PNOZ mc6p/mc6.1p

▸ Configurable, safe small controllers PNOZmulti Classic

PILZ

THE SPIRIT OF SAFETY

Contents

1 Introduction

1.1 Validity of documentation

This documentation is valid for the product PNOZ mc6p/mc6.1p. 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 mc6p/mc6.1p

▸ Jumper

2.2 Unit features

Application of the product PNOZ mc6p/mc6.1p:

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

The product has the following features:

▸ Can be configured in the PNOZmulti Configurator

▸ Connection for CANopen

▸ Station addresses from 0 ... 99, selected via rotary switch

▸ Transmission rate selected via rotary switch (1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s)

▸ Status indicators for communication with CANopen and for errors

▸ Supported protocols:

   PNOZ mc6p: CiA DS-301 V3.0

   PNOZ mc6.1p: CiA DS-301 V4.0.2

▸ **PNOZ mc6.1p**: Default COB-ID has been adapted for RPDO 3 (400 h) and TPDO 3 (380 h)

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

▸ Max. 1 PNOZ mc6p/mc6.1p can be connected to the base unit

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

▸ Coated version:

   Increased environmental requirements (see Technical details [📖 21])

2.3 Front view
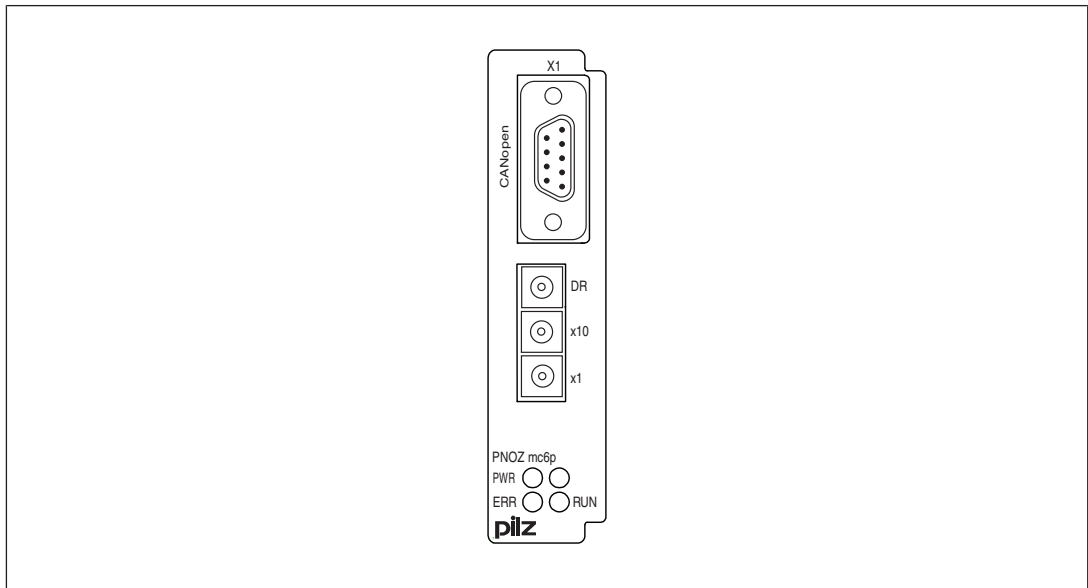
2.3.1 Key

▸ X1: CANopen interface (male 9-pin D-Sub connector)

▸ LED:

  – Power

  – Run

  – Error

3 Safety

3.1 Intended use

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 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 [📖 21]).

> **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.

The coated version of the product PNOZ mc6p/mc6.1p is suitable for use where there are increased environmental requirements (see Technical details [📖 21]).

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 Operation

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

LEDs indicate the status of the expansion module on CANopen.

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

4.2 Input and output data

The data is structured as follows:

▸ Input area

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

▸ Output range

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

▸ Output range only: Byte 3

Bits 0 … 4: Status of LEDs on the PNOZmulti

– Bit 0: OFAULT

– Bit 1: IFAULT

– Bit 2: FAULT

– Bit 3: DIAG

– Bit 4: RUN

Bit 5: Data is being exchanged.

