit/s	250 kBit/s	500 kBit/s	800 kBit/s	1 MBit/s	-

INFORMATION

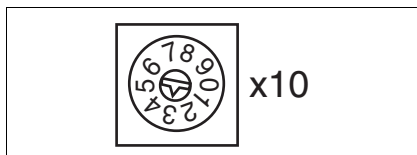
The transmission rate cannot be changed during operation.

Expansion modules PNOZmulti

PNOZ mc6p, PNOZ mc6.1p

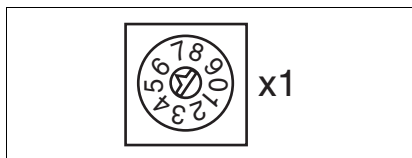
Setting the station address

The station address of the expansion module **PNOZ mc6p/mc6.1p** is set between 0 ... 99 (decimal) via two rotary switches x1 and x10.



- ▶ On the middle rotary switch x10, use a small screwdriver to set the

tens digit for the address ("3" in the example).



- ▶ On the lower rotary switch x1, set the ones digit for the address ("6" in the example). Station address 36 is set in the diagrams as an example.

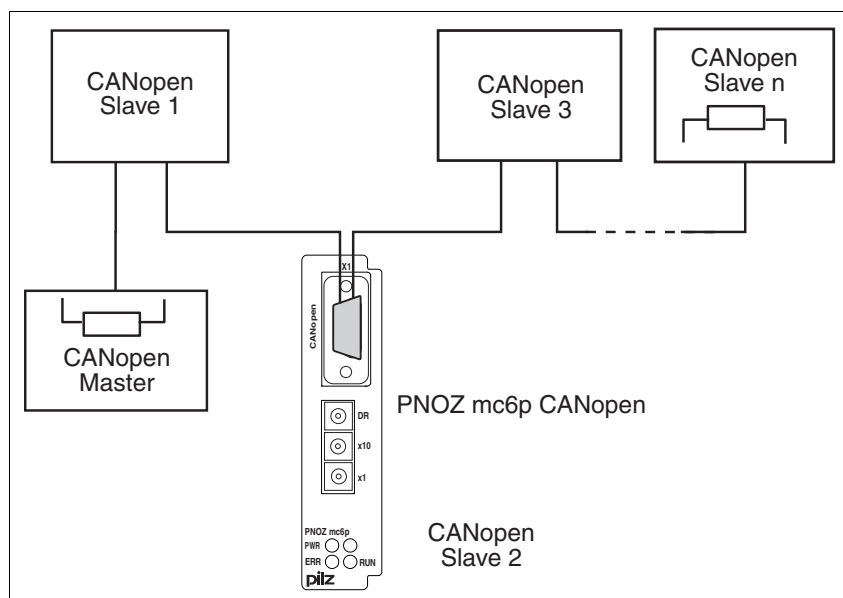
Download modified project to the PNOZmulti safety system

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

NOTICE

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

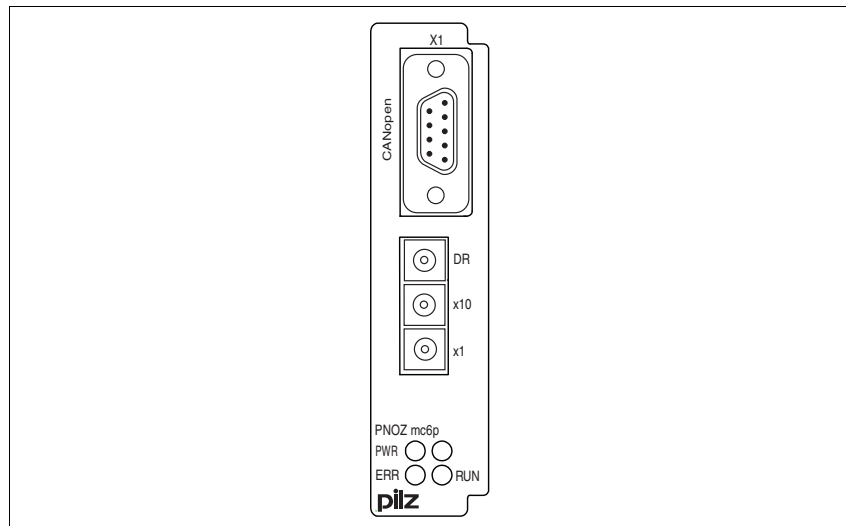
Connection example



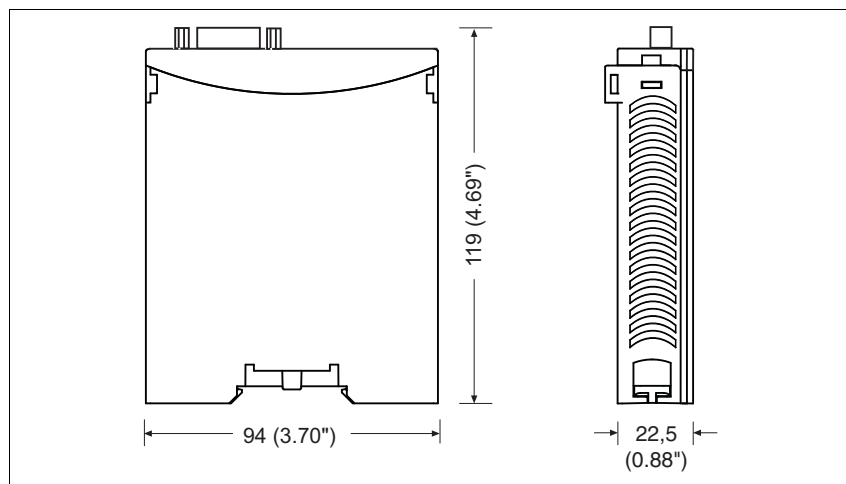
Expansion modules PNOZmulti

PNOZ mc6p, PNOZ mc6.1p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ mc6p, PNOZ mc6.1p

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

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	1.0 W No. 773712, 773733 2.5 W No. 773727
Status display	LED

Times

Supply interruption before de-energisation	20 ms
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Fieldbus interface

Fieldbus interface	CANopen
Device type	Slave
Protocol	CiA DS-301 V3,0 No. 773712, 773727 CiA DS-301 V4,02 No. 773733
Station address	0 - 99d
Transmission rates	1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s
Connection	Male 9-pin D-SUB connector
Galvanic isolation	yes
Test voltage	500 V AC

Environmental data

Ambient temperature	0 - 50 °C No. 773727 0 - 60 °C No. 773712, 773733
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary No. 773727 not permitted No. 773712, 773733
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Corrosive gas check	
SO ₂ : concentration 10 ppm, duration 10 days, passive	DIN V 40046-36 No. 773727
H ₂ S: concentration 1 ppm, duration 10 days, passive	DIN V 40046-37 No. 773727
Shock stress	
EN 60068-2-27	15g 11 ms

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

Expansion modules PNOZmulti

PNOZ mc6p, PNOZ mc6.1p

Mechanical data	
Housing material	
Housing	PPO UL 94 V0
Front	ABS UL 94 V0
Dimensions	
Height	94.0 mm
Width	22.5 mm
Depth	119.0 mm
Weight	110 g No. 773712, 773733
	145 g No. 773727

No. stands for order number.

The standards current on **2011-09** apply.

Order reference		
Product type	Features	Order no.
PNOZ mc6p	Fieldbus module, CANopen, protocol: CiA DS-301 V3.0	773 712
PNOZ mc6p coated version	Fieldbus module, CANopen, coated version, protocol: CiA DS-301 V3.0	773 727
PNOZ mc6.1p	Fieldbus module, CANopen, protocol: CiA DS-301 4.0.2	773 733

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

Expansion modules PNOZmulti

PNOZ mc7p



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

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 configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)

It connects the configurable control system PNOZmulti to CC-Link. The configurable control system PNOZmulti 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 expansion module PNOZ mc7p is used for communication between the configurable control system PNOZmulti 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.

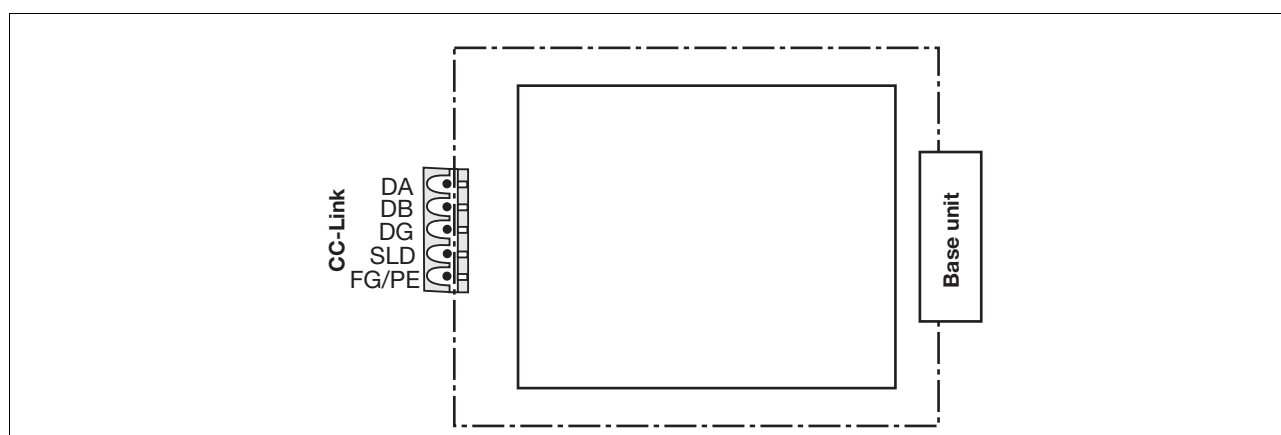
System requirements

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

Approvals

	PNOZ mc7p
	◆
	◆
	◆

Block diagram



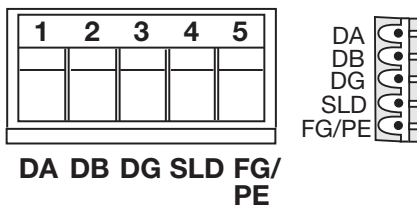
Expansion modules PNOZmulti PNOZ mc7p

Function description

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

Wiring

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



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

Please note:

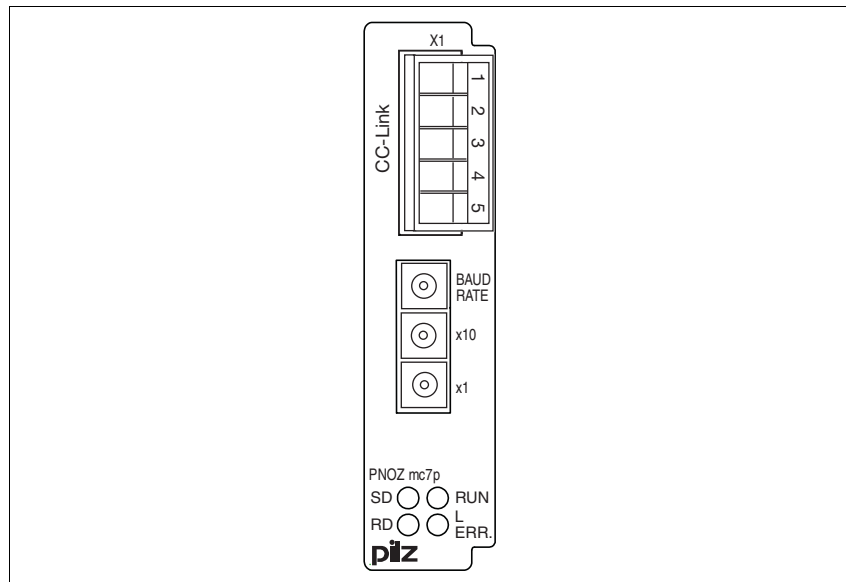
- ▶ Information given in the "Technical details" must be followed.
- ▶ Use copper wire that can withstand 75 °C.

Please note the following when connecting to CC-Link:

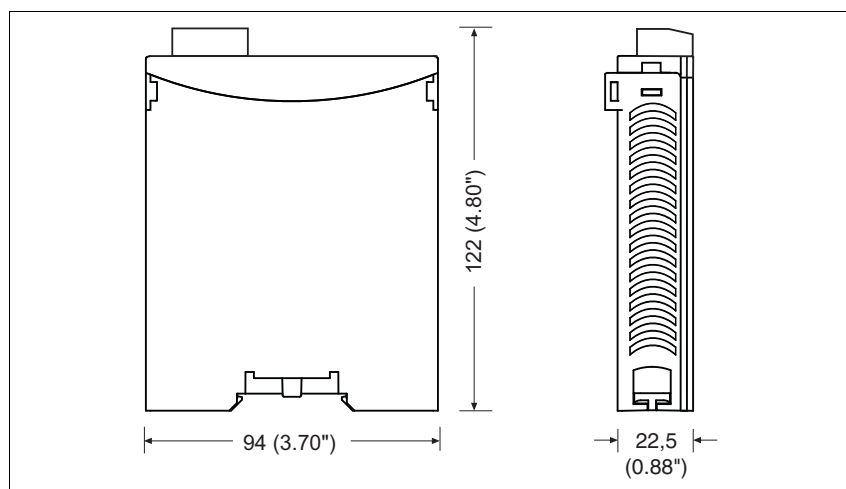
- ▶ Only use metal plugs or metallised plastic plugs
- ▶ Twisted pair, screened cable must be used to connect the interfaces

Expansion modules PNOZmulti PNOZ mc7p

Terminal configuration



Dimensions



Expansion modules PNOZmulti PNOZ mc7p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED
Times	
Supply interruption before de-energisation	20 ms
Fieldbus interface	
Fieldbus interface	CC-Link
Device type	Slave
Station address	0 ... 63d
Occupied stations	2
Transmission rates	10 MBit/s, 156 kbit/s, 2.5 MBit/s, 5 MBit/s, 625 kbit/s
Connection	5-pin Combicon plug-in connector
Galvanic isolation	yes
Test voltage	500 V AC
Environmental data	
Ambient temperature	0 - 50 °C No. 773725 0 - 55 °C No. 773726
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary No. 773725 not permitted No. 773726
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Corrosive gas check	
SO ₂ : concentration 10 ppm, duration 10 days, passive	DIN V 40046-36 No. 773725
H ₂ S: concentration 1 ppm, duration 10 days, passive	DIN V 40046-37 No. 773725
Shock stress	
EN 60068-2-27	15g 11 ms
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

Expansion modules PNOZmulti PNOZ mc7p

Mechanical data

Housing material	
Housing	PPO UL 94 V0
Front	ABS UL 94 V0
Dimensions	
Height	94.0 mm
Width	22.5 mm
Depth	122.0 mm
Weight	133 g No. 773725
	150 g No. 773726

The standards current on **2008-03** apply.

Order reference

Product type	Features	Order no.
PNOZ mc7p	Fieldbus module, CC-Link	773 726
PNOZ mc7p Coated Version	Fieldbus module, CC-Link Coated Version	773 725

Order reference: Terminator, jumper




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

Expansion modules PNOZmulti PNOZ mc8p



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

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 configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected). 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

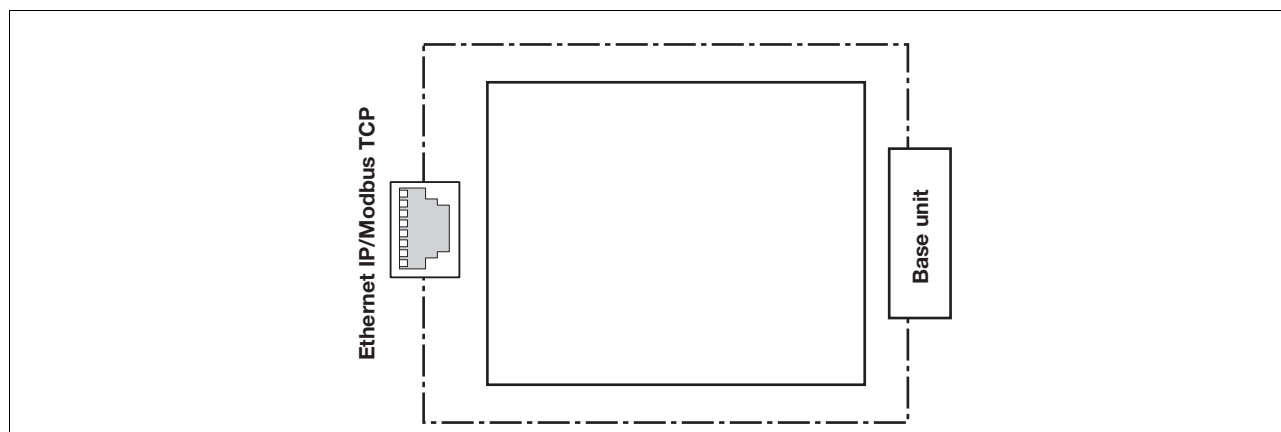
The PNOZ mc8p expansion module is used for communication between the PNOZmulti modular safety system and Ethernet IP plus Modbus TCP. Ethernet IP and Modbus TCP is designed for fast data exchange at field level. The PNOZ mc8p expansion module is a passive Ethernet IP (Adapter) or Modbus TCP (Slave) subscriber. 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

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

Block diagram



Expansion modules PNOZmulti 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 PNOZ-

multi safety system is reset, the PNOZ mc8p is configured and started automatically.

Verdrahtung

The wiring is defined in the circuit diagram of the PNOZmulti Configurator. It is possible to define which inputs and outputs on the safety system will

communicate with Ethernet IP and Modbus TCP. The connection to Ethernet IP and Modbus TCP is made via RJ45 connectors.



8 1

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

n.c.: Not connected

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:

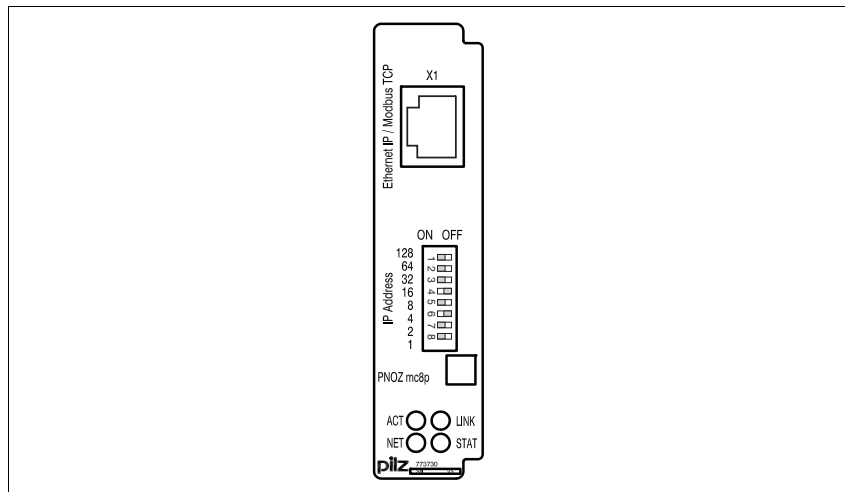
- The following minimum requirements of the connection cable and connector must be met:
 - Only use standard industrial Ethernet cable and connectors.
 - Only use double-shielded twisted pair cable and shielded RJ45 connectors (industrial connectors).
 - 10BaseT or 100BaseTX cable in accordance with 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).

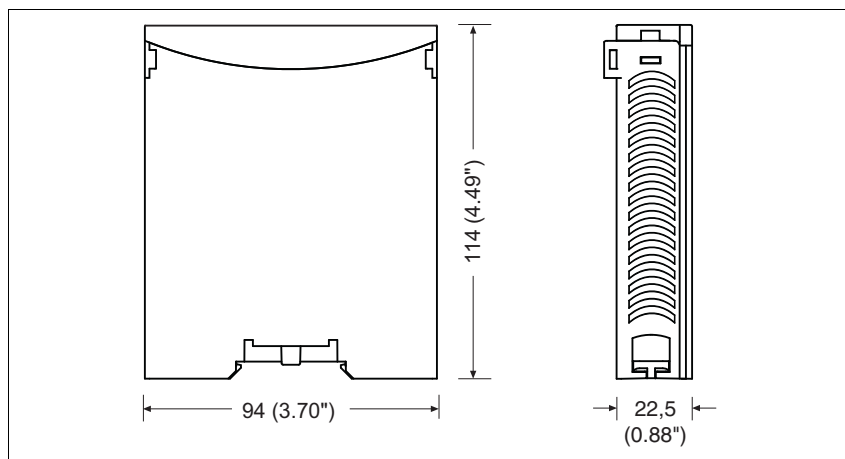
Expansion modules PNOZmulti

PNOZ mc8p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ mc8p

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

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED

Times

Supply interruption before de-energisation	20 ms
--	--------------

Fieldbus interface

Fieldbus interface	Ethernet IP, Modbus TCP
Device type	Slave
Transmission rates	10 MBit/s, 100 MBit/s
Connection	RJ45
Galvanic isolation	yes
Test voltage	500 V AC

Environmental data

Ambient temperature	-25 - 60 °C No. 773734 0 - 60 °C No. 773730
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary No. 773734 not permitted No. 773730
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	5 - 500 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms

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

Expansion modules PNOZmulti PNOZ mc8p

Mechanical data

Dimensions	
Height	94.0 mm
Width	22.5 mm
Depth	114.0 mm
Weight	137 g No. 773730
	140 g No. 773734

The standards current on **2009-10** apply.

Order reference

Product type	Features	Order no.
PNOZ mc8p	Fieldbus module, Ethernet IP, Modbus TCP	773 730
PNOZ mc8p coated version	Fieldbus module, Ethernet IP, Modbus TCP	773 734

Order reference: Terminator, jumper

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

Expansion modules PNOZmulti

PNOZ mc9p



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

Approvals

	PNOZ mc9p
	◆
	◆
	◆

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 configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected) It connects the PNOZmulti modular safety system to PROFINET IO. The modular safety system PNOZmulti 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 PNOZ mc9p expansion module is used for communication between the PNOZmulti modular safety system and PROFINET IO.

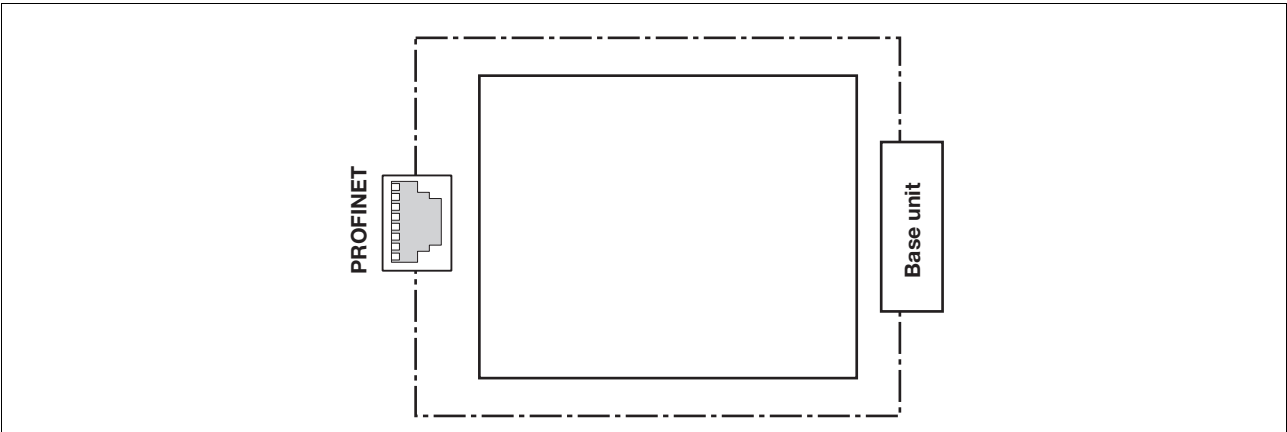
PROFINET IO is designed for fast data exchange at field level. The PNOZ mc9p expansion module is a passive PROFINET IO subscriber. The basic communication functions with PROFINET IO conform to the System Description published by the PROFIBUS User Group. The central controller (master) reads input information 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

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

Block diagram



Expansion modules PNOZmulti 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

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:

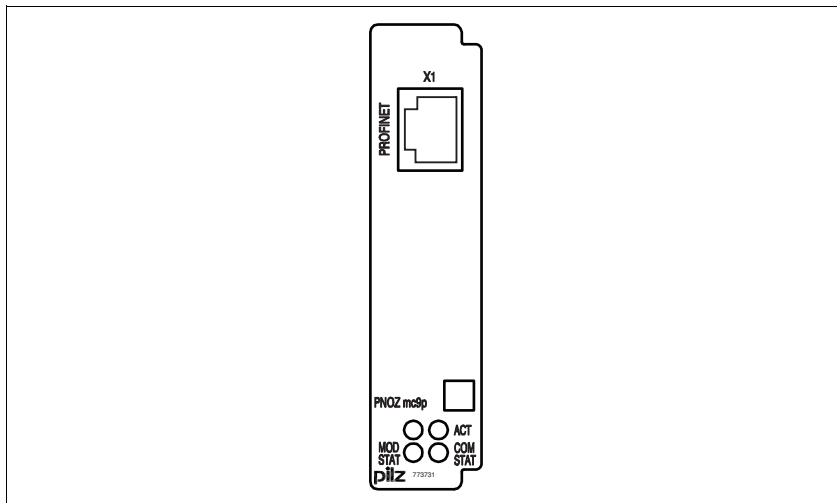
- The following minimum requirements of the connection cable and connector must be met:
 - Only use standard industrial Ethernet cable and connectors.
 - Only use double-shielded twisted pair cable and shielded RJ45 connectors (industrial connectors).
 - 100BaseTX cable in accordance with the Ethernet 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.

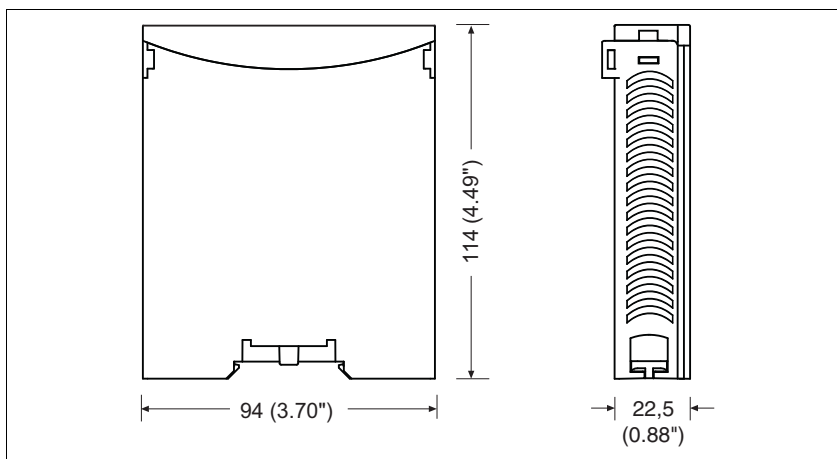
Expansion modules PNOZmulti

PNOZ mc9p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ mc9p

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	2.5 W
Status display	LED
Times	
Supply interruption before de-energisation	20 ms
Fieldbus interface	
Fieldbus interface	PROFINET IO
Device type	Slave
Transmission rates	100 MBit/s
Connection	RJ45
Galvanic isolation	yes
Test voltage	500 V AC
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms
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	22.5 mm
Depth	114.0 mm
Weight	135 g

The standards current on **2009-10** apply.

Expansion modules PNOZmulti PNOZ mc9p

Order reference

Product type	Features	Order no.
PNOZ mc9p	Fieldbus module, PROFINET IO	773 731

Order reference: Terminator, jumper





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

Expansion modules PNOZmulti PNOZ ml1p



Link module to safely connect two configurable control systems PNOZmulti.

Approvals

	PNOZ ml1p
	◆
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Point-to-point connection via 4-core shielded and twisted-pair cable
- ▶ 32 virtual inputs and 32 virtual outputs
- ▶ Status indicators
- ▶ Plug-in connection terminals (either cage clamp terminal or screw terminal)
- ▶ Max. 4 PNOZ ml1p units can be connected to the base unit
- ▶ LEDs for
 - Operating state
 - Error
 - Connection status
- ▶ Coated version: Increased environmental requirements

Unit description

The expansion module may only be connected to a base unit from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)
The configurable control system PNOZmulti is used for the safety-related

interruption of safety circuits and is designed for use in:

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

The coated version of the product **PNOZ ml1p** is suitable for use where there are increased environmental requirements (see Technical Details).

System requirements

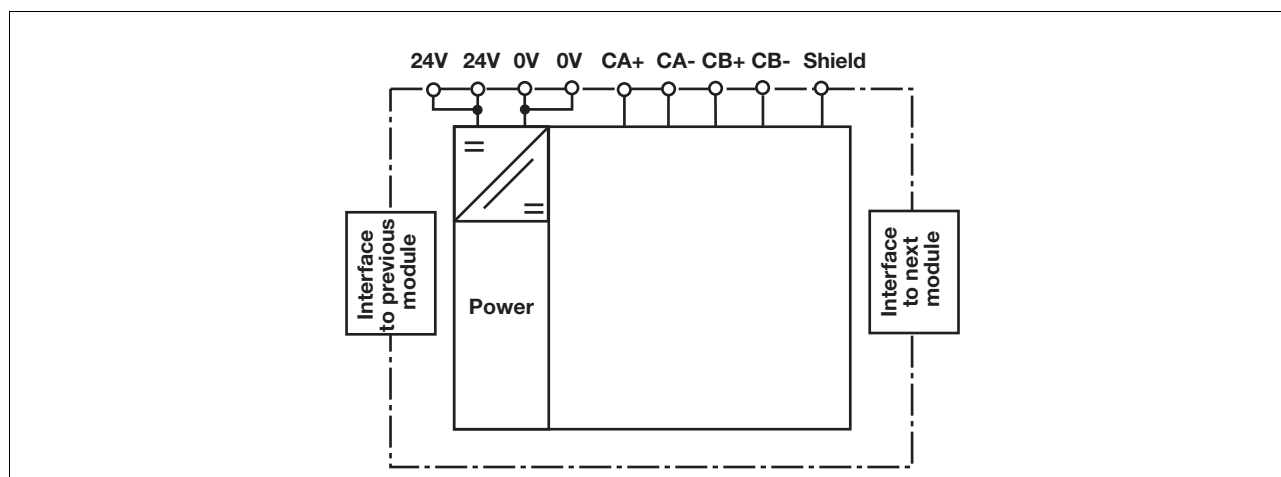
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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 PNOZmulti PNOZ ml1p

Function description

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

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

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

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

Data exchange:

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

Connection of multiple base units:

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

Data transmission time:

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

The maximum reaction time for series connection of n base units

This is the time between the activation of a safety function at the input on one base unit and the switching of an output on the connected base unit.

- ▶ The maximum reaction time t_{SUM} includes the following times:
 t_{ON} : Input delay = 4 ms
 t_{COND} : Switch-off delay of semiconductor output = 30 ms
 t_{REL} : Switch-off delay of relay output = 50 ms
 t_{BUS} : Data transmission time between two base units = 35 ms
 n : Number of connections between base units

The maximum reaction time t_{SUM} for series connection of n base units

- ▶ On semiconductor outputs:
 $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$
- ▶ On relay outputs:
 $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{REL}$

CAUTION!

For signals that are forwarded or received via the link module, a calculation must always be made in accordance with the above formulas.

- ▶ Input delay and switch-off delay are only included once in the reaction time. The data transmission time between the link modules is multiplied by the number of connections.
- ▶ Please refer to the connection examples under "Preparing for operation".

CAUTION!

For signals that are forwarded or received via the link module, 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 arrival of 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 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. The current at each terminal may not exceed 3 A.
- ▶ The max. cable length between two link modules may be max. 1000 m. Please note:
When connecting to a PNOZ ml1p with a version < 2.0, the cable length may be max. 100 m. The reduced cable length must be configured in the PNOZmulti Configurator.
- ▶ Connect the inputs and outputs from two PNOZ ml1p with a 4-core shielded cable. The cables must be twisted in pairs (see "Preparing for operation").
- ▶ Note the crossover cabling, e.g. CA+ with CB+.
- ▶ The cables must be classified into a minimum of Category 5 in accordance with ISO/IEC 11801.
- ▶ You can use ready-made cable from Pilz to connect two PNOZ ml1p. The plug-in connection terminals are either designed as cage clamp terminals or screw terminals (see order reference).
- ▶ Cable shield:
 - Note: Always connect the shield to both link modules (**Shield** terminal).
 - The shield of the connection cable may only be connected to the **Shield** terminals on both PNOZ ml1p. Do **not** connect the shield to the equipotential bonding bar, for example.

Expansion modules PNOZmulti

PNOZ ml1p

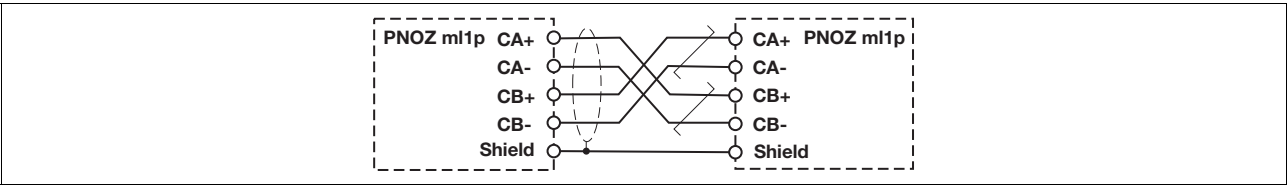
Preparing for operation

Connection

► Supply voltage

Supply voltage	AC	DC

► Connection of two PNOZmulti base units via PNOZ ml1p



Expansion modules PNOZmulti PNOZ ml1p

Connection examples

Example: 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 link

module + switch-off delay t_{COND} of the semiconductor output at O0

$$t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$$

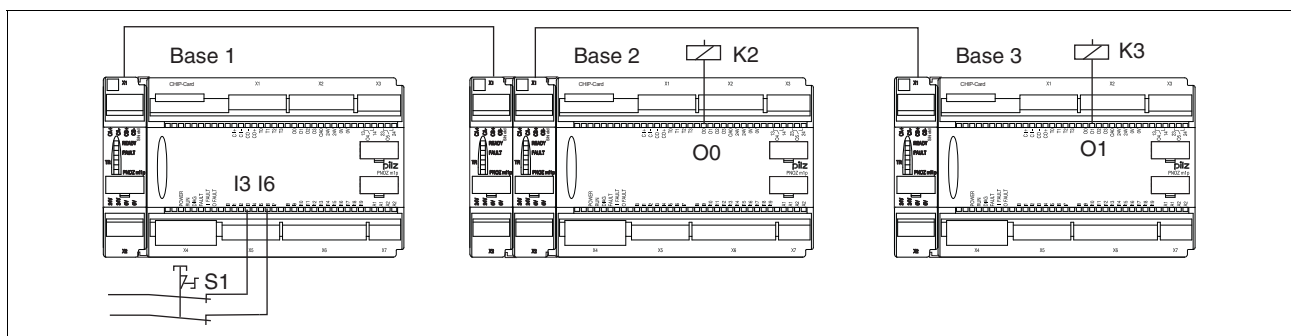
$$t_{SUM} = 4 \text{ ms} + (1 * 35 \text{ ms}) + 30 \text{ ms} = 69 \text{ ms}$$

Reaction time t_{SUM} between base unit Base 1 and Base 3:

Input delay t_{ON} at I3 und I6 + data transmission time $2 * t_{BUS}$ through link modules + switch-off delay t_{COND} of the semiconductor output at O1

$$t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$$

$$t_{SUM} = 4 \text{ ms} + (2 * 35 \text{ ms}) + 30 \text{ ms} = 104 \text{ ms}$$

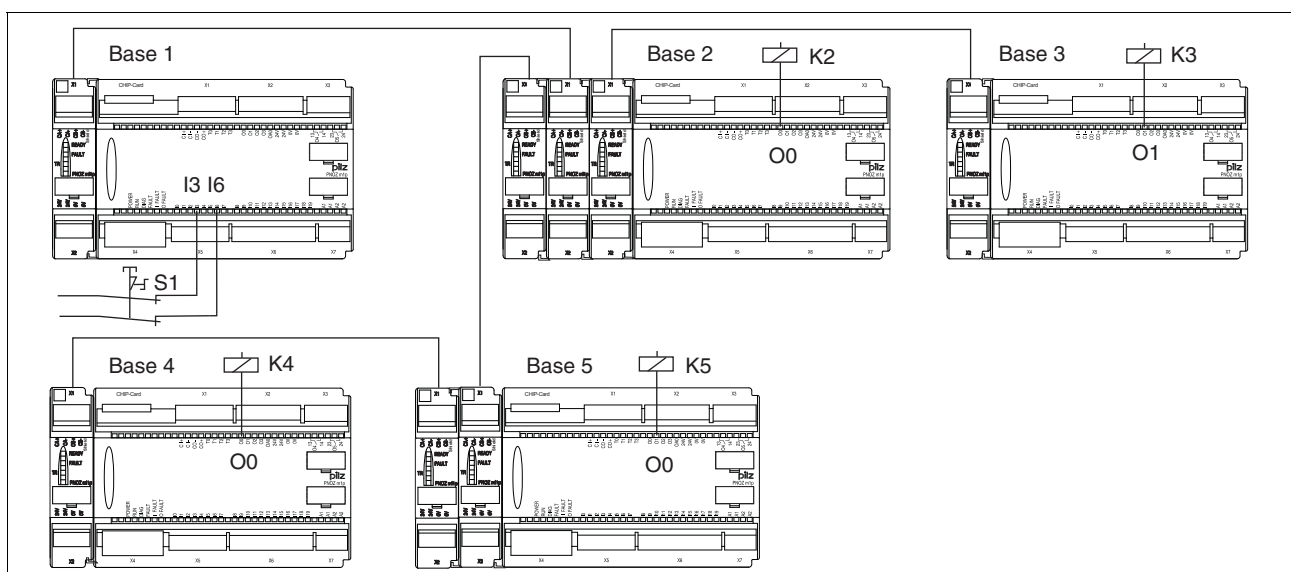


Example: Connection of 5 base units

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} :

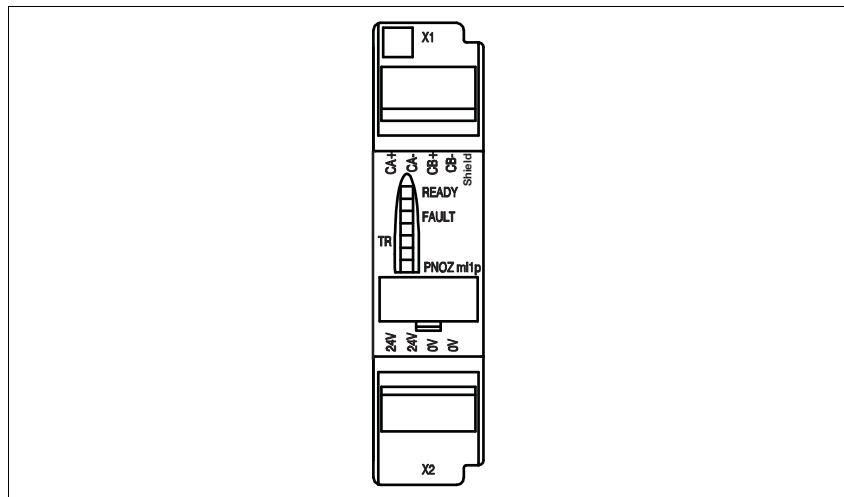
- O0 on Base 1: 69 ms
- O1 on Base 3: 104 ms
- O0 on Base 4: 139 ms
- O0 on Base 5: 104 ms



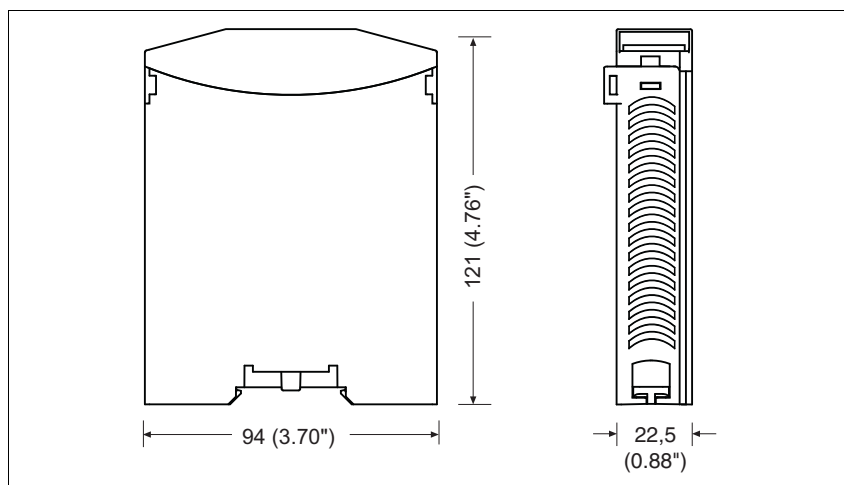
Expansion modules PNOZmulti

PNOZ ml1p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ ml1p

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
Max. data transmission time	35 ms

Inputs

Number of virtual inputs	32
--------------------------	----

Virtual outputs

Number of virtual outputs	32
---------------------------	----

Environmental data

Ambient temperature	-25 - 60 °C No. 773545 0 - 60 °C No. 773540
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	temporary No. 773545 not permitted No. 773540
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz No. 773540 5 - 500 Hz No. 773545
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms

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

Expansion modules PNOZmulti

PNOZ ml1p

Mechanical data	
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 mm ² , 22 - 14 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 0.75 mm ² , 22 - 20 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 0.75 mm ² , 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 mm ² , 26 - 14 AWG
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	120 g No. 773540
	135 g No. 773545

No. stands for order number.

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
		PL e (Cat. 4)	Cat. 4	SIL CL 3	8.82E-09	20
Link interface		PL e (Cat. 4)	Cat. 4	SIL CL 3	6.53E-10	20

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

The standards current on **2010-07** apply.

Order reference		
Product type	Features	Order no.
PNOZ ml1p	Link module	773 540
PNOZ ml1p coated version	Link module, coated version	773 545

Order reference: Accessories		
Product type	Features	Order no.
Set spring terminals	1 set of spring-loaded terminals	783 400
Set screw terminals	1 set of screw terminals	793 400

Expansion modules PNOZmulti PNOZ mli1p

Order reference: Connectors

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

Order reference: Cable





Product type	Features	Order no.
PNOZ mli1p 5m screw	Cable, 5-pin, shielded, screw terminal, 5 m	773 890
PNOZ mli1p 10m screw	Cable, 5-pin, shielded, screw terminal, 10 m	773 891
PNOZ mli1p 50m screw	Cable, 5-pin, shielded, screw terminal, 50 m	773 892
PNOZ mli1p 5m spring	Cable, 5-pin, shielded, spring-loaded terminal, 5 m	773 893
PNOZ mli1p 10m spring	Cable, 5-pin, shielded, spring-loaded terminal, 10 m	773 894
PNOZ mli1p 50m spring	Cable, 5-pin, shielded, spring-loaded terminal, 50 m	773 895
SafetyNET p Cable	SafetyNET p cable, 1 - 500 m	380 000

Expansion modules PNOZmulti PNOZ ml2p



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

Approvals

	PNOZ ml2p
	◆
	◆
	◆
	◆

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 configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

System requirements

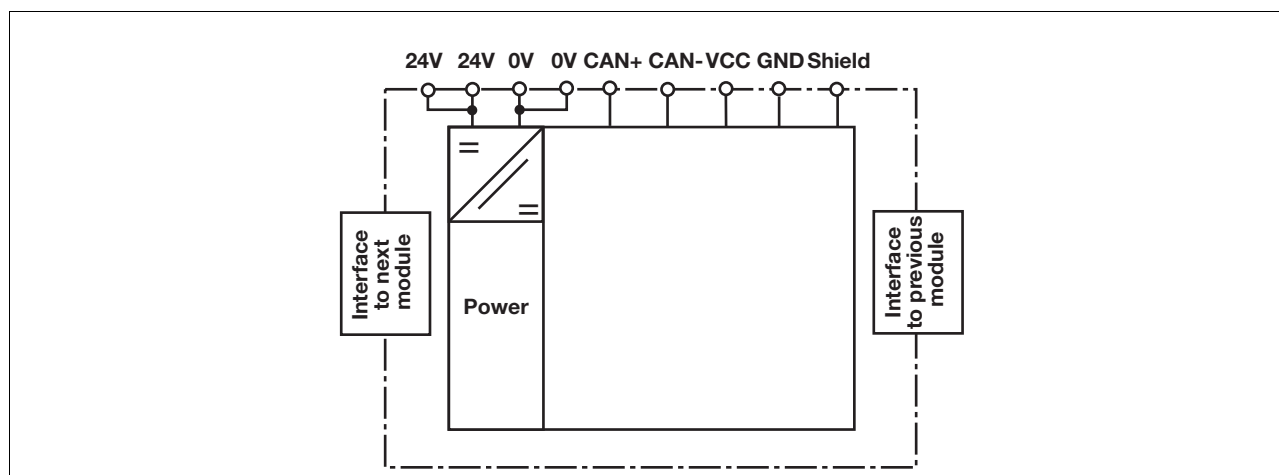
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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

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

The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti control 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. The current at each terminal may not exceed 3 A.
- ▶ Please refer to the technical details for information on the maximum cable length. Please also read the section entitled "Voltage drop".
- ▶ Shielded cable must be used from a cable length of **30 m**.
- ▶ Pilz pre-assembled cable can be used to connect the decentralised modules (see order reference).
- ▶ The plug-in connection terminals are either designed as cage clamp terminals or screw terminals (see order reference).

CAUTION!

