PNOZ m ES Powerlink

PILZ
THE SPIRIT OF SAFETY

▸ Configurable, safe small controllers PNOZmulti 2

This document is the original document.

Where unavoidable, for reasons of readability, the masculine form has been selected when formulating this document. We do assure you that all persons are regarded without discrimination and on an equal basis.

SD means Secure Digital

Contents

1 Introduction

1.1 Validity of documentation

This documentation is valid for the product PNOZ m ES Powerlink. 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 of supply

▸ Expansion module PNOZ m ES Powerlink

▸ Jumper

2.2 Unit features

Application of the product PNOZ m ES Powerlink:

Expansion module for connection to a base unit from the PNOZmulti 2 system.

The product has the following features:

▸ Can be configured in the PNOZmulti Configurator

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

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

▸ The minimum cycle time for an application of 32 Byte Output and 32 Byte Input is 275µs. The minimum cycle time is 500 µs at the maximum PDO size of 254 Byte Input and 32 Byte Output. (The inputs and outputs in this case are viewed from the Managing Node.)

▸ 128 virtual inputs and outputs on the control system PNOZmulti can be defined in the PNOZmulti Configurator for communication with the fieldbus Ethernet POWERLINK.

▸ Max. 1 PNOZ m ES Powerlink can be connected to the base unit

▸ Please refer to the document "PNOZmulti System Expansion" for details of the base units PNOZmulti 2 that can be connected.

▸ Plug-in connection terminals:
Either spring-loaded terminal or screw terminal available as an accessory (see Order references for accessories [22]).

2.3 Front view
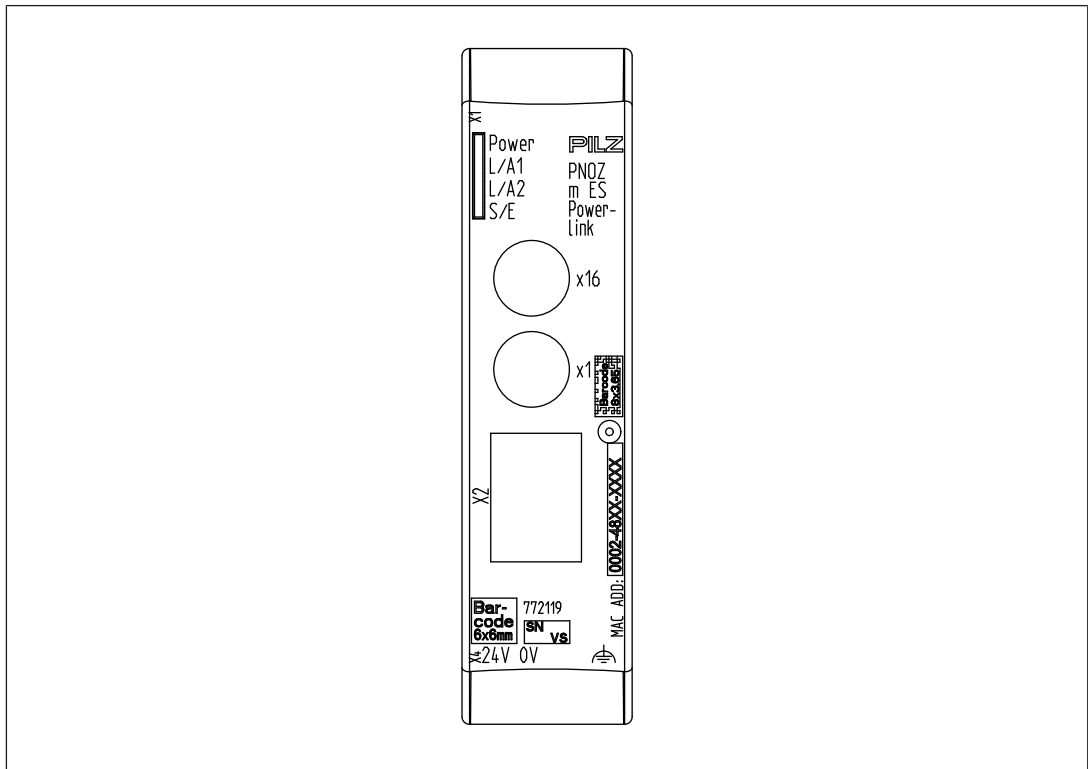
Legend:

▸ X1, X2: Ethernet POWERLINK interfaces

▸ 0 V, 24 V: Supply connections

▸ ⏚: Functional earth

▸ LED:

   – Power

   – L/A1

   – L/A2

   – S/E (Status/Error)

3 Safety

3.1 Intended use

The fieldbus module PNOZ m ES Powerlink is an expansion module of the configurable control system PNOZmulti 2. It is used for communication between the configurable control system PNOZmulti 2 and Ethernet POWERLINK. Ethernet POWERLINK is designed for fast data exchange at field level. The expansion module PNOZ m ES Powerlink 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 m ES Powerlink 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 module PNOZ m ES Powerlink can be used as a non-safety-related component in accordance with the Lifts Directive 2014/33/EU.
It meets the environmental requirements for passenger and goods lifts in accordance with EN 81-1/2, EN 81-20, EN 81-22 and EN 81-50, as well as the requirements for escalators and moving walks in accordance with EN 115-1.

The safety controller should be installed in a protected environment that meets at least the requirements of pollution degree 2.
Example: Protected inside space or control cabinet with protection type IP54 and appropriate air conditioning.

Improper use

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 operating manual,

‣ Use of the product outside the technical details (see Technical details [📖 19]).

> **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 m ES Powerlink are connected via a jumper. After the supply voltage is switched on or the PNOZmulti control system is reset, the fieldbus module PNOZ m ES Powerlink is configured and started automatically.

LEDs indicate the status of the fieldbus module 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 PNOZ m ES Powerlink

The values for the virtual inputs are set as an output in the Managing Node and transferred to the PNOZmulti 2. Each input has a number, e.g. input bit 4 of SDO 2100:02 has the number i12.

Virtual inputs 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 PNOZ m ES Powerlink

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

Virtual outputs 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

▸ Status of LEDs:

LED status 1 Output Byte
The LED status of the base unit can be requested directly as follows

- Bit 0 = 1: LED OFAULT is lit or flashes

- Bit 1 = 1: LED IFAULT is lit or flashes

- Bit 2 = 1: LED FAULT is lit or flashes

- Bit 3 = 1: LED DIAG is lit or flashes

- Bit 4 = 1: LED RUN FS is lit

- Bit 5: Reserved

– Bit 6 = 1: LED RUN ST is lit (not for PNOZ m B0)

– Bit 7: Reserved

Detailed information on data exchange is available in the document "Communication Interfaces PNOZmulti 2" in the section entitled "Fieldbus modules".

4.3 Block diagram
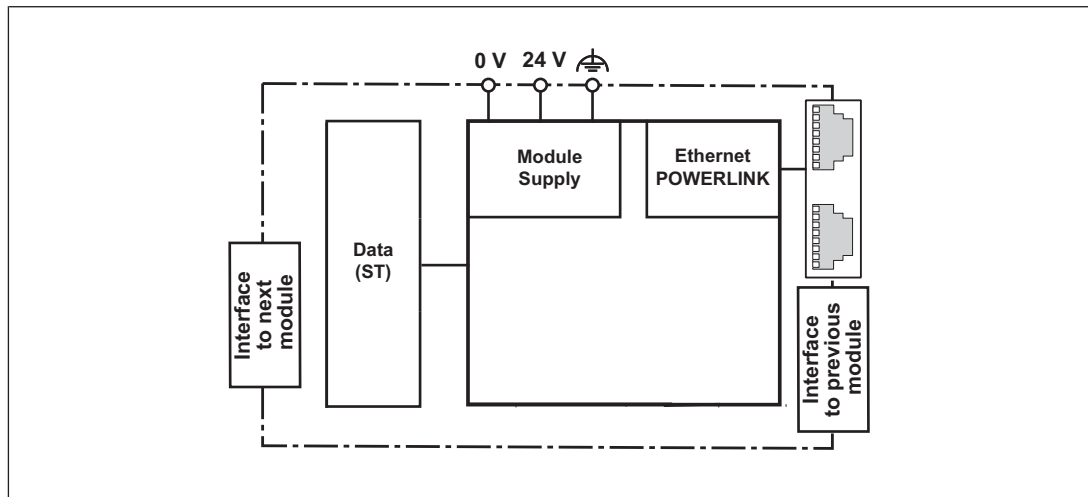
5 Installation

5.1 General installation guidelines

‣ The unit should be installed in a control cabinet with a protection type of at least IP54.