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

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

Virtual inputs on PNOZmulti Configurator	i0 ... I7	i8 ... i15	i16 ... i23
Input data CANopen	Byte 0: Bits 0 … 7	Byte 1: Bits 0 … 7	Byte 2: Bits 0 … 7
Virtual outputs on PNOZmulti Configurator	o0 ... o7	o8 ... o15	o16 ... o23
Output data CANopen	Byte 0: Bits 0 … 7	Byte 1: Bits 0 … 7	Byte 2: Bits 0 … 7

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

4.4 Block diagram
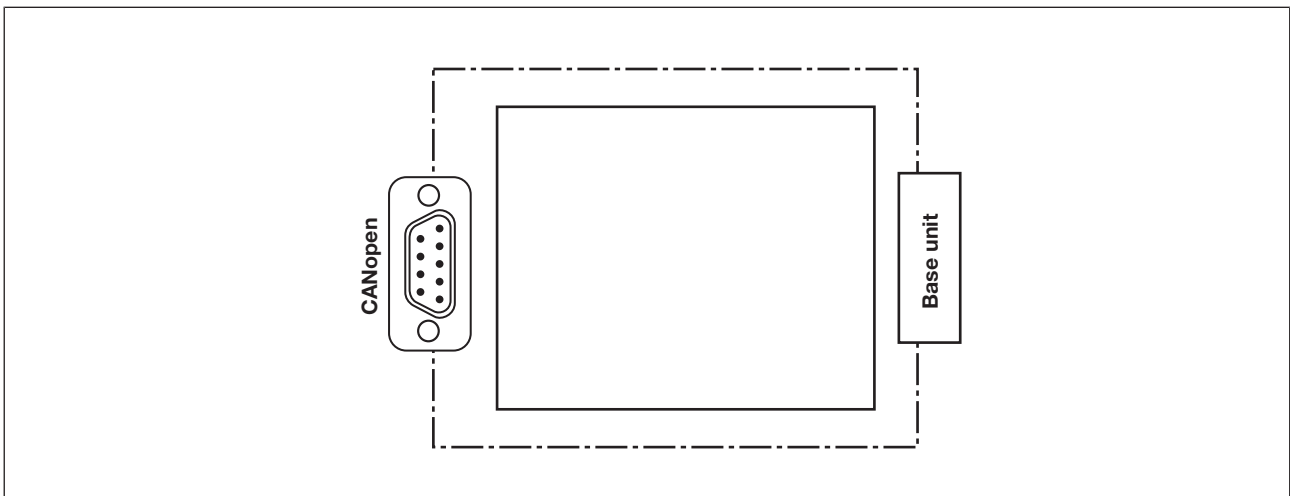
5 Installation

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
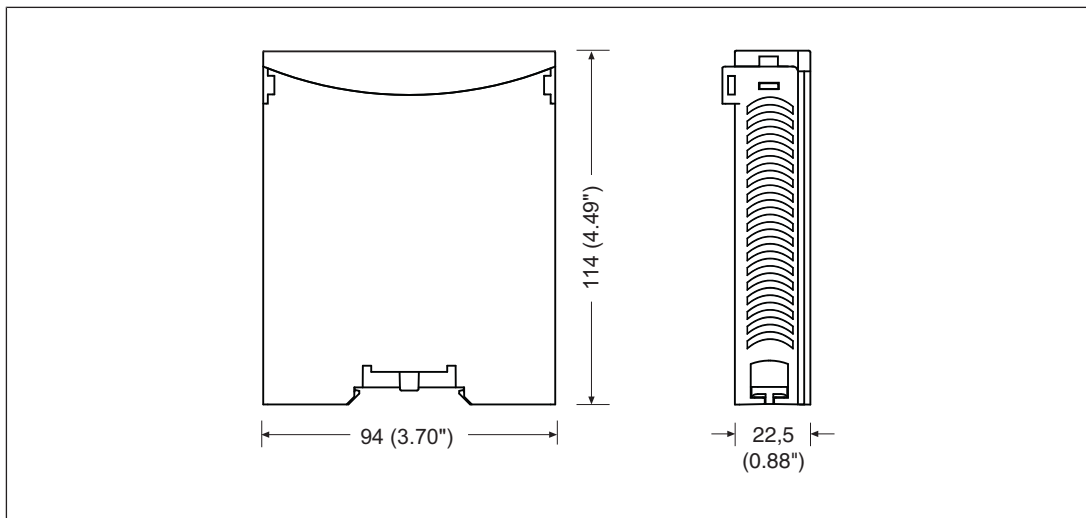
5.3 Connecting the base unit and expansion modules

You can install a maximum of 1 PNOZ mc6p/mc6.1p 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 General wiring guidelines

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

Please note:

▸ Information given in the Technical details [📖 21] must be followed.