Only connect and disconnect the expansion module when the supply voltage is switched off.

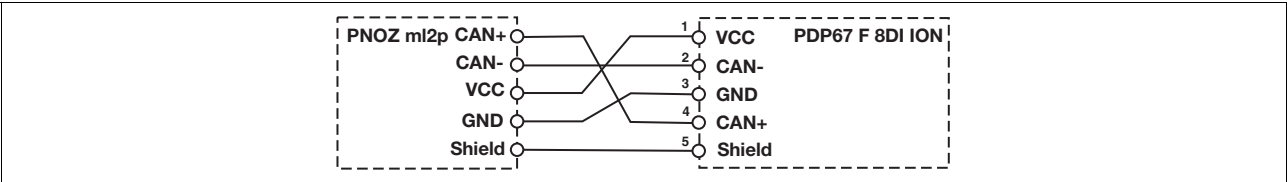
Expansion modules PNOZmulti PNOZ ml2p

Connection

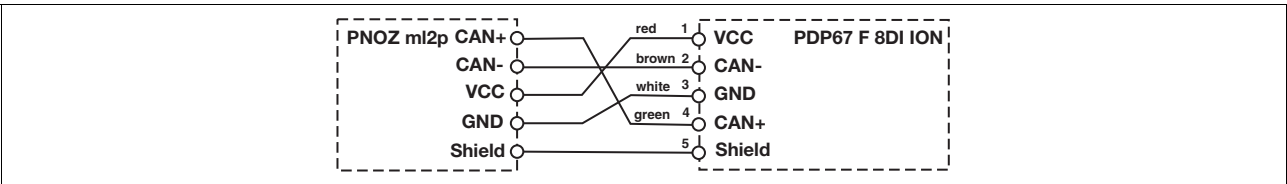
► Supply voltage

Supply voltage	AC	DC

► Connection to a decentralised input module PDP67



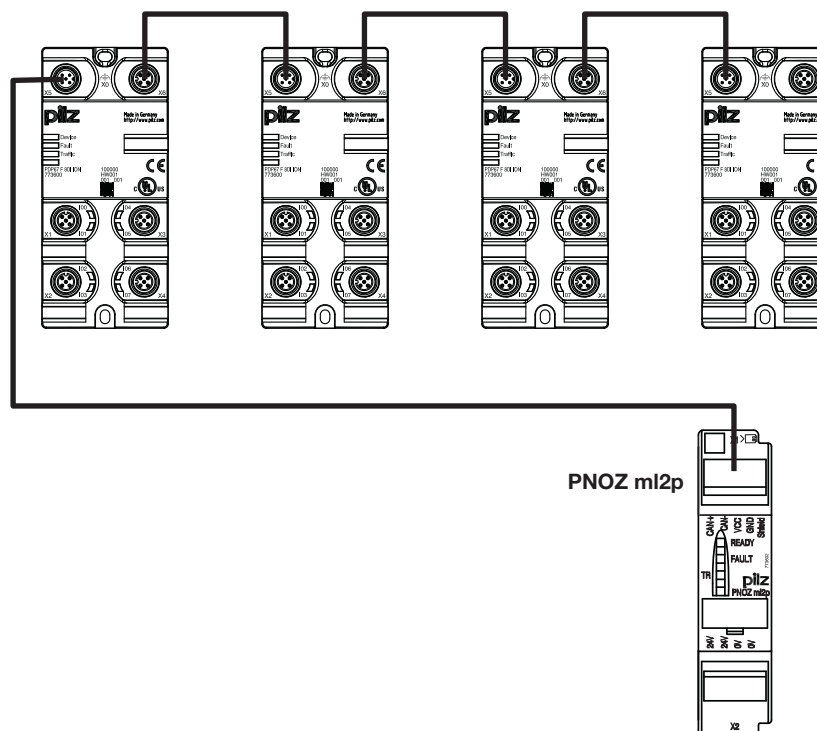
► Connection when using the PSS SB BUSCABLE LC in conjunction with a Pilz self-assembly "PSS67 M12 connector" (see order reference in the Technical Catalogue)



Expansion modules PNOZmulti PNOZ ml2p

Series connection of 4 decentral- ised modules

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



Voltage drop

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

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

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

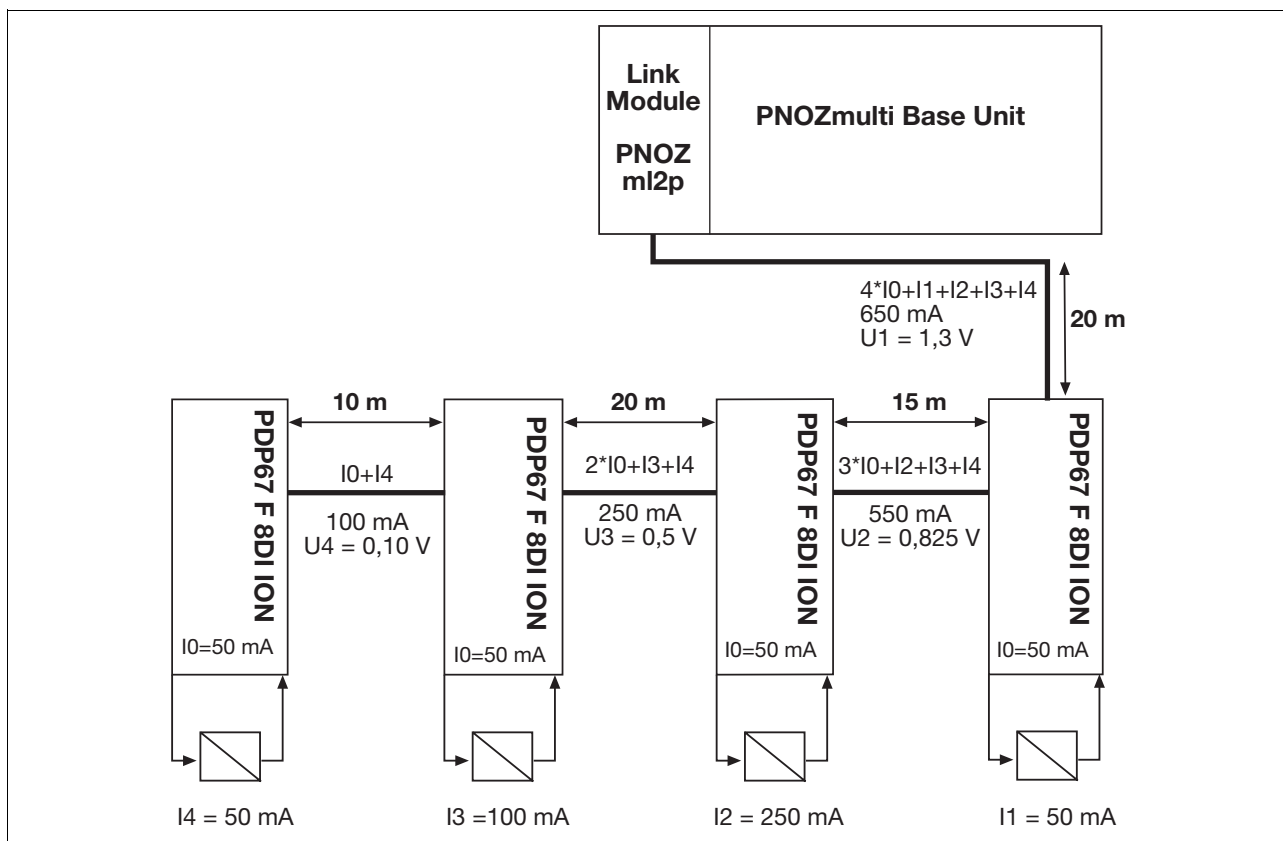
Expansion modules PNOZmulti PNOZ ml2p

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

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

$$U_{\text{total}} = U_1 + U_2 + U_3 + U_4$$

$$U_{\text{total}} = 1.3 \text{ V} + 0.825 \text{ V} + 0.5 \text{ V} + 0.10 \text{ V}$$

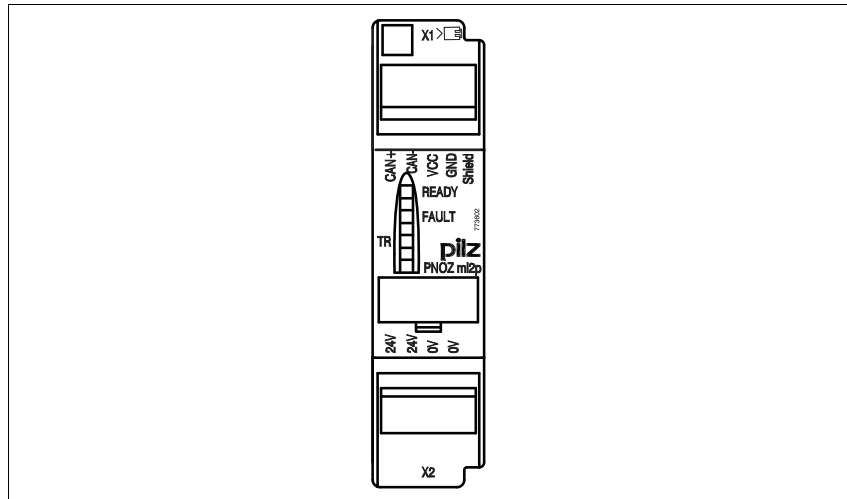
$$V = 2.725 \text{ V}$$

Total voltage drop from the link module **PNOZ ml2p** to the final PDP67 F 8DI ION:

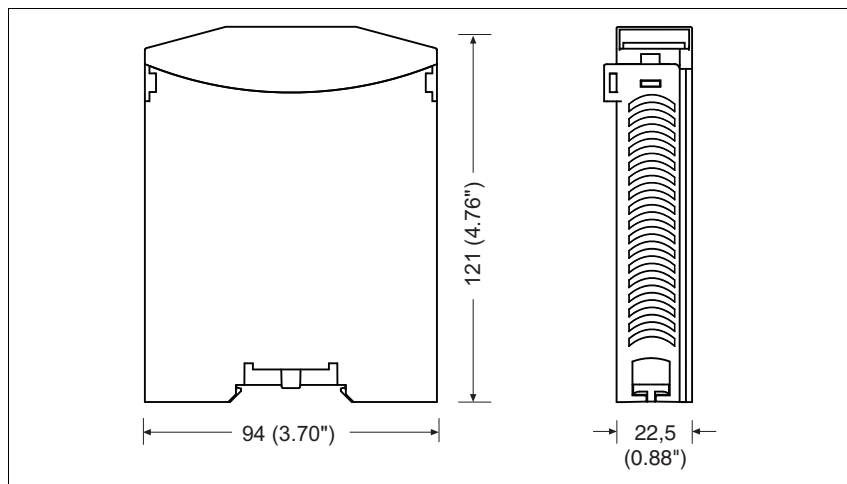
Expansion modules PNOZmulti

PNOZ ml2p

Terminal configuration



Dimensions



Expansion modules PNOZmulti 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	yes
Environmental data	
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Pollution degree	2
Rated insulation voltage	30 V
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 run unscreened	30 m
Maximum cable run screened	100 m
Housing material	
Housing	PPO UL 94 V0
Front	ABS UL 94 V0
Cross section of external conductors with screw terminals	
1 core flexible	0.50 - 1.50 mm ² , 22 - 14 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.50 - 0.75 mm ² , 22 - 20 AWG
without crimp connectors or with TWIN crimp connectors	0.50 - 0.75 mm ² , 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 mm ² , 26 - 14 AWG
Spring-loaded terminals: Terminal points per connection	1
Stripping length	9 mm

Expansion modules PNOZmulti

PNOZ ml2p

Mechanical data

Dimensions	
Height	94.0 mm
Width	22.5 mm
Depth	121.0 mm
Weight	133 g

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 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

Product type	Features	Order no.
PNOZ ml2p	Link module	773 602

Order reference: Accessories

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

Order reference: Terminator, jumper

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

Expansion modules PNOZmulti PNOZ ml2p

Order reference: Connectors

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

Order reference: Adapters

Product type	Features	Order no.
PSEN ma adapter	Adapter for connection to safety switch PSENmag	380 300
PSEN cs adapter	Adapter for connection to safety switch PSENcode	380 301

Order reference: Cable

Product type	Features	Order no.
PSS SB BUSCABLE LC	Cable, shielded, 1 - 100 m	311074
PSS67 I/O Cable	Cable, 1 - 30 m	380 320
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 4-pin, 3m	380 200
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 4-pin, 5 m	380 201
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 4-pin, 10 m	380 202
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 4-pin, 30 m	380 203
PSS67 Cable M8af M12sm	Cable, straight M12 connector, angled M8 socket, 4-pin, 3m	380 204
PSS67 Cable M8af M12sm	Cable, straight M12 connector, angled M8 socket, 4-pin, 5 m	380 205
PSS67 Cable M8af M12sm	Cable, straight M12 connector, angled M8 socket, 4-pin, 10 m	380 206
PSS67 Cable M8af M12sm	Cable, straight M12 connector, angled M8 socket, 4-pin, 30 m	380 207
PSS67 Cable M12sf M12sm	Cable, straight M12 connector, straight M12 socket, 5-pin, 3m	380 208
PSS67 Cable M12sf M12sm	Cable, straight M12 connector, straight M12 socket, 5-pin, 5 m	380 209
PSS67 Cable M12sf M12sm	Cable, straight M12 connector, straight M12 socket, 5-pin, 10 m	380 210
PSS67 Cable M12sf M12sm	Cable, straight M12 connector, straight M12 socket, 5-pin, 30 m	380 211
PSS67 Cable M12af M12am	Cable, angled M12 connector, angled M12 socket, 5-pin, 3m	380 212
PSS67 Cable M12af M12am	Cable, angled M12 connector, angled M12 socket, 5-pin, 5 m	380 213
PSS67 Cable M12af M12am	Cable, angled M12 connector, angled M12 socket, 5-pin, 10 m	380 214
PSS67 Cable M12af M12am	Cable, angled M12 connector, angled M12 socket, 5-pin, 30 m	380 215





Expansion modules PNOZmulti

PNOZ ms1p



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

Approvals

	PNOZ ms1p
	◆
	◆
	◆
	◆

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

Unit description

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

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 configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

System requirements

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

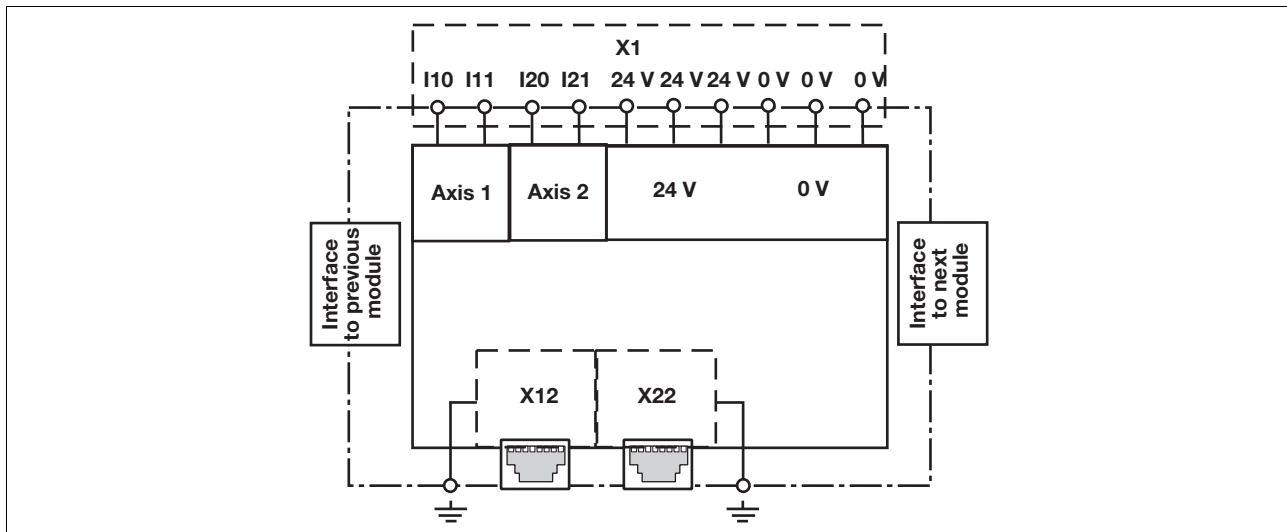
Safety features

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.

Expansion modules PNOZmulti PNOZ ms1p

Block diagram



Expansion modules PNOZmulti 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. 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 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.

Note:

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

Proximity switch

- ▶ 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 and 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 female RJ45 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"

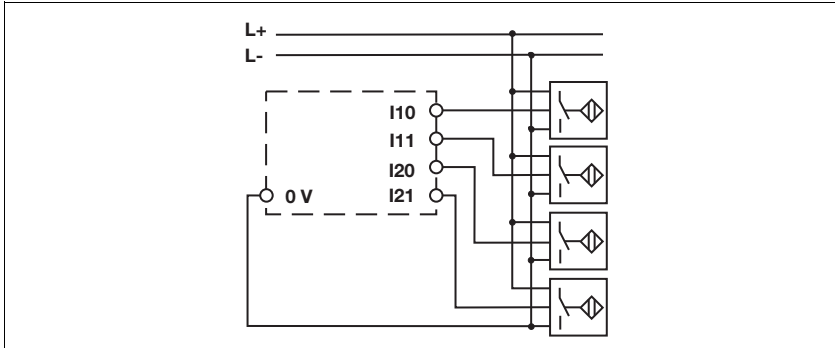
This status will only lead to a safe condition if the option for broken shearpin monitoring has been activated in the configuration.

Connection of proximity switches

Proceed as follows when connecting proximity switches:

- ▶ Terminals I10 and I11: connect the proximity switch for axis 1
- ▶ Terminals I20 and I21: connect the proximity switch for axis 2.
- ▶ If only one axis is to be monitored, either terminals I10 and I11 or terminals I20 and I21 will remain free.
- ▶ When connecting incremental encoders and proximity switches on an 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)

Expansion modules PNOZmulti PNOZ ms1p



Connection of the incremental encoder

Follow the instructions below when connecting the incremental encoder:

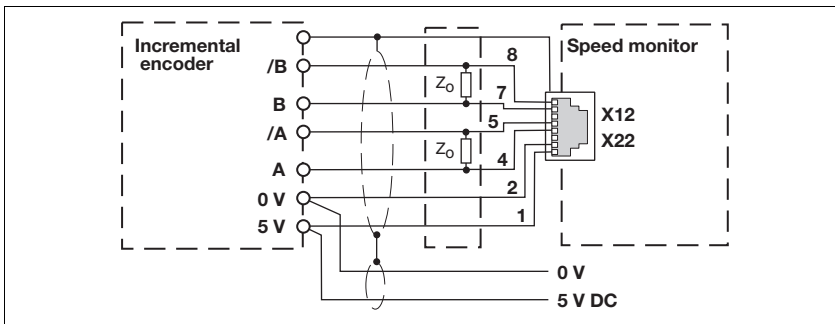
- ▶ The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- ▶ The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- ▶ Only use shielded cables for all connections
- ▶ 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.

Connect signals of the incremental encoder to the speed monitor

Input device types: 1 Vss, 5 V-TTL

- ▶ Supply incremental encoder and speed monitor with 5 VDC
- ▶ Terminate incremental encoder with $Z_O = 120 \text{ Ohm}$

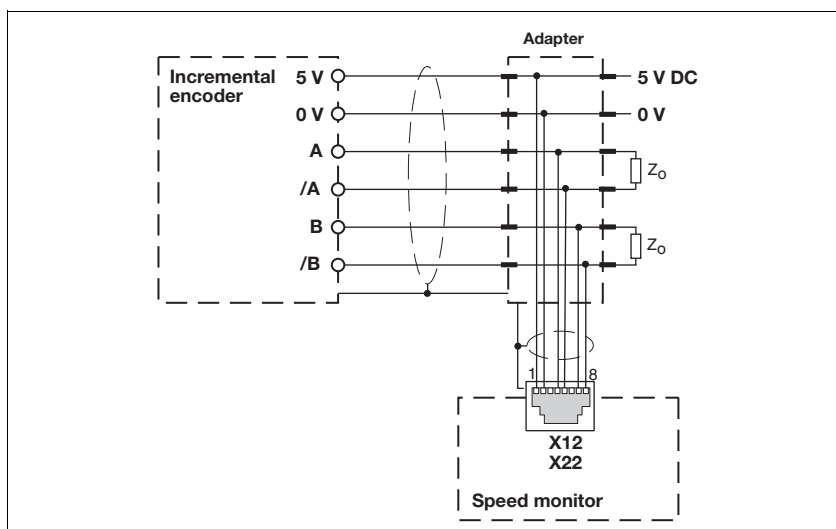
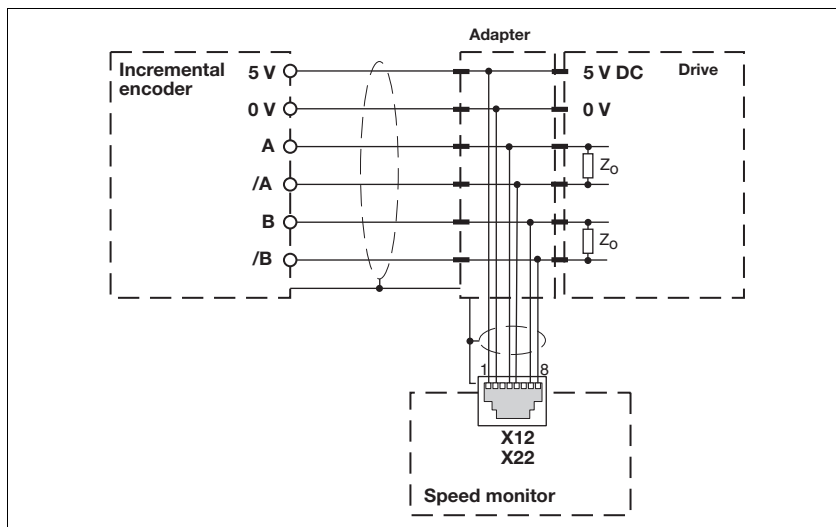
2.3



Expansion modules PNOZmulti PNOZ ms1p

Connect incremental encoder to the speed monitor via an 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 female RJ45 connector on the speed monitor.
- ▶ The adapter can also be used without connecting to a drive. The signal lines can then be terminated directly at the adapter with $Z_0 = 120 \text{ Ohm}$.
- ▶ If the signal lines in the drive are already terminated with $Z_0 = 120 \text{ Ohm}$, the incremental encoder may no longer be terminated.
- ▶ The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated in section 6.2.2.1 and in the adapter operating manual must be observed when connecting the supply voltage.

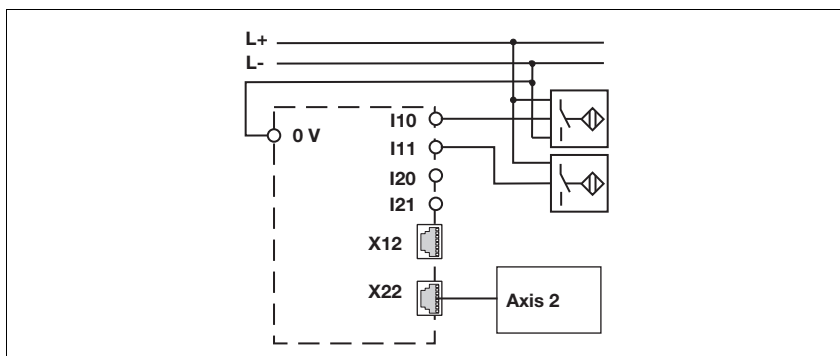


Expansion modules PNOZmulti PNOZ ms1p

Connection of proximity switches and incremental encoder

Proximity switch and incremental encoder on various axes

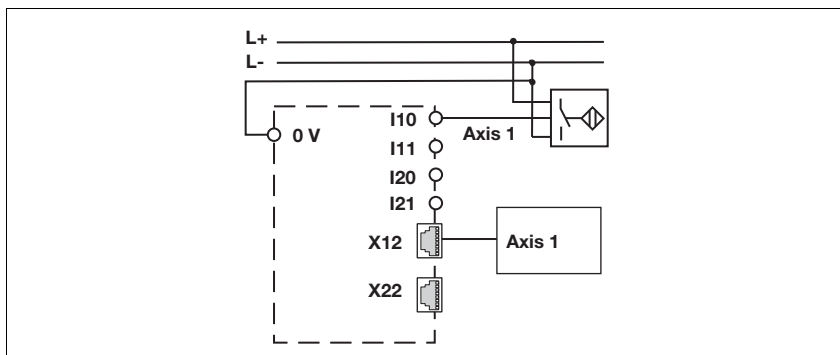
Axis 1:
proximity switch on I10, I11
or
incremental encoder on X12
Axis 2:
proximity switch on I20, I21
or
incremental encoder on X22



Proximity switch and incremental encoder on one axis

Axis 1:
Proximity switch at I10 (I11 is unused)
and

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



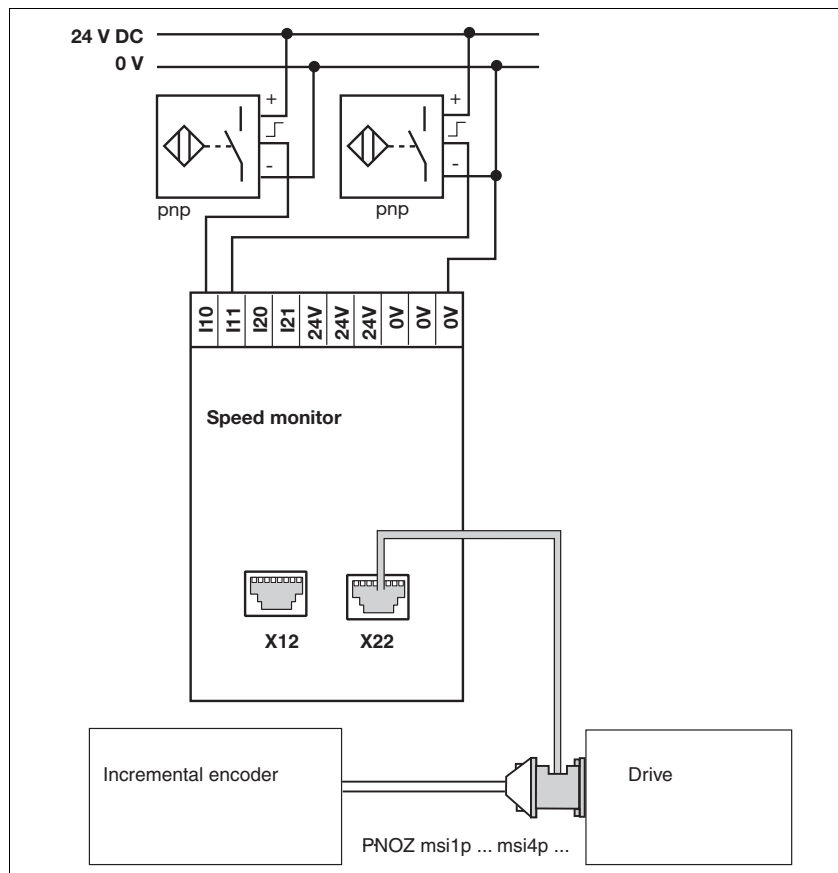
Expansion modules PNOZmulti PNOZ ms1p

Connection examples

Connection of 2 proximity switches and an incremental encoder

Description

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

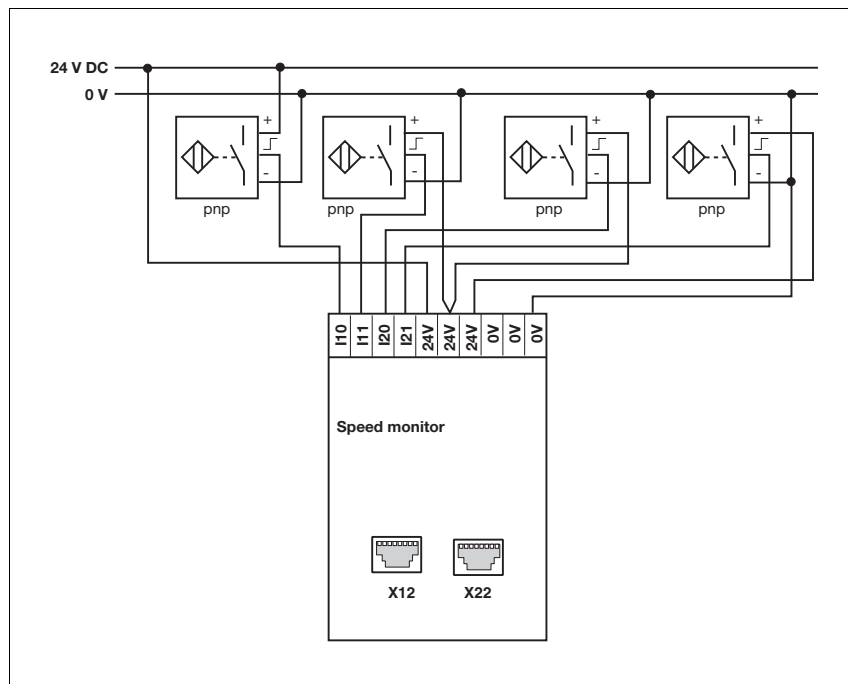


Expansion modules PNOZmulti PNOZ ms1p

Connection of 4 proximity switches

Description

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

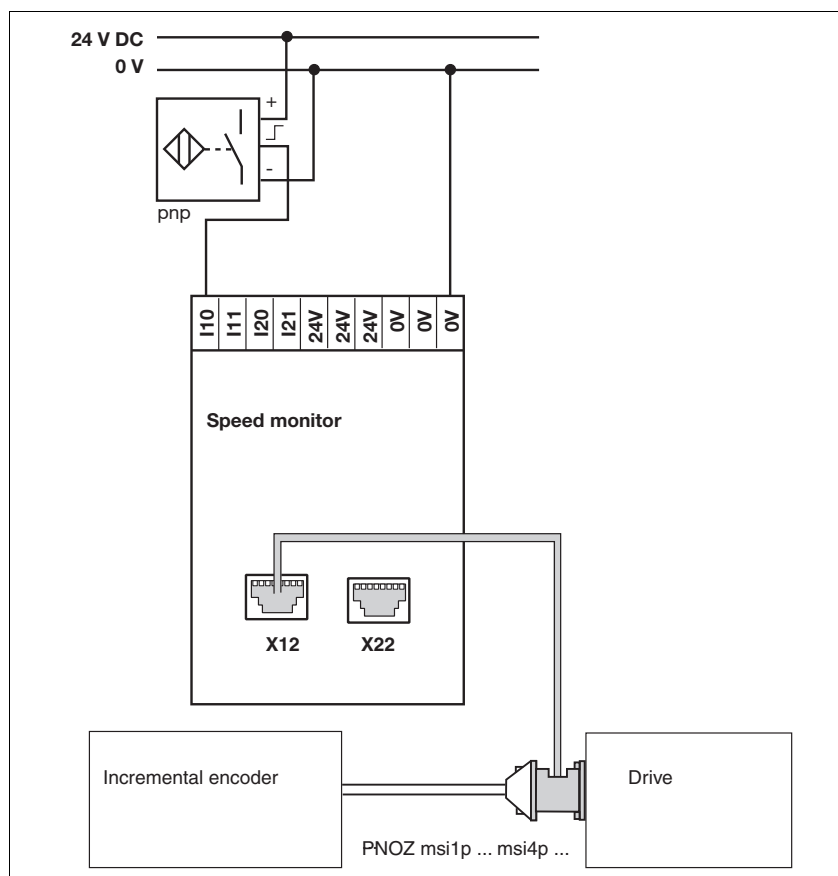


Expansion modules PNOZmulti PNOZ ms1p

Connection of an incremental encoder and proximity switch on an axis

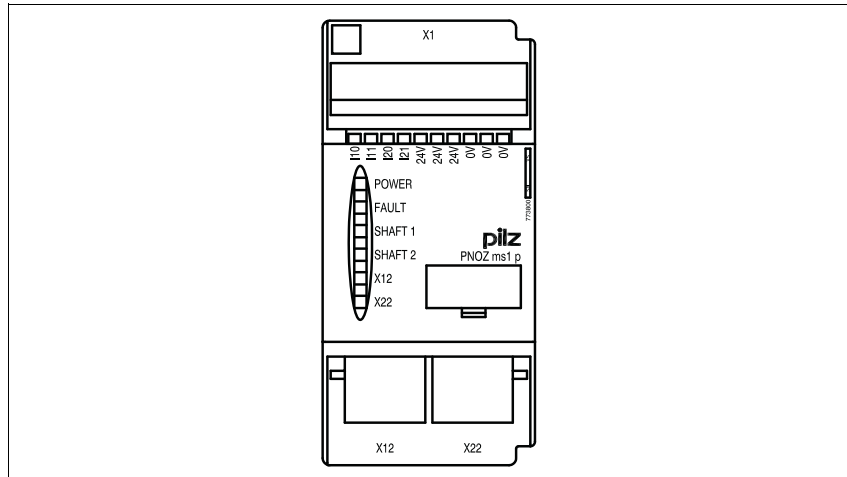
Description

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

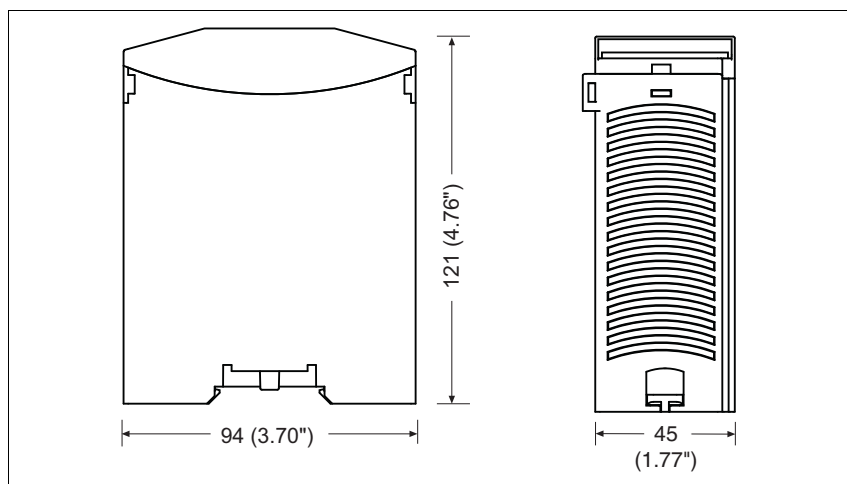


Expansion modules PNOZmulti PNOZ ms1p

Terminal configuration



Dimensions



Expansion modules PNOZmulti PNOZ ms1p

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

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	1.0 W
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 terminal, screw terminal
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
Supply voltage for incremental encoder	5 V DC ±10 %, typ.30 mA
Input signal level	0.5 - 5.0 V_{ss}
Phase position for the differential signals A _/ A and B _/ B	90° ±30°
Overload protection	-30 - 30 V
Input resistance	10.0 kOhm
Input's frequency range	0 - 500 kHz
Configurable monitoring frequency	
without hysteresis	0,1 Hz - 500 kHz
with hysteresis	0,2 Hz - 500 kHz
Connection type (incremental encoder)	RJ45 socket, 8-pin

Environmental data

Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2

Expansion modules PNOZmulti PNOZ ms1p

Environmental data	
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms
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	192 g

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 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	4.52E-09	20

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

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

Expansion modules PNOZmulti PNOZ ms1p

Order reference: Accessories

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

Order reference: Terminator, jumper

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





Expansion modules PNOZmulti

PNOZ ms2p HTL



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

Approvals

	PNOZ ms2p HTL
	◆
	◆
	◆
	◆

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

Unit description

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

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

System requirements

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

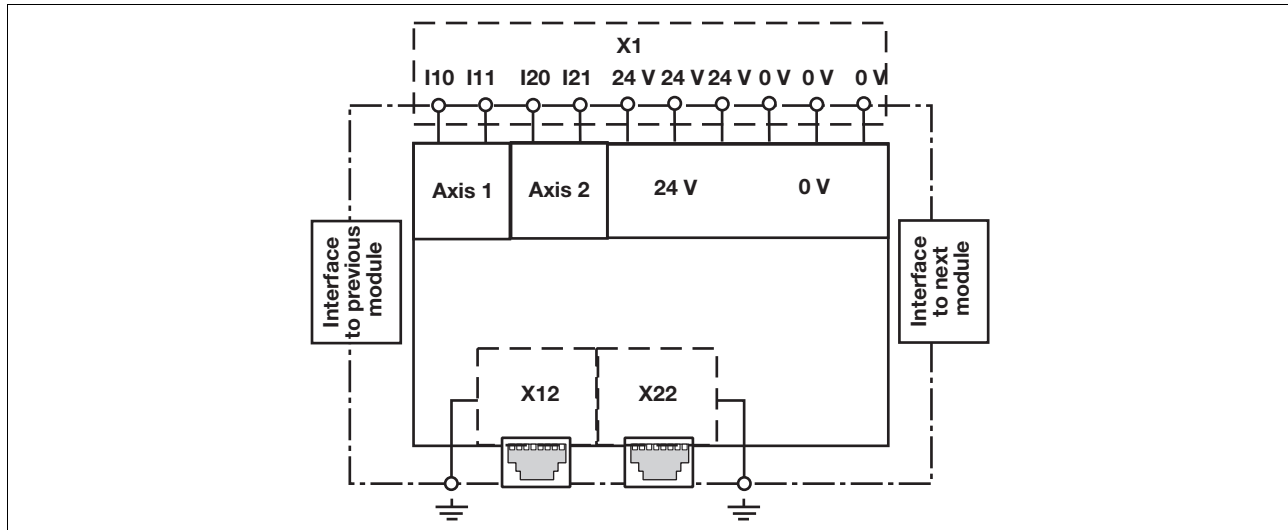
Safety features

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.

Expansion modules PNOZmulti PNOZ ms2p HTL

Block diagram



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.

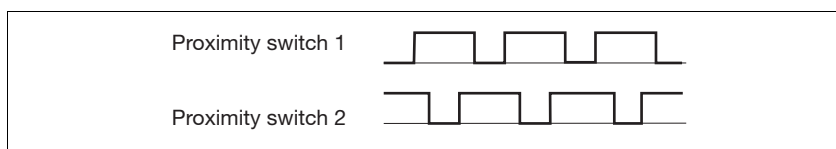
Input device types

Proximity switch

Requirements of the proximity switches

- ▶ Only "pnp" type proximity switches may be used (N/O contact, switching to positive).
- ▶ The proximity switches require a 24 VDC supply.

- ▶ The proximity switches must be fitted so that at least one is always activated (carries a high signal).
- ▶ The proximity switches must be fitted so that the recorded signals overlap.



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).

- ▶ Please note the values stated in the technical details

Expansion modules PNOZmulti PNOZ ms2p HTL

Incremental encoders

Requirements of the incremental encoders

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

The 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.

Adapter for incremental encoders

The adapter records the data between the incremental encoder and the drive and makes it available to the speed monitor via the RJ45 socket. Pilz supplies complete adapters as well as ready-made cable with RJ45 connector, which can be used when making your own adapter. The range of products in this area is constantly being expanded. Please contact us about the range of adapters that is currently available.

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).

Expansion modules PNOZmulti PNOZ ms2p HTL

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:

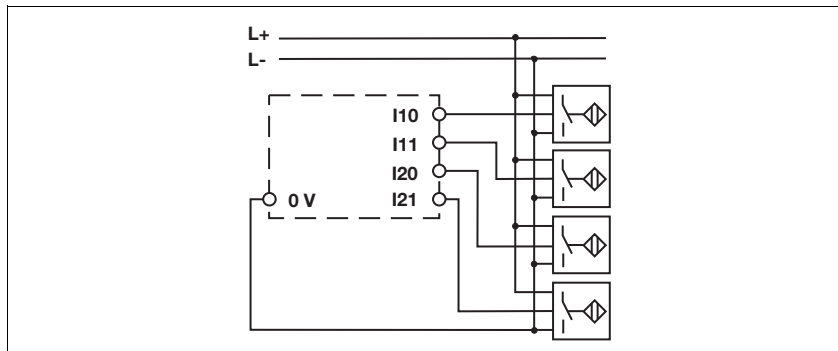
- ▶ Information given in the "Technical details" must be followed.
- ▶ Use copper wire that can withstand 75 °C.

Connection of proximity switches

Proceed as follows when connecting proximity switches:

- ▶ Terminals I10 and I11: connect the proximity switch for axis 1
- ▶ Terminals I20 and I21: connect the proximity switch for axis 2.
- ▶ If only one axis is to be monitored, either terminals I10 and I11 or terminals I20 and I21 will remain free.
- ▶ When connecting incremental encoders and proximity switches on an 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)



Connection of the incremental encoder

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 in-

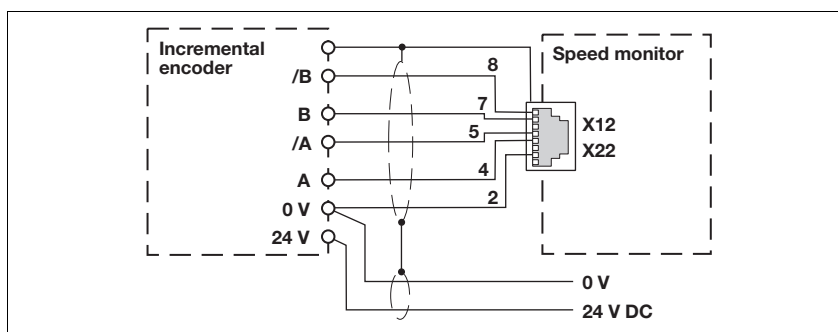
cremental encoder on connector X22 monitors axis 2.

- ▶ 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.

Connect signals of the incremental encoder to the speed monitor

Encoder types: 24 V-HTL

- ▶ Apply 24 VDC supply voltage to incremental encoder only
- ▶ Do not terminate incremental encoder with $Z_0 = 120 \text{ Ohm}$



Expansion modules PNOZmulti PNOZ ms2p HTL

Connect incremental encoder to the speed monitor via an adapter

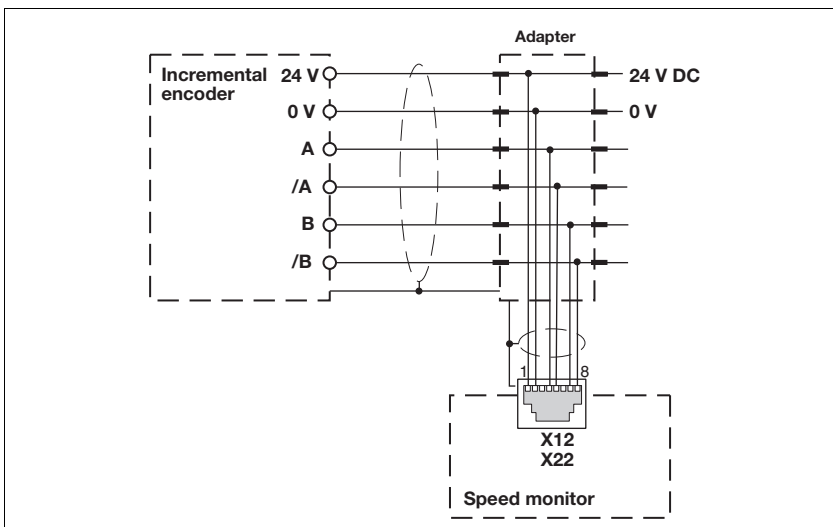
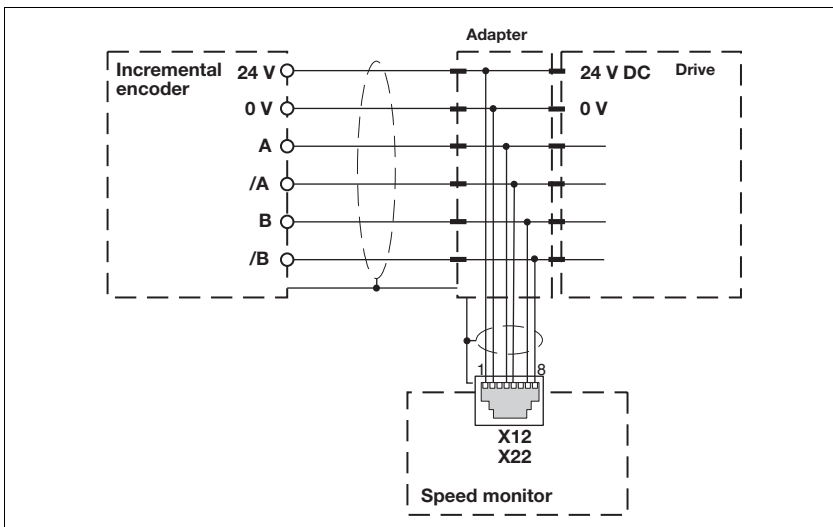
- ▶ The adapter (e.g. PNOZ msi6p) is connected between the incremental encoder and the drive. The output on the adapter is connected to

the female RJ45 connector on the speed monitor.

- ▶ The adapter can also be used without connecting to a drive.
- ▶ The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated in section 6.2.2.1 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.

