PNOZ mc12p

▸ Configurable, safe small controllers PNOZmulti Classic

PILZ

THE SPIRIT OF SAFETY

1 Introduction

1.1 Validity of documentation

This documentation is valid for the product PNOZ mc12p. It is valid until new documentation is published.

This operating manual explains the function and operation, describes the installation and provides guidelines on how to connect the product.

1.2 Using the documentation

This document is intended for instruction. Only install and commission the product if you have read and understood this document. The document should be retained for future reference.

1.3 Definition of symbols

Information that is particularly important is identified as follows:

> **DANGER!**
>
> This warning must be heeded! It warns of a hazardous situation that poses an immediate threat of serious injury and death and indicates preventive measures that can be taken.

> **WARNING!**
>
> This warning must be heeded! It warns of a hazardous situation that could lead to serious injury and death and indicates preventive measures that can be taken.

> **CAUTION!**
>
> This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.

> **NOTICE**
>
> This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken. It also highlights areas within the text that are of particular importance.

INFORMATION

This gives advice on applications and provides information on special features.

2 Overview

2.1 Scope

▸ Expansion module PNOZ mc12p

▸ Jumper

2.2 Unit features

Application of the product PNOZ mc12p:

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

The product has the following features:

▸ Can be configured in the PNOZmulti Configurator

▸ Connection for Ethernet POWERLINK (Ethernet POWERLINK V 2 protocol)

▸ Station addresses from 1 ... 239, selected via rotary switch

▸ The minimum cycle time for an application of 20 Byte Output and 50 Byte Input is 350µs. The minimum cycle time is 500 µs at the maximum PDO size of 240 Byte Input and 20 Byte Output (the inputs and outputs in this case are viewed from the Managing Node).

▸ 24 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus Ethernet POWERLINK . The number of inputs and outputs can be extended to 128. Please note that when the extended inputs and outputs 24 - 127 are used they have different properties (see document entitled "Communication Interfaces").

▸ Max. 1 PNOZ mc12p can be connected to the base unit

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

2.3 Front view
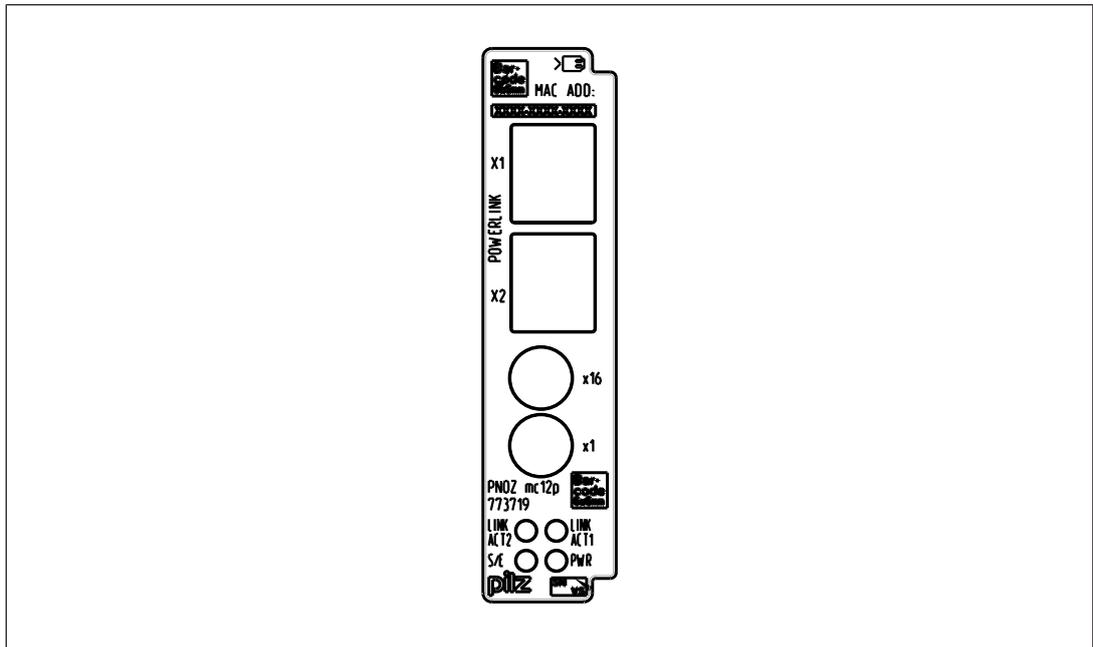
Legend:

▸ X1, X2 Ethernet POWERLINK interfaces

▸ LED:

– LINK ACT1

– LINK ACT2

– PWR

– S/E (Status/Error)

3 Safety

3.1 Intended use

The fieldbus module PNOZ mc12p is an expansion module of the configurable control system PNOZmulti. It is used for communication between the configurable control system PNOZmulti and Ethernet POWERLINK. Ethernet POWERLINK is designed for fast data exchange at field level. The expansion module PNOZ mc12p is a passive subscriber (Controlled Node) of the Ethernet POWERLINK. The basic communication functions with Ethernet POWERLINK conform to the System Description published by the POWERLINK User Group (EPSG). The central controller (Managing Node) 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 mc12p can also be used for diagnostic and commissioning functions.

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

The configurable small control systems PNOZmulti are used for the safety-related interruption of safety circuits and are designed for use in:

▸ E-STOP equipment

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

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

The following is deemed improper use in particular

▸ Any component, technical or electrical modification to the product,

▸ Use of the product outside the areas described in this manual,

▸ Use of the product outside the technical details (see Technical details [📖 17]).

> ⓘ **NOTICE**
>
> **EMC-compliant electrical installation**
>
> The product is designed for use in an industrial environment. The product may cause interference if installed in other environments. If installed in other environments, measures should be taken to comply with the applicable standards and directives for the respective installation site with regard to interference.

3.2 System requirements

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

3.3 Safety regulations

3.3.1 Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by competent persons.

A competent person is someone who, because of their training, experience and current professional activity, has the specialist knowledge required to test, assess and operate the work equipment, devices, systems, plant and machinery in accordance with the general standards and guidelines for safety technology.

It is the company's responsibility only to employ personnel who

▸ Are familiar with the basic regulations concerning health and safety / accident prevention,

▸ Have read and understood the information provided in this description under "Safety",

▸ And have a good knowledge of the generic and specialist standards applicable to the specific application.

3.3.2 Warranty and liability

All claims to warranty and liability will be rendered invalid if

▸ The product was used contrary to the purpose for which it is intended,

▸ Damage can be attributed to not having followed the guidelines in the manual,

▸ Operating personnel are not suitably qualified,

▸ Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering work etc.).

3.3.3 Disposal

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

3.3.4 For your safety

The unit meets all the necessary conditions for safe operation. However, you should always ensure that the following safety requirements are met:

▸ This operating manual only describes the basic functions of the unit. The expanded functions are described in the PNOZmulti Configurator's online help. Only use these functions once you have read and understood the documentations.

▸ Do not open the housing or make any unauthorised modifications.

▸ Please make sure you shut down the supply voltage when performing maintenance work (e.g. exchanging contactors).

4 Function description

4.1 Functions

The virtual inputs and outputs that are to be transferred via the fieldbus Ethernet POWER-LINK are selected and configured in the PNOZmulti Configurator. The base unit and the fieldbus module PNOZ mc12p are connected via a jumper. The fieldbus module is also supplied with voltage via this jumper. After the supply voltage is switched on or the control system PNOZmulti is reset, the fieldbus module PNOZ mc12p is configured and started automatically.

LEDs indicate the status of the fieldbus module on the fieldbus Ethernet POWERLINK .

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

4.2 Input and output data

The data is structured as follows:

▶ Input area

The inputs are defined in the Managing Node and transferred to the PNOZmulti. Each input has a number, e.g. input bit 4 of SDO 2100:02 has the number i12.

Virtual inputs PNOZmulti Configurator	I0 … I7	I8 … I15	I16 … I23
Ethernet POWER-LINK	SDO 2100:01: Bit 0 … 7	SDO 2100:02: Bit 0 … 7	SDO 2100:03: Bit 0 … 7

▶ Output range

The outputs are defined in the PNOZmulti Configurator. Each output that is used is given a number there, e.g. o0, o5... The state of output o0 is stored in Bit 0 of SDO 2000:01.