‣ Fit the safety system to a horizontal mounting rail. The venting slots must face upward and downward. Other mounting positions could damage the safety system.

‣ Use the locking elements on the rear of the unit to attach it to a mounting rail.

‣ In environments exposed to heavy vibration, the unit should be secured using a fixing element (e.g. retaining bracket or end angle).

‣ Open the locking slide before lifting the unit from the mounting rail.

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

‣ The ambient temperature of the PNOZmulti units in the control cabinet must not exceed the figure stated in the technical details. Air conditioning may otherwise be required.
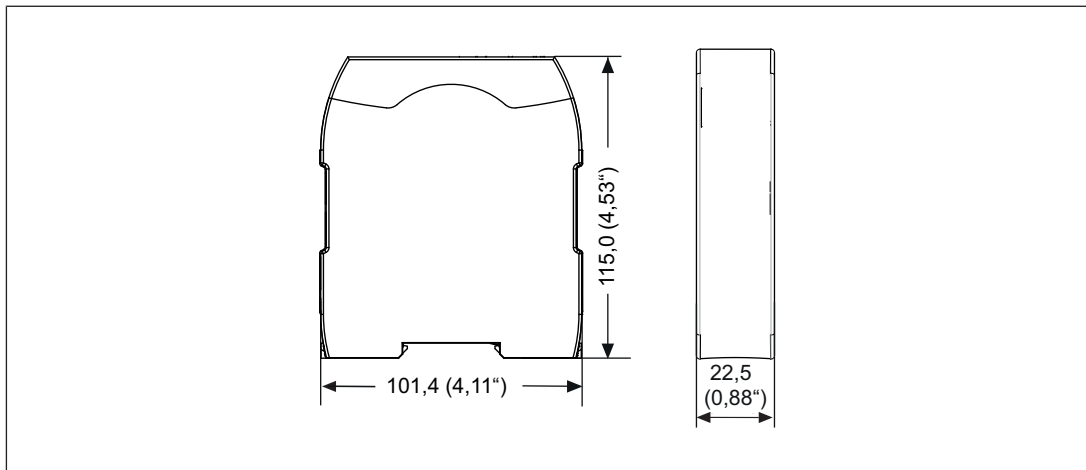
> **NOTICE**
>
> Damage due to electrostatic discharge!
>
> Electrostatic discharge can damage components. Ensure against discharge before touching the product, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.

5.2 Dimensions in mm

5.3   Connect the base unit and expansion modules

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

▸ Connect the black/yellow terminator to the expansion module.

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

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

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

6 Commissioning

6.1 General wiring guidelines

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

Please note:

▷ Information given in the "Technical details [📖 19]" 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.

▷ External measures must be used to connect the terminal ⏚ to the functional earth, when the mounting rail is **not** connected to the functional earth.

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

▷ The power supply must meet the regulations for extra low voltages with protective electrical separation (SELV, PELV).

> ⚠️ **CAUTION!**
>
> Only connect and disconnect the expansion module when the supply voltage is switched off.
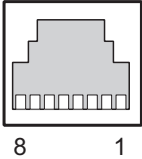
> ❗ **NOTICE**
>
> When installing, you must refer to the guidelines of the Ethernet POWER-LINKUser Group.

6.2 Connecting the supply voltage

Connect the supply voltage to the fieldbus module:

▸ **24 V** terminal: + 24 VDC

▸ **0 V** terminal: 0 V

▸ Protect the supply voltage as follows:

– Circuit breaker, characteristic C - 6 A

or

– Blow-out fuse, slow, 6A

6.3 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

6.4 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.