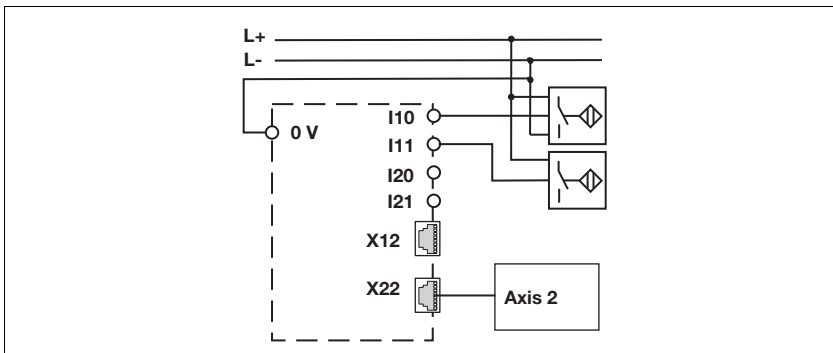


Expansion modules PNOZmulti PNOZ ms2p HTL

Connection of proximity switches and incremental encoder

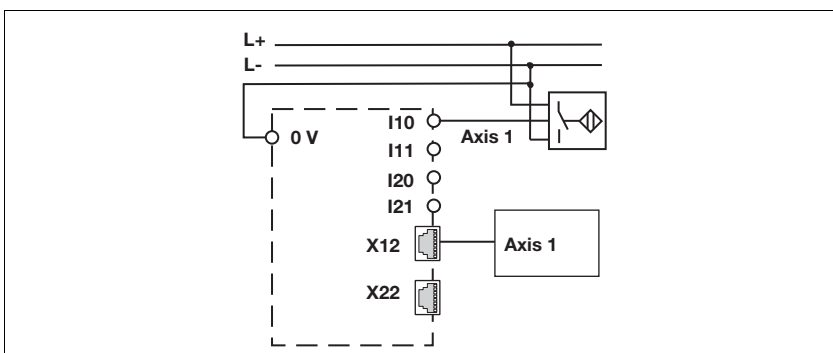
Proximity switch and incremental encoder on various axes

Axis 1:
proximity switch on I10, I11
or
incremental encoder on X12
Axe 2:
proximity switch on I10, I21
or
incremental encoder on X22



Proximity switch and incremental encoder on one axis

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



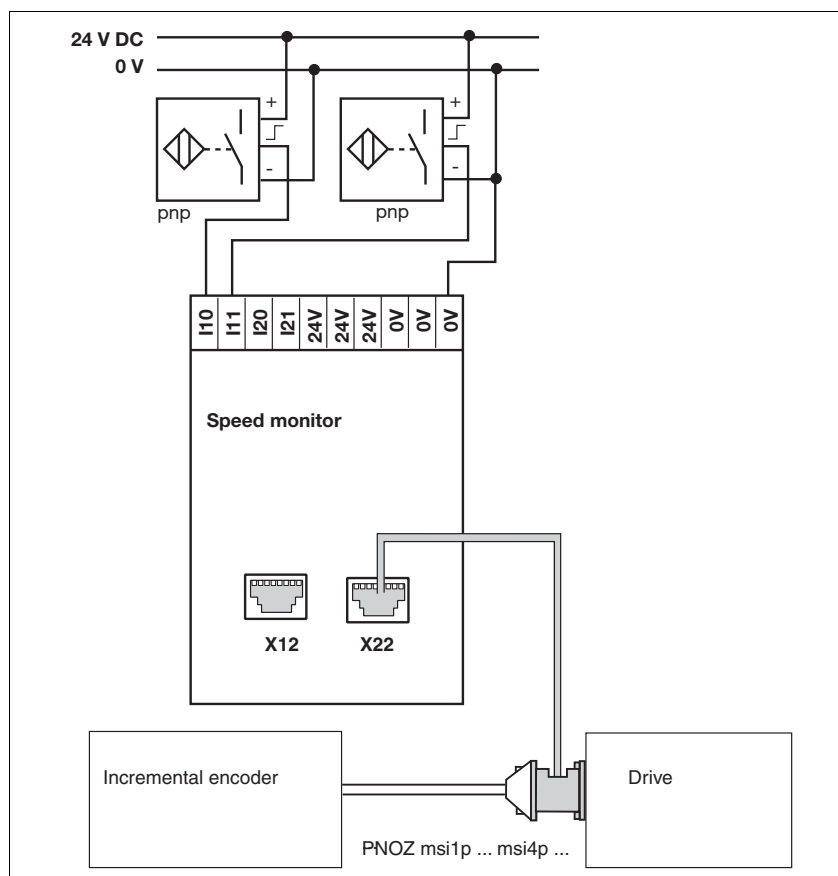
Expansion modules PNOZmulti PNOZ ms2p HTL

Connection examples

Connection of 2 proximity switches and an incremental encoder

Description

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

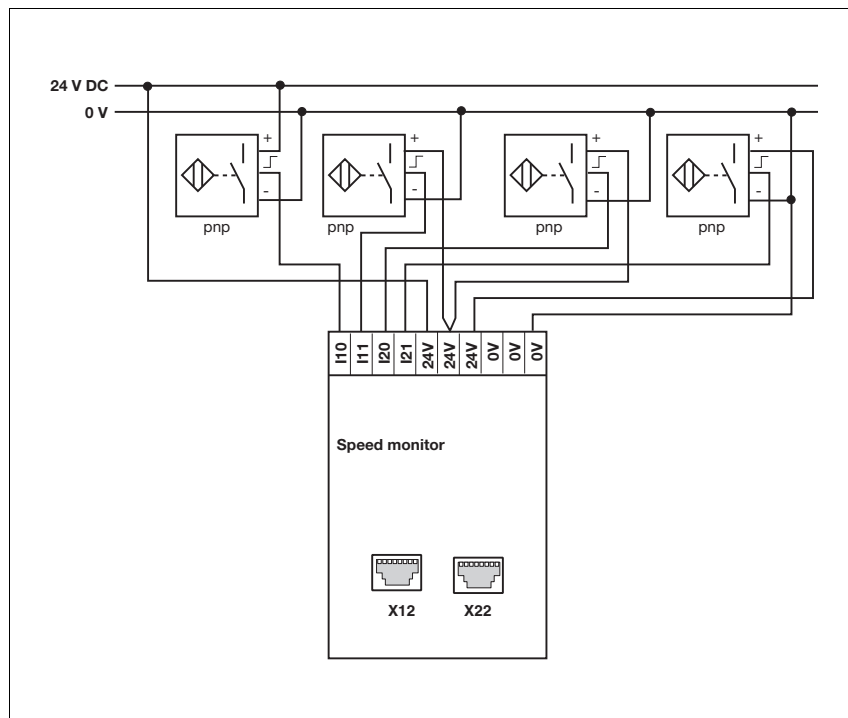


Expansion modules PNOZmulti PNOZ ms2p HTL

Connection of 4 proximity switches

Description

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

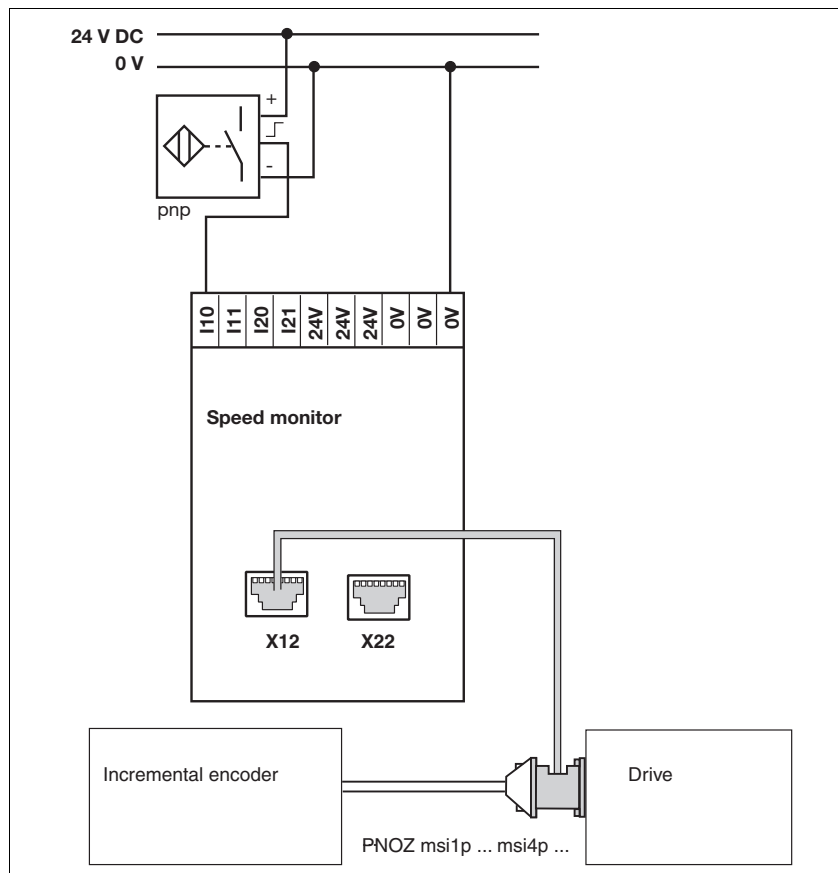


Expansion modules PNOZmulti PNOZ ms2p HTL

Connection of an incremental encoder and proximity switch on an axis

Description

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



Terminal configuration

[illegible]

Expansion modules PNOZmulti PNOZ ms2p HTL

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	1.0 W
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 terminal, screw terminal
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 V_{ss}
Phase position for the differential signals A _r /A and B _r /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)	RJ45 socket, 8-pin
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2

Expansion modules PNOZmulti

PNOZ ms2p HTL

Environmental data

Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g
	11 ms

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: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 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.

Expansion modules PNOZmulti

PNOZ ms2p HTL

Order reference

Product type	Features	Order no.
PNOZ ms2p HTL	Expansion module, speed monitor	773 815

Order reference: Accessories

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

Order reference: Terminator, jumper

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





Expansion modules PNOZmulti

PNOZ ms2p TTL



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

Approvals

	PNOZ ms2p TTL
	◆
	◆
	◆
	◆

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

Unit description

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

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 configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ E-STOP equipment

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

The coated version of the product **PNOZ ms2p TTL** is suitable for use where there are increased environmental requirements (see Technical Details).

System requirements

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

Safety features

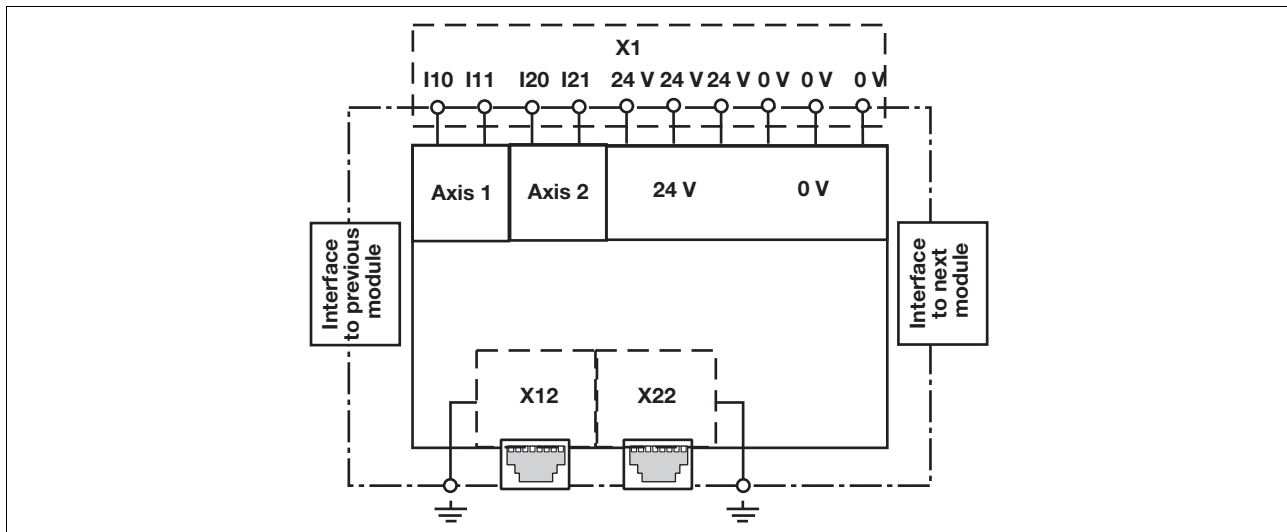
The relay conforms to the following safety criteria:

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

Expansion modules PNOZmulti

PNOZ ms2p TTL

Block diagram



Expansion modules PNOZmulti PNOZ ms2p TTL

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.

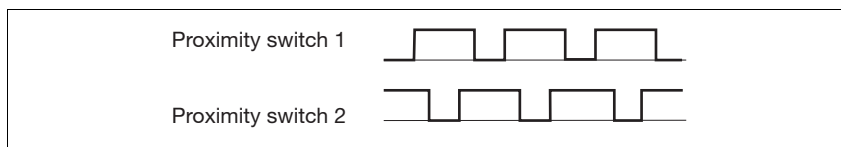
Input device types

Proximity switch

Requirements of the proximity switches

- ▶ Only "pnp" type proximity switches may be used (N/O contact, switching to positive).

- ▶ The proximity switches require a 24 VDC supply.
- ▶ The proximity switches must be fitted so that at least one is always activated (carries a high signal).
- ▶ The proximity switches must be fitted so that the recorded signals overlap.



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).

- ▶ Please note the values stated in the technical details

Incremental encoders

Requirements of the incremental encoders

- ▶ Only incremental encoders with a differential output of the following type are permitted
 - Sin/Cos
 - TTL (RS 422)
- ▶ Pay attention to the values in the technical details

Adapter for incremental encoders

The adapter records the data between the incremental encoder and the drive and makes it available to the speed monitor via the RJ45 socket.

Pilz supplies complete adapters as well as ready-made cable with RJ45 connector, which can be used when making your own adapter. The range of products in this area is constantly

being expanded. Please contact us about the range of adapters that is currently available.

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 con-

dition is cleared again as required (see "Signal statuses" table).

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

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:

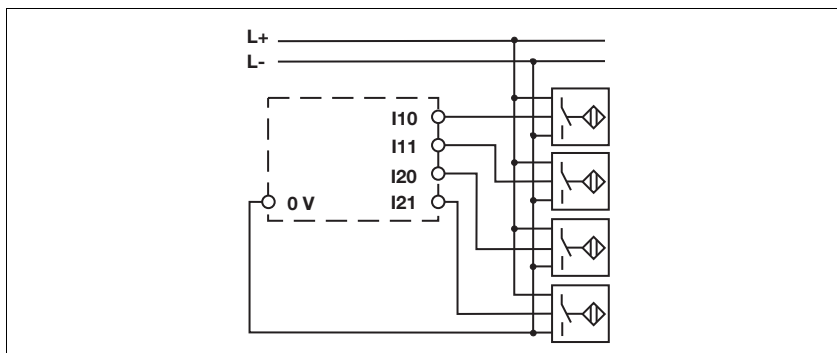
- ▶ Information given in the "Technical details" must be followed.
- ▶ Use copper wire that can withstand 75 °C.

Expansion modules PNOZmulti PNOZ ms2p TTL

Connection of proximity switches

Proceed as follows when connecting proximity switches:

- ▶ Terminals I10 and I11: connect the proximity switch for axis 1
- ▶ Terminals I20 and I21: connect the proximity switch for axis 2.
- ▶ If only one axis is to be monitored, either terminals I10 and I11 or terminals I20 and I21 will remain free.
- ▶ When connecting incremental encoders and proximity switches on an 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)



Connection of the incremental encoder

Follow the instructions below when connecting the incremental encoder:

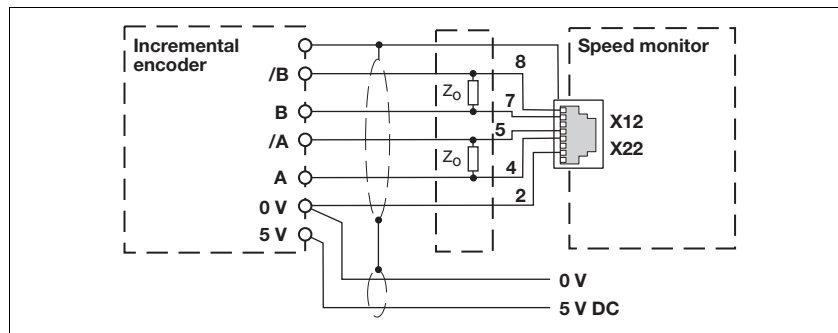
- ▶ The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- ▶ The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- ▶ Only use shielded cables for all connections
- ▶ 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.

Expansion modules PNOZmulti PNOZ ms2p TTL

Connect signals of the incremental encoder to the speed monitor

Encoder types: 1 Vss, 5 V-TTL

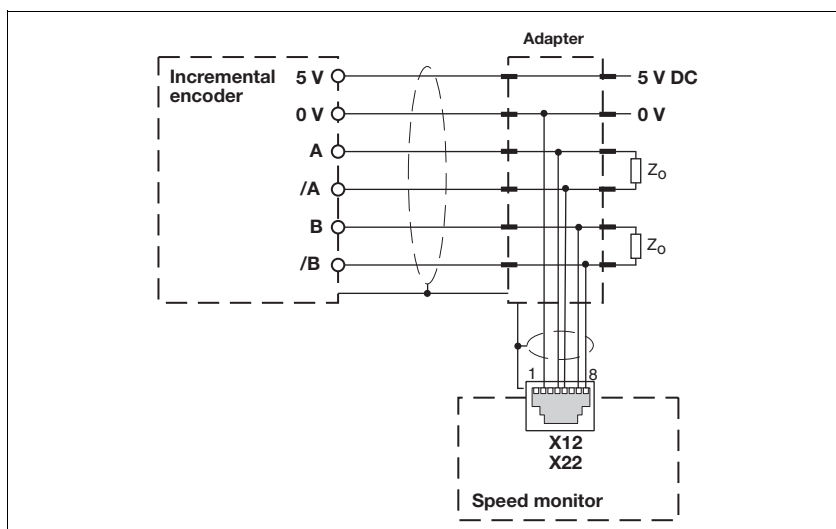
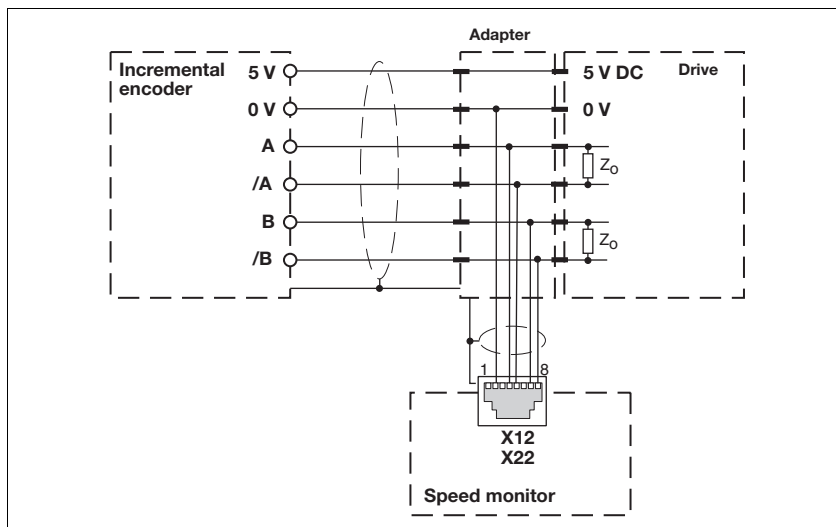
- ▶ Apply 5 VDC to incremental encoder only
- ▶ Terminate incremental encoder with $Z_0 = 120 \text{ Ohm}$



Expansion modules PNOZmulti PNOZ ms2p TTL

Connect incremental encoder to the speed monitor via an 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 signal lines can then be terminated directly at the adapter with $Z_0 = 120 \text{ Ohm}$.
- ▶ If the signal lines in the drive are already terminated with $Z_0 = 120 \text{ Ohm}$, the incremental encoder may no longer be terminated.
- ▶ The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated in section 6.2.2.1 and in the adapter operating manual must be observed when connecting the supply voltage.
- ▶ Supply 5 VDC to incremental encoder only.



Expansion modules PNOZmulti PNOZ ms2p TTL

Connection of proximity switches and incremental encoder

Proximity switch and incremental encoder on various axes

Axis 1:

proximity switch on I10, I11

or

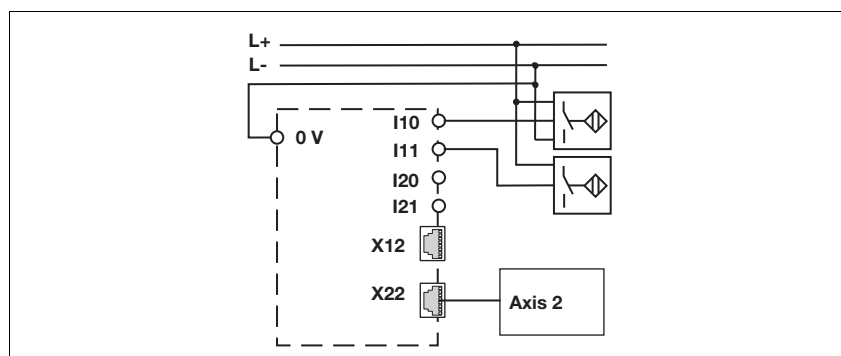
incremental encoder on X12

Axle 2:

proximity switch on I10, I21

or

incremental encoder on X22



Expansion modules PNOZmulti PNOZ ms2p TTL

Proximity switch and incremental encoder on one axis

Axis 1:

Proximity switch at I10 (I11 is unused)

and

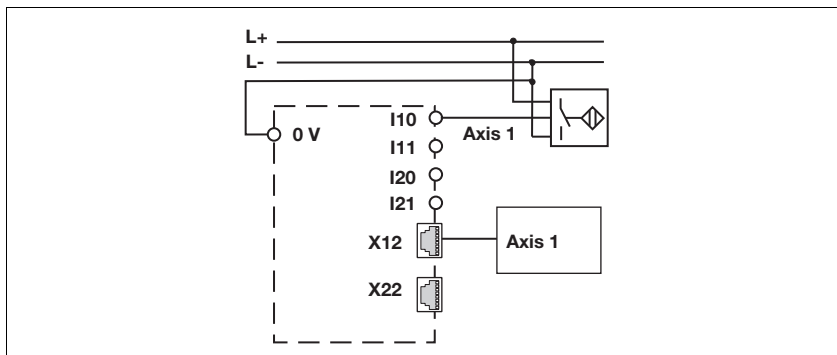
Incremental encoder at X12

Axis 2:

Proximity switch at I20 (I21 is unused)

and

Incremental encoder at X22



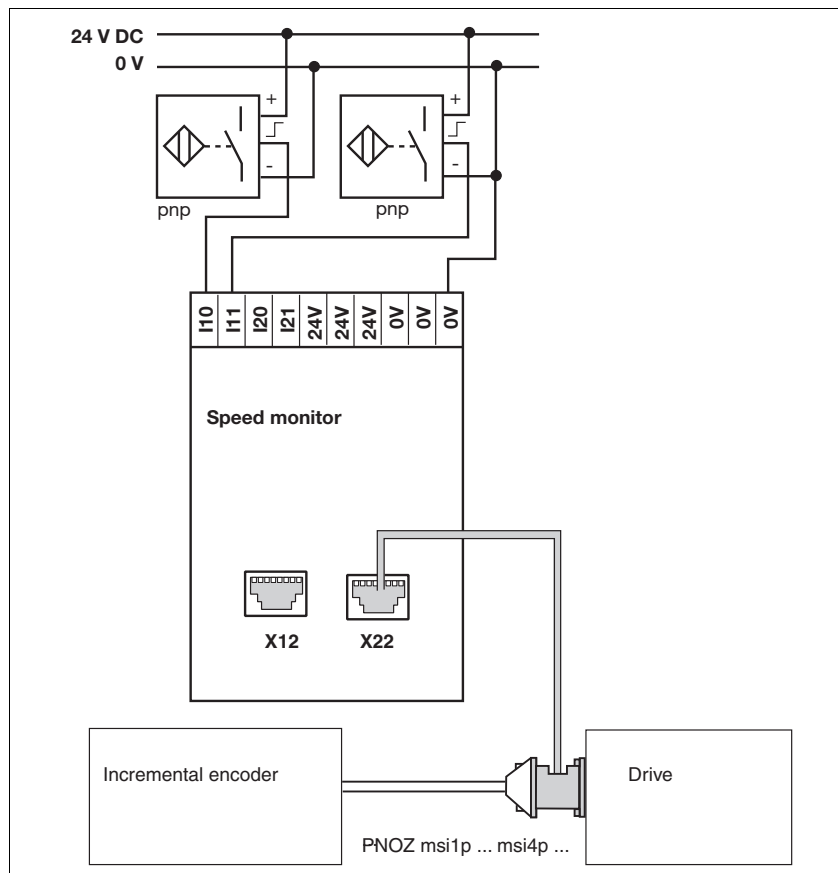
Expansion modules PNOZmulti PNOZ ms2p TTL

Connection examples

Connection of 2 proximity switches and an incremental encoder

Description

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

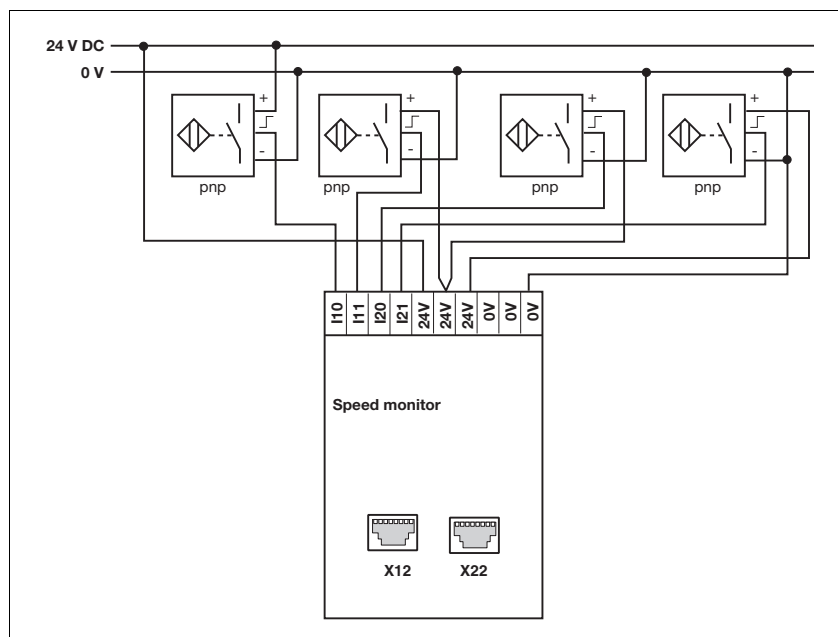


Expansion modules PNOZmulti PNOZ ms2p TTL

Connection of 4 proximity switches

Description

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

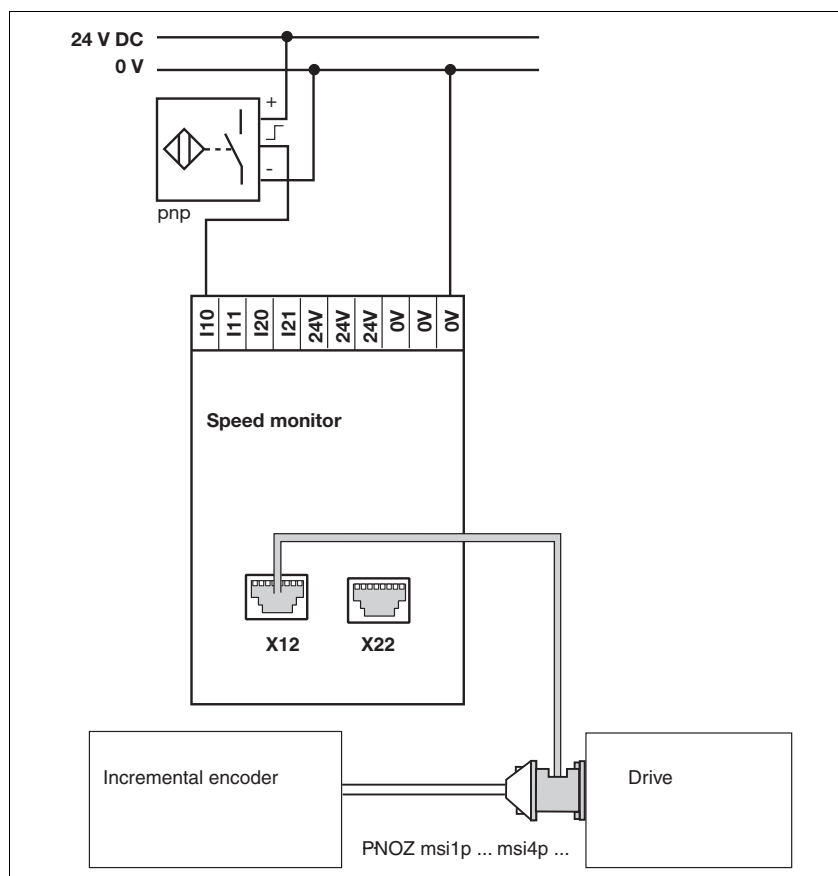


Expansion modules PNOZmulti PNOZ ms2p TTL

Connection of an incremental encoder and proximity switch on an axis

Description

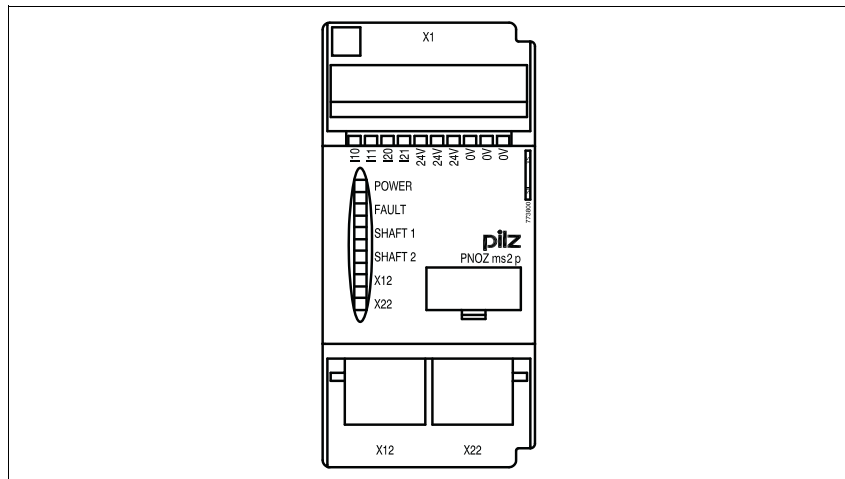
- ▶ 1 proximity switch, pnp-switching
- ▶ 1 incremental encoder
- ▶ Incremental encoder and proximity switch on one axis



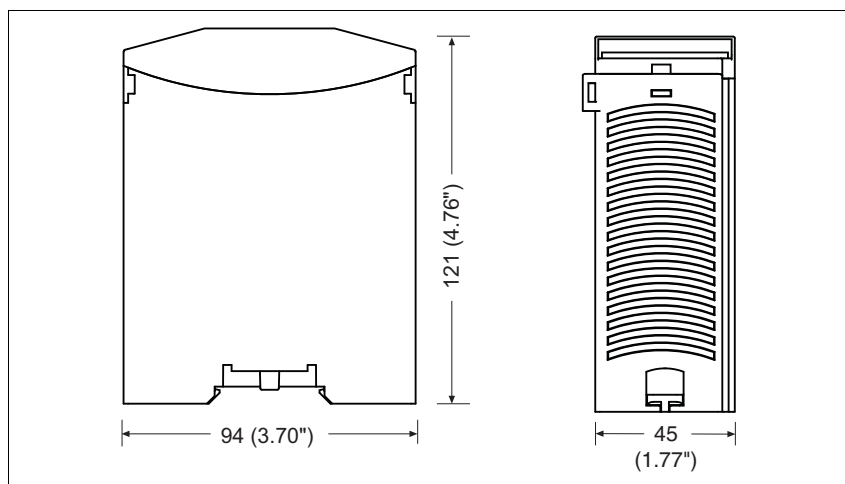
Expansion modules PNOZmulti

PNOZ ms2p TTL

Terminal configuration



Dimensions



Expansion modules PNOZmulti PNOZ ms2p TTL

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

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	1.0 W
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 terminal, screw terminal
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	0.5 - 5.0 Vss
Phase position for the differential signals A _r /A and B _r /B	90° ±30°
Overload protection	-30 - 30 V
Input resistance	10.0 kOhm
Input's frequency range	0 - 500 kHz
Configurable monitoring frequency	
without hysteresis	0,1 Hz - 500 kHz
with hysteresis	0,2 Hz - 500 kHz
Connection type (incremental encoder)	RJ45 socket, 8-pin

Environmental data

Ambient temperature	-25 - 60 °C No. 773811 0 - 60 °C No. 773816
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted No. 773816 permitted No. 773811
EMC	EN 61131-2

Expansion modules PNOZmulti

PNOZ ms2p TTL

Environmental data						
Vibration to EN 60068-2-6						
Frequency	10 - 150 Hz No. 773816 5 - 500 Hz No. 773811					
Max. acceleration	1g					
Airgap creepage in accordance with EN 61131-2						
Overvoltage category	III					
Pollution degree	2					
Rated insulation voltage	30 V					
Shock stress	15g 11 ms					
EN 60068-2-27						
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: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 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 **2009-10** apply.

Expansion modules PNOZmulti

PNOZ ms2p TTL

Order reference

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

Order reference: Accessories

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

Order reference: Connectors

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





Expansion modules PNOZmulti

PNOZ ms3p HTL



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

Approvals

	PNOZ ms3p HTL
	◆
	◆
	◆
	◆

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
 - Fault 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 in accordance with EN ISO 13849-1 up to PL e and EN IEC 62061 up to SIL CL 3.

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

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

System requirements

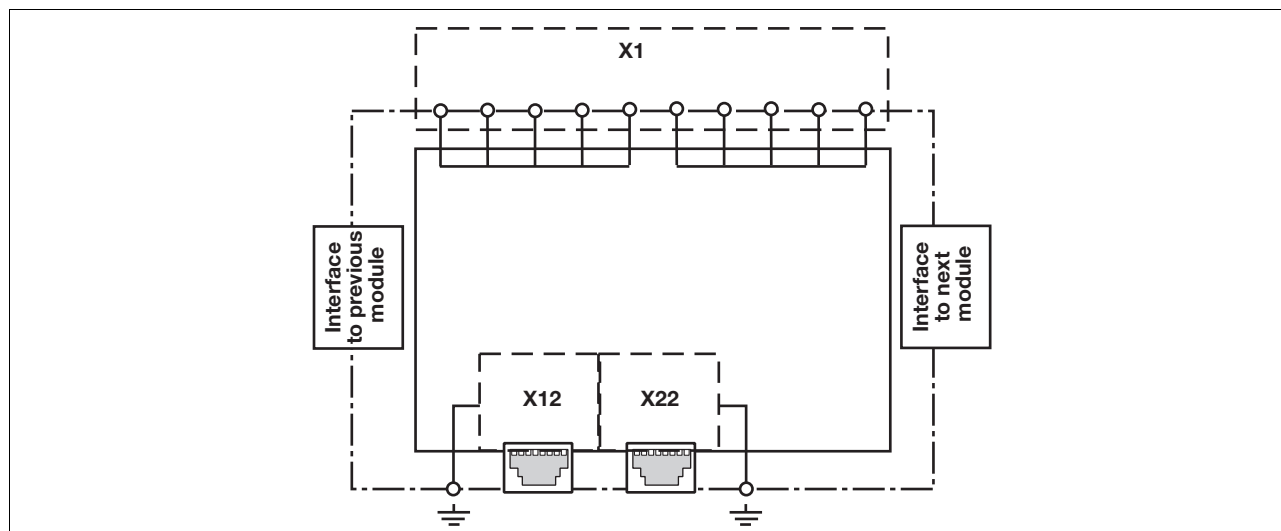
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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 PNOZmulti PNOZ ms3p 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 implemented safety circuit, the values may be transferred from the base unit to a relay output on the safety system, for example. Incremental encoders may be used to record the values.

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

Requirements of the incremental encoders

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

Adapter for incremental encoders

The adapter records the data between the incremental encoder and the drive and makes it available to the speed monitor via the RJ45 socket.

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

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.

Preparing for operation

Follow the instructions below when connecting the incremental encoder:

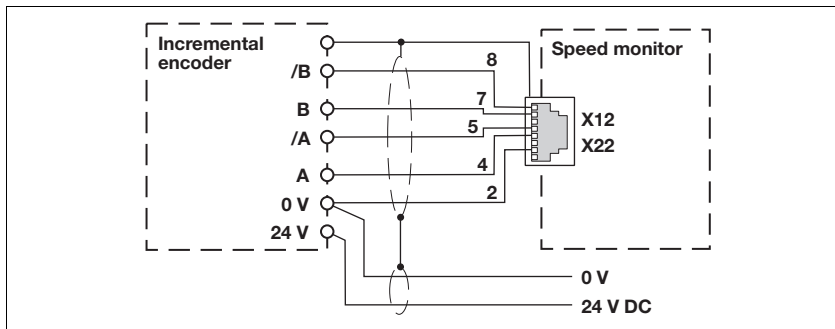
- ▶ The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- ▶ The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- ▶ Only use shielded cables for all connections
- ▶ 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.

Expansion modules PNOZmulti PNOZ ms3p HTL

Connect the signals from the incremental encoder to the speed monitor

Encoder types: 24 V-HTL

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



Expansion modules PNOZmulti PNOZ ms3p HTL

Connect the incremental encoder to the speed monitor via an adapter

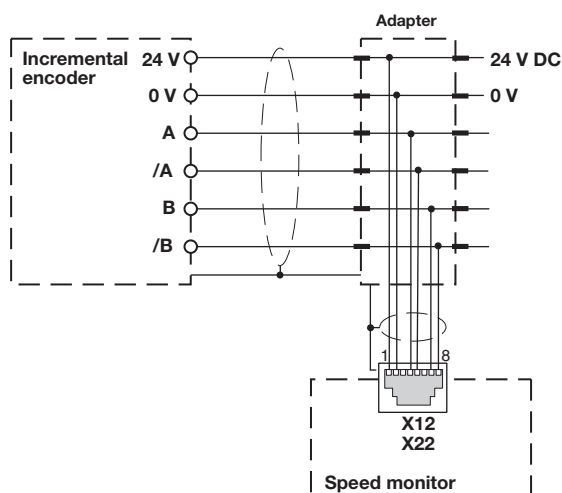
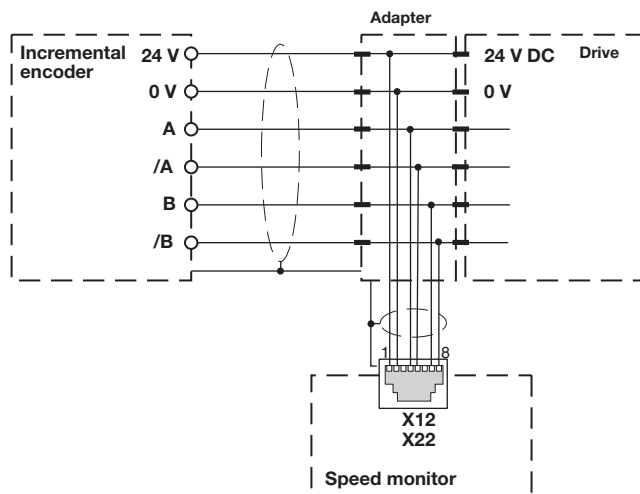
- ▶ The adapter (e.g. PNOZ msi6p) is connected between the incremental encoder and the drive. The output on the adapter is connected to

the female RJ45 connector on the speed monitor.

- ▶ The adapter can also be used without connecting to a drive.
- ▶ The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated in section 6.2.2.1 and in the adapter

operating manual must be observed when connecting the supply voltage.

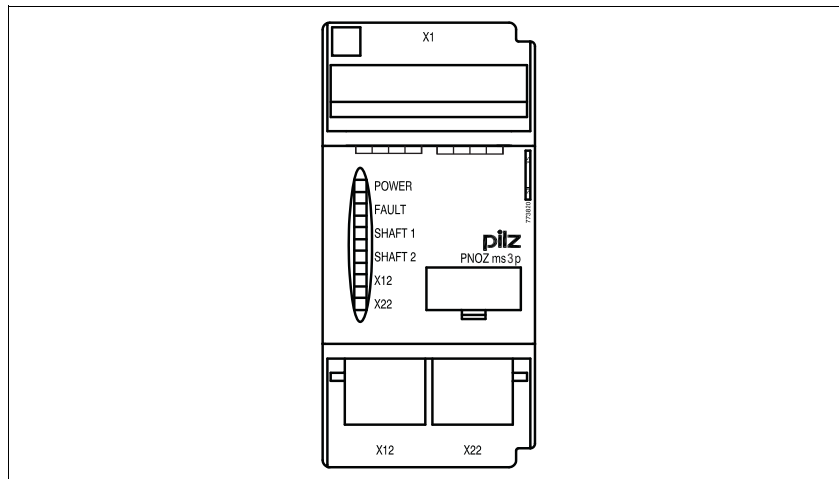
- ▶ Supply voltage (12 V – 30 V) to incremental encoder only.
- ▶ HTL signals may not be fitted with a terminating resistor.



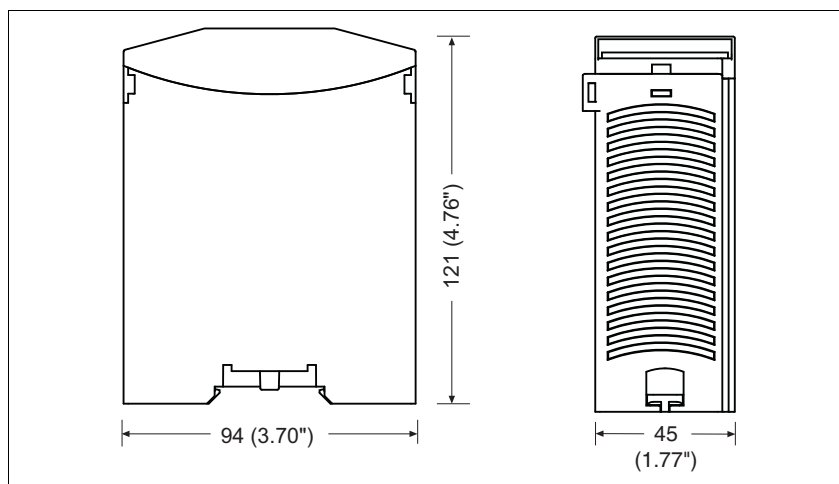
Expansion modules PNOZmulti

PNOZ ms3p HTL

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ ms3p HTL

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

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	1.0 W
Status display	LED

Times

Configurable switch-off delay	0 - 2,500 ms
Reaction 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

Incremental encoder input

Number of inputs	2
Input signal level	12.0 - 30.0 V_{ss}
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)	RJ45 socket, 8-pin

Environmental data

Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g
	11 ms

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

Expansion modules PNOZmulti

PNOZ ms3p HTL

Mechanical data	
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	211 g

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
	incremental encoder	PL e (Cat. 3)	Cat. 3	SIL CL 3	6.36E-09	20

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

The standards current on **2009-10** apply.

Order reference		
Product type	Features	Order no.
PNOZ ms3p HTL	Expansion module, speed monitor	773 825

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

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

Expansion modules PNOZmulti PNOZ ms3p TTL



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

Approvals

	PNOZ ms3p TTL
	◆
	◆
	◆
	◆

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
 - Fault 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 in accordance with EN ISO 13849-1 up to PL e and EN IEC 62061 up to SIL CL 3.

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

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

System requirements

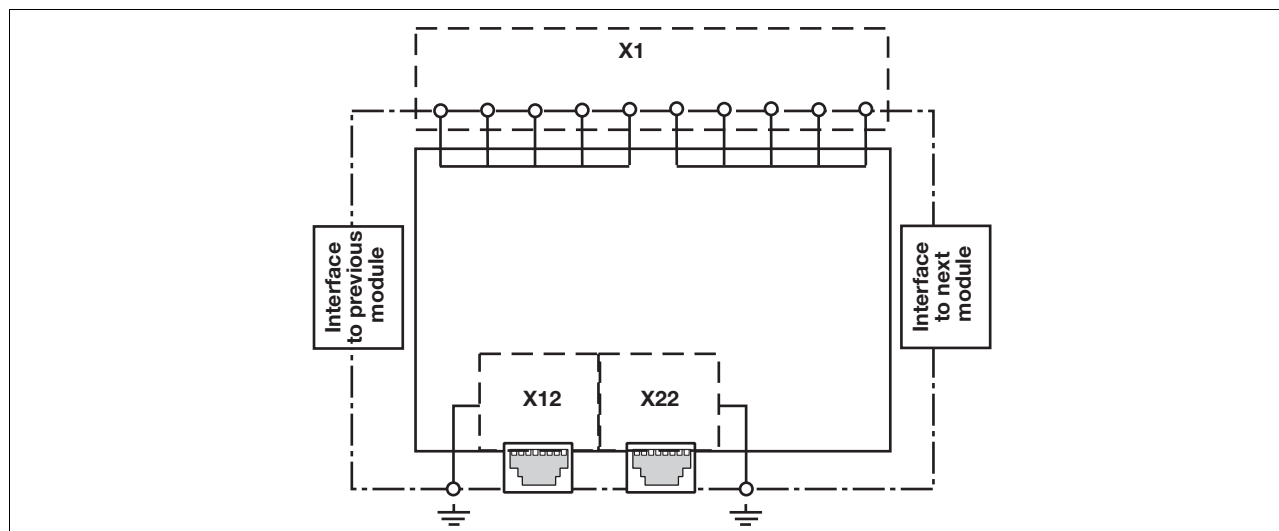
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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 PNOZmulti PNOZ ms3p TTL

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

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

Requirements of the incremental encoders

- ▶ Only incremental encoders with a differential output of the following type are permitted
 - Sin/Cos
 - TTL (RS 422)
- ▶ Pay attention to the values in the technical details

Adapter for incremental encoders

The adapter records the data between the incremental encoder and the drive and makes it available to the speed monitor via the RJ45 socket.