Virtual outputs PNOZmulti Configurator	O0 … O7	O8 … O15	O16 … O23
Ethernet POWER-LINK	SDO 2000:01: Bit 0 … 7	SDO 2000:02: Bit 0 … 7	SDO 2000:03: Bit 0 … 7

Detailed information on data exchange is available in the document "Communication Interfaces" in the section entitled "Fieldbus modules".

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

4.3   Block diagram
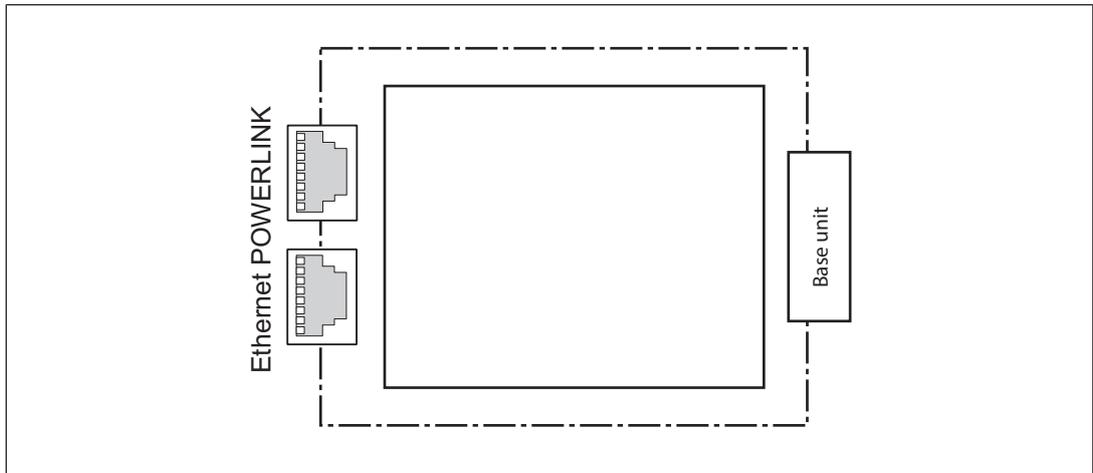
5 Installation

5.1 General installation guidelines

▸ The control system should be installed in a control cabinet with a protection type of at least IP54. Fit the control system to a horizontal mounting rail. The venting slots must face upward and downward. Other mounting positions could destroy the control system.

▸ Use the locking elements on the rear of the unit to attach it to a mounting rail. Connect the control system to the mounting rail in an upright position, so that the earthing springs on the control system are pressed on to the mounting rail.

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

▸ To comply with EMC requirements, the mounting rail must have a low impedance connection to the control cabinet housing.

> **!** **NOTICE**
>
> Damage due to electrostatic discharge!
>
> Electrostatic discharge can damage components. Ensure against discharge before touching the product, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.

5.2 Dimensions in mm
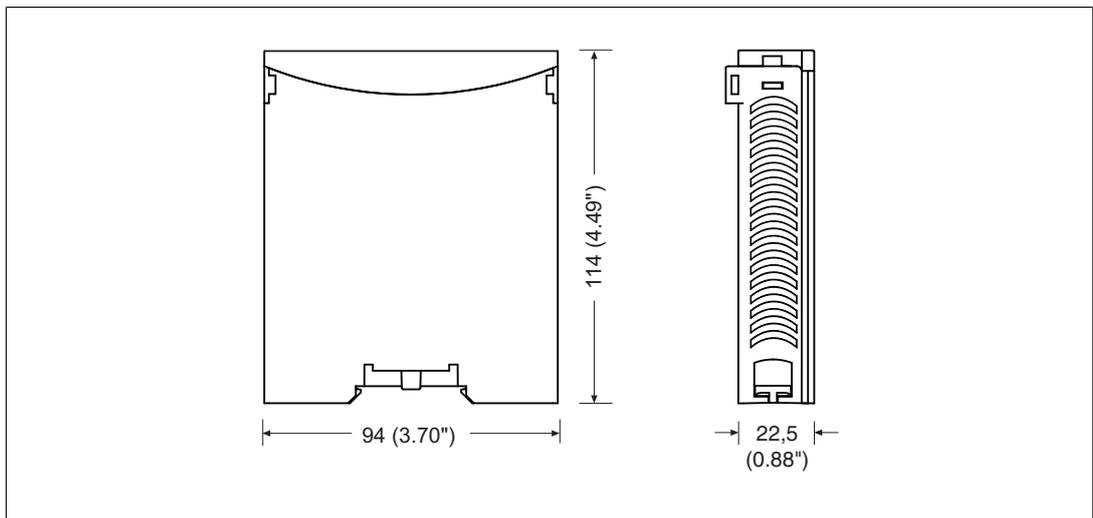
5.3   Connecting the base unit and expansion modules

You can install a maximum of 1 PNOZ mc12p to the left of the base unit.