6.5 Connection example
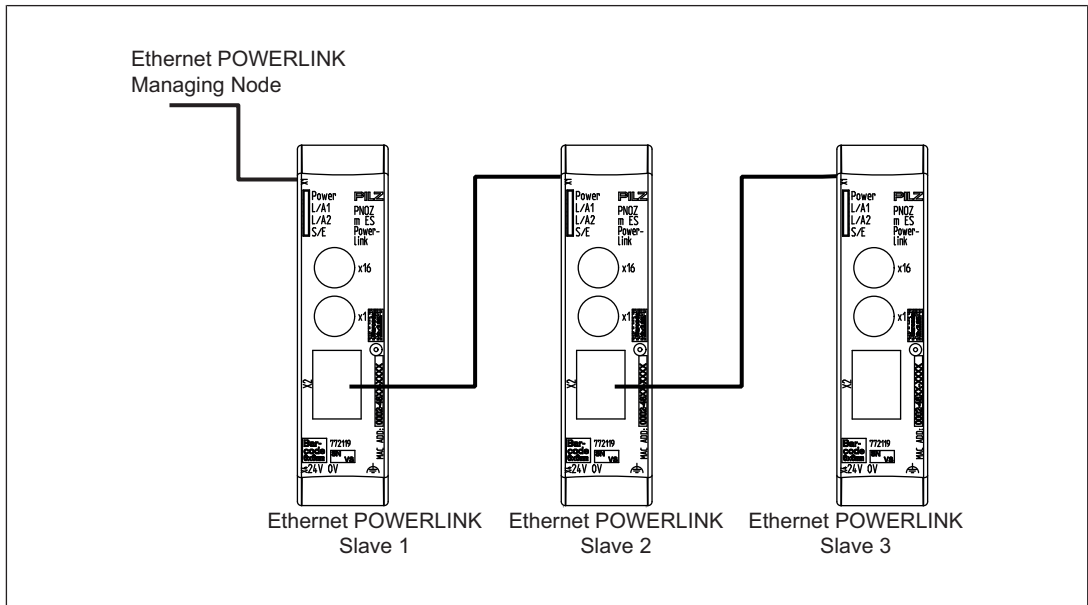
7 Operation

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

The expansion module PNOZ m ES Powerlink is configured and started automatically.

7.1 Messages

Legend

☼	LED on
◐	LED flashes
◐⚡	LED flashes briefly
●	LED off

LED			Meaning
Power	☼		Supply voltage is present.
	●		Supply voltage is not present
L/A1	☼	Green	Bus connection available at X1
	◐	Green	Data traffic present at X1
	●		Bus connection is not available at X1
L/A2	☼	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	**CE, EAC, UKCA, cULus Listed**
Electrical data	
Supply voltage	
for	**Module supply**
Voltage	**24 V**
Kind	**DC**
Voltage tolerance	**-20 %/+25 %**
Max. continuous current that the external power supply must provide	**50 mA**
Output of external power supply (DC)	**1,2 W**
Potential isolation	**yes**
Supply voltage	
for	**Module supply**
internal	**Via base unit**
Voltage	**3,3 V**
Kind	**DC**
Current consumption	**60 mA**
Power consumption	**0,2 W**
Max. power dissipation of module	**1,5 W**
Status indicator	**LED**
Fieldbus interface	
Fieldbus interface	**Ethernet POWERLINK V2**
Device type	**Controlled Node**
Transmission rates	**100 MBit/s**
Connection	**RJ45**
Galvanic isolation	**yes**
Environmental data	
Ambient temperature	
In accordance with the standard	**EN 60068-2-14**
Temperature range	**0 - 60 °C**
Forced convection in control cabinet off	**55 °C**
Storage temperature	
In accordance with the standard	**EN 60068-2-1/-2**
Temperature range	**-25 - 70 °C**
Climatic suitability	
In accordance with the standard	**EN 60068-2-30, EN 60068-2-78**
Condensation during operation	**Not permitted**
Max. operating height above sea level	**2000 m**
EMC	**EN 61131-2**