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

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.

Preparing for operation

Follow the instructions below when connecting the incremental encoder:

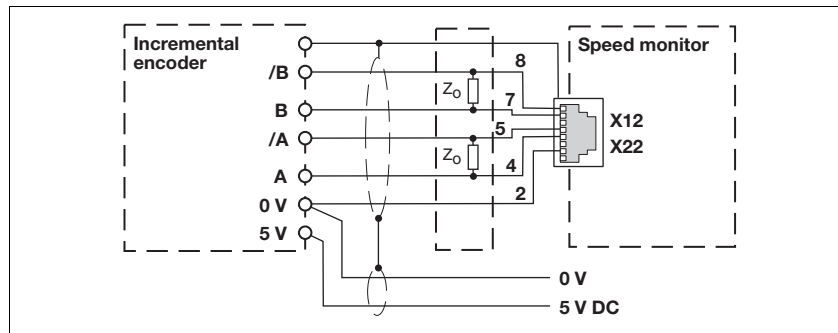
- ▶ The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- ▶ The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.
- ▶ Only use shielded cables for all connections
- ▶ 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.

Expansion modules PNOZmulti PNOZ ms3p TTL

Connect the signals from the incremental encoder to the speed monitor

Encoder types: 1 Vss, 5 V-TTL

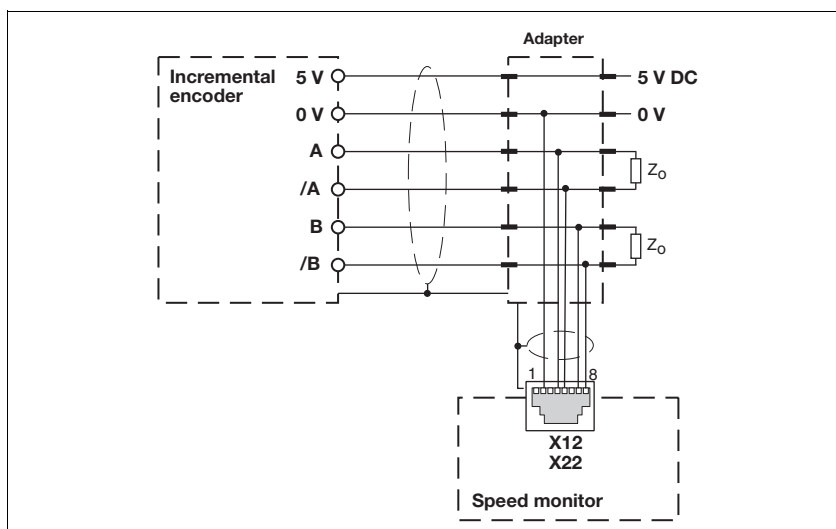
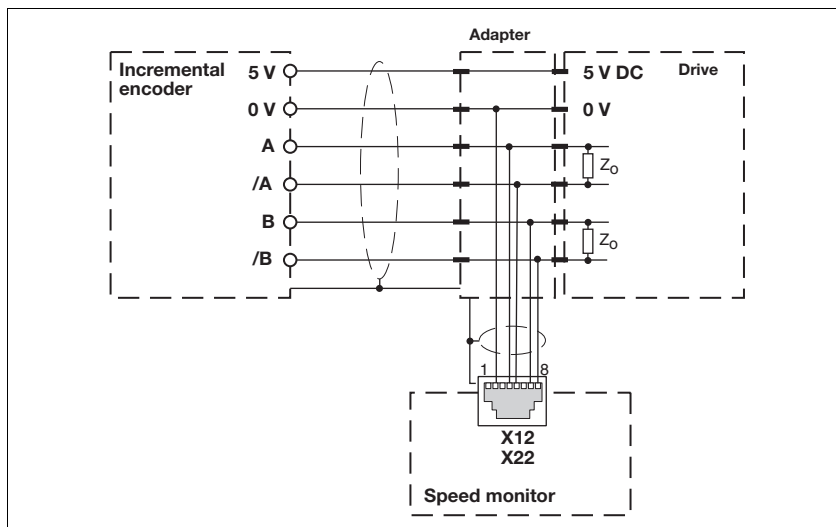
- ▶ Apply 5 VDC to incremental encoder only
- ▶ Do not terminate incremental encoder with $Z_0 = 120 \text{ Ohm}$



Expansion modules PNOZmulti PNOZ ms3p TTL

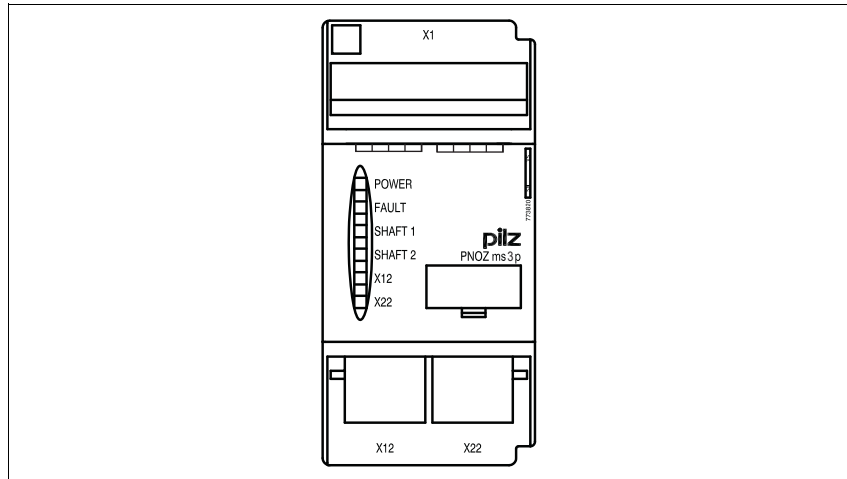
Connect the incremental encoder to the speed monitor via an adapter

- ▶ 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 signal lines can then be terminated directly at the adapter with $Z_0 = 120 \text{ Ohm}$.
- ▶ If the signal lines in the drive are already terminated with $Z_0 = 120 \text{ Ohm}$, the incremental encoder may no longer be terminated.
- ▶ The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated in section 6.2.2.1 and in the adapter operating manual must be observed when connecting the supply voltage.
- ▶ Supply 5 VDC to incremental encoder only.

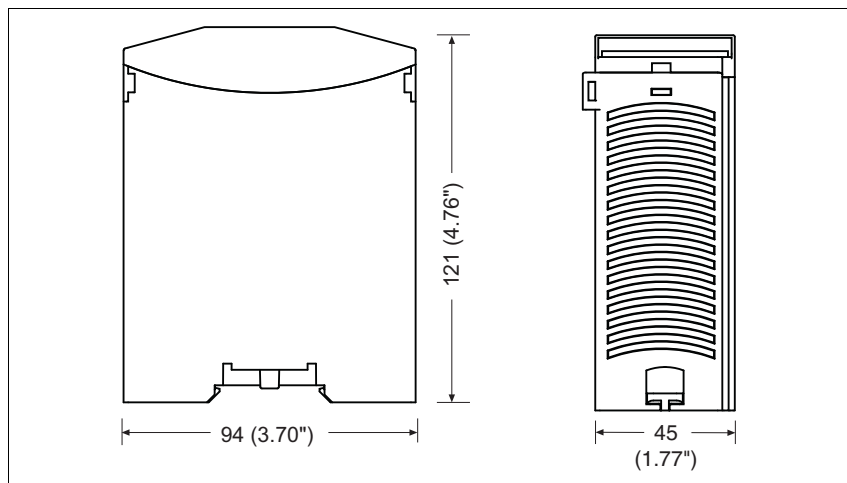


Expansion modules PNOZmulti PNOZ ms3p TTL

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ ms3p TTL

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	
Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	1.0 W
Status display	LED
Times	
Configurable switch-off delay	0 - 2,500 ms
Reaction 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
Incremental encoder input	
Number of inputs	2
Input signal level	0.5 - 5.0 V_{ss}
Phase position for the differential signals A ₊ /A and B ₊ /B	90° ±30°
Overload protection	-30 - 30 V
Input resistance	10.0 kOhm
Input's frequency range	0 - 500 kHz
Configurable monitoring frequency without hysteresis	0,1 Hz - 500 kHz
with hysteresis	0,2 Hz - 500 kHz
Connection type (incremental encoder)	RJ45 socket, 8-pin
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g
	11 ms
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

Expansion modules PNOZmulti PNOZ ms3p TTL

Mechanical data

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: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
	incremental encoder	PL e (Cat. 3)	Cat. 3	SIL CL 3	6.36E-09	20

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

The standards current on **2009-10** apply.

Order reference

Product type	Features	Order no.
PNOZ ms3p TTL	Expansion module, speed monitor	773 826

Order reference: Accessories

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

Order reference: Terminator, jumper





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

Expansion modules PNOZmulti PNOZ ms4p



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

Approvals

	PNOZ ms4p
	◆
	◆
	◆
	◆

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 encoder
 - Axis status, standstill and excess speed
 - Faults on the system
- ▶ Connection technology incremental encoder: Female RJ45 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 in accordance with EN ISO 13849-1 up to PL e and EN IEC 62061 up to SIL CL 3.

The expansion module may only be connected to a base unit from the con-

figurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units that can be connected)

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

System requirements

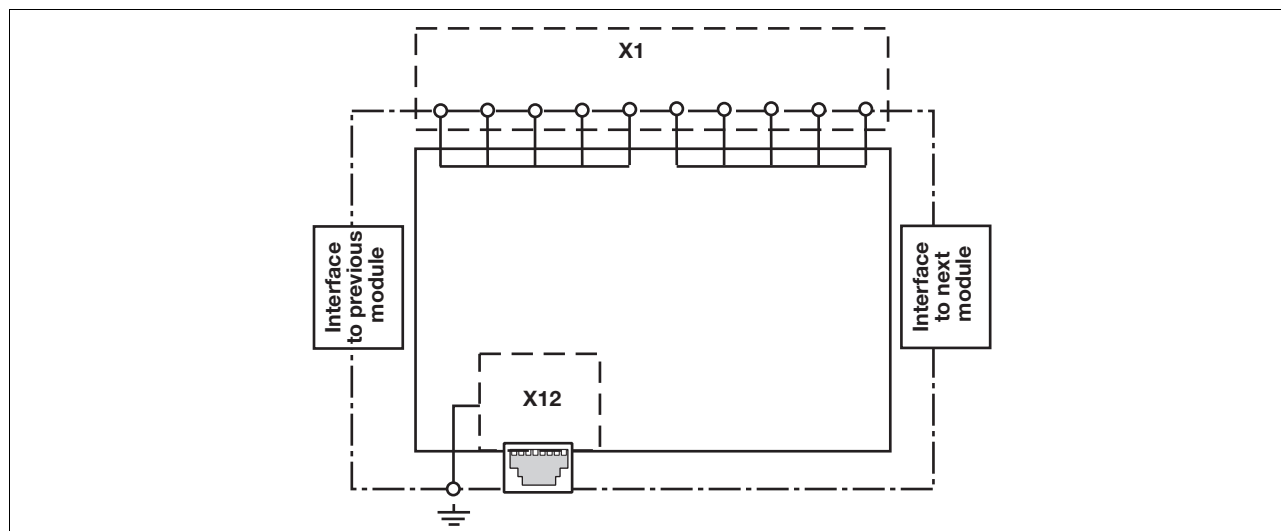
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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 PNOZmulti 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 implemented safety circuit, the values may be transferred from the base unit to a relay output on the safety system, for example. Incremental encoders may be used to record the values. The configuration of the speed monitor is described in detail in the PNOZmulti Configurator's online help.

Incremental encoders

Requirements of the incremental encoders

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

Adapter for incremental encoders

The adapter records the data between the incremental encoder and the drive and makes it available to the speed monitor via the RJ45 socket.

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

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.

Preparing for operation

Follow the instructions below when connecting the incremental encoder:

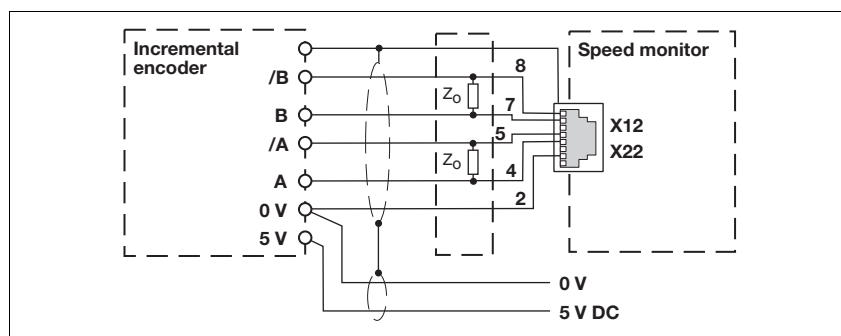
- ▶ The incremental encoder can be connected via an adapter (e.g. PNOZ msi4p) or can be connected directly to the speed monitor.
- ▶ The incremental encoder on connector X12 monitors the axis.
- ▶ Only use shielded cables for all connections
- ▶ Always connect 0 V on the incremental encoder and speed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

Expansion modules PNOZmulti PNOZ ms4p

Connect the signals from the incremental encoder to the speed monitor

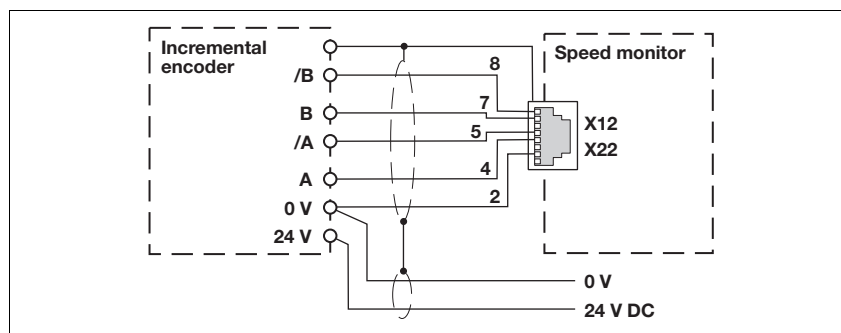
Encoder types: 1 Vss, 5 V-TTL

- ▶ Apply 5 VDC to incremental encoder only
- ▶ Do not terminate incremental encoder with $Z_0 = 120 \text{ Ohm}$



Encoder types: 24 V-HTL

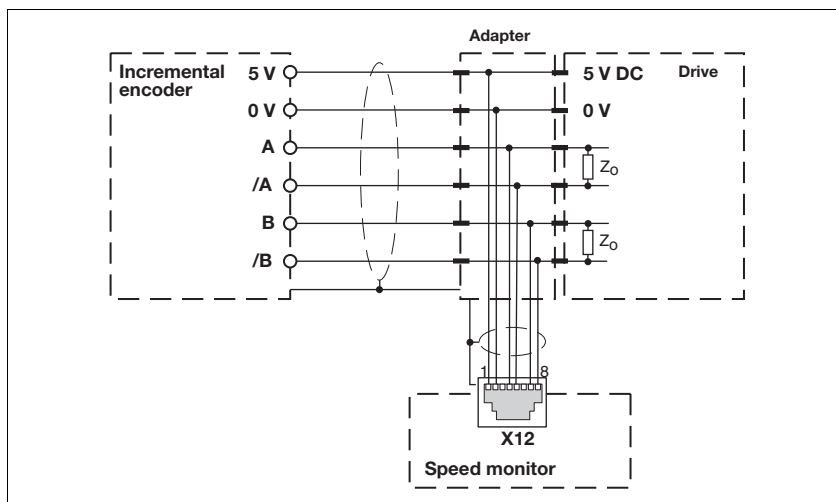
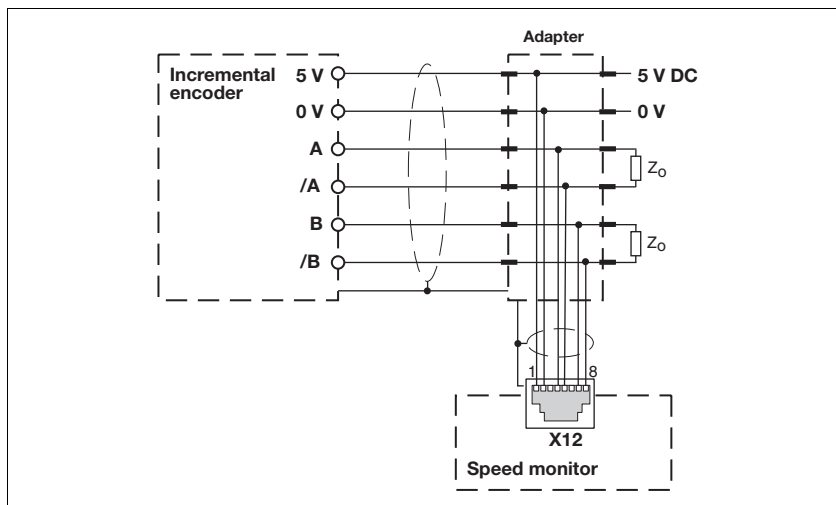
- ▶ Apply 24 VDC supply voltage to incremental encoder only
- ▶ Do not terminate incremental encoder with $Z_0 = 120 \text{ Ohm}$



Expansion modules PNOZmulti PNOZ ms4p

Connect the incremental encoder to the speed monitor via an adapter

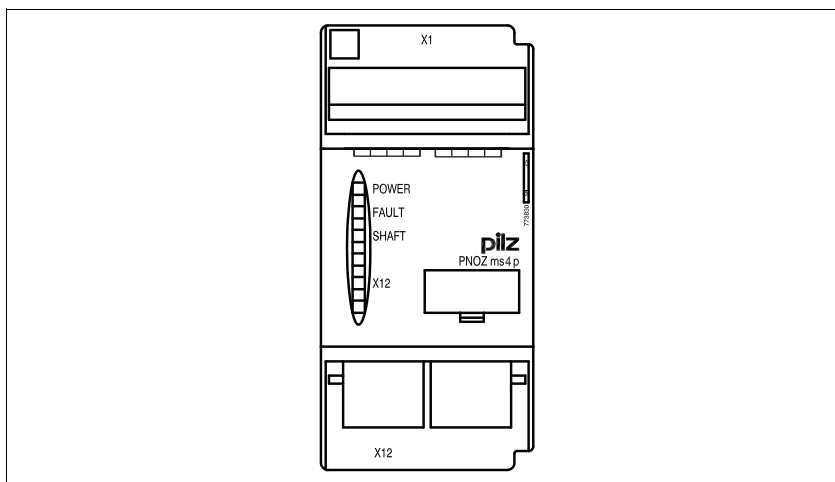
- ▶ The adapter (e.g. PNOZ msi6p) is connected between the incremental encoder and the drive. The output on the adapter is connected to the RJ-45 female connector on the speed monitor.
- ▶ The adapter also can be used without connecting to a drive. The signal lines can then be terminated directly at the adapter with $Z_0 = 120 \text{ Ohm}$.
- ▶ If the signal lines in the drive are already terminated with $Z_0 = 120 \text{ Ohm}$, the incremental encoder may no longer be terminated.
- ▶ The signals relevant for the speed monitor are utilised in parallel by the adapter. The information stated in section 7.2.2.1 and in the adapter operating manual must be observed when connecting the supply voltage.
- ▶ Supply 5 VDC to incremental encoder only. 24 V-HTL signals may not be terminated.



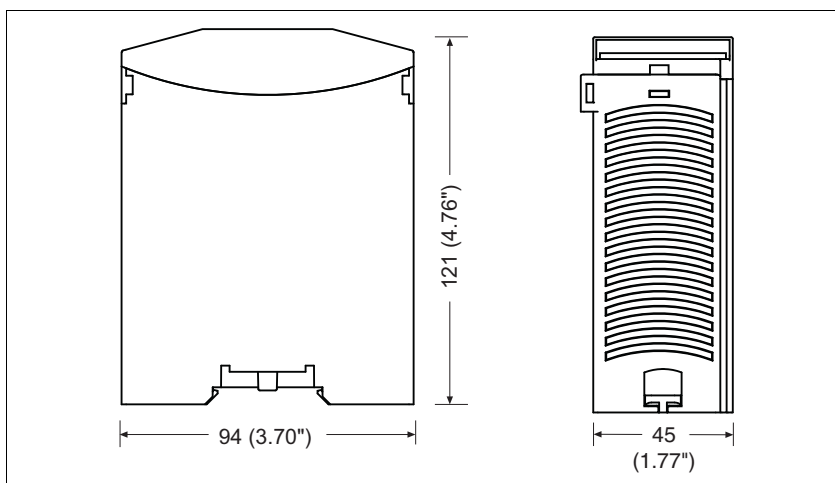
Expansion modules PNOZmulti

PNOZ ms4p

Terminal configuration



Dimensions



Expansion modules PNOZmulti

PNOZ ms4p

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

Module's supply voltage via base unit	5 V DC
Voltage tolerance	-2 %/+2 %
Power consumption	1.0 W
Status display	LED

Times

Configurable switch-off delay	0 - 2,500 ms
Reaction 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

Incremental encoder input

Number of inputs	1
Input signal level	0.5 - 30.0 Vss
Phase position for the differential signals A ₊ /A and B ₊ /B	90° ±30°
Overload protection	-30 - 30 V
Input resistance	10.0 kOhm
Input's frequency range	0 - 500 kHz
Configurable monitoring frequency	
without hysteresis	0,1 Hz - 500 kHz
with hysteresis	0,2 Hz - 500 kHz
Connection type (incremental encoder)	RJ45 socket, 8-pin

Environmental data

Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	III
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g
	11 ms

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

Expansion modules PNOZmulti PNOZ ms4p

Mechanical data	
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	203 g

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
	incremental encoder	PL e (Cat. 3)	Cat. 3	SIL CL 3	6.36E-09	20

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

The standards current on **2008-12** apply.

Order reference		
Product type	Features	Order no.
PNOZ ms4p	Expansion module, speed monitor	773 830

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

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

Base units PNOZmulti Mini

Base units PNOZmulti Mini

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PNOZ mm0.1p	2.4-12
PNOZ mm0.2p	2.4-22





Base units PNOZmulti Mini

PNOZ mm0p



PNOZmulti Mini base unit

Approvals

	PNOZ mm0p
	◆
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Semiconductor outputs:
 - 4 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ 12 inputs for connecting, for example:
 - E-STOP pushbuttons
 - Two-hand pushbuttons
 - Safety gate limit switches
 - Reset buttons
 - Light beam devices
 - Scanners
 - Enabling switches
 - PSEN
 - Operating mode selector switches
 - Pressure sensitive mats
- ▶ 8 configurable inputs/outputs
 - Can be configured as:
 - Inputs (see above for connection options)
 - or
 - Auxiliary outputs
- ▶ 4 configurable outputs
 - Can be configured as:
 - Auxiliary outputs
 - or
 - Test pulse outputs
- ▶ LED for:
 - Error messages
 - Diagnostics
 - Supply voltage
 - Output circuits
 - Input circuits
- ▶ Display for:
 - Error messages
 - State of supply voltage
 - State of inputs/outputs
 - Status information
 - Unit information
- ▶ Monitors shorts across the inputs through test pulse outputs
- ▶ Monitoring of shorts between the safety outputs
- ▶ Plug-in connection terminals:
 - either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- ▶ Rotary knob for menu control

Unit description

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ 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).

System requirements

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

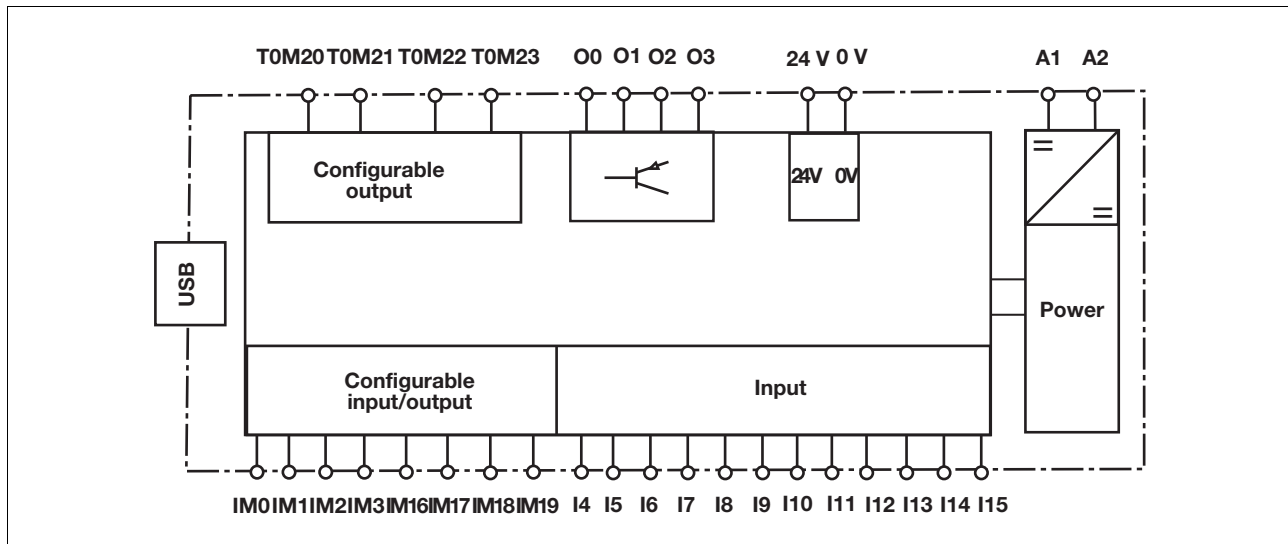
Safety features

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.

Base units PNOZmulti Mini PNOZ mm0p

Block diagram



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.

Diagnostics

The status and error messages displayed by the LEDs are saved in an error stack. This error stack can be shown on the display or can be read from the PNOZmulti Configurator via the USB port.

Wiring

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

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.
- ▶ The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with 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.
- ▶ Test pulse outputs are also used to supply safety mats that trigger a short circuit. Test pulses that are used for the safety mat may not be reused for other purposes.

Base units PNOZmulti Mini 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
E-STOP without detection of shorts across contacts		
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 PNOZmulti Mini PNOZ mm0p

- Connection examples for semiconductor outputs

Redundant output		
Single output		
Single output with advanced fault detection*		

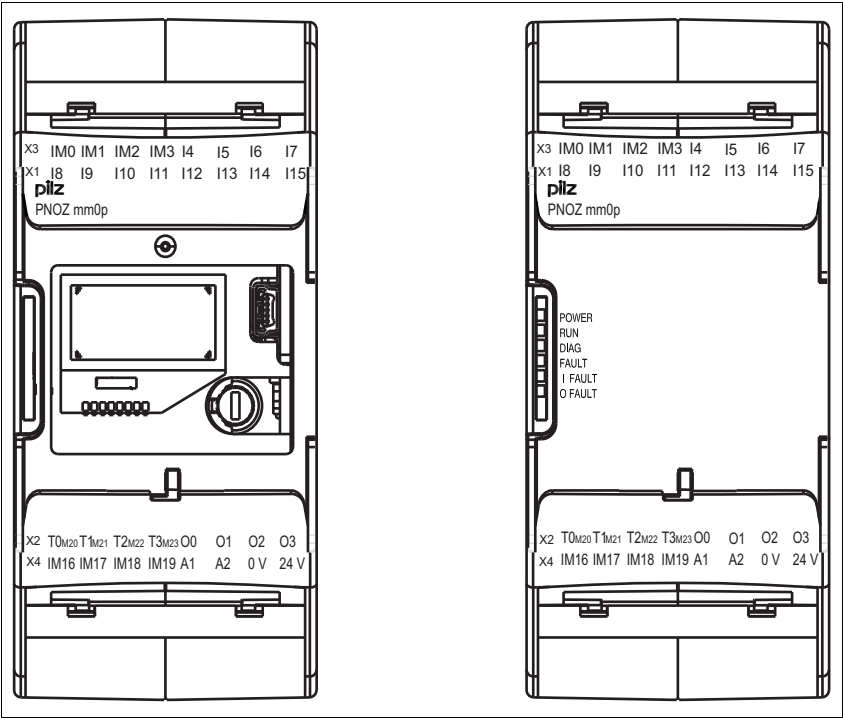
*Two loads may be connected to each safety output with advanced fault detection, even on applications in accordance with EN IEC 62061, SIL CL 3. Prerequisite: Feedback loop is connected, shorts across contacts and external power sources are excluded (e.g. through separate multicore cables). Please note 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 PNOZmulti Mini PNOZ mm0p

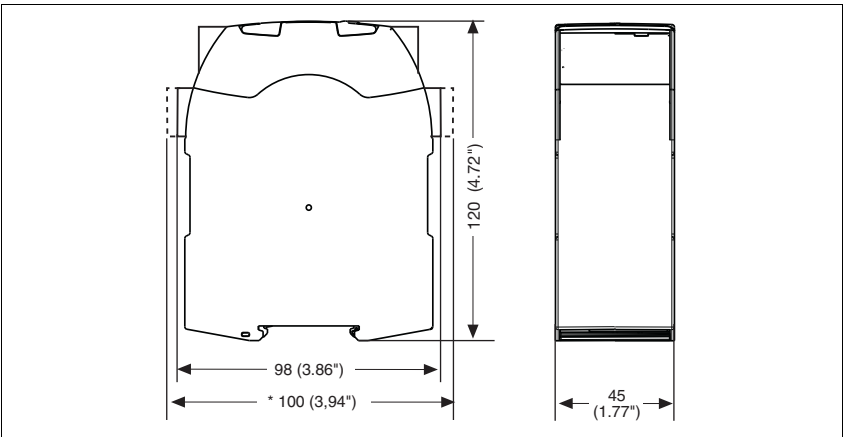
Terminal configuration



Front view with and without cover

Dimensions

*with spring-loaded terminals



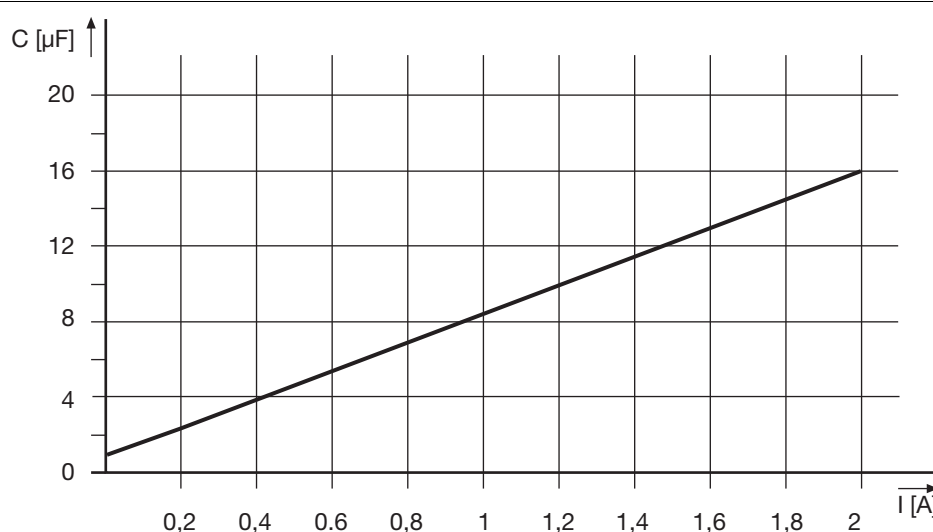
Base units PNOZmulti Mini

PNOZ mm0p

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Maximum capacitive load C (μF) with load current I (A) 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	35.0 W
Residual ripple DC	5 %
Status display	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	12
Voltage and current at input, reset and feedback circuit	24.0 V, 5.0 mA
Galvanic isolation	no
Signal level at "0"	-3 - +5 V DC
Signal level at "1"	15 - 30 V DC
Min. pulse duration	16 ms
Pulse suppression	0.6 ms
Maximum input delay	4 ms

Test pulse outputs

Number of test pulse outputs	4
------------------------------	---

Base units PNOZmulti Mini

PNOZ mm0p

Test pulse outputs	
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	24 V
current	2 A
power	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	330 µs
Galvanic isolation	yes
Short circuit-proof	yes
Switch-off delay	30 ms
Residual current at "0"	0.5 mA
Signal level at "1"	U_B - 0,5 V DC at 2 A
Configurable inputs/outputs (inputs or auxiliary outputs)	
Number	8
Galvanic isolation	no
Inputs	
Voltage on the input circuit	24.0 V
Current on the input circuit	5 mA
Signal level at "0"	-3 ... +5 V DC
Signal level at "1"	15 ... 30 V DC
Max. filter time	4.0 ms
Min. pulse duration	16 ms
Pulse suppression	0.6 ms
Auxiliary outputs	
Voltage	24.0 V
Current	75 mA
Power	1.8 W
Short circuit-proof	yes
Residual current at "0"	0.5 mA
Voltage at "1"	U_B - 2 V at 0,1 A
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	II
Pollution degree	2
Rated insulation voltage	30 V
Rated impulse withstand voltage	2.50 kV
Shock stress	
EN 60068-2-27	15g
	11 ms
EN 60068-2-29	25g
	6 ms

Base units PNOZmulti Mini

PNOZ mm0p

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	1.0 km
Sum of individual cable runs at the test pulse output	2 km
Housing material	
Housing	PC
Front	PC
Cross section of external conductors with screw terminals	
Power supply, inputs, auxiliary output, semiconductor outputs, test pulse outputs, cascading outputs:	
1 core flexible	0.25 - 2.50 mm ² , 24 - 12 AWG
2 core, same cross section, flexible:	
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm ² , 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 mm ² , 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length	9 mm
Dimensions	
Height	100.0 mm
Width	45.0 mm
Depth	120.0 mm
Weight	226 g

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
Logic						
CPU		PL e (Cat. 4)	Cat. 4	SIL CL 3	1.54E-09	20
Input						
SC inputs	single-channel	PL d (Cat. 2)	Cat. 3	SIL CL 2	3.95E-09	20
SC inputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	4.61E-10	20
SC inputs	light beam device	PL e (Cat. 4)	Cat. 4	SIL CL 3	3.95E-10	20
Output						
SC outputs	single-channel with advanced fault detection	PL e (Cat. 4)	Cat. 4	SIL CL 3	7.65E-10	20
SC outputs	single-channel	PL d (Cat. 2)	Cat. 3	SIL CL 2	8.90E-10	20
SC outputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	7.86E-10	20

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

The standards current on **2010-08** apply.

Base units PNOZmulti Mini

PNOZ mm0p

Order reference

Product type	Features	Order no.
PNOZ mm0p	Base unit	772 000

Order reference: Accessories

Product Type	Features	Order no.
PNOZ s Set1 spring-loaded terminals	1 set of spring-loaded terminals	751 008
PNOZ s Set1 screw terminals	1 set of screw terminals	750 008

Order reference: Cable

Product Type	Features	Order no.
PSSu A USB-CAB03	Mini USB cable, 3 m	312 992
PSSu A USB-CAB05	Mini USB cable, 5 m	312 993





Base units PNOZmulti Mini

PNOZ mm0.1p



PNOZmulti Mini base unit

Approvals

	PNOZ mm0.1p
	◆
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Semiconductor outputs:
 - 4 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ 12 inputs for connecting, for example:
 - E-STOP pushbuttons
 - Two-hand pushbuttons
 - Safety gate limit switches
 - Reset buttons
 - Light beam devices
 - Scanners
 - Enabling switches
 - PSEN
 - Operating mode selector switches
 - Pressure sensitive mats
- ▶ 8 configurable inputs/outputs
 - Can be configured as:
 - Inputs (see above for connection options)
 - or
 - Auxiliary outputs
- ▶ 4 configurable outputs
 - Can be configured as:
 - Auxiliary outputs
 - or
 - Test pulse outputs
- ▶ LED for:
 - Error messages
 - Diagnostics
 - Supply voltage
 - Output circuits
 - Input circuits
- ▶ Display for:
 - Error messages
 - State of supply voltage
 - State of inputs/outputs
 - Status information
 - Unit information
- ▶ Monitors shorts across the inputs through test pulse outputs
- ▶ Monitoring of shorts between the safety outputs
- ▶ Plug-in connection terminals:
 - either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- ▶ Rotary knob for menu control

- ▶ Expansion modules can be connected (please refer to the document "PNOZmulti System Expansion" for details of the type and number that can be connected)

Unit description

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ 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).

System requirements

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

Safety features

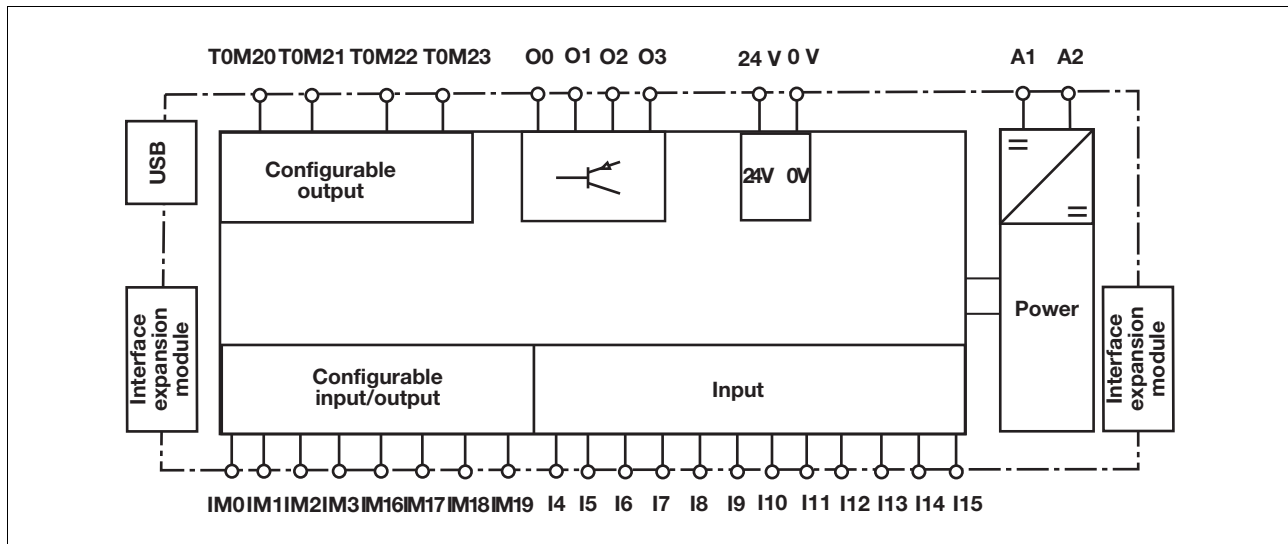
The relay conforms to the following safety criteria:

- ▶ 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.

Base units PNOZmulti Mini

PNOZ mm0.1p

Block diagram



Function description

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

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

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

Diagnostics

The status and error messages displayed by the LEDs are saved in an error stack. This error stack can be shown on the display or can be read from the PNOZmulti Configurator via the USB port.

Wiring

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

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.
- ▶ The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with 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.
- ▶ Test pulse outputs are also used to supply safety mats that trigger a short circuit. Test pulses that are used for the safety mat may not be reused for other purposes.

Base units PNOZmulti Mini PNOZ mm0.1p

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
E-STOP without detection of shorts across contacts		
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 PNOZmulti Mini

PNOZ mm0.1p

- 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

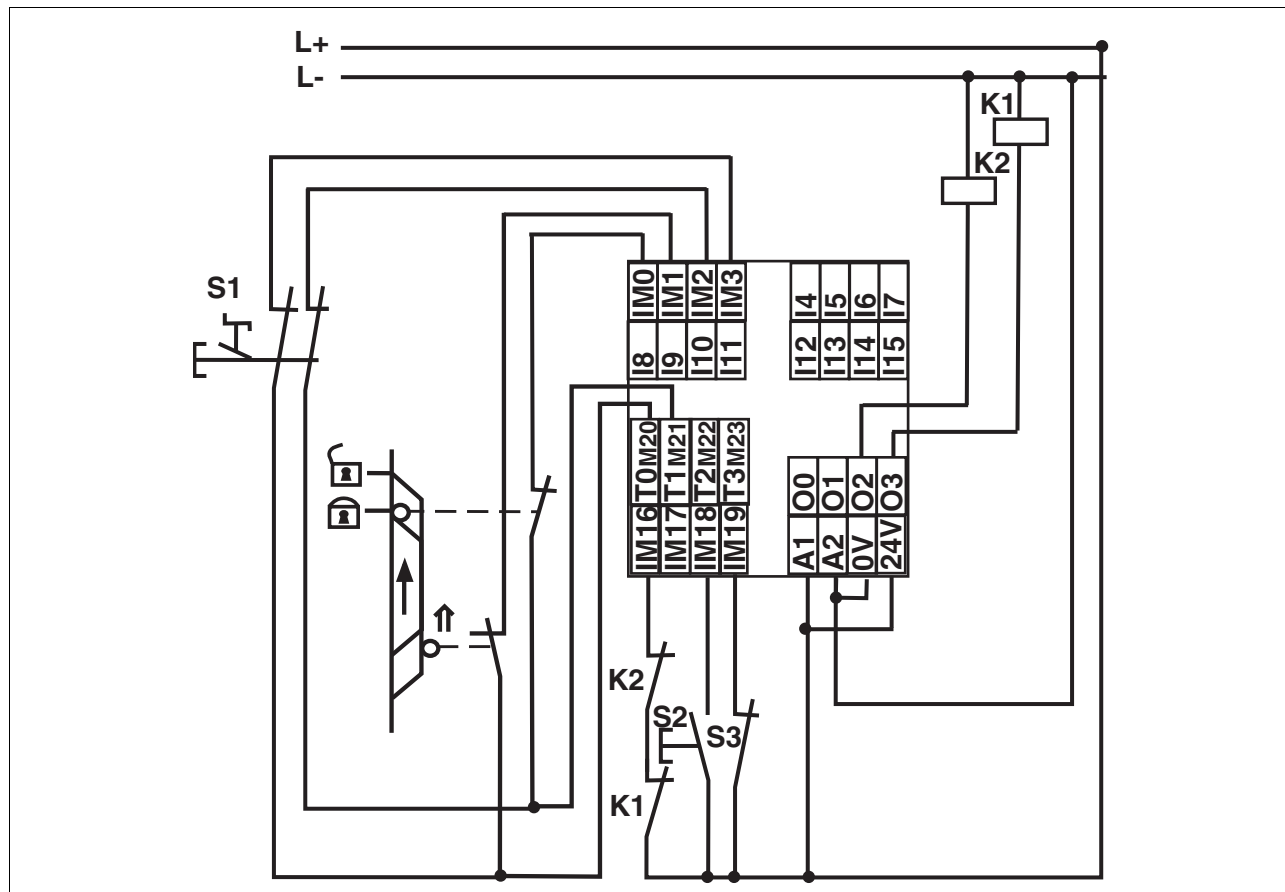
Feedback loop	Redundant output
Contacts from external contactors	

Base units PNOZmulti Mini

PNOZ mm0.1p

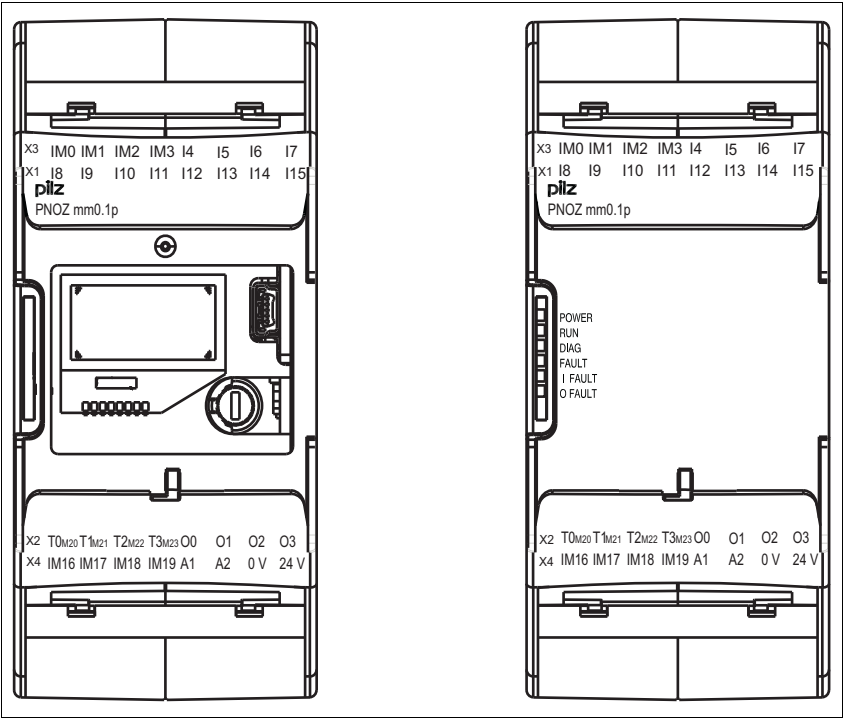
Connection example

Dual-channel E-STOP and safety gate wiring, monitored reset (IM18), feed-back loop (IM16)



Base units PNOZmulti Mini PNOZ mm0.1p

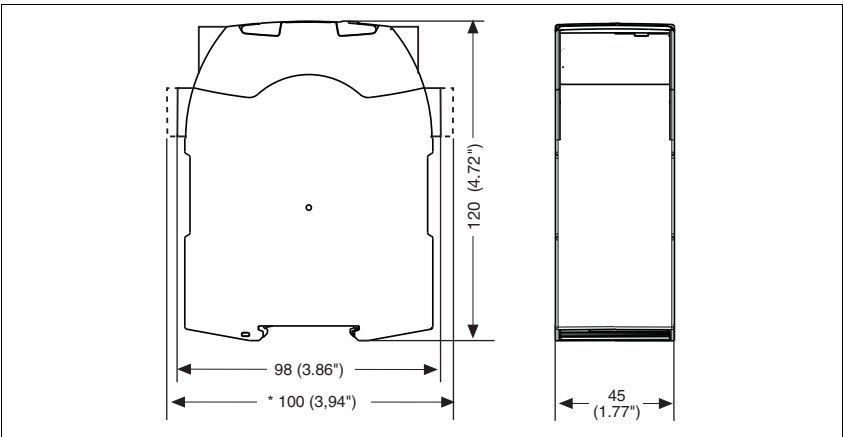
Terminal configuration



Front view with and without cover

Dimensions

*with spring-loaded terminals



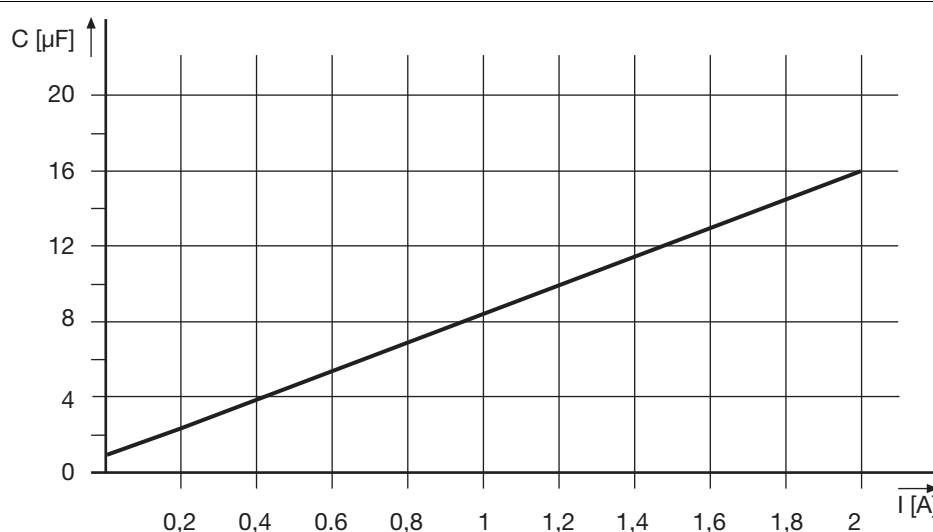
Base units PNOZmulti Mini

PNOZ mm0.1p

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Maximum capacitive load C (μF) with load current I (A) 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	35.0 W
Residual ripple DC	5 %
Status display	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	12
Voltage and current at input, reset and feedback circuit	24.0 V, 5.0 mA
Galvanic isolation	no
Signal level at "0"	-3 - +5 V DC
Signal level at "1"	15 - 30 V DC
Min. pulse duration	16 ms
Pulse suppression	0.6 ms
Maximum input delay	4 ms

Test pulse outputs

Number of test pulse outputs	4
------------------------------	---

Base units PNOZmulti Mini

PNOZ mm0.1p

Test pulse outputs	
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	24 V
current	2 A
power	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	330 µs
Galvanic isolation	yes
Short circuit-proof	yes
Switch-off delay	30 ms
Residual current at "0"	0.5 mA
Signal level at "1"	U_B - 0,5 V DC at 2 A
Configurable inputs/outputs (inputs or auxiliary outputs)	
Number	8
Galvanic isolation	no
Inputs	
Voltage on the input circuit	24.0 V
Current on the input circuit	5 mA
Signal level at "0"	-3 ... +5 V DC
Signal level at "1"	15 ... 30 V DC
Max. filter time	4.0 ms
Min. pulse duration	16 ms
Pulse suppression	0.6 ms
Auxiliary outputs	
Voltage	24.0 V
Current	75 mA
Power	1.8 W
Short circuit-proof	yes
Residual current at "0"	0.5 mA
Voltage at "1"	U_B - 2 V at 0,1 A
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	II
Pollution degree	2
Rated insulation voltage	30 V
Rated impulse withstand voltage	2.50 kV
Shock stress	
EN 60068-2-27	15g
EN 60068-2-29	11 ms
EN 60068-2-29	25g
EN 60068-2-29	6 ms

Base units PNOZmulti Mini

PNOZ mm0.1p

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	1.0 km
Sum of individual cable runs at the test pulse output	2 km
Housing material	
Housing	PC
Front	PC
Cross section of external conductors with screw terminals	
Power supply, inputs, auxiliary output, semiconductor outputs, test pulse outputs, cascading outputs:	
1 core flexible	0.25 - 2.50 mm² , 24 - 12 AWG
2 core, same cross section, flexible:	
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm² , 24 - 16 AWG
Torque setting with screw terminals	0.50 Nm
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	2
Stripping length	9 mm
Dimensions	
Height	100.0 mm
Width	45.0 mm
Depth	120.0 mm
Weight	231 g

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
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Logic

CPU		PL e (Cat. 4)	Cat. 4	SIL CL 3	1.54E-09	20
Expansion right		PL e (Cat. 4)	Cat. 4	SIL CL 3	2.13E-10	20
Expansion left		PL e (Cat. 4)	Cat. 4	SIL CL 3	2.38E-10	20

Input

SC inputs	single-channel	PL d (Cat. 2)	Cat. 3	SIL CL 2	3.95E-09	20
SC inputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	4.61E-10	20
SC inputs	light beam device	PL e (Cat. 4)	Cat. 4	SIL CL 3	3.95E-10	20

Output

SC outputs	single-channel with advanced fault detection	PL e (Cat. 4)	Cat. 4	SIL CL 3	7.65E-10	20
SC outputs	single-channel	PL d (Cat. 2)	Cat. 3	SIL CL 2	8.90E-10	20
SC outputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	7.86E-10	20

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

The standards current on **2010-08** apply.