Connect the base unit and the expansion module as described in the operating instructions for the base units.

▸ Do **not** connect a terminator to the last expansion module on the left-hand side.

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

6 Commissioning

6.1 Wiring

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

Please note:

‣ Information given in the Technical details [📖 17] must be followed.

‣ Use copper wiring with a temperature stability of 75 °C.

Please note the following when connecting to Ethernet POWERLINK:

‣ The following minimum requirements of the connection cable and connector must be met:

– Only use standard industrial Ethernet cable and connectors.

– Only use double-shielded twisted pair cable and shielded RJ45 connectors (industrial connectors).

– 100BaseTX cable in accordance with the Ethernet standard (min. Category 5)

‣ Measures to protect against interference:

Ensure the requirements for the industrial use of Ethernet POWERLINK are met, as stated in the Installation Manual published by the User Group.

> ⚠️ **CAUTION!**
> Only connect and disconnect the expansion module when the supply voltage is switched off.

6.2 Interface assignment

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.
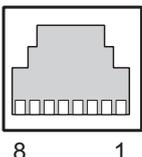
n.c.: Not connected

6.3 Connection example

Ethernet POWERLINK
Managing Node

Ethernet POWERLINK
Controlled Node 1

Ethernet POWERLINK
Controlled Node 2

Ethernet POWERLINK
Controlled Node 3
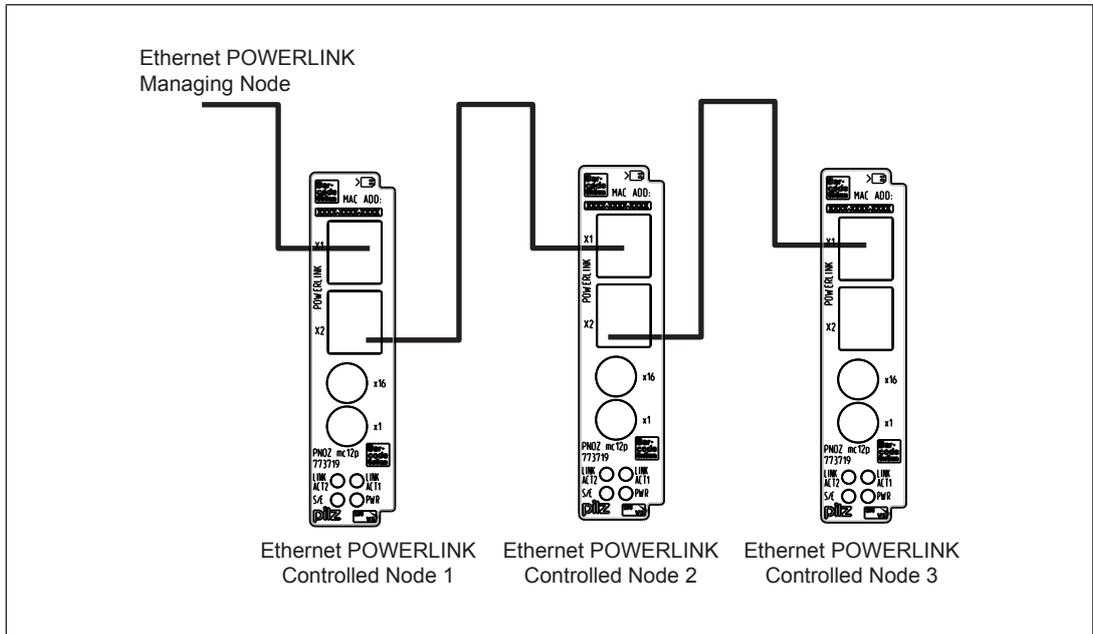
6.4 Download modified project to the PNOZmulti system

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

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

7 Operation

When the supply voltage is switched on, the PNOZmulti copies the configuration from the chip card.