▸ The position of the expansion module is specified in the Hardware configuration of the PNOZmulti Configurator.

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

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

▸ The power supply must meet the regulations for extra low voltages with safe separation (SELV, PELV).

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

> ❗ **NOTICE**
>
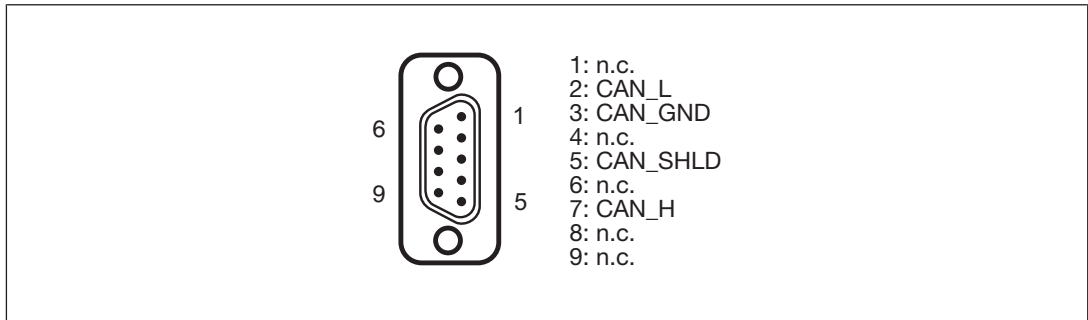> When installing, you must refer to the guidelines of the CANopenUser Group.

6.2 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

6.3 CANopen interface

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

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

n.c. = not connected

Please note the following when connecting to CANopen:

▸ Only use metal plugs or metallised plastic plugs

▸ Twisted pair, screened cable must be used to connect the interfaces

6.3.1 CANopen termination

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

6.4 Preparing for operation

6.4.1 Setting the transmission rate

DR

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

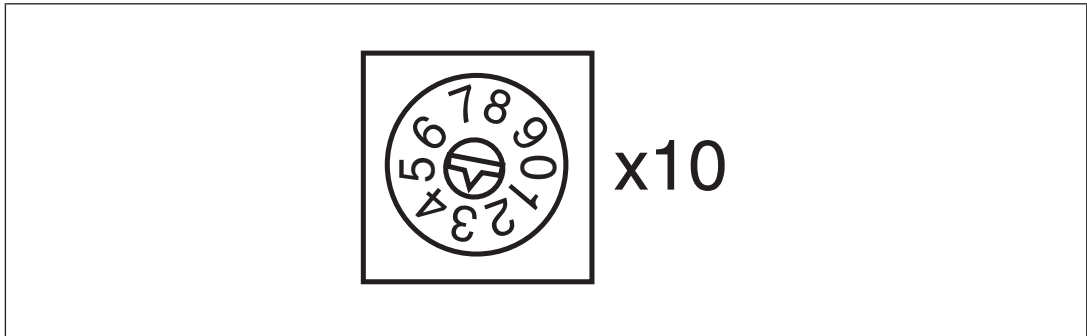| Switch setting	0	1	2	3	4	5	6	7	8	9
Transmission rate	-	10 kBit/s	20 kBit/s	50 kBit/s	125 kBit/s	250 kBit/s	500 kBit/s	800 kBit/s	1 MBit/s	-

	INFORMATION
	The transmission rate cannot be changed during operation.

6.4.2 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).
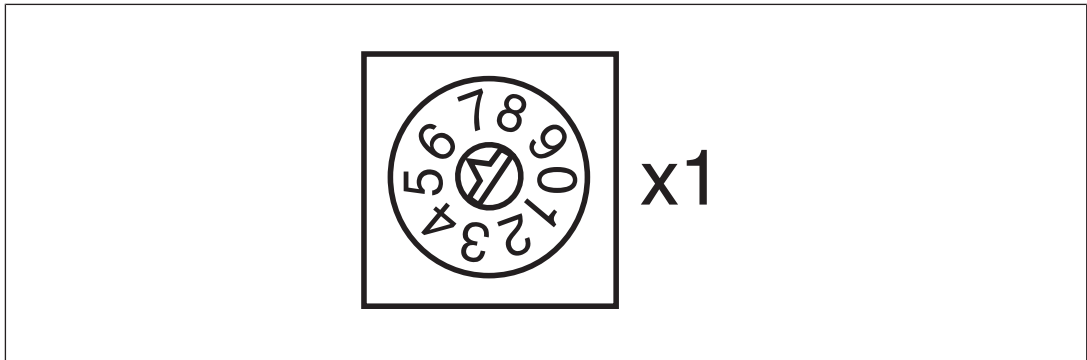
▸ On the lower rotary switch x1, set the ones digit for the address ("6" in the example).