Base units PNOZmulti Mini

PNOZ mm0.1p

Order reference

Product Type	Features	Order no.
PNOZ mm0.1p	Base unit	772 001

Order reference: Accessories

Product Type	Features	Order no.
PNOZ s Set1 spring-loaded terminals	1 set of spring-loaded terminals	751 008
PNOZ s Set1 screw terminals	1 set of screw terminals	750 008

Order reference: Terminator, jumper

Product Type	Features	Order no.
PNOZ s terminator plug	Right terminator, yellow, x10	750 010
PNOZ mm0.xp terminator left	Left terminator, black/yellow, x1	779 261

Order reference: Cable

Product Type	Features	Order no.
PSSu A USB-CAB03	Mini USB cable, 3 m	312 992
PSSu A USB-CAB05	Mini USB cable, 5 m	312 993





Base units PNOZmulti Mini

PNOZ mm0.2p



PNOZmulti Mini base unit

Approvals

	PNOZ mm0.2p
	◆
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Semiconductor outputs:
 - 4 safety outputs
 - Depending on the application, up to PL e of EN ISO 13849-1 and up to SIL CL 3 of EN IEC 62061
- ▶ 12 inputs for connecting, for example:
 - E-STOP pushbuttons
 - Two-hand pushbuttons
 - Safety gate limit switches
 - Reset buttons
 - Light beam devices
 - Scanners
 - Enabling switches
 - PSEN
 - Operating mode selector switches
 - Pressure sensitive mats
- ▶ 8 configurable inputs/outputs
 - Can be configured as:
 - Inputs (see above for connection options)
 - or
 - Auxiliary outputs
- ▶ 4 configurable outputs
 - Can be configured as:
 - Auxiliary outputs
 - or
 - Test pulse outputs
- ▶ LED for:
 - Error messages
 - Diagnostics
 - Supply voltage
 - Output circuits
 - Input circuits
- ▶ Display for:
 - Error messages
 - State of supply voltage
 - State of inputs/outputs
 - Status information
 - Unit information
- ▶ Monitors shorts across the inputs through test pulse outputs
- ▶ Monitoring of shorts between the safety outputs
- ▶ Plug-in connection terminals:
 - either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- ▶ Rotary knob for menu control
- ▶ Expansion modules can be connected
 - (please refer to the document "PNOZmulti System Expansion" for

details of the type and number that can be connected)

- ▶ Integrated interface (RJ45 socket) for safe connection of two configurable control systems:
 - Connection options:
 - Two PNOZmulti Mini base units or
 - One PNOZmulti Mini base unit with one PNOZmulti base unit (both the units to be connected need either an integrated interface or a link module)
 - Point-to-point connection via 4-core shielded, twisted-pair cable
 - 32 virtual inputs and 32 virtual outputs for data transfer

Unit description

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ 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).

System requirements

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

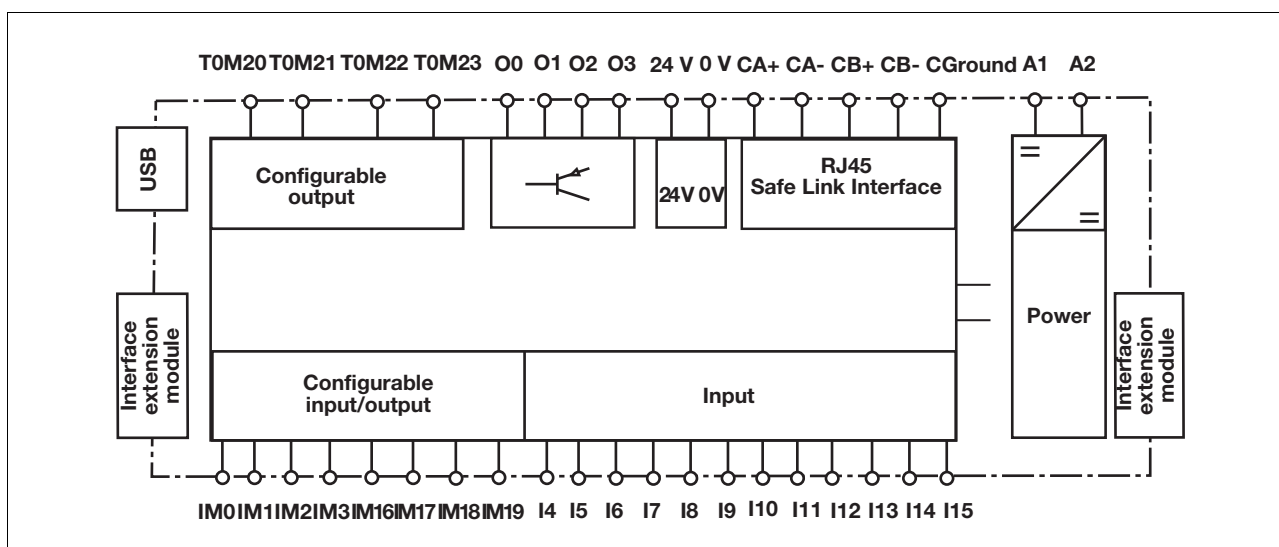
Base units PNOZmulti Mini PNOZ mm0.2p

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



Function description

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

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

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

Connection of two base units

The integrated interface for connection of 2 base units is used to safely transfer the input information from 32

virtual inputs and 32 virtual outputs between two PNOZmulti systems. Each base unit needs either an integrated interface or a link module for the connection.

Data exchange:

- ▶ Data is exchanged cyclically.
- ▶ At the end of the PNOZmulti cycle, each base unit sends its output data to the other base unit or to the link module on the other base unit.
- ▶ At the same time the base unit reads the input data from the other base unit.

Connection of multiple base units:

Any number of base units can be connected via link modules or via the integrated interface. Each base unit needs a link module or an integrated interface for the connection between two base units.

However, only a maximum of 4 link modules may be connected to any one base unit.

Data transmission time:

The t_{BUS} data transmission time is the time between the virtual output at base unit 1 being set and the virtual

input at base unit 2 becoming available (see "Technical details").

The maximum reaction time for series connection of n base units

This is the time between the activation of a safety function at the input on one base unit and the switching of an output on the connected base unit.

- ▶ The maximum reaction time t_{SUM} includes the following times:

t_{ON} : Input delay = 4 ms

t_{COND} : Switch-off delay of semiconductor output = 30 ms

t_{REL} : Switch-off delay of relay output = 50 ms

t_{BUS} : Data transmission time between two base units = 35 ms

n: Number of connections between base units

The maximum reaction time t_{SUM} for series connection of n base units

- ▶ On semiconductor outputs:

$$t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$$

- ▶ On relay outputs:

$$t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{REL}$$

Base units PNOZmulti Mini PNOZ mm0.2p

CAUTION!

For signals that are forwarded or received via the link module or interface, a calculation must always be made in accordance with the above formulas.

- ▶ Input delay and switch-off delay are only included once in the reaction time. The data transmission time is multiplied by the number of connections.
- ▶ Please refer to the connection examples under "Preparing for operation".

CAUTION!

For signals that are forwarded or received via the link module or interface, 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 arrival of 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.

Diagnostics

The status and error messages displayed by the LEDs are saved in an error stack. This error stack can be shown on the display or can be read from the PNOZmulti Configurator via the USB port.

Wiring

The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a safety function and the outputs that are to switch this safety function. 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.
- ▶ The safety system and input circuits must always be supplied by a single power supply. The power supply must meet the regulations for extra low voltages with 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.
- ▶ 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.

When connecting two base units via the integrated interface please note:

- ▶ The max. cable length between two base units on a connection with
 - one link module PNOZ ml1p <V2.0: 100 m
 - one link module PNOZ ml1p from V2.0, PNOZ mml1p or one base unit PNOZ mm0.2p: 1000 m
- ▶ Connect the inputs and outputs via the two interfaces using 4-core shielded cable. The cables must be twisted in pairs (see "Preparing for operation").
- ▶ Note the crossover cabling, e.g. CA+ with CB+.
- ▶ The cables must be classified into a minimum of Category 5 in accordance with ISO/IEC 11801.

Base units PNOZmulti Mini

PNOZ mm0.2p

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
E-STOP without detection of shorts across contacts		
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 PNOZmulti Mini PNOZ mm0.2p

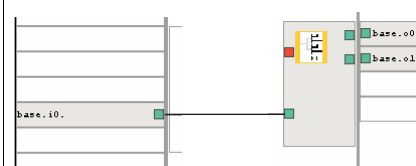
- Connection examples for semiconductor outputs

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	

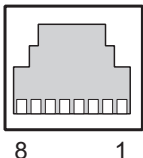


Base units PNOZmulti Mini

PNOZ mm0.2p

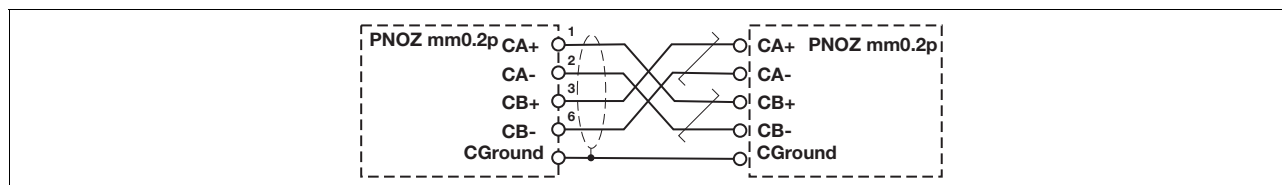
Connection of two base units

Interface assignment

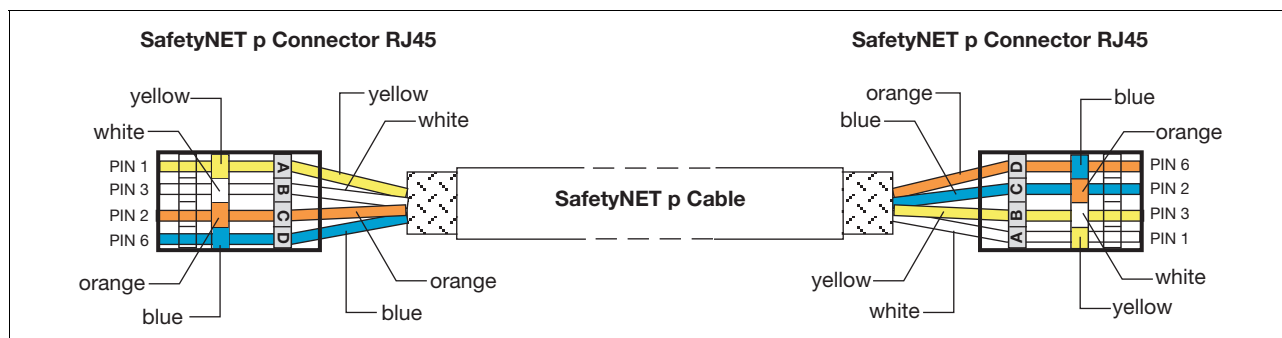
RJ45 socket 8-pin	PIN	Layout
	1	CA+
	2	CA-
	3	CB+
	4	n.c.
	5	n.c.
	6	CB-
	7	n.c.
	8	n.c.
	Shield	CGround

Connection

- Connection of two base units PNOZmulti Mini via the integrated interface



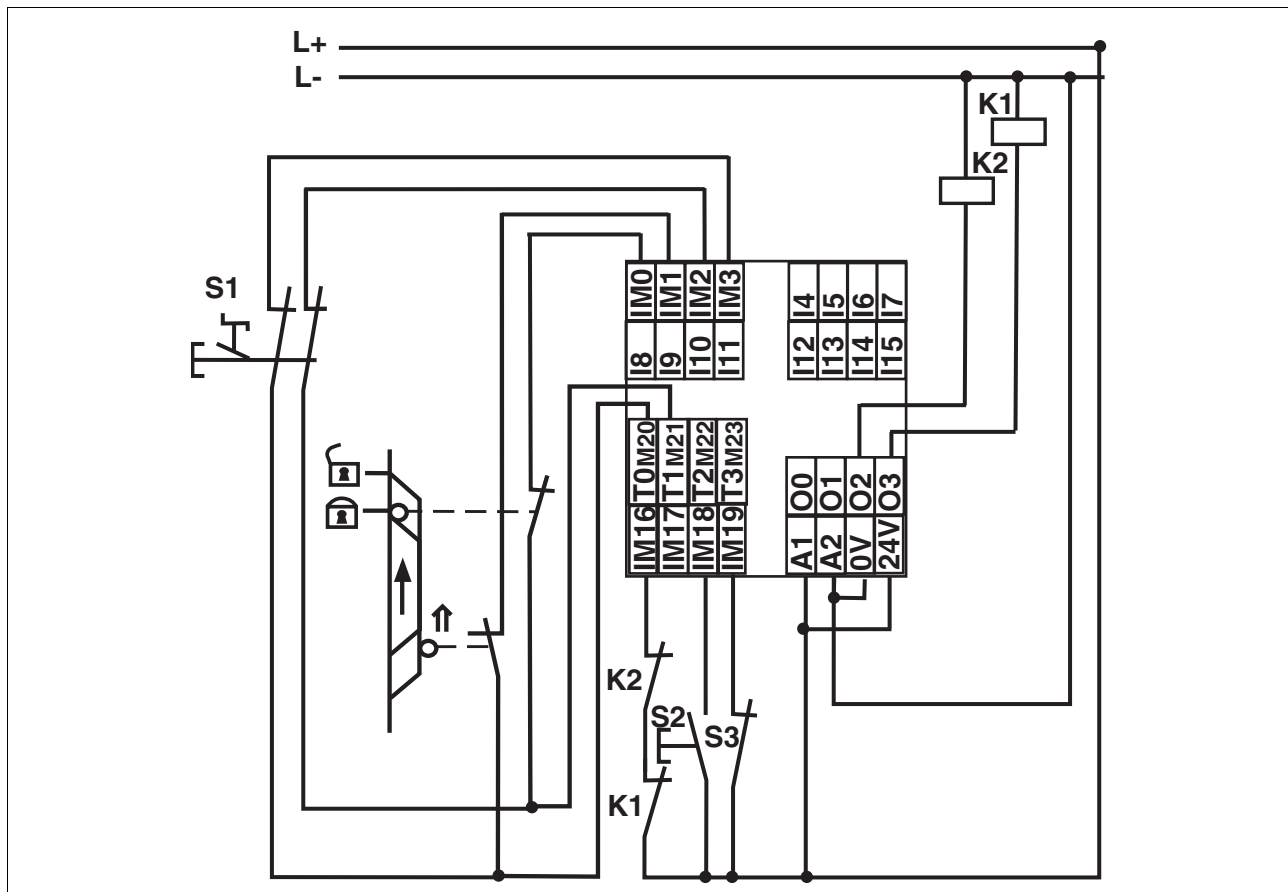
- Connection cable configuration when using:
 - 2 plug-in connectors "SafetyNET p Connector RJ45"
 - 1 connection cable "SafetyNET p Cable"
 (available as accessory, see order reference)



Base units PNOZmulti Mini PNOZ mm0.2p

Connection examples

Dual-channel E-STOP and safety gate wiring, monitored reset (IM18), feed-back loop (IM16)



Connection of multiple base units via the integrated interface

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 I4 and I6 + data transmission time $1 * t_{BUS}$ through link module/interface + switch-off delay t_{COND} of the semiconductor output at O0

$$t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$$

$$t_{SUM} = 4 \text{ ms} + (1 * 35 \text{ ms}) + 30 \text{ ms} = 69 \text{ ms}$$

Reaction time t_{SUM} between base unit Base 1 and Base 3:

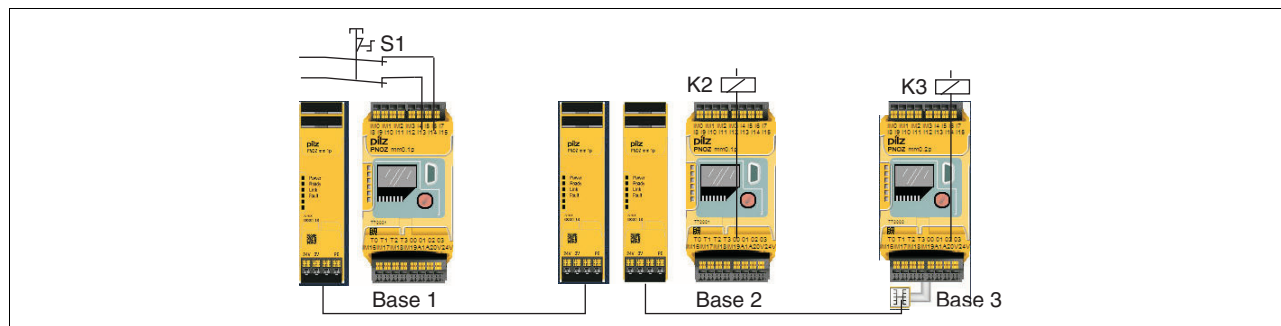
Input delay t_{ON} at I4 und I6 + data transmission time $2 * t_{BUS}$ through link

modules/interfaces + switch-off delay t_{COND} of the semiconductor output at O1

$$t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$$

$$t_{SUM} = 4 \text{ ms} + (2 * 35 \text{ ms}) + 30 \text{ ms} = 104 \text{ ms}$$

Base units PNOZmulti Mini PNOZ mm0.2p

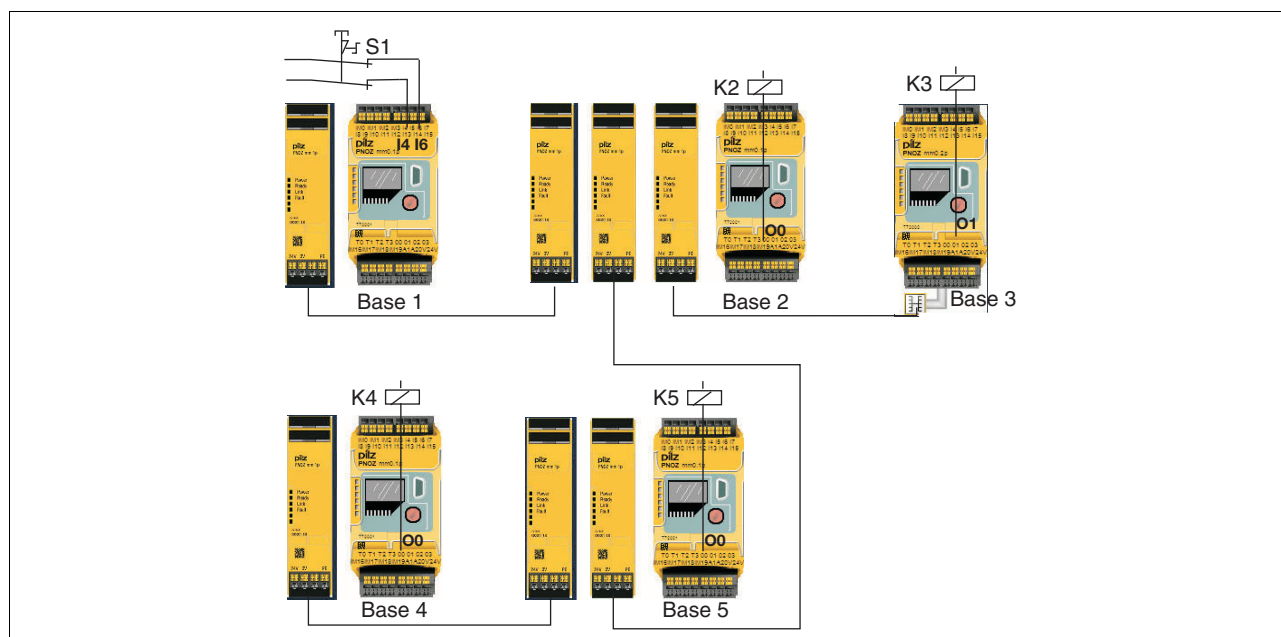


Example 2: Connection of 5 base units

The reaction times are calculated in the same way as application example 1.

1. After pressing S1 on Base 1, the semiconductor outputs switch after the following reaction times t_{SUM} :

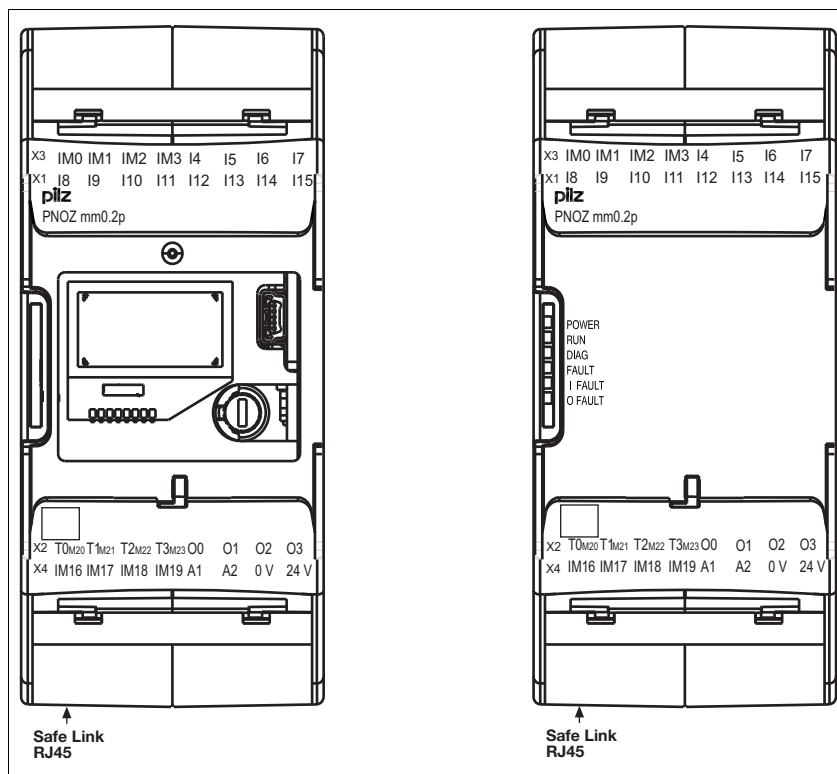
- O0 on Base 2: 69 ms
- O1 on Base 3: 104 ms
- O0 on Base 4: 139 ms
- O0 on Base 5: 104 ms



Base units PNOZmulti Mini

PNOZ mm0.2p

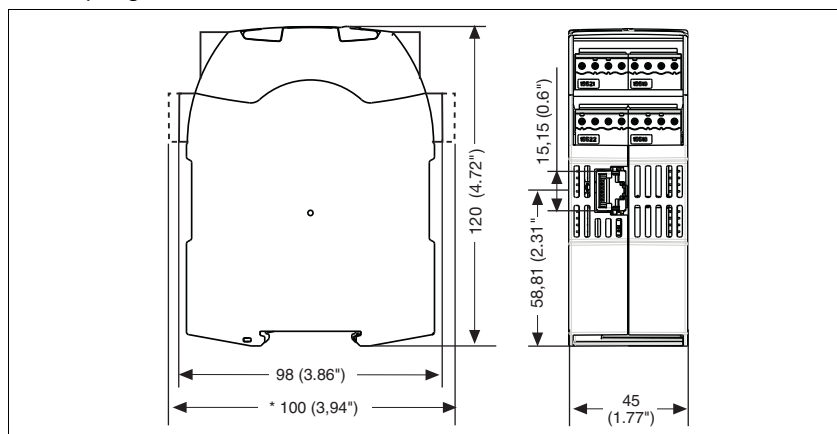
Terminal configuration



Front view with and without cover

Dimensions

* with spring-loaded terminals



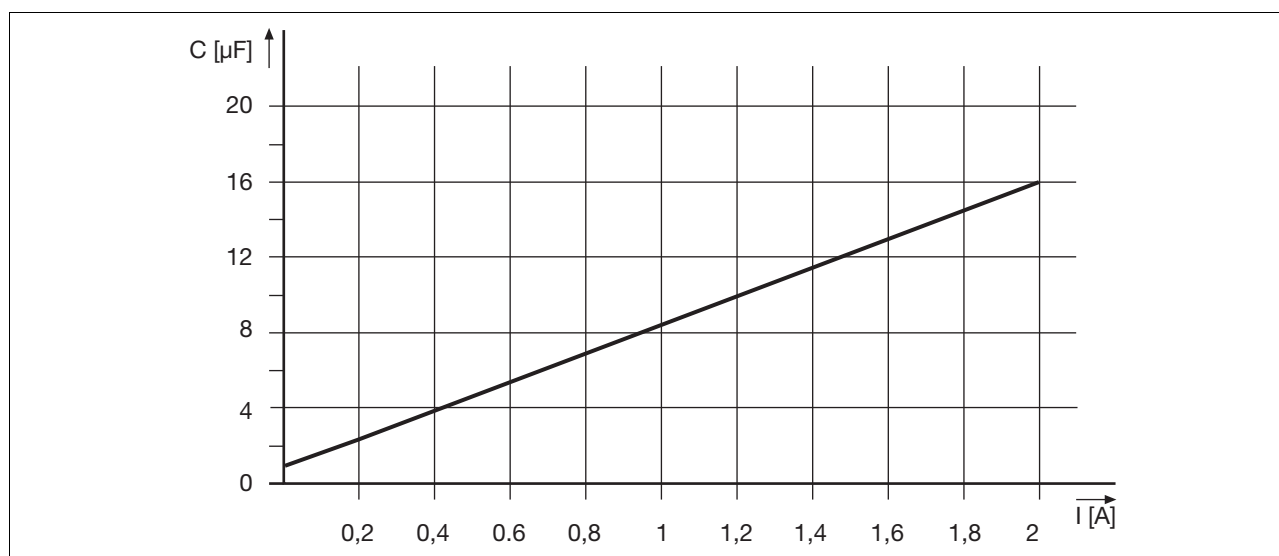
Base units PNOZmulti Mini

PNOZ mm0.2p

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

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



2.4

Technical details

Electrical data

Supply voltage U_B DC	24 V
Voltage tolerance	-15 %/+20 %
Power consumption at U_B DC without load	35.0 W
Residual ripple DC	5 %
Status display	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
Max. data transmission time	35 ms

Inputs

Number	12
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	16 ms
Pulse suppression	0.6 ms
Maximum input delay	4 ms
Number of virtual inputs	32

Base units PNOZmulti Mini

PNOZ mm0.2p

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
Virtual outputs	
Number of virtual outputs	32
Semiconductor outputs	
Number	4
Switching capability	
voltage	24 V
current	2 A
power	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	330 µs
Galvanic isolation	yes
Short circuit-proof	yes
Switch-off delay	30 ms
Residual current at "0"	0.5 mA
Signal level at "1"	U_B - 0,5 V DC at 2 A
Configurable inputs/outputs (inputs or auxiliary outputs)	
Number	8
Galvanic isolation	no
Inputs	
Voltage on the input circuit	24.0 V
Current on the input circuit	5 mA
Signal level at "0"	-3 ... +5 V DC
Signal level at "1"	15 ... 30 V DC
Max. filter time	4.0 ms
Min. pulse duration	16 ms
Pulse suppression	0.6 ms
Auxiliary outputs	
Voltage	24.0 V
Current	75 mA
Power	1.8 W
Short circuit-proof	yes
Residual current at "0"	0.5 mA
Voltage at "1"	U_B - 2 V at 0,1 A
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	II
Pollution degree	2
Rated insulation voltage	30 V
Rated impulse withstand voltage	2.50 kV

Base units PNOZmulti Mini

PNOZ mm0.2p

Environmental data	
Shock stress	
EN 60068-2-27	15g
	11 ms
EN 60068-2-29	25g
	6 ms
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	1.0 km
Sum of individual cable runs at the test pulse output	2 km
Max. cable length between two link modules	1 km
Housing material	
Housing	PC
Front	PC
Cross section of external conductors with screw terminals	
Power supply, inputs, auxiliary output, semiconductor outputs, test pulse outputs, cascading outputs:	
1 core flexible	0.25 - 2.50 mm² , 24 - 12 AWG
2 core, same cross section, flexible:	
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm² , 24 - 16 AWG
Torque setting with screw terminals	0.50 Nm
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	2
Stripping length	9 mm
Dimensions	
Height	100.0 mm
Width	45.0 mm
Depth	120.0 mm
Weight	240 g

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
Logic						
CPU		PL e (Cat. 4)	Cat. 4	SIL CL 3	1.54E-09	20
Expansion right		PL e (Cat. 4)	Cat. 4	SIL CL 3	2.13E-10	20
Expansion left		PL e (Cat. 4)	Cat. 4	SIL CL 3	2.38E-10	20
Link interface		PL e (Cat. 4)	Cat. 4	SIL CL 3	6.53E-10	20
Input						
SC inputs	single-channel	PL d (Cat. 2)	Cat. 3	SIL CL 2	3.95E-09	20
SC inputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	4.61E-10	20
SC inputs	light beam device	PL e (Cat. 4)	Cat. 4	SIL CL 3	3.95E-10	20

Base units PNOZmulti Mini

PNOZ mm0.2p

Output						
SC outputs	single-channel with advanced fault detection	PL e (Cat. 4)	Cat. 4	SIL CL 3	7.65E-10	20
SC outputs	single-channel	PL d (Cat. 2)	Cat. 3	SIL CL 2	8.90E-10	20
SC outputs	dual-channel	PL e (Cat. 4)	Cat. 4	SIL CL 3	7.86E-10	20

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

The standards current on **2011-01** apply.

Order reference		
Product Type	Features	Order no.
PNOZ mm0.2p	Base unit	772 002

Order reference: Accessories		
Product Type	Features	Order no.
PNOZ s Set1 spring-loaded terminals	1 set of spring-loaded terminals	751 008
PNOZ s Set1 screw terminals	1 set of screw terminals	750 008

Order reference: Terminator, jumper		
Product Type	Features	Order no.
PNOZ s terminator plug	Right terminator, yellow, x10	750 010
PNOZ mm0.xp terminator left	Left terminator, black/yellow, x1	779 261

Order reference: Cable		
Product Type	Features	Order no.
PSSu A USB-CAB03	Mini USB cable, 3 m	312 992
PSSu A USB-CAB05	Mini USB cable, 5 m	312 993
SafetyNET p Connector RJ45	RJ45 plug-in connector	380 400
SafetyNET p Cable	SafetyNET p cable, 1 - 500 m	380 000



Expansion modules PNOZmulti Mini

Expansion modules PNOZmulti Mini

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Expansion modules PNOZmulti Mini

PNOZ mmc1p



Communication module for connection to a configurable safety relay PNOZmulti Mini.

Approvals

	PNOZ mmc1p
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ 2 Ethernet interfaces
- ▶ Status indicators for supply voltage, communication and errors
- ▶ Max. 1 communication module can be connected to the left of the base unit PNOZmulti Mini

Unit description

The expansion module **PNOZ mmc1p** is used for communication of the configurable safety relay PNOZmulti Mini via Ethernet.

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

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

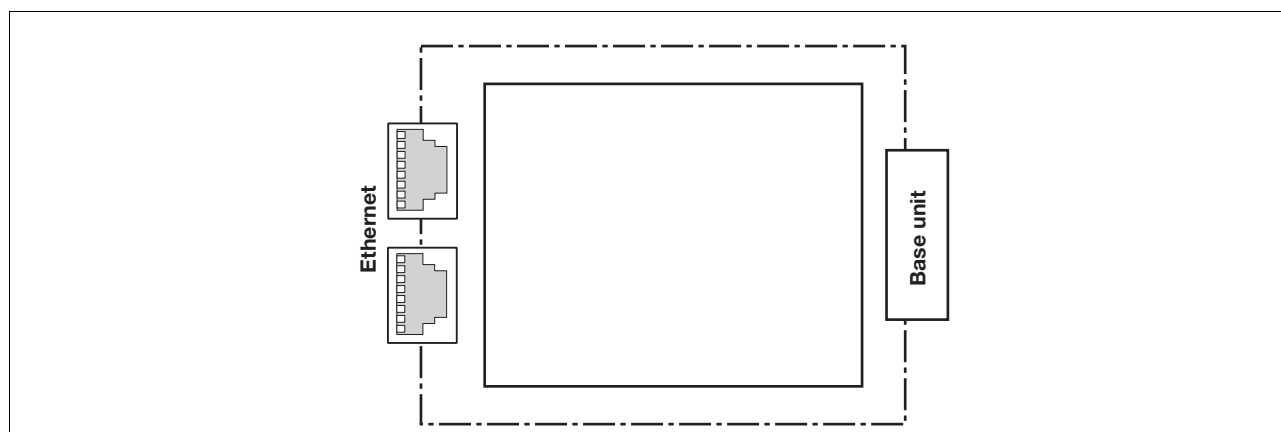
- ▶ E-STOP equipment

- ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1
- The expansion module may not be used for safety-related functions.

System requirements

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

Block diagram



Expansion modules PNOZmulti Mini PNOZ mmc1p

Function description

The product **PNOZ mmc1p** has two Ethernet interfaces to

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

via Ethernet.

Information on diagnostics via the Ethernet interfaces can be found in the "Special Applications Technical Catalogue".

Information on communication via Modbus/TCP can be found in the operating instructions "PNOZmulti Modbus".

The connection to Ethernet is made via the two 8-pin RJ45 sockets.

The Ethernet interface is configured in the PNOZmulti Configurator and is described in the online help for the PNOZmulti Configurator.

Patch cable can therefore be used 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)

Wiring

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

Note:

- ▶ Information given in the "Technical details" must be followed.

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.

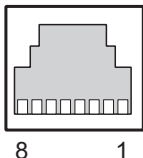
INFORMATION

The connected subscribers must support the autosensing/autonegotiation function. If not, the communication partner must be set permanently to "10 Mbit/s, half duplex".

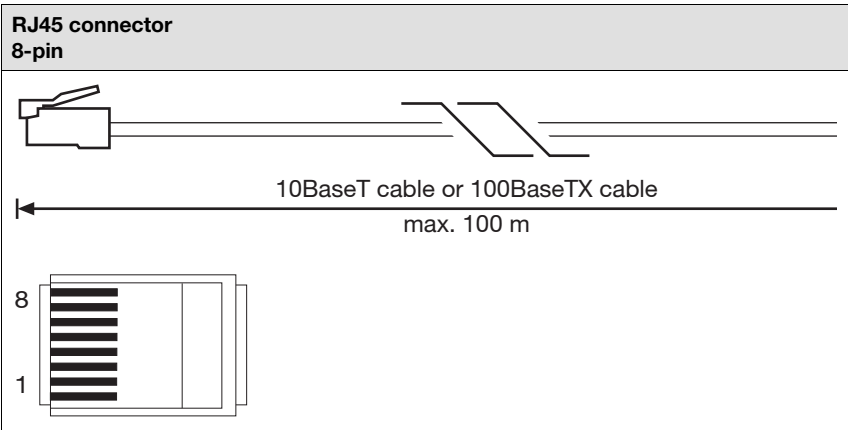
The switch's automatic crossover function means there is no need to distinguish on the connection cable between patch cable (uncrossed data line connection) and crossover cable (crossover data line connection). The switch automatically creates the correct data line connection internally.

Expansion modules PNOZmulti Mini PNOZ mmc1p

Interface assignment

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



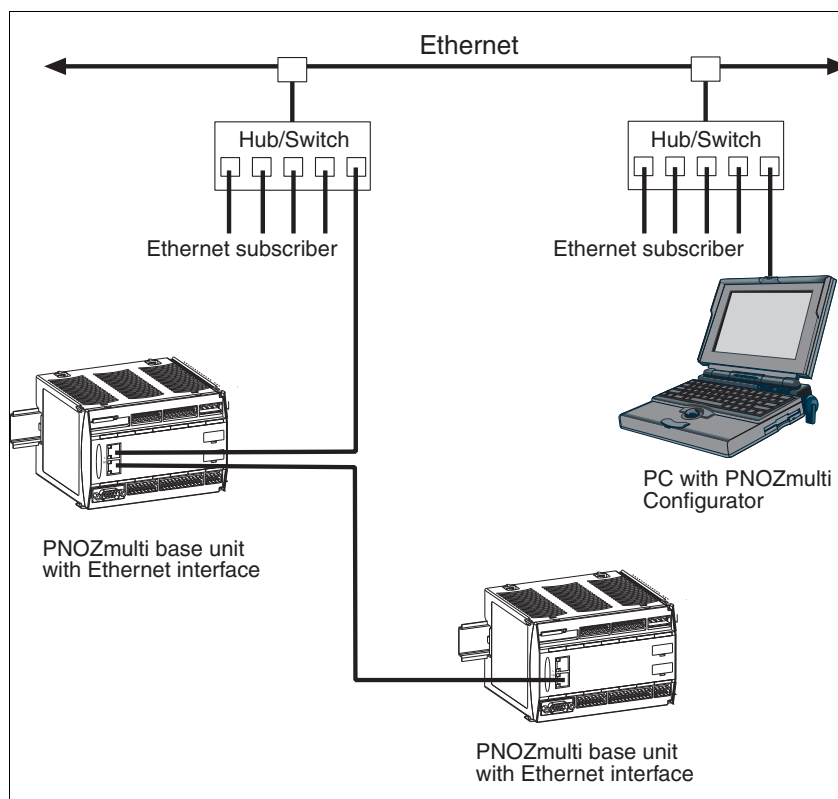
NOTICE

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.

Expansion modules PNOZmulti Mini PNOZ mmc1p

Process data exchange

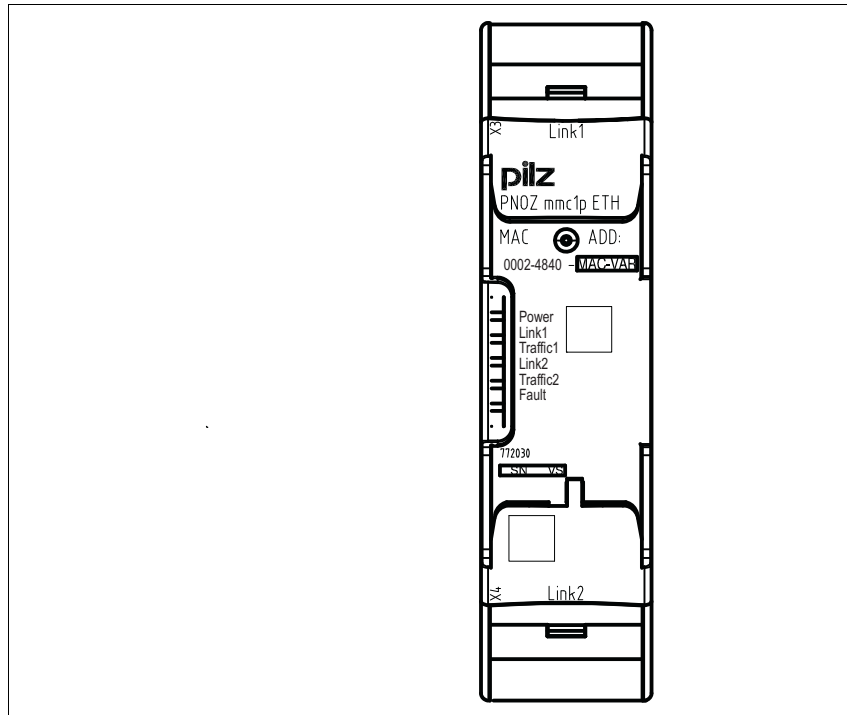
The RJ45 interfaces on the internal autosensing switch enable process data to be exchanged with other Ethernet subscribers within a network. The product **PNOZ mmc1pETH** can also be connected to Ethernet via a hub (hub or switch).