The expansion module PNOZ mc12p is configured and started automatically.

7.1 LED indicators

Legend

⌖	LED on
◑	LED flashes
◑⚡	LED flashes briefly
●	LED off

LED			Meaning
PWR	⌖		Supply voltage is present
	●		Supply voltage is not present
LINK ACT1	⌖	green	Bus connection available at X1
	◑	green	Data traffic present at X1
	●		Bus connection is not available at X1
LINK ACT2	⌖	green	Bus connection available at X2
	◑	green	Data traffic present at X2
	●		Bus connection not available at X2
S/E	●		No supply at the bus controller or the bus controller is in a NOT_ACTIVE state. If communication with Ethernet POWERLINK is not detected within 5 s, the bus controller switches to a BASIC_Ethernet state.
	⌖	red	Bus controller in a fault condition (e.g. loss of Ethernet Frames, accumulation of collisions on the network etc.)
	◑⚡	green	The bus controller has not detected any communication with Ethernet POWERLINK. If communication with Ethernet POWERLINK is detected, the bus switches to a PRE_OPERATIONAL_1 state.
	◑	green: 1x	The bus controller is in a PRE_OPERATIONAL_1 state.
	◑	Green: 2 x short	The bus controller is in a PRE_OPERATIONAL_2 state.
	◑	Green: 3 x short	The bus controller is in a READY_TO_OPERATE state
	⌖	green	The bus controller is in an OPERATIONAL state
	◑	green	The bus controller is in a STOPPED state

8 Technical Details

General	
Certifications	**CCC, CE, EAC (Eurasian), cULus Listed**
Electrical data	
Supply voltage	
for	**Module supply**
internal	**Via base unit**
Voltage	**5 V**
Kind	**DC**
Voltage tolerance	**-2 %/+2 %**
Power consumption	**1,6 W**
Status indicator	**LED**
Fieldbus interface	
Fieldbus interface	**Ethernet POWERLINK V2**
Device type	**Controlled Node**
Transmission rates	**100 MBit/s**
Connection	**RJ45**
Galvanic isolation	**yes**
Times	
Supply interruption before de-energisation	**20 ms**
Environmental data	
Ambient temperature	
In accordance with the standard	**EN 60068-2-14**
Temperature range	**0 - 60 °C**
Storage temperature	
In accordance with the standard	**EN 60068-2-1/-2**
Temperature range	**-25 - 70 °C**
Climatic suitability	
In accordance with the standard	**EN 60068-2-30**
Humidity	**93 % r. h. at 40 °C**
Condensation during operation	**Not permitted**
EMC	**EN 61131-2**
Vibration	
In accordance with the standard	**EN 60068-2-6**
Frequency	**10 - 150 Hz**
Acceleration	**1g**
Shock stress	
In accordance with the standard	**EN 60068-2-27**
Acceleration	**15g**
Duration	**11 ms**
Max. operating height above sea level	**2000 m**

Environmental data	
Airgap creepage	
In accordance with the standard	**EN 61131-2**
Overvoltage category	**III**
Pollution degree	**2**
Rated insulation voltage	**25 V**
Protection type	
In accordance with the standard	**EN 60529**
Mounting area (e.g. control cabinet)	**IP54**
Housing	**IP20**
Terminals	**IP20**
Potential isolation	
Potential isolation between	**Fieldbus and module voltage**
Type of potential isolation	**Functional insulation**
Rated surge voltage	**500 V**
Mechanical data	
Mounting position	**horizontally on mounting rail**
DIN rail	
Top hat rail	**35 x 7,5 EN 50022**
Recess width	**27 mm**
Material	
Bottom	**PPO UL 94 V0**
Front	**ABS UL 94 V0**
Dimensions	
Height	**94 mm**
Width	**22,5 mm**
Depth	**114 mm**
Weight	**115 g**

Where standards are undated, the 2020-07 latest editions shall apply.

9 Order reference

9.1 Product

Product type	Features	Order No.
PNOZ mc12p	Fieldbus module, Ethernet POWERLINK	773 719

9.2 Accessories

Terminator, jumper

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

▶ Support

Technical support is available from Pilz round the clock.

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