Environmental data	
Vibration	
In accordance with the standard	**EN 60068-2-6**
Frequency	**10 - 150 Hz**
Acceleration	**1g**
Shock stress	
In accordance with the standard	**EN 60068-2-27**
Acceleration	**15g**
Duration	**11 ms**
Airgap creepage	
In accordance with the standard	**EN 61131-2**
Overvoltage category	**II**
Pollution degree	**2**
Rated insulation voltage	**30 V**
Protection type	
In accordance with the standard	**EN 60529**
Housing	**IP20**
Terminals	**IP20**
Mounting area (e.g. control cabinet)	**IP54**
Potential isolation	
Potential isolation between	**Fieldbus and module voltage**
Type of potential isolation	**Functional insulation**
Rated surge voltage	**500 V**
Mechanical data	
Mounting position	**horizontally on mounting rail**
DIN rail	
Top hat rail	**35 x 7,5 EN 50022**
Recess width	**27 mm**
Material	
Bottom	**PC**
Front	**PC**
Top	**PC**
Connection type	**Spring-loaded terminal, screw terminal**
Conductor cross section with screw terminals	
1 core flexible	**0,25 - 2,5 mm², 24 - 12 AWG**
2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors	**0,2 - 1,5 mm², 24 - 16 AWG**
Torque setting with screw terminals	**0,5 Nm**
Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector	**0,2 - 2,5 mm², 24 - 12 AWG**
Spring-loaded terminals: Terminal points per connection	**2**
Stripping length with spring-loaded terminals	**9 mm**

Mechanical data	
Dimensions	
Height	**101,4 mm**
Width	**22,5 mm**
Depth	**110,4 mm**
Weight	**90 g**

Where standards are undated, the 2013-10 latest editions shall apply.

9 Order reference

9.1 Product

Product type	Features	Order no.
PNOZ m ES Power-link	Configurable safe small controllers PNOZmulti 2, fieldbus module, POWERLINK.	772119

9.2 Accessories

9.2.1 Terminals

Product type	Features	Order no.
Spring terminals PNOZ, 1 pc.	Spring-loaded terminals, for fieldbus modules on PNOZ mm0.xp, 1 set.	783542
Spring terminals PNOZ mmcxp, 10 pcs.	Spring-loaded terminals, for fieldbus modules on PNOZ mm0.xp, 10 sets.	783543
Screw terminals PNOZ mmcxp, 1 pc.	Plug-in screw terminal, fieldbus modules on PNOZ mm0.xp, 1 set.	793542
Screw terminals PNOZ mmcxp, 10 pcs.	Plug-in screw terminal, fieldbus modules on PNOZ mm0.xp, 10 sets.	793543

9.2.2 Connector plug

Product type	Features	Order no.
PNOZ mm0.xp connector left (10 pcs)	Connector plug to connect the modules to the left-hand side of the PNOZmulti base unit, yellow/black (10 pieces).	779260

▶ Support

Technical support is available from Pilz round the clock.

Americas

Brazil
+55 11 97569-2804

Canada
+1 888 315 7459

Mexico
+52 55 5572 1300

USA (toll-free)
+1 877-PILZUSA (745-9872)

Asia

China
+86 21 60880878-216

Japan
+81 45 471-2281

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+82 31 778 3300

Australia and Oceania

Australia
+61 3 95600621

New Zealand
+64 9 6345350

Europe

Austria
+43 1 7986263-0

Belgium, Luxembourg
+32 9 3217570

France
+33 3 88104003

Germany
+49 711 3409-444

Ireland
+353 21 4804983

Italy, Malta
+39 0362 1826711

Scandinavia
+45 74436332

Spain
+34 938497433

Switzerland
+41 62 88979-32

The Netherlands
+31 347 320477

Turkey
+90 216 5775552

United Kingdom
+44 1536 462203

You can reach our international hotline on:
+49 711 3409-222
support@pilz.com

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ISO 9001:2015
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We are represented internationally. Please refer to our homepage www.pilz.com for further details or contact our headquarters.

Headquarters: Pilz GmbH & Co. KG, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: info@pilz.com, Internet: www.pilz.com

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