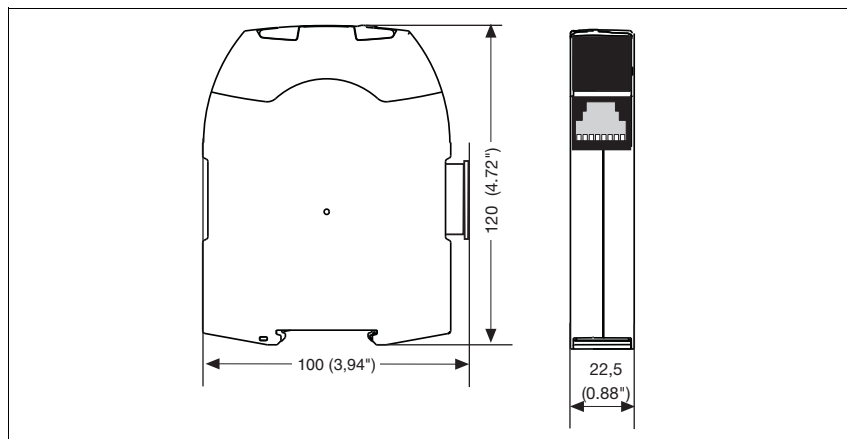
Expansion modules PNOZmulti Mini

PNOZ mmc1p

Terminal configuration



Dimensions



Expansion modules PNOZmulti Mini

PNOZ mmc1p

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Technical details	
Ethernet IP/Modbus TCP	
Device type	
Modbus TCP	Slave
Connection	RJ45
Galvanic isolation	yes
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Overvoltage category	II
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g
	11 ms
EN 60068-2-29	25g
	6 ms
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	0.1 km
Housing material	
Housing	PC
Front	PC
Dimensions	
Height	100.0 mm
Width	22.5 mm
Depth	120.0 mm
Weight	100 g

The standards current on **07/2010** apply.

Order reference		
Product type	Features	Order no.
PNOZ mmc1p ETH	Expansion module	772 030

Expansion modules PNOZmulti Mini PNOZ mmc2p



Communication module for connection to a configurable safety relay PNOZmulti Mini.

Approvals

	PNOZ mmc2p
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ 1 serial interface RS232
- ▶ Status indicator for supply voltage
- ▶ Max. 1 communication module can be connected to the left of the base unit PNOZmulti Mini
- ▶ Plug-in connection terminals (either cage clamp terminals or screw terminals)

Unit description

The expansion module **PNOZ mmc2p** is used for communication of the configurable safety relay PNOZmulti Mini via a serial interface RS232. The expansion module may only be connected to a base unit PNOZmulti Mini from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units PNOZmulti Mini that can be connected). The configurable control system PNOZmulti is used for the safety-relat-

ed interruption of safety circuits and is designed for use in:

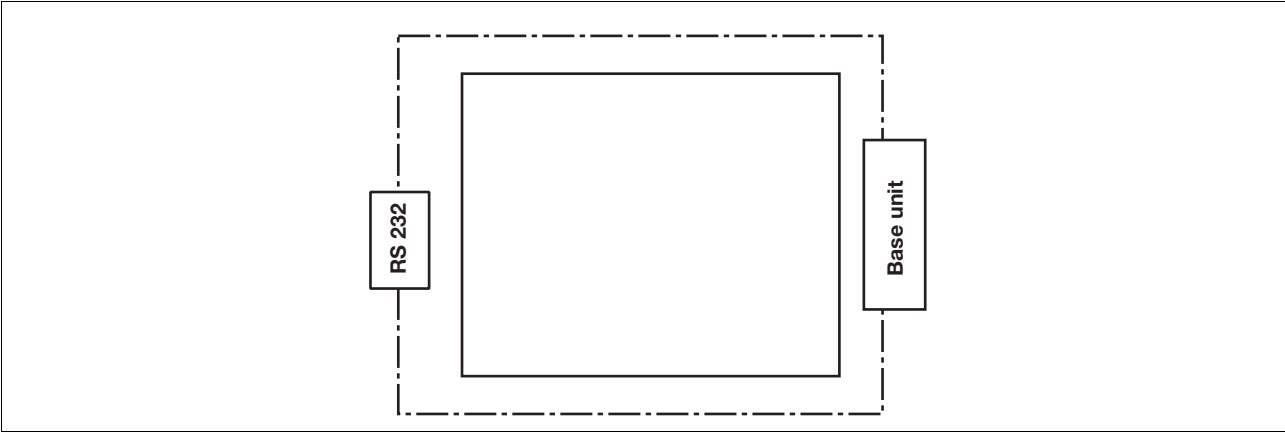
- ▶ E-STOP equipment
- ▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

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

System requirements

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

Block diagram



Expansion modules PNOZmulti Mini PNOZ mmc2p

Function description

The product **PNOZ mmc2p** has a serial interface RS232 interface to

- Download the project
- Read the diagnostic data

- Set virtual inputs for standard functions
- Read virtual outputs for standard functions.

Information on diagnostics can be found in the Special Applications Technical Catalogue.

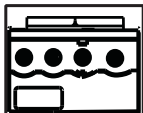
Verdrahtung

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

Note:

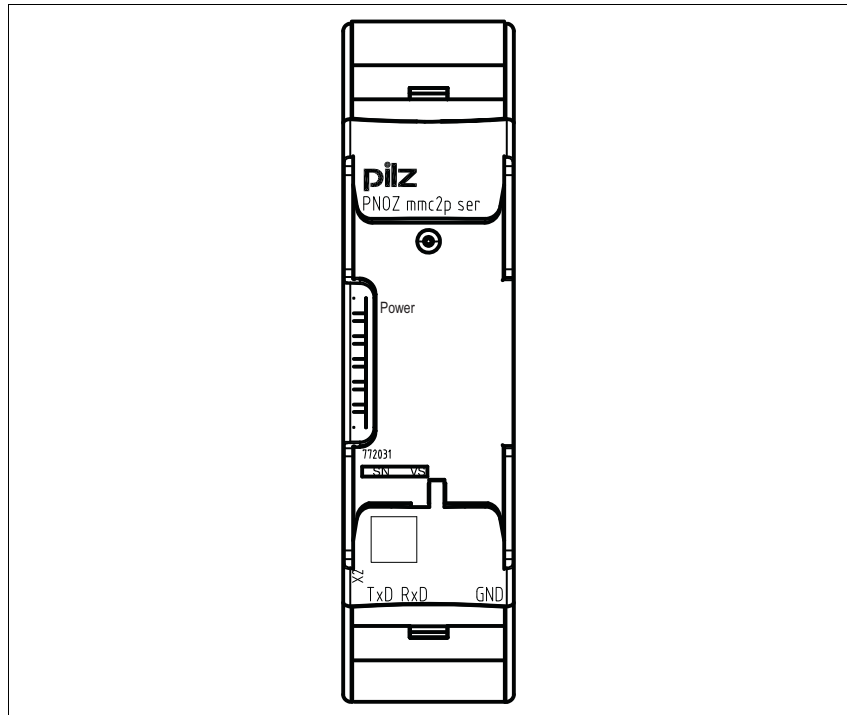
- Information given in the "Technical details" must be followed.

Interface configuration

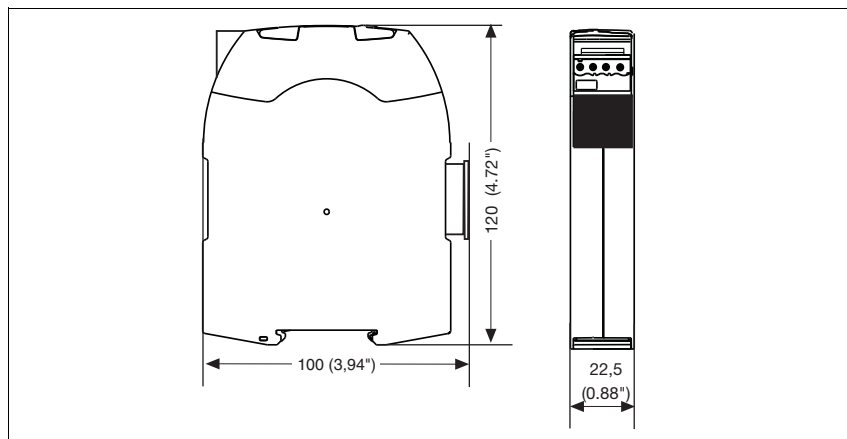
Serial interface RS232	Standard
 TxD RxD GND	TxD (Transmit)
	RxD (Receive)
	GND (Ground)

Expansion modules PNOZmulti Mini PNOZ mmc2p

Terminal configuration



Dimensions



Expansion modules PNOZmulti Mini

PNOZ mmc2p

Notice

This data sheet is only intended for use during configuration. Please refer to the operating manual for installation and operation.

Technical details	
Ethernet IP/Modbus TCP	
Galvanic isolation	no
Environmental data	
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Overvoltage category	II
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms
EN 60068-2-29	25g 6 ms
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	22.0 m
Housing material	
Housing	PC
Front	PC
Cross section of external conductors with screw terminals	
1 core flexible	0.50 - 1.50 mm ² , 22 - 14 AWG
2 core, same cross section, flexible:	
Rigid single-core, flexible multicore or multi-core with crimp connector	0.5 - 1.5 mm ²
Torque setting with screw terminals	0.50 Nm
Spring-loaded terminals: Terminal points per connection	2
Stripping length	9 mm
Dimensions	
Height	100.0 mm
Width	22.5 mm
Depth	120.0 mm
Weight	85 g

The standards current on **07/2010** apply.

Expansion modules PNOZmulti Mini PNOZ mmc2p

Order reference

Product type	Features	Order no.
PNOZ mmc2p serial	Expansion module	772 031

Order reference: Accessories

Product type	Features	Order no.
Spring terminals PNOZ mmc2p, mml1p 1 pc.	Spring-loaded terminals, 1 pieces	783 538
Spring terminals PNOZ mmc2p, mml1p 10 pcs	Spring-loaded terminals, 10 pieces	783 539
Screw terminals PNOZ mmc2p, mml1p 1 pc.	Screw terminals, 1 piece	793 538
Screw terminals PNOZ mmc2p, mml1p 10 pcs.	Screw terminals, 10 pieces	793 539




Expansion modules PNOZmulti Mini

PNOZ mmc3p



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

Approvals

	PNOZ mmc3p
	◆
	◆
	◆

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
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- ▶ 24 virtual outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus **PROFIBUS DP**. The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- ▶ Max. 1 **PNOZ mmc3p** can be connected to the base unit
- ▶ Please refer to the section entitled "System Expansion" for details of the connectable base units PNOZmulti Mini.

Unit description

The expansion module **PNOZ mmc3p** is used for communication between the configurable control system PNOZmulti and PROFIBUS-DP. PROFIBUS-DP is designed for fast data exchange at field level. The expansion module **PNOZ mmc3p** is a passive subscriber (Slave) of PROFIBUS-DP (DPV0). 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 only be connected to a base unit PNOZmulti Mini from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Ex-

pansion" for details of the base units PNOZmulti Mini that can be connected).

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

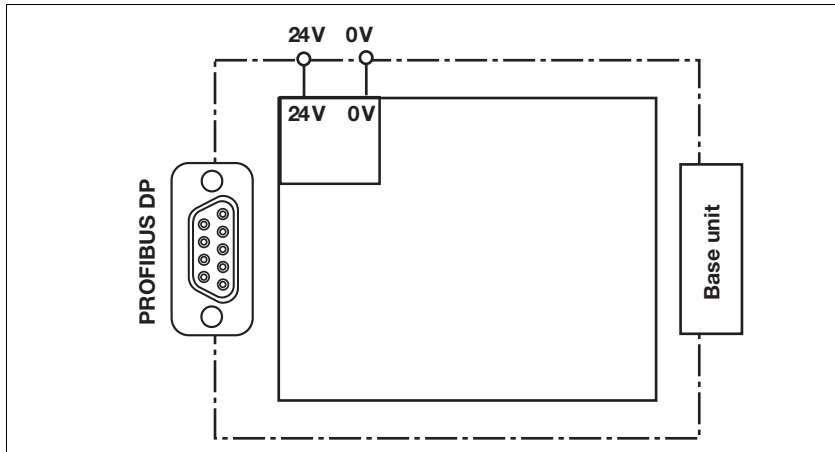
The expansion module may not be used for safety-related functions.

System requirements

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

Expansion modules PNOZmulti Mini PNOZ mmc3p

Block diagram



Function description

The virtual inputs and outputs that are to be transferred via PROFIBUS are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module **PNOZ mmc3p** are connected via a jumper.

The station address is set via rotary switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module **PNOZ mmc3p** is configured and started automatically.

LEDs indicate the status of the expansion module on PROFIBUS.

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

- Bit 1: IFAULT
- Bit 2: FAULT
- Bit 3: DIAG
- Bit 4: RUN

Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

Input and output data

The data is structured as follows:

- ▶ Input range

The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.
- ▶ Output range

The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.
- ▶ Output range only: Byte 3

Bits 0 ... 4: Status of LEDs on the PNOZmulti

 - Bit 0: OFAULT

Expansion modules PNOZmulti Mini PNOZ mmc3p

Assigning the inputs/outputs in the PNOZmulti Configurator to the PROFIBUS-DP inputs/outputs

Virtual inputs on PNOZmulti Configurator	I0 ... I7	I8 ... I15	I16 ... I23
Input data PROFIBUS DP	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7
Virtual outputs on PNOZmulti Configurator	O0 ... O7	O8 ... O15	O16 ... O23
Output data PROFIBUS DP	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

Wiring

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

PROFIBUS DP interface

It is possible to define which outputs on the control system will communicate with PROFIBUS-DP. The connection to PROFIBUS-DP is made via a

Note:

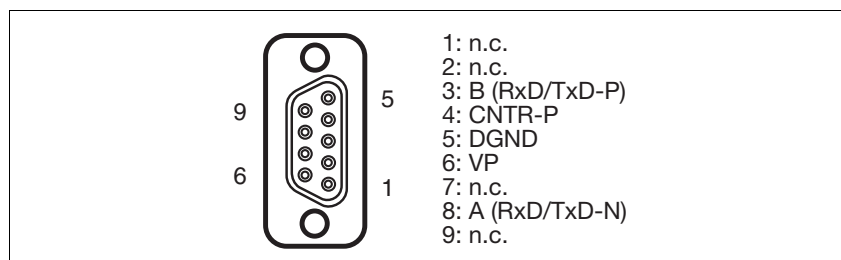
- Information given in the "Technical details" must be followed.
- Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.

- The power supply must meet the regulations for extra low voltages with safe separation.

Connecting the supply voltage

Connect the supply voltage to the fieldbus module:

- Terminal **24 V**: + 24 V DC
- Terminal **0 V**: 0 V



n.c. = not connected

Please note the following when connecting to PROFIBUS-DP:

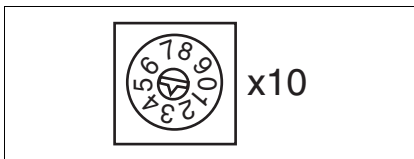
- Only use metal plugs or metallised plastic plugs
- Twisted pair, screened cable must be used to connect the interfaces

Expansion modules PNOZmulti Mini PNOZ mmc3p

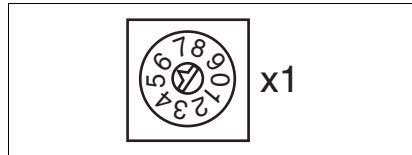
Preparing for operation

Setting the station address

The station address of the expansion module **PNOZ mmc3p** is set between 0 ... 99 (decimal) via two rotary switches x1 and x10.



- ▶ On the upper rotary switch x10, use a small screwdriver to set the tens digit for the address ("3" in the example).



- ▶ On the lower rotary switch x1, set the ones digit for the address ("6" in the example).

Station address 36 is set in the diagrams as an example.

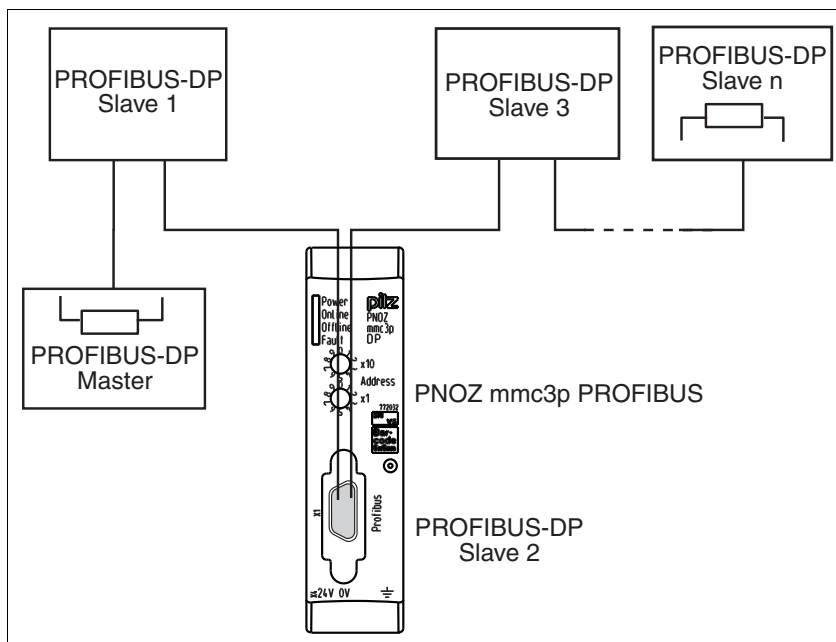
Download modified project to the control system PNOZmulti

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

NOTICE

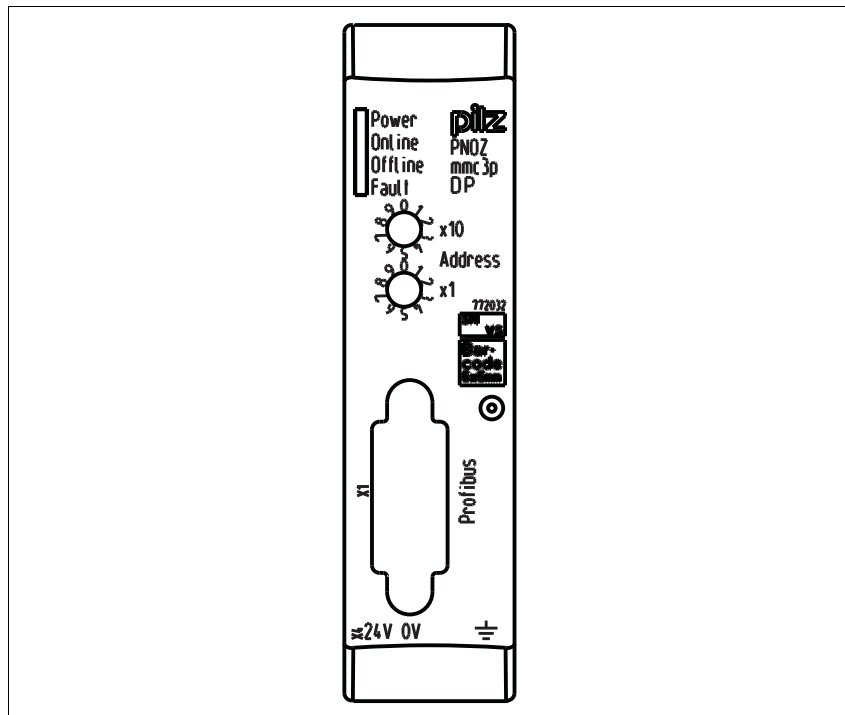
For the commissioning and after every program change, you must check whether the safety devices are functioning correctly.

Connection example



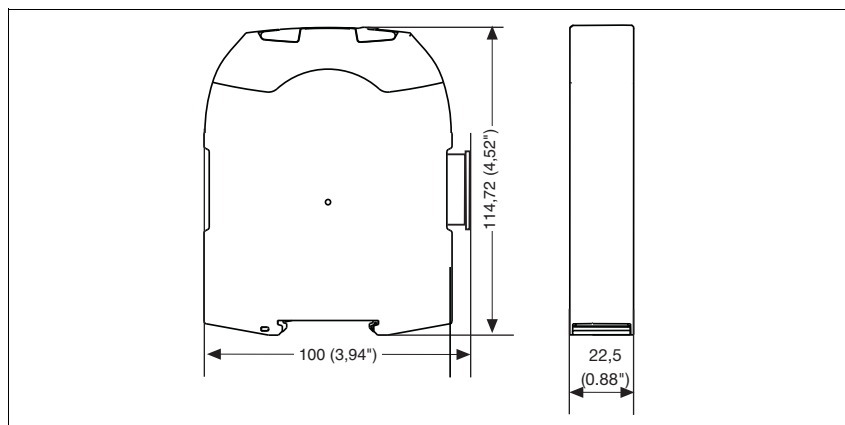
Expansion modules PNOZmulti Mini PNOZ mmc3p

Terminal configuration



2.5

Dimensions



Expansion modules PNOZmulti Mini

PNOZ mmc3p

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	1.5 W
Residual ripple DC	5 %
Status display	LED

Times

Supply interruption before de-energisation	20 ms
--	-------

Fieldbus interface

Fieldbus interface	PROFIBUS DP
Device type	Slave DPV0
Station address	0 - 99d
Transmission rate	9.6 kBit/s - 12 MBit/s
Connection	Female 9-pin D-SUB connector
Galvanic isolation	yes
Test voltage	500 V AC

Environmental data

Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	II
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms

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	PC
Front	PC

Expansion modules PNOZmulti Mini

PNOZ mmc3p

Mechanical data

Cross section of external conductors with screw terminals

Power supply, inputs, auxiliary output, semiconductor outputs,
test pulse outputs, cascading outputs:

1 core flexible **0.25 - 2.50 mm² , 24 - 12 AWG**

2 core, same cross section, flexible:

without crimp connectors or with TWIN crimp connectors **0.20 - 1.50 mm² , 24 - 16 AWG**

Torque setting with screw terminals **0.50 Nm**

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 **2**

Stripping length **9 mm**

Dimensions

Height **100.0 mm**

Width **22.5 mm**

Depth **115.0 mm**

Weight **95 g**

The standards current on **2011-09** apply.

Order reference

Product type	Features	Order no.
PNOZ mmc3p	Fieldbus module, PROFIBUS-DP	772 032

2.5

Order reference: Terminator, jumper

Product type	Features	Order no.
PNOZ mm0.xp connector left	Black/yellow jumper to connect the modules on the left-hand side, 1 piece	779 260

Order reference: Accessories




Product type	Features	Order no.
Spring terminals PNOZ mmcxp 1 pc.	Spring-loaded terminals, 1 piece	783 542
Spring terminals PNOZ mmcxp 10 pcs.	Spring-loaded terminals, 10 pieces	783 543
Screw terminals PNOZ mmcxp 1 pc.	Screw terminals, 1 piece	793 542
Screw terminals PNOZ mmcxp 10 pcs.	Screw terminals, 10 pieces	793 543

Expansion modules PNOZmulti Mini PNOZ mmc4p



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

Approvals

	PNOZ mmc4p
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Connection for DeviceNet
- ▶ Station addresses from 0 ... 63 can be selected via DIP switches
- ▶ Status indicators for communication with DeviceNet and for errors
- ▶ 24 virtual outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus **DeviceNet**. The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- ▶ Max. 1 **PNOZ mmc4p** can be connected to the base unit
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- ▶ Please refer to the section entitled "System Expansion" for details of the connectable base units PNOZmulti Mini.

Unit description

The expansion module **PNOZ mmc4p** is used for communication between the configurable control system PNOZmulti Mini and DeviceNet. DeviceNet is designed for fast data exchange at field level. The expansion module **PNOZ mmc4p** is a passive DeviceNet subscriber (Slave). The basic communication functions with DeviceNet 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 expansion module **PNOZ mmc4p** can also be used for diagnostic and commissioning functions. Data traffic is monitored on the Master/Slave side. The expansion module may only be connected to a base unit PNOZmulti Mini from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Ex-

pansion" for details of the base units PNOZmulti Mini that can be connected).

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

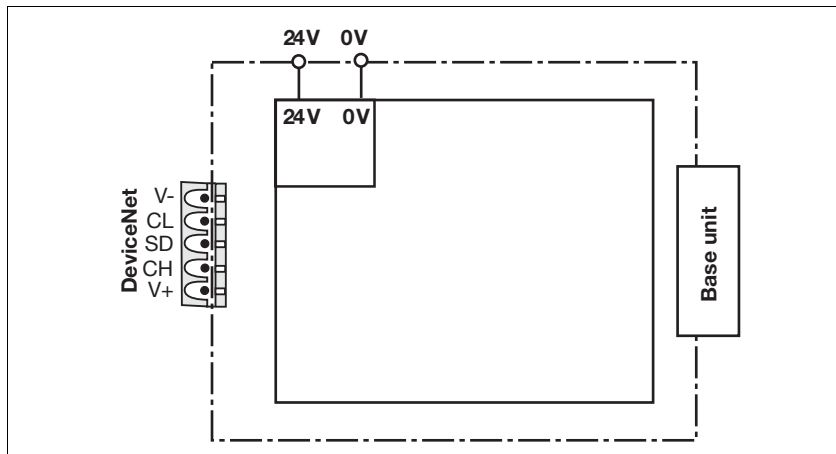
The expansion module may not be used for safety-related functions.

System requirements

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

Expansion modules PNOZmulti Mini PNOZ mmc4p

Block diagram



Function description

The virtual inputs and outputs that are to be transferred via DeviceNet are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module **PNOZ mmc4p** are connected via a jumper.

The station address and the transmission rate are set using DIP switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module **PNOZ mmc4p** is configured and started automatically.

LEDs indicate the status of the expansion module on DeviceNet.

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

- Bit 0: OFAULT
- Bit 1: IFAULT
- Bit 2: FAULT
- Bit 3: DIAG
- Bit 4: RUN

Bit 5: Data is being exchanged.

Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

Input and output data

The data is structured as follows:

- ▶ Input range

The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.
- ▶ Output range

The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.
- ▶ Output range only: Byte 3

Bits 0 ... 4: Status of LEDs on the PNOZmulti

Expansion modules PNOZmulti Mini PNOZ mmc4p

Assigning the inputs/outputs in the PNOZmulti Configurator to the PROFIBUS-DP inputs/outputs

Virtual inputs on PNOZmulti Configurator	I0 ... I7	I8 ... I15	I16 ... I23
Input data DeviceNet	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7
Virtual outputs on PNOZmulti Configurator	O0 ... O7	O8 ... O15	O16 ... O23
Output data DeviceNet	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

Wiring

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

DeviceNet interface

It is possible to define which outputs on the control system will communicate with DeviceNet. The connection to DeviceNet is made via a 5-pin screw connector.

Note:

- ▶ Information given in the "Technical details" must be followed.
- ▶ Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.

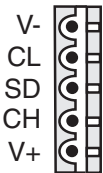
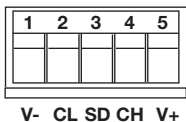
- ▶ The power supply must meet the regulations for extra low voltages with safe separation.

Connecting the supply voltage

Connect the supply voltage to the fieldbus module:

- ▶ Terminal **24 V**: + 24 V DC
- ▶ Terminal **0 V**: 0 V

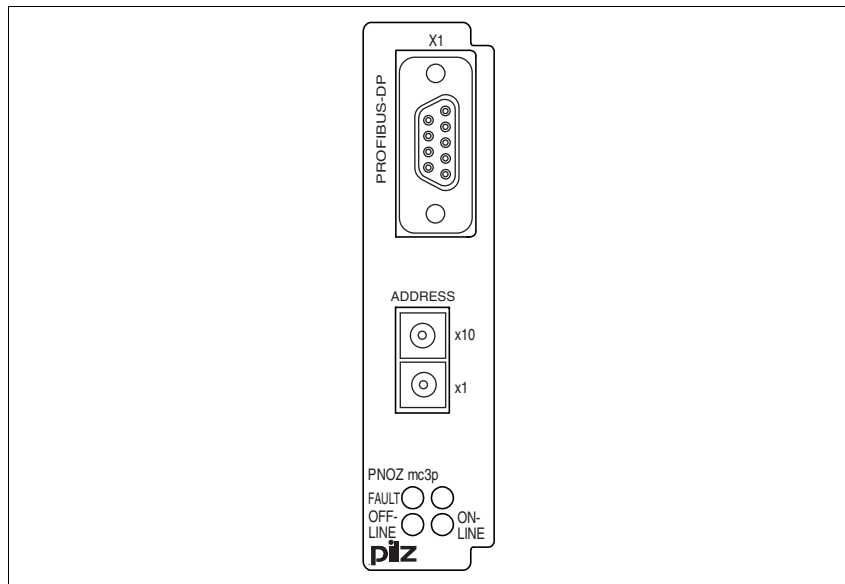
2.5



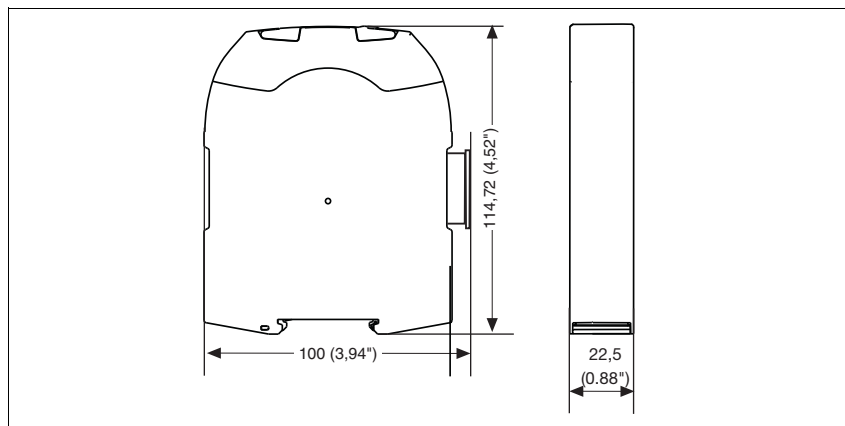
- 1: V-
- 2: CL (CAN_L)
- 3: Cable shield
- 4: CH (CAN_H)
- 5: V+

Expansion modules PNOZmulti Mini PNOZ mmc4p

Terminal configuration



Dimensions



Expansion modules PNOZmulti Mini

PNOZ mmc4p

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	1.5 W
Residual ripple DC	5 %
Status display	LED

Times

Supply interruption before de-energisation	20 ms
--	-------

Fieldbus interface

Fieldbus interface	DeviceNet
External supply (DC)	24 V
Power consumption	0.75 W
Device type	Slave
Station address	0 ... 63d
Transmission rates	125 kBit/s, 250 kBit/s, 500 kBit/s
Connection	5-pin Combicon plug-in connector
Galvanic isolation	yes
Test voltage	500 V AC

Environmental data

Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	II
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms

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	PC
Front	PC

Expansion modules PNOZmulti Mini

PNOZ mmc4p

Mechanical data

Cross section of external conductors with screw terminals

Power supply, inputs, auxiliary output, semiconductor outputs,
test pulse outputs, cascading outputs:

1 core flexible 0.25 - 2.50 mm², 24 - 12 AWG

2 core, same cross section, flexible:

without crimp connectors or with TWIN crimp connectors 0.20 - 1.50 mm², 24 - 16 AWG

Torque setting with screw terminals 0.50 Nm

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 2

Stripping length 9 mm

Dimensions

Height 100.0 mm

Width 22.5 mm

Depth 110.0 mm

Weight 95 g

The standards current on **2011-09** apply.

Order reference

Product type	Features	Order no.
PNOZ mmc4p	Fieldbus module, DeviceNet	772 033

2.5

Order reference: Terminator, jumper

Product type	Features	Order no.
PNOZ mm0.xp connector left	Black/yellow jumper to connect the modules on the left-hand side, 1 piece	779 260

Order reference: Accessories

Product type	Features	Order no.
Spring terminals PNOZ mmcxp 1 pc.	Spring-loaded terminals, 1 piece	783 542
Spring terminals PNOZ mmcxp 10 pcs.	Spring-loaded terminals, 10 pieces	783 543
Screw terminals PNOZ mmcxp 1 pc.	Screw terminals, 1 piece	793 542
Screw terminals PNOZ mmcxp 10 pcs.	Screw terminals, 10 pieces	793 543




Expansion modules PNOZmulti Mini

PNOZ mmc6p



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

Approvals

	PNOZ mmc6p
	◆
	◆
	◆

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
- ▶ 24 virtual outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus **CANopen**. The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").
- ▶ Max. 1 **PNOZ mmc6p** can be connected to the base unit
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)
- ▶ Please refer to the section entitled "System Expansion" for details of the connectable base units PNOZmulti Mini.

Unit description

The fieldbus module **PNOZ mmc6p** is an expansion module of the configurable control system PNOZmulti Mini. It is used for communication between the configurable control system PNOZmulti and CANopen.

CANopen is designed for fast data exchange at field level. The expansion module **PNOZ mmc6p** is a passive CANopen subscriber (Slave). The basic communication functions with CANopen conform to the guidelines of the CANopen User Group CiA DS-301 V4.2.0. 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 expansion module **PNOZ mmc6p** can also be used for diagnostic and commissioning functions. Data traffic is monitored on the Master/Slave side.

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

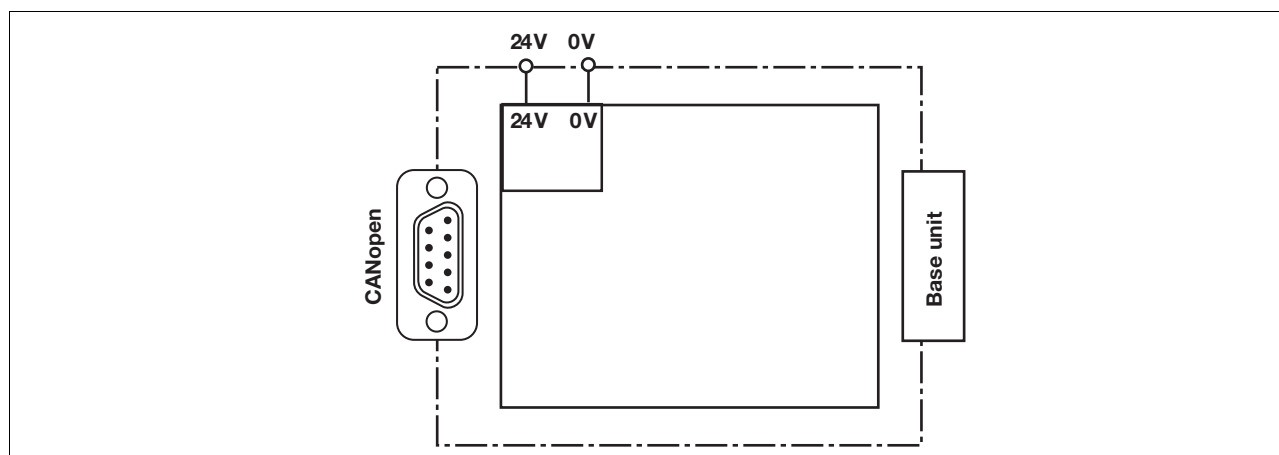
The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

Expansion modules PNOZmulti Mini PNOZ mmc6p

Block diagram



Input and output data

The data is structured as follows:

- ▶ **Input range**
The inputs are defined in the master and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of byte 1 has the number i12.
- ▶ **Output range**
The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number

there, e.g. o0, o5... The status of output o0 is stored in bit 0 of byte 0; the status of output o5 is stored in bit 5 of byte 0 etc.

- ▶ **Output range only: Byte 3**
Bits 0 ... 4: Status of LEDs on the PNOZmulti
 - Bit 0: OFAULT
 - Bit 1: IFAULT
 - Bit 2: FAULT

- Bit 3: DIAG
- Bit 4: RUN

Bit 5: Data is being exchanged.
Detailed information on data exchange (tables, segments) is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

Assigning the inputs/outputs in the PNOZmulti Configurator to the CANopen inputs/outputs

Virtual inputs on PNOZmulti Configurator	I0 ... I7	I8 ... I15	I16 ... I23
Input data CANopen	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7
Virtual outputs on PNOZmulti Configurator	O0 ... O7	O8 ... O15	O16 ... O23
Output data CANopen	Byte 0: Bit 0 ... 7	Byte 1: Bit 0 ... 7	Byte 2: Bit 0 ... 7

The number of virtual inputs and outputs can be extended to 128 (see document "Communication Interfaces" in the section entitled "Fieldbus modules")

Expansion modules PNOZmulti Mini PNOZ mmc6p

Function description

The virtual inputs and outputs that are to be transferred via CANopen are selected and configured in the PNOZmulti Configurator. The base unit and the expansion module **PNOZ mmc6p** are connected via a jumper. The station address and the transmission rate are set using rotary switches. After the supply voltage is switched on or the PNOZmulti control system is reset, the expansion module **PNOZ mmc6p** is configured and started automatically. LEDs indicate the status of the expansion module on CANopen.

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

Wiring

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

- ▶ Information given in the "Technical details" must be followed.
- ▶ Always connect the mounting rail to the protective earth via an earthing terminal. This will be used to dissipate hazardous voltages in the case of a fault.

- ▶ The power supply must meet the regulations for extra low voltages with safe separation.

CAUTION!

Only connect and disconnect the expansion module when the supply voltage is switched off.

NOTICE

When installing, you must refer to the guidelines published by the CANopen User Group (CiA).

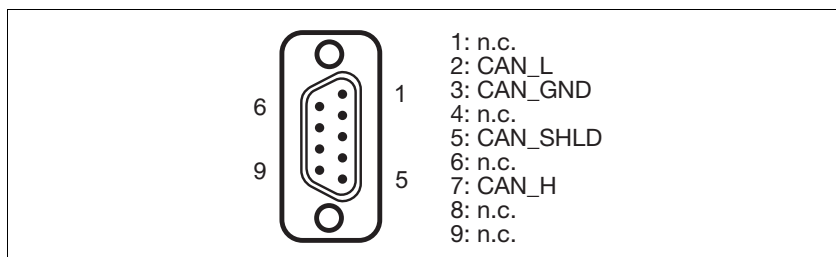
Connecting the supply voltage

Connect the supply voltage to the fieldbus module:

- ▶ Terminal **24 V**: + 24 V DC
- ▶ Terminal **0 V**: 0 V

CANopen interface

The connection to CANopen is made via a male 9-pin D-Sub connector.



n.c. = not connected

Please note the following when connecting to CANopen:

- ▶ Only use metal plugs or metallised plastic plugs
- ▶ Twisted pair, screened cable must be used to connect the interfaces

CANopen termination

To minimise cable reflection and to guarantee a defined rest signal on the transmission line, CANopen must be terminated at both ends.

Expansion modules PNOZmulti Mini PNOZ mmc6p

Preparing for operation

Setting the transmission rate



- On the upper rotary switch DR, use a small screwdriver to set the transmission rate (in the example, “3” corresponds to 50 kBit/s).

Switch setting	0	1	2	3	4	5	6	7	8	9
Transmission rate	-	10 kBit/s	20 kBit/s	50 kBit/s	125 kBit/s	250 kBit/s	500 kBit/s	800 kBit/s	1 MBit/s	-

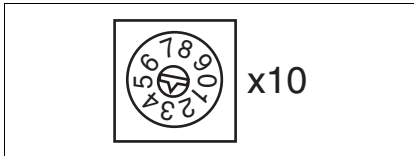
INFORMATION

The transmission rate cannot be changed during operation.

Expansion modules PNOZmulti Mini PNOZ mmc6p

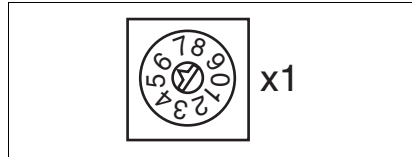
Setting the station address

The station address of the expansion module **PNOZ mmc6p** is set between 0 ... 99 (decimal) via two rotary switches x1 and x10.



- On the middle rotary switch x10, use a small screwdriver to set the

tens digit for the address ("3" in the example).



- On the lower rotary switch x1, set the ones digit for the address ("6" in the example). Station address 36 is set in the diagrams as an example.

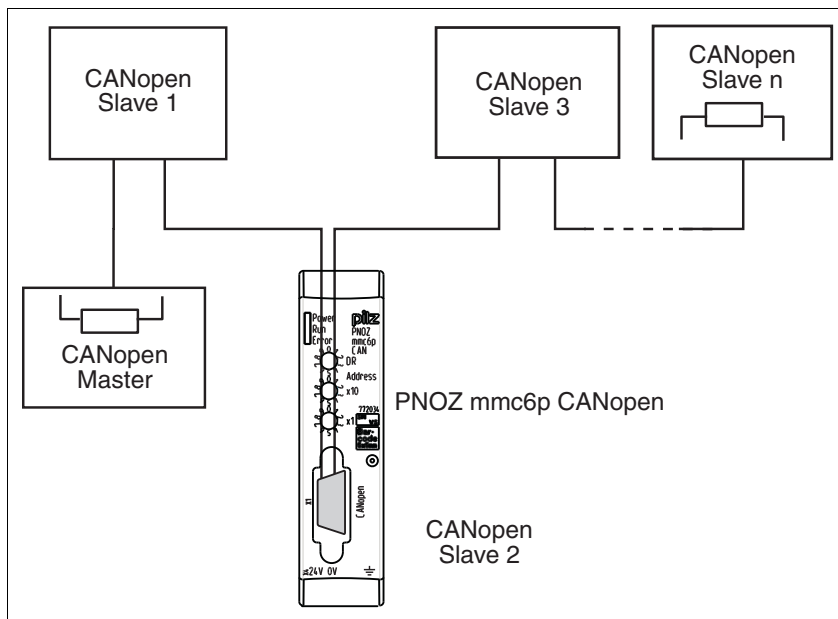
Download modified project to the PNOZmulti safety system

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

NOTICE

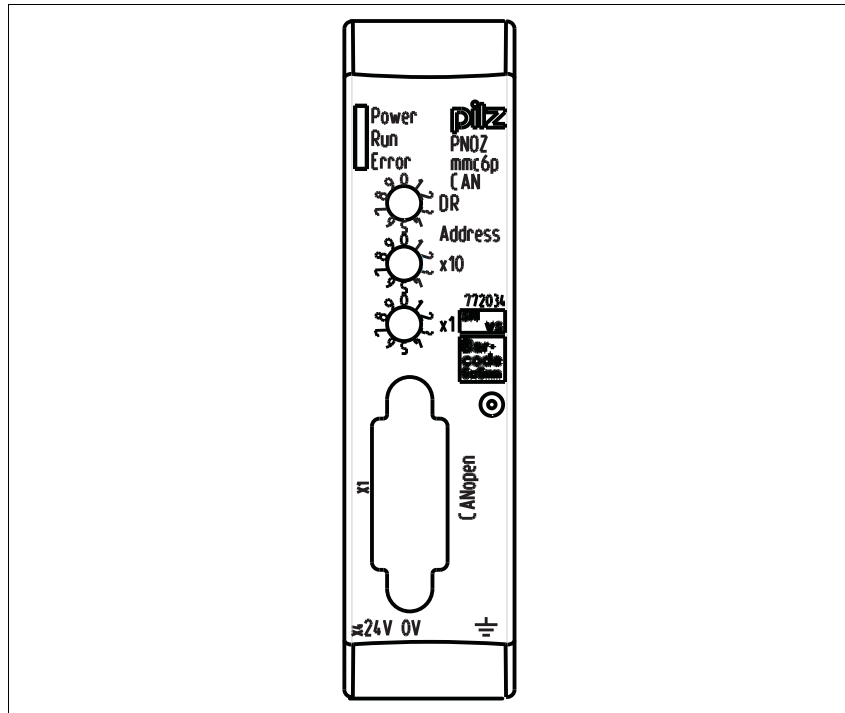
For the commissioning and after every program change, you must check whether the safety devices are functioning correctly.

Connection example



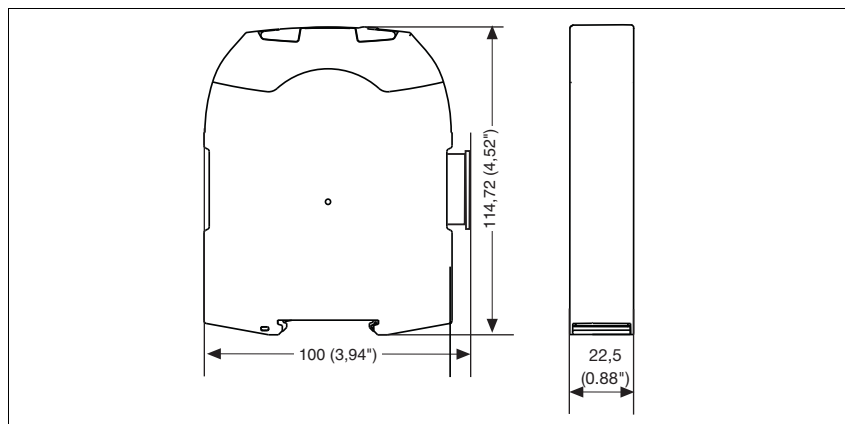
Expansion modules PNOZmulti Mini PNOZ mmc6p

Terminal configuration



2.5

Dimensions



Expansion modules PNOZmulti Mini

PNOZ mmc6p

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	1.5 W
Residual ripple DC	5 %
Status display	LED

Times

Supply interruption before de-energisation	20 ms
--	-------

Fieldbus interface

Fieldbus interface	CANopen
Device type	Slave
Protocol	CiA 301 V4,2,0
Station address	0 - 99d
Transmission rates	1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s
Connection	Male 9-pin D-SUB connector
Galvanic isolation	yes
Test voltage	500 V AC

Environmental data

Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	not permitted
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Airgap creepage in accordance with EN 61131-2	
Overvoltage category	II
Pollution degree	2
Rated insulation voltage	30 V
Shock stress	
EN 60068-2-27	15g 11 ms

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	PC
Front	PC

Expansion modules PNOZmulti Mini PNOZ mmc6p

Mechanical data	
Cross section of external conductors with screw terminals Power supply, inputs, auxiliary output, semiconductor outputs, test pulse outputs, cascading outputs:	
1 core flexible	0.25 - 2.50 mm ² , 24 - 12 AWG
2 core, same cross section, flexible: without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm ² , 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 mm ² , 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length	9 mm
Dimensions	
Height	100.0 mm
Width	22.5 mm
Depth	115.0 mm
Weight	95 g

The standards current on **2011-09** apply.