Station address 36 is set in the diagrams as an example.

6.4.3 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 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.

6.4.4   Connection example

7 Operation

When the supply voltage is switched on, the PNOZmulti copies the configuration from the chip card.
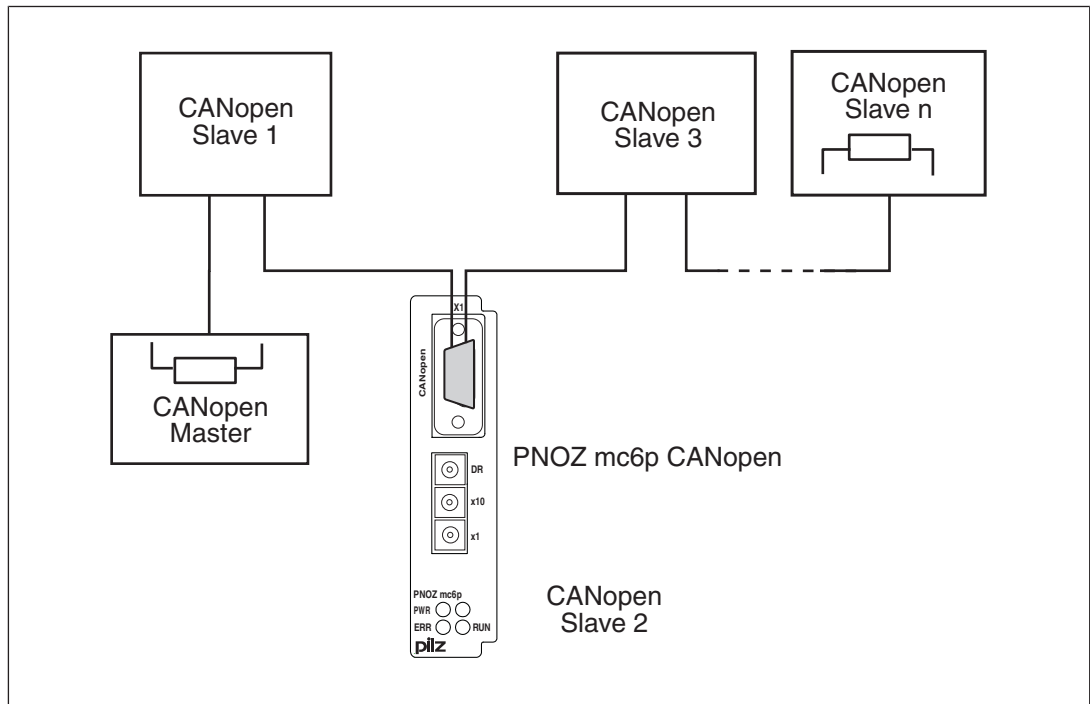
The expansion module PNOZ mc6p/mc6.1p is configured and started automatically. The LEDs "RUN" and "ERR" display the status of the PNOZ mc6p/mc6.1p on CANopen.

7.1 LED indicators

Legend

●	LED off
◖←	LED flashes
◖←1	LED flashes once
◖←2	LED flashes twice
◖←3	LED flashes three times
☼	LED on

LED		Key
PWR	☼	Supply voltage is present
	●	Supply voltage is not present
RUN	☼	PNOZ mc6p/mc6.1p In "Operational" status
	◖←1	PNOZ mc6p/mc6.1p In "Stopped" status
	◖←	PNOZ mc6p/mc6.1p In "Pre-Operational" status
	●	No supply voltage or module error detected
ERR	☼	CAN controller is in "Bus off" status
	◖←1	Error threshold value has been reached, the CAN controller has received too many error telegrams
	◖←2	Monitoring error, activation of master-slave monitoring error, e.g. heartbeat monitoring
	◖←3	Error in "Synchronisation" operating status, a synchronisation telegram, e.g. with simultaneous writing on several devices, did not occur within the configured time
	●	No error