Order reference		
Product type	Features	Order no.
PNOZ mmc6p	Fieldbus module, CANopen	772 034

Order reference: Terminator, jumper		
Product type	Features	Order no.
PNOZ mm0.xp connector left	Black/yellow jumper to connect the modules on the left-hand side, 1 piece	779 260





Order reference: Accessories		
Product type	Features	Order no.
Spring terminals PNOZ mmcxp 1 pc.	Spring-loaded terminals, 1 piece	783 542
Spring terminals PNOZ mmcxp 10 pcs.	Spring-loaded terminals, 10 pieces	783 543
Screw terminals PNOZ mmcxp 1 pc.	Screw terminals, 1 piece	793 542
Screw terminals PNOZ mmcxp 10 pcs.	Screw terminals, 10 pieces	793 543

Expansion modules PNOZmulti Mini PNOZ mml1p



Link module to safely connect two configurable control systems PNOZmulti.

Approvals

	PNOZ mml1p
	◆
	◆
	◆
	◆

Unit features

- ▶ Connection options:
 - Two PNOZmulti Mini base units or
 - One PNOZmulti Mini base unit with one PNOZmulti base unit
- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Point-to-point connection via 4-core shielded and twisted-pair cable
- ▶ 32 virtual inputs and 32 virtual outputs
- ▶ Status indicators
- ▶ Max. 4 PNOZ mml1p units can be connected to the base unit
- ▶ LEDs for
 - Operating state
 - Error
 - Connection status
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)

Unit description

The expansion module is used for the point-to-point connection of safe virtual inputs and outputs between two base units.

The expansion module may only be connected to a base unit PNOZmulti Mini from the configurable control system PNOZmulti (please refer to the

document "PNOZmulti System Expansion" for details of the base units PNOZmulti Mini that can be connected).

The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

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

System requirements

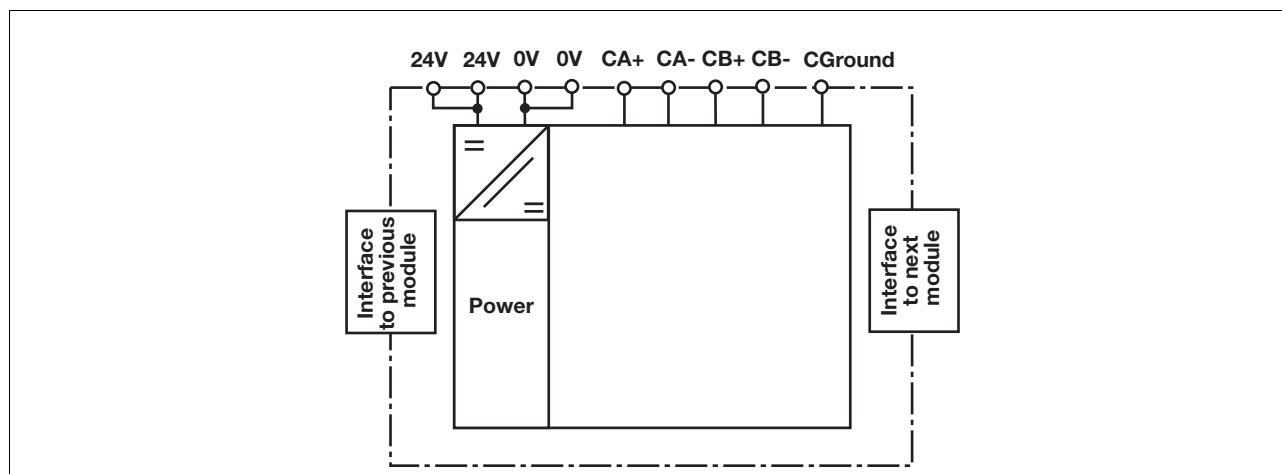
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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 PNOZmulti Mini PNOZ mml1p

Function description

The link module **PNOZ mml1p** is used to safely transfer the input information from 32 virtual inputs and 32 virtual outputs between two PNOZmulti systems. One link module is assigned to each base unit. Data is exchanged cyclically.

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

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

Data exchange:

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

Connection of multiple base units:

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

Data transmission time:

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

The maximum reaction time for series connection of n base units

This is the time between the activation of a safety function at the input on one

base unit and the switching of an output on the connected base unit.

- ▶ The maximum reaction time t_{SUM} includes the following times:
 t_{ON} : Input delay = 4 ms
 t_{COND} : Switch-off delay of semiconductor output = 30 ms
 t_{REL} : Switch-off delay of relay output = 50 ms
 t_{BUS} : Data transmission time between two base units = 35 ms
 n : Number of connections between base units

The maximum reaction time t_{SUM} for series connection of n base units

- ▶ On semiconductor outputs:
 $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$
- ▶ On relay outputs:
 $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{REL}$

CAUTION!

For signals that are forwarded or received via the link module, a calculation must always be made in accordance with the above formulas.

- ▶ Input delay and switch-off delay are only included once in the reaction time. The data transmission time between the link modules is multiplied by the number of connections.
- ▶ Please refer to the connection examples under "Preparing for operation".

CAUTION!

For signals that are forwarded or received via the link module, 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 arrival of 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

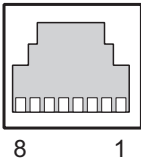
The wiring is defined in the circuit diagram of the PNOZmulti Configurator.

Note:


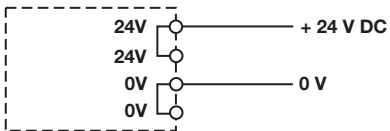
- ▶ Information given in the "Technical details" must be followed.
- ▶ The power supply must meet the regulations for extra low voltages with safe separation.
- ▶ 2 connection terminals are available for each of the supply connections 24 V and 0 V. This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 3 A.
- ▶ The max. cable length between two link modules on a connection with one link module
 - PNOZ mml1p <V2.0: 100 m
 - PNOZ mml1p from V2.0, PNOZ mml1p: 1000 m
- ▶ Connect the inputs and outputs from two link modules with 4-core shielded cable. The cables must be twisted in pairs (see "Preparing for operation").
- ▶ Note the crossover cabling, e.g. CA+ with CB+.
- ▶ The cables must be classified into a minimum of Category 5 in accordance with ISO/IEC 11801.

Expansion modules PNOZmulti Mini PNOZ mml1p

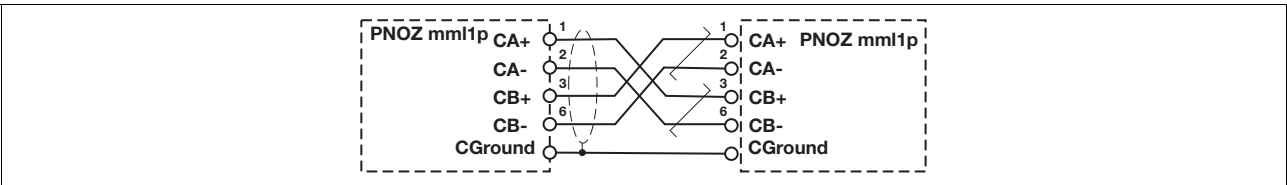
Preparing for operation

RJ45 socket 8-pin	PIN	Layout
	1	CA+
	2	CA-
	3	CB+
	4	n.c.
	5	n.c.
	6	CB-
	7	n.c.
	8	n.c.
	Shield	CGround

► Supply voltage

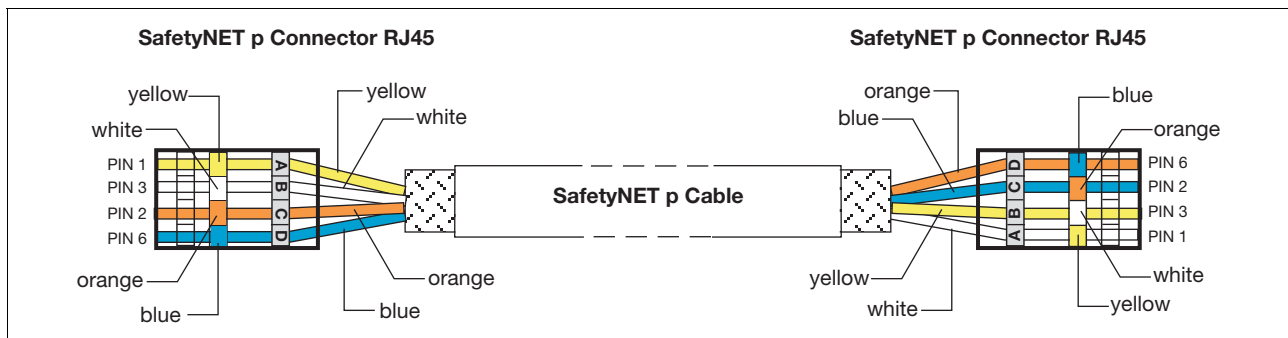
Supply voltage	AC	DC
		

► Connection of two base units PNOZmulti Mini via PNOZ mml1p



Expansion modules PNOZmulti Mini PNOZ mml1p

- Connection cable configuration when using:
 - 2 plug-in connectors "SafetyNET p Connector RJ45"
 - 1 connection cable "SafetyNET p Cable"
 (available as accessory, see order reference)



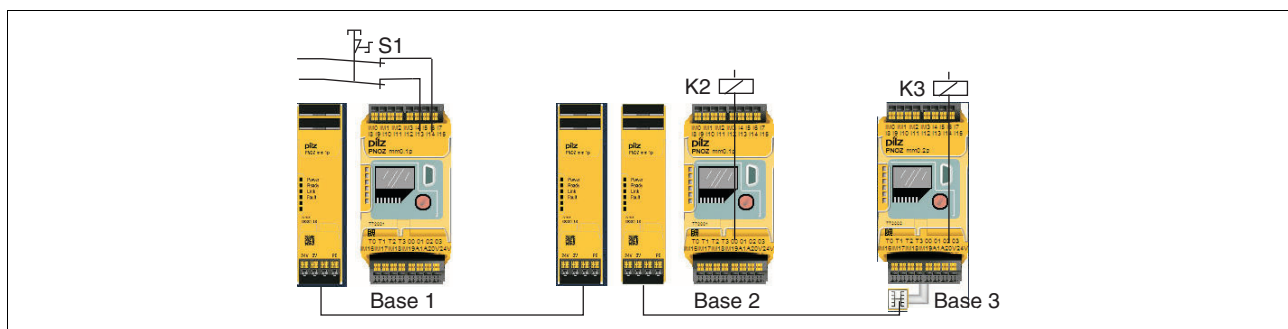
Connection examples

Example: Series connection of 3 base units

Reaction time t_{SUM} between base unit Base 1 and Base 2:
 Input delay t_{ON} at I4 and I6 + data transmission time $1 * t_{BUS}$ through link module/interface + switch-off delay t_{COND} of the semiconductor output at O0

$t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$
 $t_{SUM} = 4 \text{ ms} + (1 * 35 \text{ ms}) + 30 \text{ ms} = 69 \text{ ms}$
 Reaction time t_{SUM} between base unit Base 1 and Base 3:
 Input delay t_{ON} at I4 und I6 + data transmission time $2 * t_{BUS}$ through link

modules/interfaces + switch-off delay t_{COND} of the semiconductor output at O1
 $t_{SUM} = t_{ON} + (n * t_{BUS}) + t_{COND}$
 $t_{SUM} = 4 \text{ ms} + (2 * 35 \text{ ms}) + 30 \text{ ms} = 104 \text{ ms}$



Expansion modules PNOZmulti Mini PNOZ mml1p

Example: Connection of 5 base units

The reaction times are calculated in the same way as application example

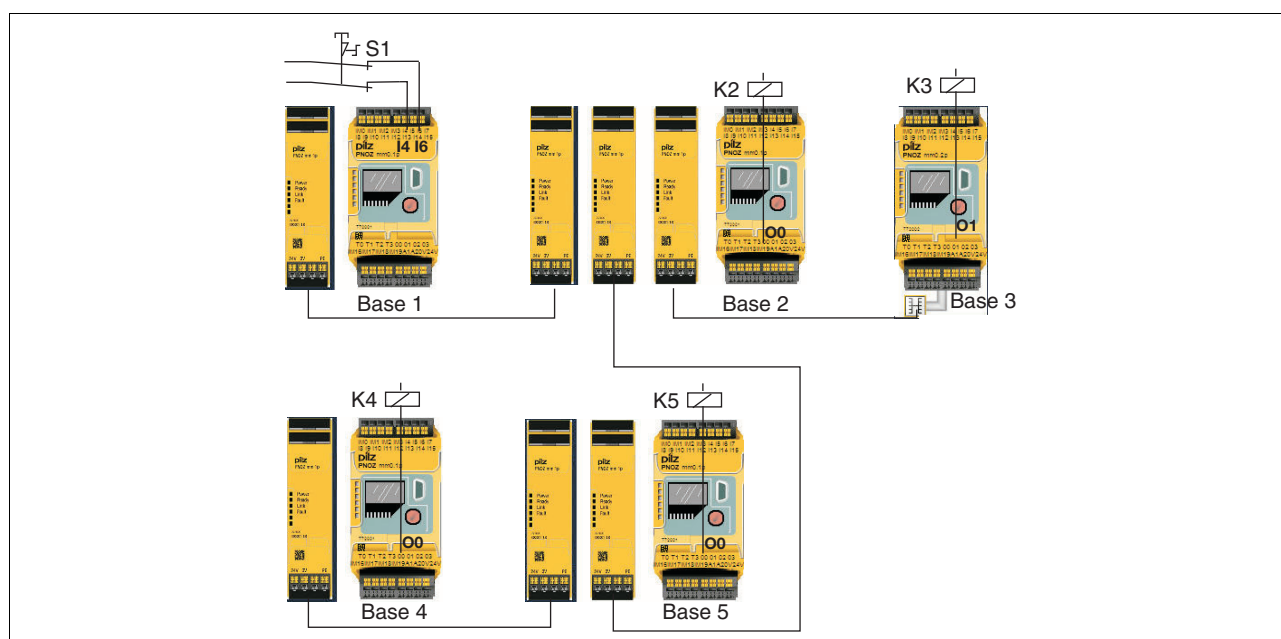
1. After pressing S1 on Base 1, the semiconductor outputs switch after the following reaction times t_{SUM} :

O0 on Base 2: 69 ms

O1 on Base 3: 104 ms

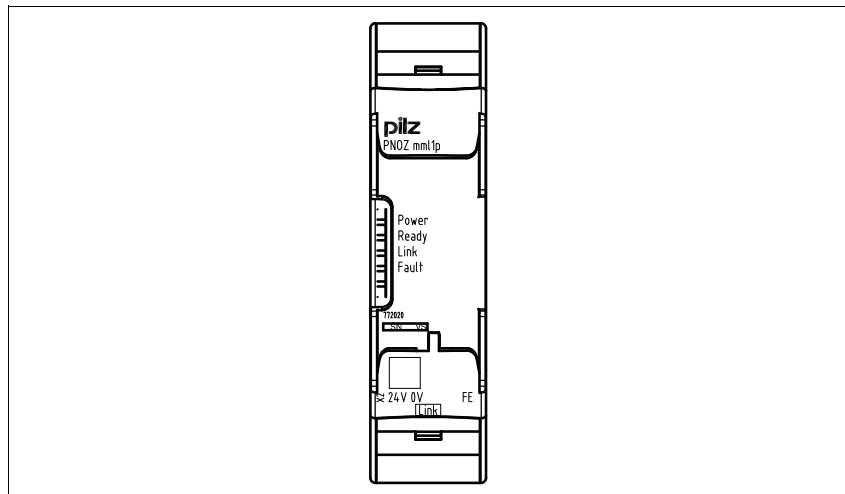
O0 on Base 4: 139 ms

O0 on Base 5: 104 ms

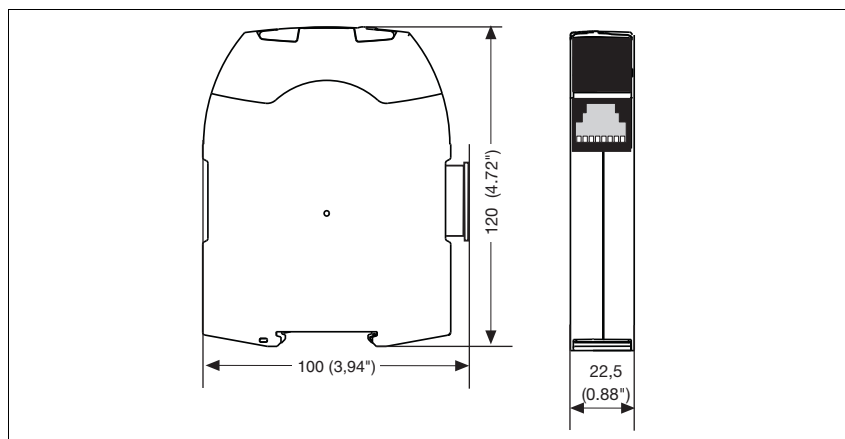


Expansion modules PNOZmulti Mini PNOZ mml1p

Terminal configuration



Dimensions



Expansion modules PNOZmulti Mini

PNOZ mml1p

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
Max. data transmission time	35 ms

Inputs

Number of virtual inputs	32
--------------------------	----

Virtual outputs

Number of virtual outputs	32
---------------------------	----

Environmental data

Climatic suitability	EN 60068-2-14, EN 60068-2-1, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78
Ambient temperature	0 - 60 °C
Storage temperature	-25 - 70 °C
Climatic suitability in accordance with EN 60068-2-30, EN 60068-2-78	93 % r. h. at 40 °C
Condensation	no
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g

Airgap creepage in accordance with EN 61131-2

Shock stress	
EN 60068-2-27	15g 11 ms
EN 60068-2-29	25g 6 ms

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
Max. cable length between two link modules	1 km
Housing material	
Housing	PC
Front	PC
Cross section of external conductors with screw terminals	
1 core flexible	0.25 - 2.50 mm ² , 24 - 12 AWG
2 core, same cross section, flexible:	
without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm ² , 24 - 16 AWG

Expansion modules PNOZmulti Mini

PNOZ mml1p

Mechanical data	
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 mm ² , 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length	9 mm
Dimensions	
Height	100.0 mm
Width	22.5 mm
Depth	120.0 mm
Weight	95 g

Safety characteristic data						
Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 T _M [year]
		PL e (Cat. 4)	Cat. 4	SIL CL 3	8.82E-09	20

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

The standards current on **2011-01** apply.

Order reference		
Product type	Features	Order no.
PNOZ mml1p	Expansion module	772 020

Order reference: Accessories		
Product type	Features	Order no.
Spring terminals PNOZ mmc2p, mml1p 1 pc.	Spring-loaded terminals, 1 pieces	783 538
Spring terminals PNOZ mmc2p,mml1p 10 pcs	Spring-loaded terminals, 10 pieces	783 539
Screw terminals PNOZ mmc2p, mml1p 1 pc.	Screw terminals, 1 piece	793 538
Screw terminals PNOZ mmc2p,mml1p 10 pcs.	Screw terminals, 10 pieces	793 539





Order reference: Terminator, jumper		
Product type	Features	Order no.
PNOZ mm0.xp connector left	Black/yellow jumper to connect the modules on the left-hand side, 1 piece	779 260

Expansion modules PNOZmulti Mini PNOZ mml2p



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

Approvals

	PNOZ mml2p
	◆
	◆
	◆
	◆

Unit features

- ▶ Can be configured in the PNOZmulti Configurator
- ▶ Max. 4 PNOZ mml2p can be connected to the base unit
- ▶ Max. 4 decentralised modules can be connected to the link module PNOZ mml2p
- ▶ LEDs for
 - Operating state
 - Error
 - Connection status
- ▶ Plug-in connection terminals: either spring-loaded terminal or screw terminal available as an accessory (see order reference)

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 PNOZmulti Mini from the configurable control system PNOZmulti (please refer to the document "PNOZmulti System Expansion" for details of the base units PNOZmulti Mini that can be connected). The configurable control system PNOZmulti is used for the safety-related interruption of safety circuits and is designed for use in:

- ▶ E-STOP equipment

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

System requirements

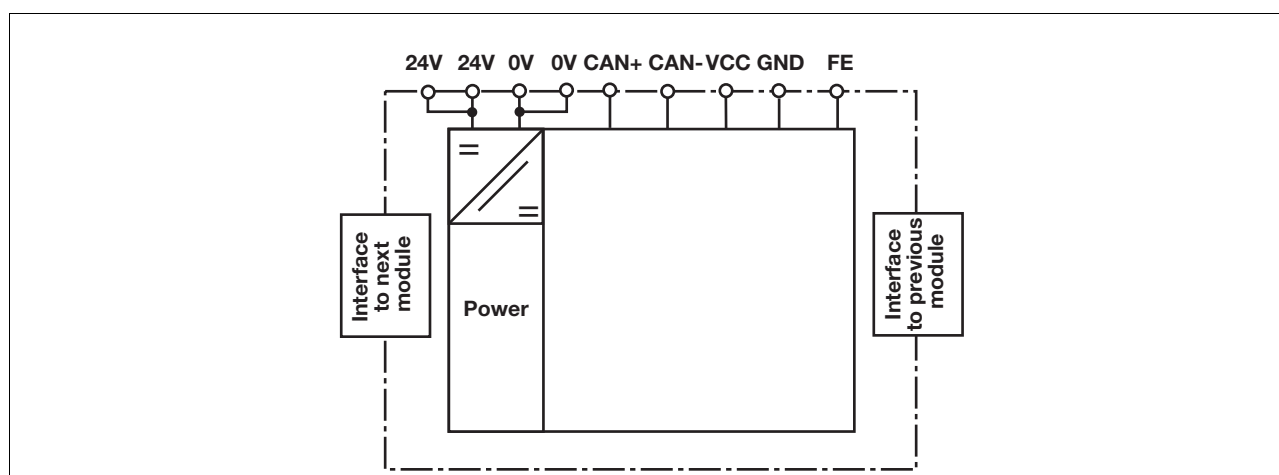
Please refer to the "Product Modifications" document in the "Version overview" section for details of which versions of the base unit and PNOZmulti Configurator can be used for this product.

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 PNOZmulti Mini PNOZ mml2p

Function description

Data exchange:

- ▶ Communication with the decentralised modules is via a safe data link.
- ▶ The link module **PNOZ mml2p** reads the input information from the decentralised modules as part of each cycle and then forwards it to the base unit.
- ▶ At the end of a PNOZmulti cycle, the base unit sends its output data to its link module. This output data is immediately sent to the decentralised modules.

Linking several decentralised modules:

- ▶ A maximum of 4 link modules can be connected to a base unit PNOZmulti Mini.
- ▶ A maximum of 4 decentralised modules can be connected to a link module **PNOZ mml2p**.
- ▶ If a decentralised module receives data intended for a different decentralised module that is connected, the data is forwarded without being processed.

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

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

The link module **PNOZ mml2p** is used to safely transfer the input information from decentralised modules to the safety system PNOZmulti.

Wiring

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


Note:

- ▶ Information given in the "Technical details" must be followed.
- ▶ External measures must be used to connect the FE terminal to the function earth (e.g. mounting rail).
- ▶ The power supply must meet the regulations for extra low voltages with safe separation.
- ▶ 2 connection terminals are available for each of the supply connections 24 V and 0 V. This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 3 A.
- ▶ Please refer to the technical details for information on the maximum cable length. Please also read the section entitled "Voltage drop".
- ▶ Shielded cable must be used from a cable length of **30 m**.
- ▶ Pilz pre-assembled cable can be used to connect the decentralised modules (see order reference).
- ▶ The plug-in connection terminals are either designed as cage clamp terminals or screw terminals (see order reference).

CAUTION!

Only connect and disconnect the expansion module when the supply voltage is switched off.

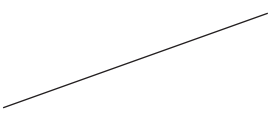
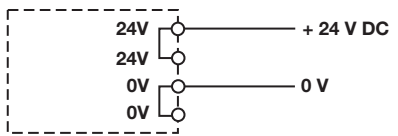
Insulation voltage test

The product **PNOZ mml2p** is connected to functional earth  via protection elements on the supply voltage. Insulation voltage tests are only possible with voltages up to ca. 42 V.

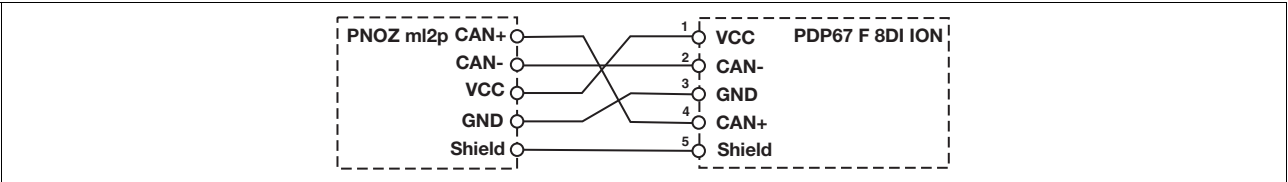
Expansion modules PNOZmulti Mini PNOZ mml2p

Connection

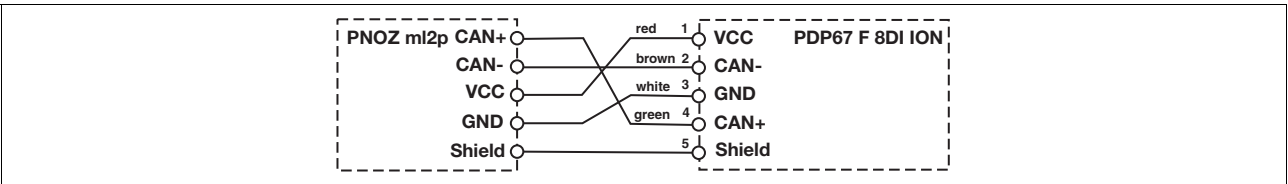
- Supply voltage

Supply voltage	AC	DC
		

- Connection to a decentralised input module PDP67



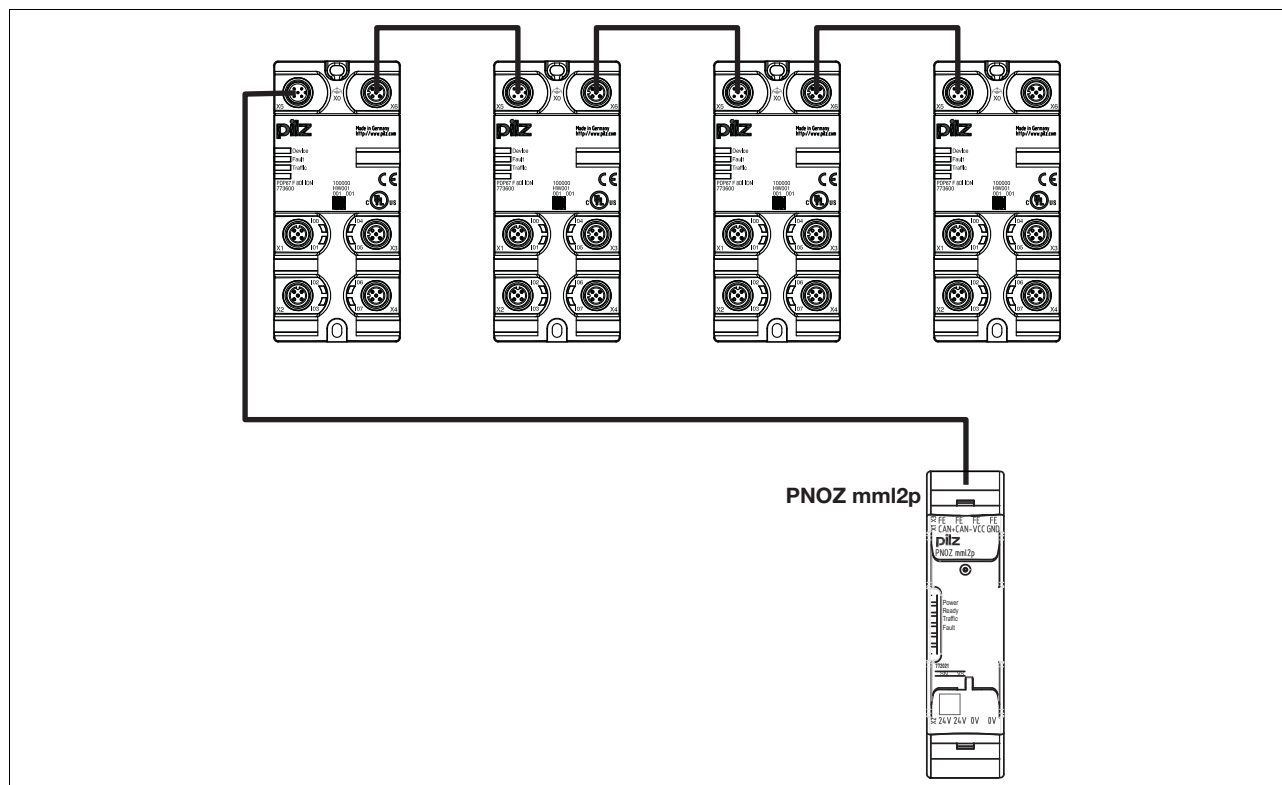
- Connection when using the PSS SB BUSCABLE LC in conjunction with a Pilz self-assembly "PSS67 M12 connector" (see order reference in the Technical Catalogue)



Expansion modules PNOZmulti Mini PNOZ mml2p

Series connection of 4 decentral- ised modules

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



Expansion modules PNOZmulti Mini PNOZ mml2p

Voltage drop

The max. cable length depends on the voltage drop in the supply voltage ca-

bles. 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).

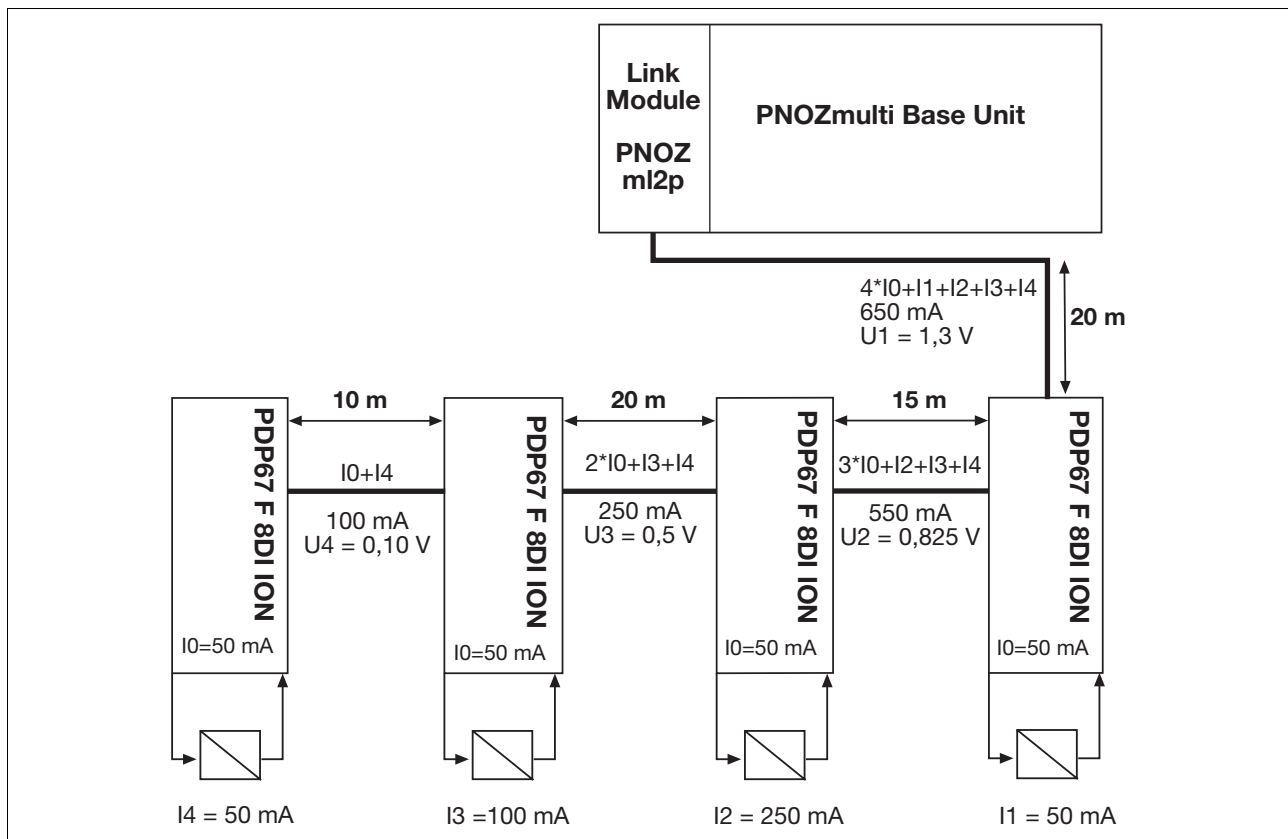
Guidelines for various cable types

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 PNOZmulti Mini PNOZ mml2p

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

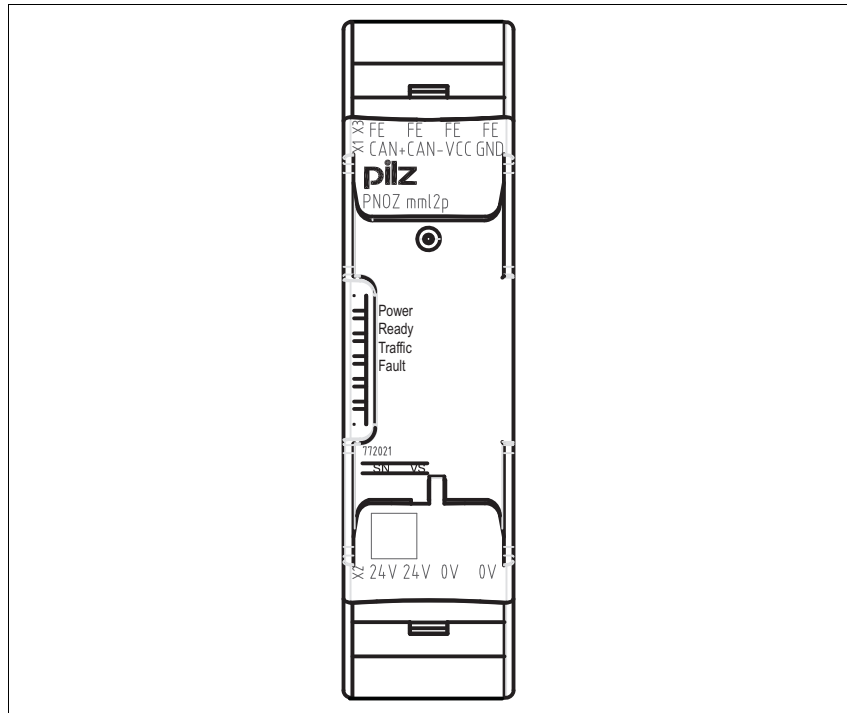
Total voltage drop from the link module **PNOZ mml2p** to the final PDP67 F 8DI ION:

$$U_{\text{total}} = U_1 + U_2 + U_3 + U_4$$

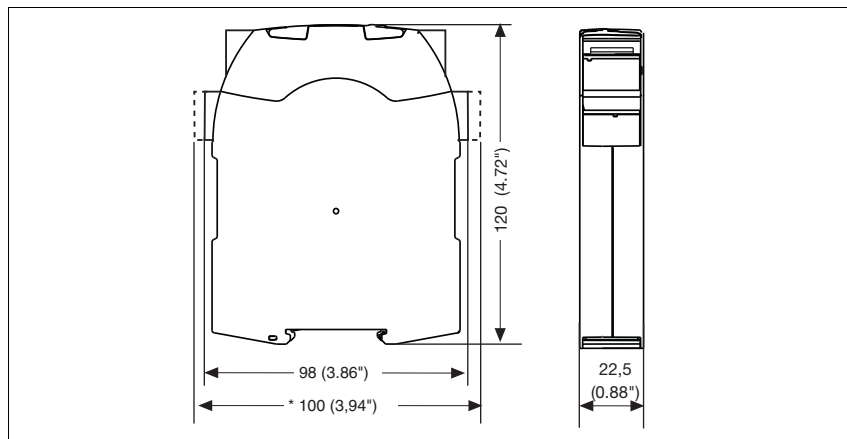
$$U_{\text{total}} = 1.3 \text{ V} + 0.825 \text{ V} + 0.5 \text{ V} + 0.10 \text{ V} = 2.725 \text{ V}$$

Expansion modules PNOZmulti Mini PNOZ mml2p

Terminal configuration



Dimensions



Expansion modules PNOZmulti Mini

PNOZ mml2p

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
Outputs	
Maximum output current decentralised module supply	4 A
Short-circuit protection of the decentralised module supply	yes
Environmental data	
EMC	EN 61131-2
Vibration to EN 60068-2-6	
Frequency	10 - 150 Hz
Max. acceleration	1g
Climatic suitability	EN 60068-2-14, EN 60068-2-1, EN 60068-2-2, EN 60068-2-30, EN 60068-2-78
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 run unscreened	30 m
Maximum cable run screened	100 m
Housing material	
Housing	PC
Front	PC
Cross section of external conductors with screw terminals	
1 core flexible	0.25 - 2.50 mm ² , 24 - 12 AWG
2 core, same cross section, flexible: without crimp connectors or with TWIN crimp connectors	0.20 - 1.50 mm ² , 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 mm ² , 24 - 12 AWG
Spring-loaded terminals: Terminal points per connection	2
Stripping length	9 mm
Dimensions	
Height	100.0 mm
Width	22.5 mm
Depth	120.0 mm
Weight	100 g

Expansion modules PNOZmulti Mini

PNOZ mml2p

Safety characteristic data

Unit	Operating mode	EN ISO 13849-1: 2006 PL	EN 954-1 Category	EN IEC 62061 SIL CL	PFH [1/h]	EN ISO 13849-1: 2006 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 **2011-01** apply.

Order reference

Product type	Features	Order no.
PNOZ mml2p	Link module	772 021

Order reference: Accessories

Product type	Features	Order no.
Spring terminals PNOZ mml2p 1 pc.	Spring-loaded terminals, 1 piece	783 540
Spring terminals PNOZ mml2p 10 pcs.	Spring-loaded terminals, 10 pieces	783 541
Screw terminals PNOZ mml2p 1 pc.	Screw terminals, 1 piece	793 540
Screw terminals PNOZ mml2p 10 pcs.	Screw terminals, 10 pieces	793 541

Order reference: Terminator, jumper

Product type	Features	Order no.
PNOZ mm0.xp connector left	Black/yellow jumper to connect the modules on the left-hand side, 1 piece	779 260

Expansion modules PNOZmulti Mini

PNOZ mml2p

Order reference: Cable

Product type	Features	Order no.
PSS SB BUSCABLE LC	Cable, shielded, 1 - 100 m	311074
PSS67 I/O Cable	Cable, 1 - 30 m	380 320
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 4-pin, 3m	380 200
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 4-pin, 5 m	380 201
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 4-pin, 10 m	380 202
PSS67 Cable M8sf M12sm	Cable, straight M12 connector, straight M8 socket, 4-pin, 30 m	380 203
PSS67 Cable M8af M12sm	Cable, straight M12 connector, angled M8 socket, 4-pin, 3m	380 204
PSS67 Cable M8af M12sm	Cable, straight M12 connector, angled M8 socket, 4-pin, 5 m	380 205
PSS67 Cable M8af M12sm	Cable, straight M12 connector, angled M8 socket, 4-pin, 10 m	380 206
PSS67 Cable M8af M12sm	Cable, straight M12 connector, angled M8 socket, 4-pin, 30 m	380 207
PSS67 Cable M12sf M12sm	Cable, straight M12 connector, straight M12 socket, 5-pin, 3m	380 208
PSS67 Cable M12sf M12sm	Cable, straight M12 connector, straight M12 socket, 5-pin, 5 m	380 209
PSS67 Cable M12sf M12sm	Cable, straight M12 connector, straight M12 socket, 5-pin, 10 m	380 210
PSS67 Cable M12sf M12sm	Cable, straight M12 connector, straight M12 socket, 5-pin, 30 m	380 211
PSS67 Cable M12af M12am	Cable, angled M12 connector, angled M12 socket, 5-pin, 3m	380 212
PSS67 Cable M12af M12am	Cable, angled M12 connector, angled M12 socket, 5-pin, 5 m	380 213
PSS67 Cable M12af M12am	Cable, angled M12 connector, angled M12 socket, 5-pin, 10 m	380 214
PSS67 Cable M12af M12am	Cable, angled M12 connector, angled M12 socket, 5-pin, 30 m	380 215

Order reference: Adapters

Product type	Features	Order no.
PSEN ma adapter	Adapter for connection to safety switch PSENmag	380 300
PSEN cs adapter	Adapter for connection to safety switch PSENcode	380 301

Order reference: Connectors

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

Adapters for speed monitors

Adapters for speed monitors

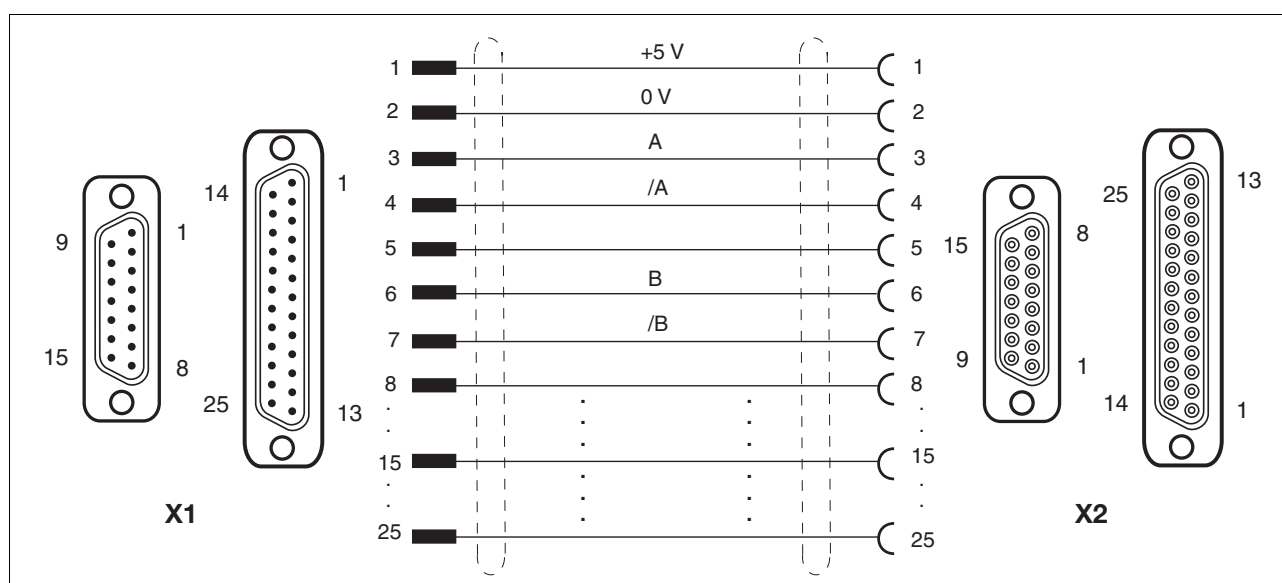
Contents	Page
Adapters for speed monitors	
PNOZ msi1Ap, PNOZ msi1Bp, PNOZ msi3Ap, PNOZ msi3Bp	2.6-2
PNOZ msi6p	2.6-4
PNOZ msi9p, PNOZ msi10p, PNOZ msi11p	2.6-6
PNOZ msi S09, PNOZ msi S16, PNOZ msi S25	2.6-8

PNOZ msi1Ap, PNOZ msi1Bp, PNOZ msi3Ap, PNOZ msi3Bp

Diagram illustrating the connection of a PNOZ ms1p safety relay. The relay is connected to an Incremental encoder (X1) and a Drive (X2). The relay is labeled "PNOZ msi...". The output terminals are labeled X3, with the following connections:

- PNOZ ms1p
- PNOZ ms2p
- PNOZ ms3p
- PNOZ ms4p
- PNOZ s30

Pin assignment



- ▶ 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

Adapters for speed monitors

PNOZ msi1Ap, PNOZ msi1Bp, PNOZ msi3Ap, PNOZ msi3Bp

Technical details	
Environmental data	
Approvals	UL/cUL
Connector X1	15/25-pin male D-Sub connector
Connector X2	15/25-pin female D-Sub connector
Connector X3	8-pin RJ-45 connector
Condensation	Not permitted
Ambient temperature	0 ... +60 °
Storage temperature	-25 ... +70 °
Protection type	IP20
Mounting	IP54
Cable type	CAT.6 SSTP/PiMF flexible
Cable insulation material	PVC, grey
Cable cross section	26 AWG
Colour coding in accordance with	EIA/TIA 568B
Cable length L	2500 mm/5000 mm
Cable diameter	6.1 mm
Cable length tolerance	± 0.15 m
Fixing screws	UNC 4-40
Housing material	TPE-SEBS UL 94 HB Signal yellow
Weight	PNOZ msi1Ap: 150 g Order no. : 773840 PNOZ msi1Ap: 250 g Order no. : 773844 PNOZ msi1Bp: 150 g Order no. : 773841 PNOZ msi1Bp: 250 g Order no. : 773839 PNOZ msi3Ap: 130 g Order no. : 773842 PNOZ msi3Bp: 130 g Order no. : 773843

Order reference		
Product type	Features	Order no.
PNOZ msi1Ap	Adapter, 25-pin, 2.5 m	773 840
PNOZ msi1Ap	Adapter, 25-pin, 5.0 m	773 844
PNOZ msi1Bp	Adapter, 25-pin, 2.5 m	773 841
PNOZ msi1Bp	Adapter, 25-pin, 5.0 m	773 839
PNOZ msi3Ap	Adapter, 15-pin, 2.5 m	773 842
PNOZ msi3Bp	Adapter, 15-pin, 2.5 m	773 843

Adapters for speed monitors

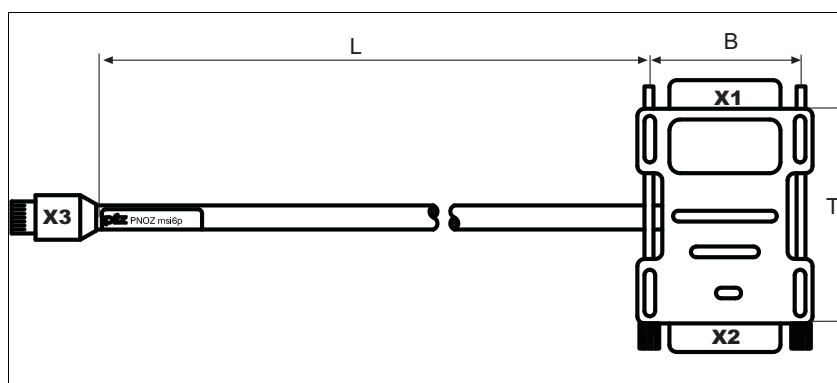
PNOZ msi6p

Description

The connection cable is used to connect an incremental encoder to the speed monitors PNOZ ms2p, PNOZ ms3p, PNOZ ms4p or PNOZ s30.

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 RJ45 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



INFORMATION

The signals Z and /Z on the speed monitor PNOZ s30 are not recorded.

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 °
Storage temperature	-25 ... +70 °
Protection type	IP51
Dimensions W/D	31.5 mm/40.0 mm
Cable length L	7,500 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

Adapters for speed monitors

PNOZ msi6p

Order reference		
Product type	Features	Order no.
PNOZ msi6p	Connection cable, 7.5 m	773 859
PNOZ msi6p	Connection cable, 2.5 m	773 860
PNOZ msi6p	Connection cable, 1.5 m	773 861

Adapters for speed monitors

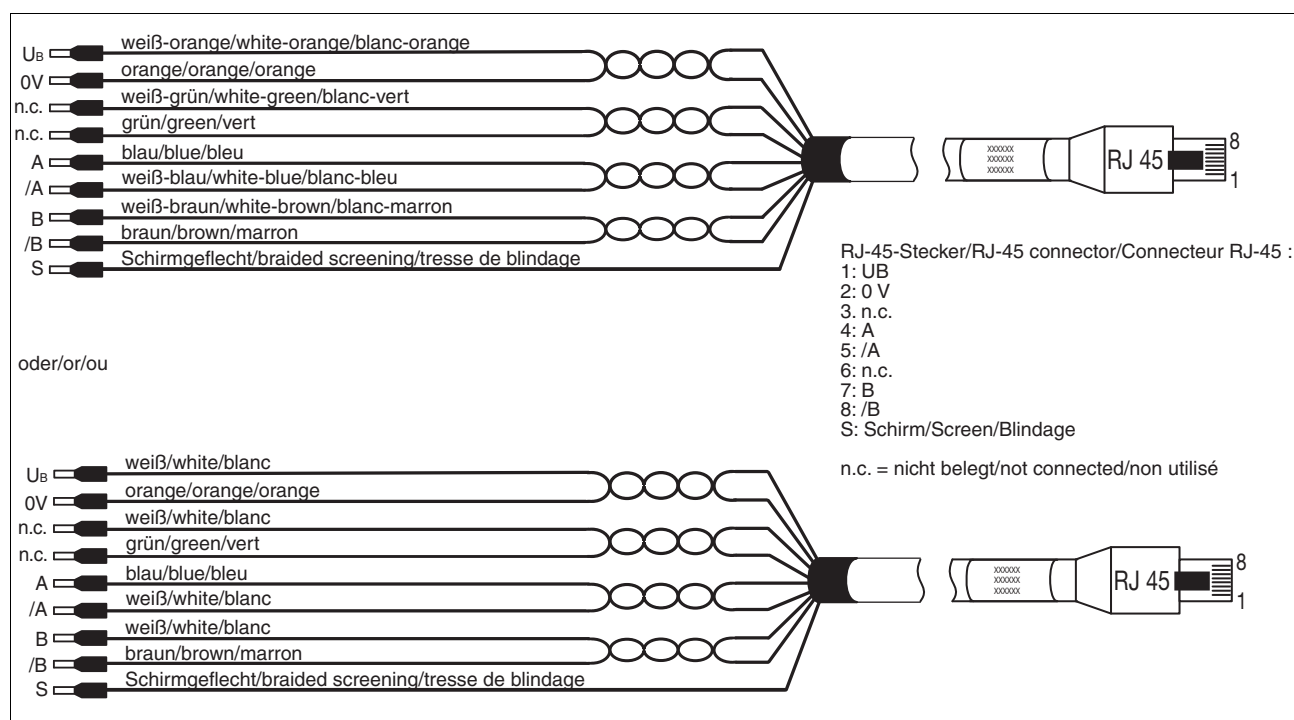
PNOZ msi9p, PNOZ msi10p, PNOZ msi11p

Description

The connection cables PNOZ msi9p, PNOZ msi10p and PNOZ msi11p are used to connect an incremental encoder or adapter to the speed monitors PNOZ ms1p, PNOZ ms2p, PNOZ ms3p, PNOZ ms4p or PNOZ s30.

The connection to the speed monitor is made via the RJ45 connector. The cable cores for connecting the incremental encoder or adapter feature wires with crimp connectors. The cable cores are labelled.

Terminal assignment



INFORMATION

The signals Z and /Z on the speed monitor PNOZ s30 are not recorded.

Technical details

Environmental data

Cable length	
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

Adapters for speed monitors

PNOZ msi9p, PNOZ msi10p, PNOZ msi11p

Environmental data	
Ambient temperature	0 ... +60 ?
Storage temperature	-25 ... +70 ?
Protection type	IP20
Weight	
PNOZ msi9p	180 g
PNOZ msi10p	90 g
PNOZ msi11p	75 g

Order reference		
Product type	Features	Order no.
PNOZ msi9p	Connection cable, 5.0 m	773 856
PNOZ msi10p	Connection cable, 2.5 m	773 854
PNOZ msi11p	Connection cable, 1.5 m	773 855

Order reference: Accessories		
Product type	Features	Order no.
PNOZ msi S09	Connector set, 9-pin	773 870
PNOZ msi S15	Connector set, 15-pin	773 871
PNOZ msi S25	Connector set, 25-pin	773 872

Adapters for speed monitors

PNOZ msi S09, PNOZ msi S16, PNOZ msi S25

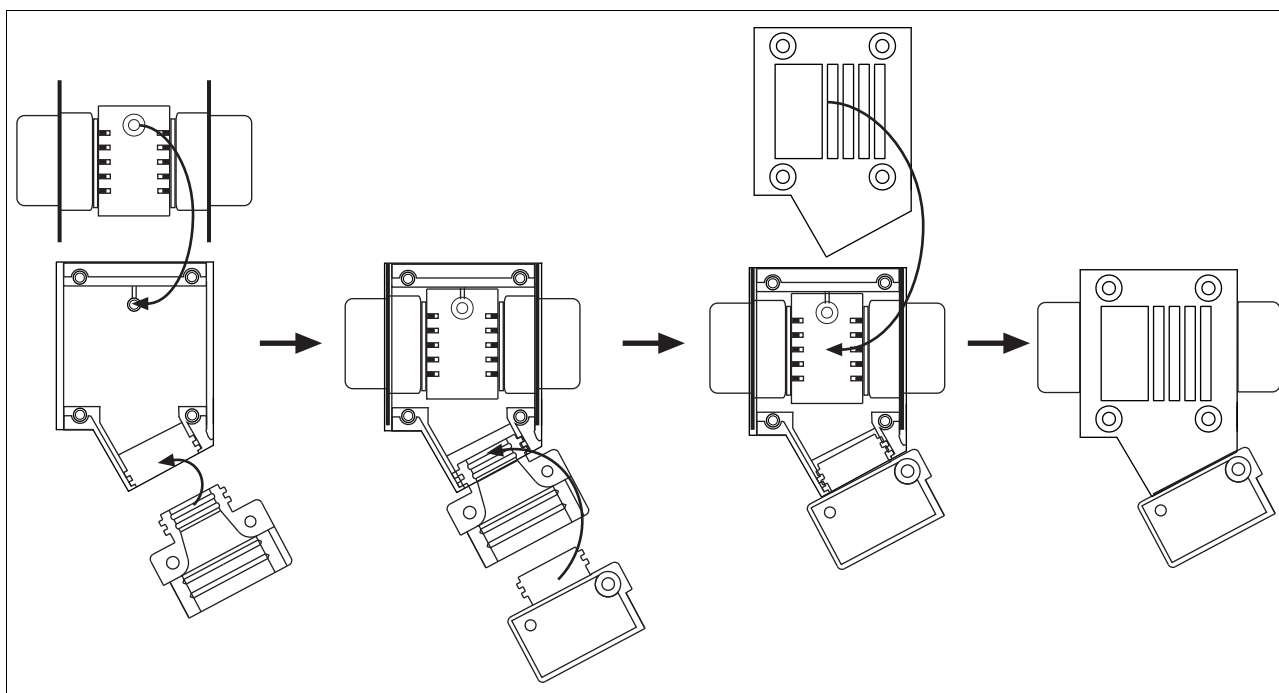
Description

The PNOZ msi connector sets are used to connect frequency converters to the speed monitors PNOZ ms1p, PNOZ ms2p, PNOZ ms3p, PNOZ ms4p or PNOZ s30.

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 sig-

nals that are relevant for the speed monitor are recorded in parallel and are fed to the RJ45 connector via the cable. (Pilz adapter cable, see order reference for accessories).

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



INFORMATION

The signals Z and /Z on the speed monitor PNOZ s30 are not recorded.

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

Adapters for speed monitors

PNOZ msi S09, PNOZ msi S16, PNOZ msi S25

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 °
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		
Product type	Features	Order no.
PNOZ msi S09	Connector set, 9-pin	773 870
PNOZ msi S15	Connector set, 15-pin	773 871
PNOZ msi S25	Connector set, 25-pin	773 872

Order reference: Accessories		
Product type	Features	Order no.
PNOZ msi10p	Adapter cable, 2.5 m	773 854
PNOZ msi11p	Adapter cable, 1.5 m	773 855

Software

Software

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Software	
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Software

PNOZmulti Configurator



The PNOZmulti Configurator is a graphic tool for the configuration and programming of the configurable control systems PNOZmulti.

Features

- ▶ Graphic configuration of safety circuit
- ▶ Project configuration, configuration generation, documentation, commissioning
- ▶ Data transfer via integrated interface or chip card
- ▶ User interface in German, English, French, Italian, Spanish, Japanese, Chinese (selectable)

System requirements

Please refer to the readme file for the PNOZmulti Configurator for details of the current system requirements.

Description

The PNOZmulti Configurator is a graphic tool for the configuration and programming of the configurable control system PNOZmulti.

The elements of the safety circuit are depicted as icons on the Configurator user interface.

The safety circuit can be created quickly and easily using drag & drop. The PNOZmulti Configurator downloads the complete safety circuit to the PNOZmulti via a chip card or via the integrated interface.

The safety circuit can also be uploaded from the PNOZmulti to the PNOZmulti Configurator for revision.

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

- ▶ E-STOP
- ▶ Two-hand pushbutton
- ▶ Enabling switch
- ▶ Operating mode selector switch
- ▶ Press functions
- ▶ Light beam device
- ▶ Light grid
- ▶ Pressure sensitive mat
- ▶ Speed monitoring
- ▶ Muting

Users can configure fieldbus inputs and outputs in conjunction with the fieldbus modules. These inputs and outputs can only be used for standard functions.

Virtual inputs and outputs can be configured via the integrated interface.

They are handled in exactly the same way as fieldbus inputs and outputs. Inputs and outputs for standard functions are supported.

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

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

The project can be protected through passwords.

Licences and versions

In order to use the full scope of the PNOZmulti Configurator, you will need a valid licence in addition to the software package.

Without a licence, the PNOZmulti Configurator can only be used in a demo version.

A range of licences are available to meet varying requirements:

▶ Basic Licence

Single user licence, issued to one owner (company name and location/project must be stated)

▶ User Licence

Discounted licence for an additional workstation, issued to the owner of a basic licence.

▶ Lite Licence

Licence limited to the base units PNOZ m0p and the base units PNOZmulti Mini, for use on one workstation.

▶ Multi-user Licence

Multi-user licence, graduated according to the number of workstations (up to 25, 50, 100 and over 100)

▶ Project Licence

Licence to use the software within a contractually limited framework.

▶ Basic/User/Multi User/Project Upgrade Licence

Discounted licence enabling owners of a licence to change to a newer version of the software

▶ Time Limited Licence

Basic licence restricted to 2, 3 or 4 months

These licence types are available as a full version or service version.

Full version The full version provides the whole functional range of a licence.

Service version: The service version of a licence is intended for service and maintenance. The service version only offers limited editing features.

The following functions are available on the respective versions:

Software

PNOZmulti Configurator

Functions	Demo version	Service version	Full version
Load and save error stack	x	x	x
Function elements	Max. 10	Infinite	Infinite
Save project		x	x
Load project from hardware		x	x
Save project to hardware		x	x
Dynamic program display		x	x
Print function		x	x
Change project	x		x
Password level 1	x		x
Password level 2	x	x	x
Password level 3	x	x	x
Project write protection	x		x
Project read protection	x		x
Import/export	x		x
Create macro	x		x

Order reference

PNOZmulti Configurator	Features	Order no.
Software + Manual	CD and manual	773 000
Software	CD	773 000D
Basic Licence	Single user licence, issued to one owner (company name and location/project must be stated), full version	773 010B
User Licence	Discounted licence for an additional workstation, issued to the owner of a basic licence, full version	773 010K
Lite Licence	Licence limited to the PNOZ m0p and the base units PNOZmulti Mini, for use on one workstation, full version	773 010L
Multi User Licence	Multi user licence, graduated according to the number of workstations (up to 25, 50, 100 and over 100), full version	773 010M
Project Licence	Licence issued for a specific project. In contrast to the multi user licence, this licence is not limited to one legal entity. Full version	773 010G
Basic Upgrade Licence	Discounted licence enabling owners of a basic licence to change to a newer version of the software, full version	773 010U
User Upgrade Licence	Discounted licence enabling owners of a user licence to change to a newer version of the software, full version	773 010V
Multi User Upgrade Licence	Discounted licence enabling owners of a multi user licence to change to a newer version of the software, full version	773 010N
Project Upgrade Licence	Discounted licence enabling owners of a project licence to change to a newer version of the software, full version	773 010W
Time Limited Licence, 2Mth	Basic licence restricted to 2 months, full version	773 010S
Time Limited Licence, 3Mth	Basic licence restricted to 3 months, full version	773 010R
Time Limited Licence, 4Mth	Basic licence restricted to 4 months, full version	773 010Q
Basic Licence, Service	Single user licence, issued to one owner (company name and location/project must be stated), service version	773 011B
User Licence, Service	Discounted licence for an additional workstation, issued to the owner of a basic licence, service version	773 011K
Lite Licence, Service	Licence limited to the PNOZ m0p and the base units PNOZmulti Mini, for use on one workstation, service version	773 011L
Multi User Licence, Service	Multi user licence, graduated according to the number of workstations (up to 25, 50, 100 and over 100), service version	773 011M

Software

PNOZmulti Configurator

PNOZmulti Configurator	Features	Order no.
Project Licence, Service	Licence issued for a specific project. In contrast to the multi user licence, this licence is not limited to one legal entity. Service Version	773 011G
Basic Upgrade Licence, Service	Discounted licence enabling owners of a basic licence to change to a newer version of the software, service version	773 011U
User Upgrade Licence, Service	Discounted licence enabling owners of a user licence to change to a newer version of the software, service version	773 011V
Multi User Upgrade Licence, Service	Changing a multi user licence to a newer version of the software (discounted), service version	773 011N
Project Upgrade Licence, Service	Discounted licence enabling owners of a project licence to change to a newer version of the software, service version	773 011W



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Safety assessments

Before using a unit in a safety function it is necessary to perform a safety assessment (in Europe for example, 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.

Current applications

Current applications are available on our Pilz homepage (www.pilz.de), in the download area under "Application Notes".

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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, 1 piece	779 201
Chip card, 8 kByte, 10 pieces	779 200
Chip card 32 kByte, 1 piece	779 211
Chip card 32 kByte, 10 pieces	779 212
Chip card holder	779 240
Chip card reader	779 230
Labels for chip card, 10 pieces	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, Lite Licence	773 010L
PNOZmulti Configurator, Project Licence	773 010G
PNOZmulti Configurator, Multi User Licence	773 010M
PNOZmulti Configurator, Basic Upgrade Licence	773 010U
PNOZmulti Configurator, User Upgrade Licence	773 010V
PNOZmulti Configurator, Project Upgrade Licence	773 010W
PNOZmulti Configurator, Multi User Upgrade Licence	773 010N
PNOZmulti Configurator, Time Limited Licence, 2 months	773 010S
PNOZmulti Configurator, Time Limited Licence, 3 months	773 010R
PNOZmulti Configurator, Time Limited Licence, 4 months	773 010Q
PNOZmulti Service Tool, Basic Licence	773 011B
PNOZmulti Service Tool, User Licence	773 011K
PNOZmulti Service Tool, Lite Licence	773 011L
PNOZmulti Service Tool, Project Licence	773 011G
PNOZmulti Service Tool, Multi User Licence	773 011M
PNOZmulti Service Tool, Basic Upgrade Licence	773 011U
PNOZmulti Service Tool, User Upgrade Licence	773 011V
PNOZmulti Service Tool, Project Upgrade Licence	773 011W
PNOZmulti Service Tool, Multi User Upgrade Licence	773 011N

Cable, adapter

Description	Order no.
Cable, adapter	
PNOZ mli1p 5m screw, 5-pin cable, shielded, screw terminal, 5 m	773 890
PNOZ mli1p 10m screw, 5-pin cable, shielded, screw terminal, 10 m	773 891
PNOZ mli1p 50m screw, 5-pin cable, shielded, screw terminal, 50 m	773 892
PNOZ mli1p 5m spring, 5-pin cable, shielded, spring-loaded terminal, 5 m	773 893
PNOZ mli1p 10m spring, 5-pin cable, shielded, spring-loaded terminal, 10 m	773 894
PNOZ mli1p 50m spring, 5-pin cable, shielded, spring-loaded terminal, 50 m	773 895
PNOZ msi1Ap adapter and cable, 25-pin, 2.5 m for speed monitor PNOZ msxp	773 840
PNOZ msi1Ap adapter and cable, 25-pin, 5.0 m for speed monitor PNOZ msxp	773 844
PNOZ msi1Bp adapter and cable, 25-pin, 2.5 m for speed monitor PNOZ msxp	773 841
PNOZ msi1Bp adapter and cable, 25-pin, 5.0 m for speed monitor PNOZ msxp	773 839
PNOZ msi3Ap adapter and cable, 15-pin, 2.5 m for speed monitor PNOZ msxp	773 842
PNOZ msi3Bp adapter and cable, 15-pin, 2.5 m for speed monitor PNOZ msxp	773 843
PNOZ msi5p adapter and cable Bos/Rex, 15-pin, 2.5 m for speed monitor PNOZ msxp	773 857
PNOZ msi5p adapter and cable, Bos/Rex, 15-pin, 1.5 m for speed monitor PNOZ msxp	773 858
PNOZ msi6p adapter and cable, Elau, 9-pin, 7.5 m for PNOZ ms2p/PNOZ ms3p/PNOZ ms4p	773 859
PNOZ msi6p adapter and cable, Elau, 9-pin, 2.5 m for PNOZ ms2p/PNOZ ms3p/PNOZ ms4p	773 860
PNOZ msi6p adapter and cable, Elau, 9-pin, 1.5 m for PNOZ ms2p/PNOZ ms3p/PNOZ ms4p	773 861
PNOZ msi7p adapter and cable, SEW, 15-pin, 2.5 m for speed monitor PNOZ msxp	773 864
PNOZ msi7p adapter and cable, SEW, 15-pin, 1.5 m for speed monitor PNOZ msxp	773 865
PNOZ msi8p adapter and cable, Lenze, 9-pin, 2.5 m for speed monitor PNOZ msxp	773 862
PNOZ msi8p adapter and cable, Lenze, 9-pin, 1.5 m for speed monitor PNOZ msxp	773 863
PNOZ msi9p adapter cable 5.0 m for speed monitor PNOZ msxp	773 856
PNOZ msi10p adapter cable 2.5 m for speed monitor PNOZ msxp	773 854
PNOZ msi11p adapter cable 1.5 m for speed monitor PNOZ msxp	773 855
PNOZ msi19p connection cable, 1.5 m for PNOZ ms2p/PNOZ ms3p/PNOZ ms4p	773 846
PNOZ msi19p connection cable, 2.5 m for PNOZ ms2p/PNOZ ms3p/PNOZ ms4p	773 847
PNOZ msi S09 9-pin adapter for speed monitor PNOZ msxp, connector set	773 870
PNOZ msi S15 15-pin adapter for speed monitor PNOZ msxp, connector set	773 871
PNOZ msi S25 25-pin adapter for speed monitor PNOZ msxp, connector set	773 872
PSEN ma adapter for connection to safety switch PSENmag	380 300
PSEN cs adapter for connection to safety switch PSENcode	380 301
PSS SB BUSCABLE LC cable, shielded, 1 - 100 m	311 074
PSS67 I/O Cable, 1 - 30 m	380 320
PSS67 Cable, M8sf M12sm cable, straight M12 connector, straight M8 socket, 4-pin, 3m	380 200
PSS67 Cable, M8sf M12sm cable, straight M12 connector, straight M8 socket, 4-pin, 5 m	380 201
PSS67 Cable, M8sf M12sm cable, straight M12 connector, straight M8 socket, 4-pin, 10 m	380 202
PSS67 Cable, M8sf M12sm cable, straight M12 connector, straight M8 socket, 4-pin, 30 m	380 203
PSS67 Cable, M8af M12sm cable, straight M12 connector, angled M8 socket, 4-pin, 3m	380 204
PSS67 Cable, M8af M12sm cable, straight M12 connector, angled M8 socket, 4-pin, 5 m	380 205
PSS67 Cable, M8af M12sm cable, straight M12 connector, angled M8 socket, 4-pin, 10 m	380 206
PSS67 Cable, M8af M12sm cable, straight M12 connector, angled M8 socket, 4-pin, 30 m	380 207
PSS67 Cable, M12sf M12sm cable, straight M12 connector, straight M12 socket, 5-pin, 3m	380 208
PSS67 Cable, M12sf M12sm cable, straight M12 connector, straight M12 socket, 5-pin, 5 m	380 209
PSS67 Cable, M12sf M12sm cable, straight M12 connector, straight M12 socket, 5-pin, 10 m	380 210
PSS67 Cable, M12sf M12sm cable, straight M12 connector, straight M12 socket, 5-pin, 30 m	380 211
PSS67 Cable, M12af M12am cable, angled M12 connector, angled M12 socket, 5-pin, 3m	380 212
PSS67 Cable, M12af M12am cable, angled M12 connector, angled M12 socket, 5-pin, 5 m	380 213
PSS67 Cable, M12af M12am cable, angled M12 connector, angled M12 socket, 5-pin, 10 m	380 214
PSS67 Cable, M12af M12am cable, angled M12 connector, angled M12 socket, 5-pin, 30 m	380 215
PSSu A USB-CAB03 Mini USB cable, 3 m	312 992
PSSu A USB-CAB05 Mini USB cable, 5 m	312 993
SafetyNET p cable, 1 - 500 m	380 000
SafetyNET p Connector RJ45 – RJ45 plug-in connector	380 400

Connectors, terminals

For details of the respective connection terminals, terminators and jumpers, please refer to the data sheets for the relevant products.

Order reference



5.0

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PNOZ m0p ETH	Base unit, Ethernet interface	773 113	2.2-2
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PNOZ m1p coated version	Base unit, coated version	773 105	2.2-16
PNOZ m1p ETH	Base unit, Ethernet interface	773 103	2.2-16
PNOZ m1p ETH coated version	Base unit, Ethernet interface, coated version	773 104	2.2-16
PNOZ m2p	Base unit	773 120	2.2-31
PNOZ m2p ETH	Base unit, Ethernet interface	773 123	2.2-31
PNOZ m3p	Base unit	773 125	2.2-45
PNOZ m3p ETH	Base unit, Ethernet interface	773 126	2.2-45
PNOZ ma1p	Expansion module, 2 analogue inputs	773 812	2.3-2
PNOZ ma1p coated version	Expansion module, 2 analogue inputs, coated version	773 813	2.3-2
PNOZ mc0p	Expansion module, power supply for fieldbus modules	773 720	2.3-64
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PNOZ mc6p coated version	Fieldbus module, CANopen, coated version, protocol: CiA DS-301 V3.0	773 727	2.3-108
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PNOZ mo2p coated version	Expansion module, 1 or 2 relay outputs, positive-guided, coated version	773 525	2.3-28
PNOZ mo3p	Expansion module, 2 dual-pole semiconductor outputs, safe	773 510	2.3-37
PNOZ mo4p	Expansion module, 2 or 4 relay outputs, positive-guided	773 536	2.3-44
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773 733	PNOZ mc6.1p	Fieldbus module, CANopen, protocol: CiA DS-301 4.0.2	2.3-108

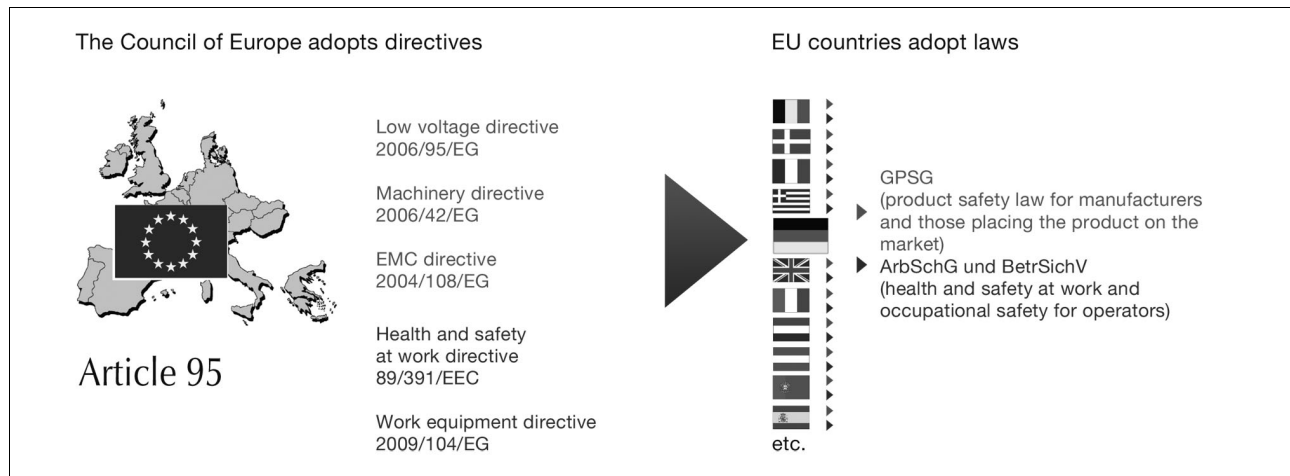
Products

Numerically by order number

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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 internal market.

Many of the directives recognise mandatory CE-marking for products, 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.

- ▶ Devices for use in potentially explosive areas (ATEX) (94/9/EC)
- ▶ Machinery (2006/42/EC)
- ▶ Low voltage equipment (2006/95/EC)
- ▶ Personal protective equipment (89/686/EEC)
- ▶ Cable cars (2000/9/EC)

which they implement the requirements of the directive.

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.

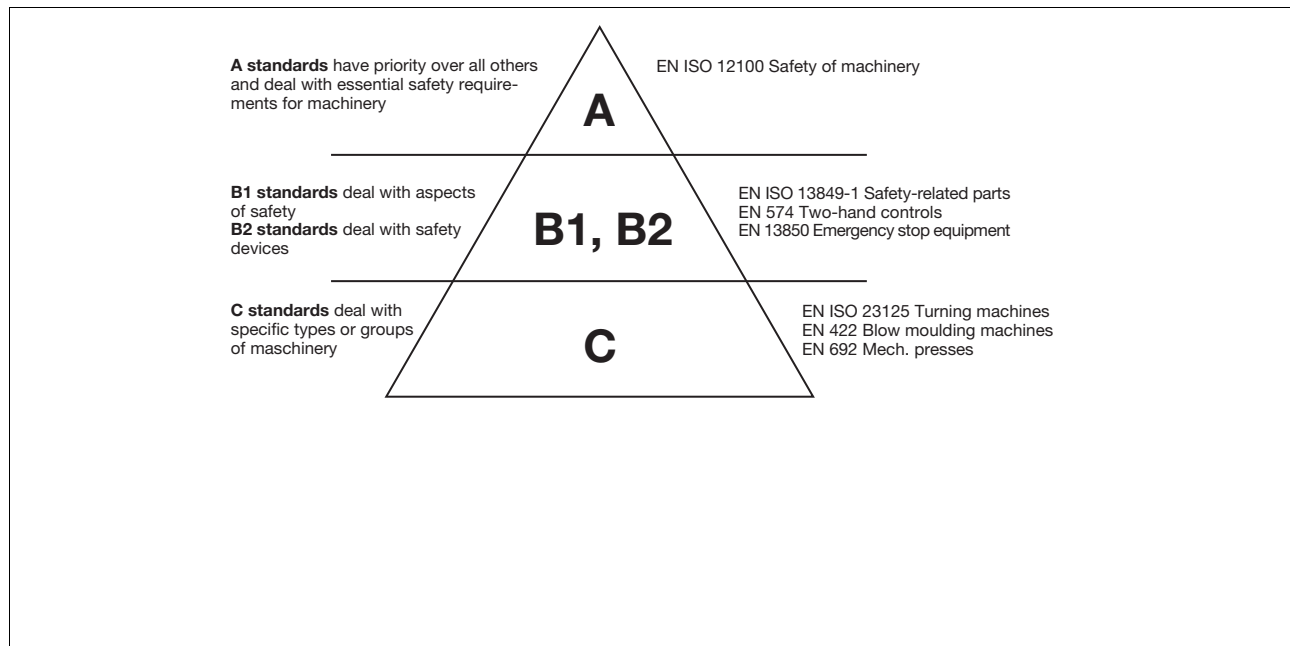
Position of the standards in Europe

The legal status of standards is constantly under discussion. Inside Europe, i.e. within the scope of the European directives that are subject to mandatory CE-marking, 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

Key engineering directives:

- ▶ General product safety (2001/95/EC)
- ▶ Health and safety (89/391/EEC)
- ▶ Use of work equipment (2009/104/EC)
- ▶ Lifts (95/16/EC)
- ▶ Waste electrical and electronic equipment (2002/96/EC)
- ▶ Electromagnetic compatibility (EMC) (2004/108/EC)

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, un-

less 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) (<http://eur-lex.europa.eu/>). Standards in Europe are subdivided into what are termed A, B, and C standards.

Risk analysis

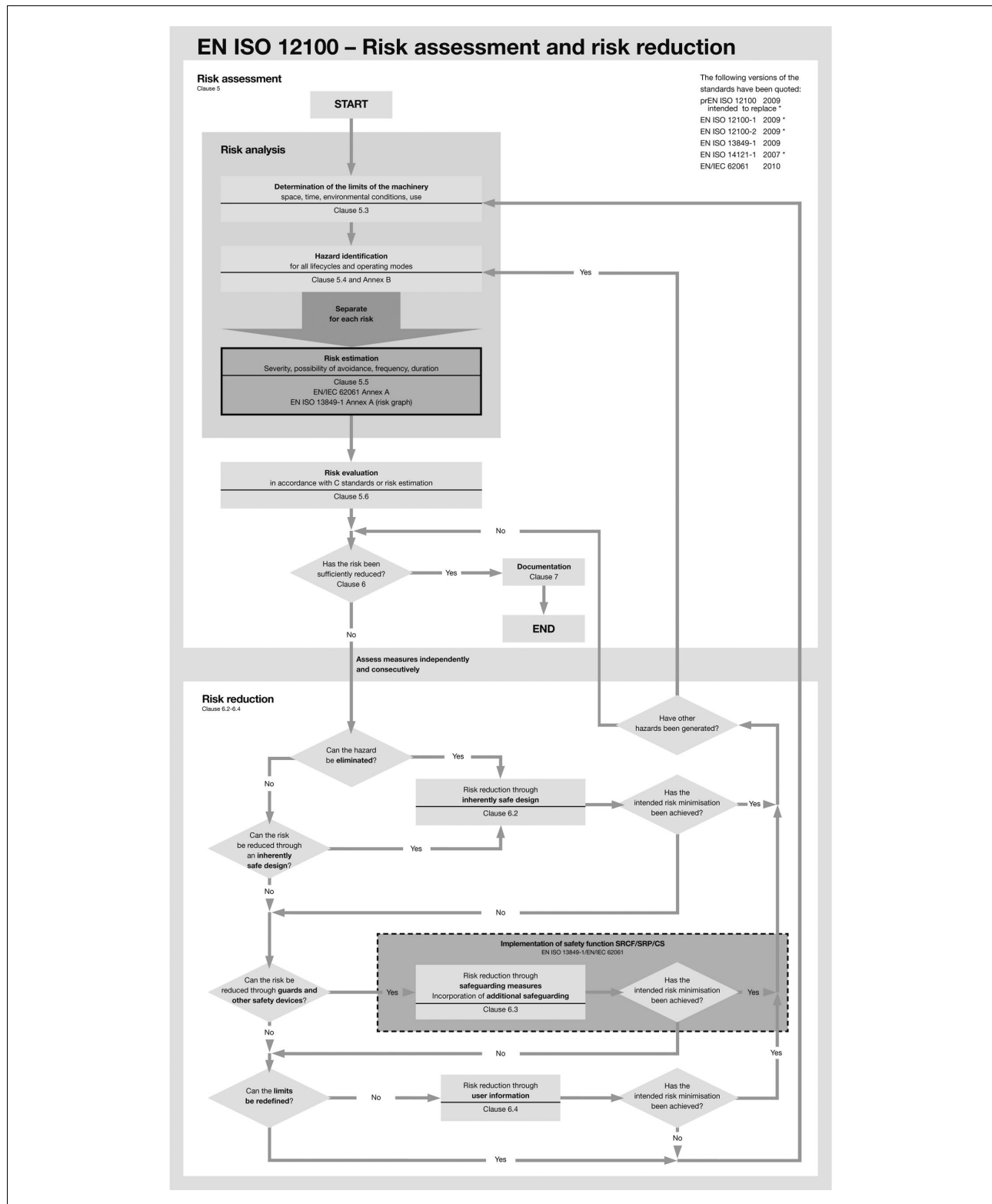
Risk assessment

Under the terms of the Machinery Directive, a machine manufacturer must carry out a risk assessment in order to identify all the risks and hazards associated with 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 ISO 12100 contains “Principles for risk assessment” on machinery. These approaches can be called upon as part of a comprehensive analysis. EN ISO 13849-1 expands on EN ISO 12100 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.

Risk analysis



Iterative process in accordance with EN ISO 12100

Legal regulations outside Europe and standards for functional safety

Legal regulations outside Europe

The situation is somewhat different in the USA: The legal basis in the USA can be viewed 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. People there are mainly familiar with two types of standards: OSHA (Occupational Safety and Health Administration) and ANSI (American National Standards Institute). Government bodies publish OSHA standards and compliance is mandatory. OSHA standards are comparable with European directives, although OSHA is more concerned with describing technical property requirements than with abstract requirements.

ANSI standards, on the other hand, are developed by private organisations and their application is generally not absolutely essential. However, ANSI standards are still included in contracts and OSHA frequently adopts ANSI standards. 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.

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,

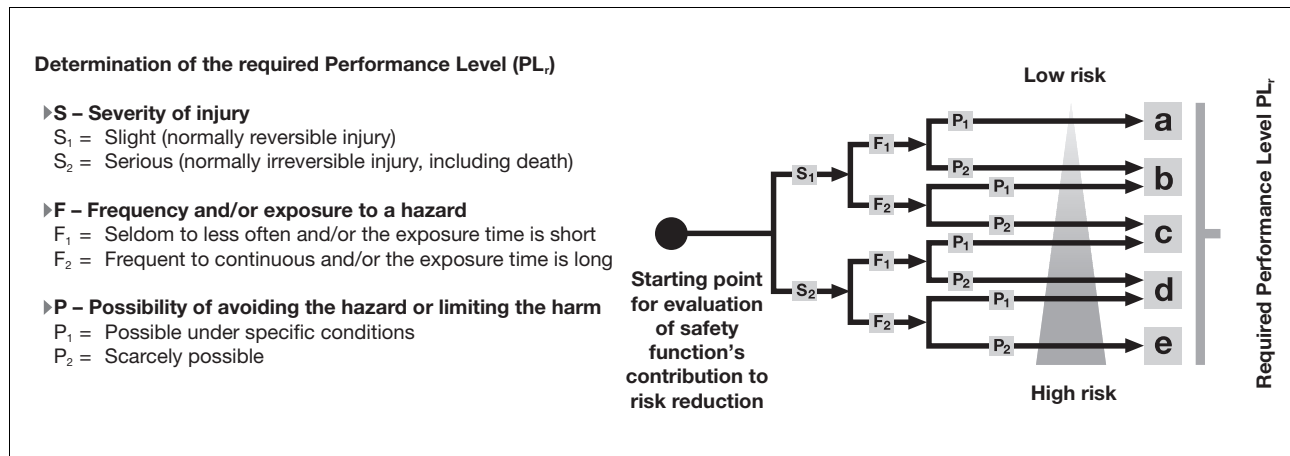
certification is mandatory, otherwise it will be necessary to supply a type of "declaration of no objection" from a national notified body.

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 ISO 13849-1 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 estimation can be used to assess the risk potential for danger zones on machinery. The category is then established without the use of risk-reducing measures.

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



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, depending on the device type:

Complex devices:

- PL: Performance Level
- Cat: Category
- T_M: Mission time

Simple devices:

- MTTF_d

Simple devices on which wear is based on operations:

- B10_d

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. When calculating the performance level of a control solution it is advisable to use

software tools such as PAScal (WEBLINK), as they simplify the mathematical methods described in the standards considerably.

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.

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.

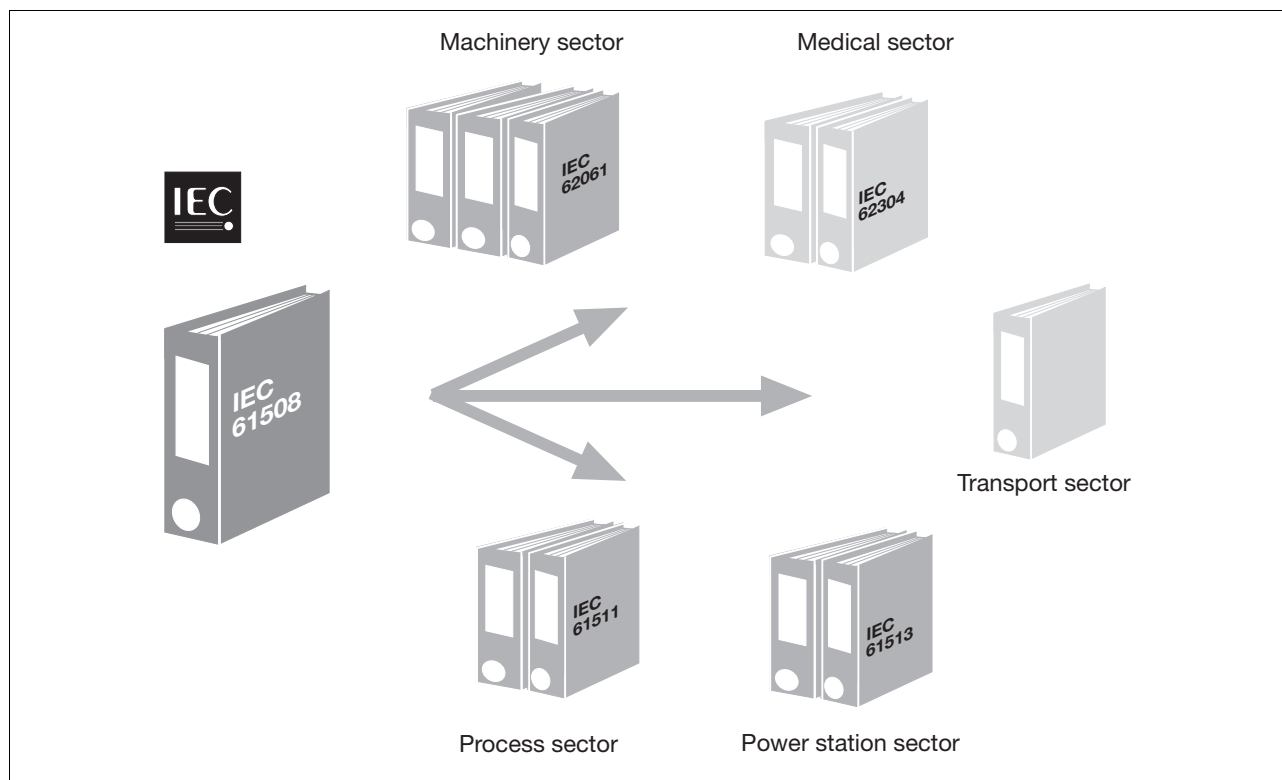
One of the main tasks of EN/IEC 61508 is to serve as a basis for the

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.

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 CI					Frequency and duration	Fr	Probability of hzd. event	Pr	Avoidance
		3-4	5-7	8-10	11-13	14-15					
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
Reversible, first aid	1				OM	SIL 1	> 2 wks – ≤ 1 year	3	Rarely	2	Possible
							> 1 year	2	Negligible	1	Likely

□ 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 hazard-

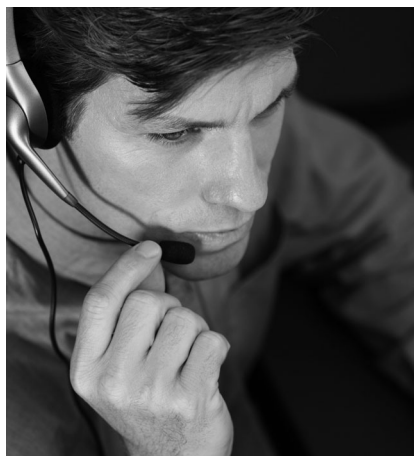
ous event (Pr) and the possibility of avoiding or limiting the harm (Av).

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

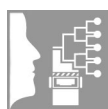
When calculating the SIL of a control solution it is advisable to use software tools such as PASCAL (WEBLINK), as already mentioned under EN ISO 13849-1. These simplify the application of the mathematical methods described in the standards considerably.

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Pre-sales/after sales Professional services



We can provide consulting and engineering, training and support, from the project configuration phase through to commissioning.



Risk assessment

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



Safety concept

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



Safety design

As part of the safety design, Pilz produces detailed documentation regarding the implementation, taking into account the safety concept.



System implementation

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



Safety validation

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



CE Services

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



Plant assessment

Analysis and assessment of the safety-related condition of your plant and machinery. Proposal of basic recommendations for improvement.



Hazard assessment in accordance with BetrSichV

Identification and assessment of work processes and work equipment and development of custom-fit solutions.



Inspection of safeguards

Regular inspection of safeguards (for example: light grids, safety gate systems, etc.) is essential. The scope and schedule of these inspections are defined in various national directives and laws.



International compliance services

Pilz develops the necessary strategies to enable compliance with the respective ISO, IEC, ANSI and any other standards.



Training and education

A wide range of seminars and training courses on machinery safety helps to communicate the fundamentals for minimising risk and assuring your success.



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.



Supply and repair service

From a fast, economical repair through to a long supply guarantee to safeguard your investment – always expect more from Pilz.



Certificates and approvals

Pilz is certified to DIN ISO 9001. International approvals and certification from recognised test houses confirm our products' suitability for worldwide use.



Internet

Our homepage at www.pilz.com provides the latest information, electronic shopping, direct dialogue and enquiry functions as well as extensive download options.



E-Business

The focus of Pilz's E-Business activities is to strengthen customer orientation through the use of new media and to increase added value via a supplementary business model for Business-to-Business.



Worldwide representatives

Our worldwide network of subsidiaries and sales partners ensures comprehensive support and assistance with your questions and problems.



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D-ISO-12033-01-01

DAKkS

Pilz GmbH & Co. KG operates an independent inspection body in accordance with DIN EN ISO/IEC 17020:2004 for the plant and machinery sector, accredited by the German Accreditation Body (DAKkS).

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Business terms and conditions

Terms of delivery and payment



The terms of delivery and of payment of the respective Pilz company with whom a sales contract is closed are applied. As a rule this is the Pilz company that places the order. Please select the legal contract partner from the order confirmation.

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