8 Technical details

General	773712	773727	773733
Certifications	CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed	CCC, CE, EAC (Eurasian), KCC, KOSHA, TÜV, cULus Listed	CCC, CE, EAC (Eurasian), cULus Listed
Electrical data	**773712**	**773727**	**773733**
Supply voltage			
for	Module supply	Module supply	Module supply
internal	Via base unit	Via base unit	Via base unit
Voltage	5 V	5 V	5 V
Kind	DC	DC	DC
Voltage tolerance	-2 %/+2 %	-2 %/+2 %	-2 %/+2 %
Power consumption	1 W	2,5 W	1 W
Status indicator	LED	LED	LED
Fieldbus interface	**773712**	**773727**	**773733**
Fieldbus interface	CANopen	CANopen	CANopen
Device type	Slave	Slave	Slave
Log	CiA DS-301 V3.0	CiA DS-301 V3.0	CiA DS-301 V4.02
Station address	0 - 99d	0 - 99d	0 - 99d
Transmission rates	1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s	1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s	1 MBit/s, 10 kbit/s, 125 kBit/s, 20 kbit/s, 250 kBit/s, 50 kbit/s, 500 kBit/s, 800 kbit/s
Connection	9-pin D-Sub male connector	9-pin D-Sub male connector	9-pin D-Sub male connector
Galvanic isolation	yes	yes	yes
Test voltage	500 V AC	500 V AC	500 V AC
Times	**773712**	**773727**	**773733**
Supply interruption before de-energisation	20 ms	20 ms	20 ms
Environmental data	**773712**	**773727**	**773733**
Ambient temperature			
In accordance with the standard	EN 60068-2-14	EN 60068-2-14	EN 60068-2-14
Temperature range	0 - 60 °C	0 - 50 °C	0 - 60 °C
Storage temperature			
In accordance with the standard	EN 60068-2-1/-2	EN 60068-2-1/-2	EN 60068-2-1/-2
Temperature range	-25 - 70 °C	-25 - 70 °C	-25 - 70 °C
Climatic suitability			
In accordance with the standard	EN 60068-2-30, EN 60068-2-78	EN 60068-2-30, EN 60068-2-78	EN 60068-2-30, EN 60068-2-78
Humidity	93 % r. h. at 40 °C	93 % r. h. at 40 °C	93 % r. h. at 40 °C
Condensation during operation	Not permitted	Short-term	Not permitted
EMC	EN 61131-2	EN 61131-2	EN 61131-2

Environmental data	773712	773727	773733
Vibration			
In accordance with the standard	EN 60068-2-6	EN 60068-2-6	EN 60068-2-6
Frequency	10 - 150 Hz	10 - 150 Hz	10 - 150 Hz
Acceleration	1g	1g	1g
Corrosive gas check			
SO_2: Concentration 10 ppm, duration 10 days, passive	–	DIN V 40046-36	–
H_2S: Concentration 1 ppm, duration 10 days, passive	–	DIN V 40046-37	–
Shock stress			
In accordance with the standard	EN 60068-2-27	EN 60068-2-27	EN 60068-2-27
Acceleration	15g	15g	15g
Duration	11 ms	11 ms	11 ms
Max. operating height above sea level	2000 m	2000 m	2000 m
Airgap creepage			
In accordance with the standard	EN 61131-2	EN 61131-2	EN 61131-2
Overvoltage category	III	III	III
Pollution degree	2	2	2
Rated insulation voltage	30 V	30 V	30 V
Protection type			
In accordance with the standard	EN 60529	EN 60529	EN 60529
Mounting area (e.g. control cabinet)	IP54	IP54	IP54
Housing	IP20	IP20	IP20
Terminals	IP20	IP20	IP20
Mechanical data	**773712**	**773727**	**773733**
Mounting position	horizontally on mounting rail	horizontally on mounting rail	horizontally on mounting rail
DIN rail			
Top hat rail	35 x 7,5 EN 50022	35 x 7,5 EN 50022	35 x 7,5 EN 50022
Recess width	27 mm	27 mm	27 mm
Material			
Bottom	PPO UL 94 V0	PPO UL 94 V0	PPO UL 94 V0
Front	ABS UL 94 V0	ABS UL 94 V0	ABS UL 94 V0
Dimensions			
Height	94 mm	94 mm	94 mm
Width	22,5 mm	22,5 mm	22,5 mm
Depth	119 mm	119 mm	119 mm
Weight	115 g	145 g	110 g

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

9 Order reference

9.1 Product

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

9.2 Accessories

Jumper

Product type	Features	Order No.
KOP-XE	Jumper	774 639
KOP-XE coated	Jumper, coated version	774 640

▶ Support

Technical support is available from Pilz round the clock.

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