Expansion modules
PNOZ ms1p

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

Approvals

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

Unit features

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

Unit description

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

System requirements

▸ PNOZmulti Configurator: from Version 3.0.0
▸ Base unit PNOZ m1p: from Version 3.0
Please contact Pilz if you have an older version.

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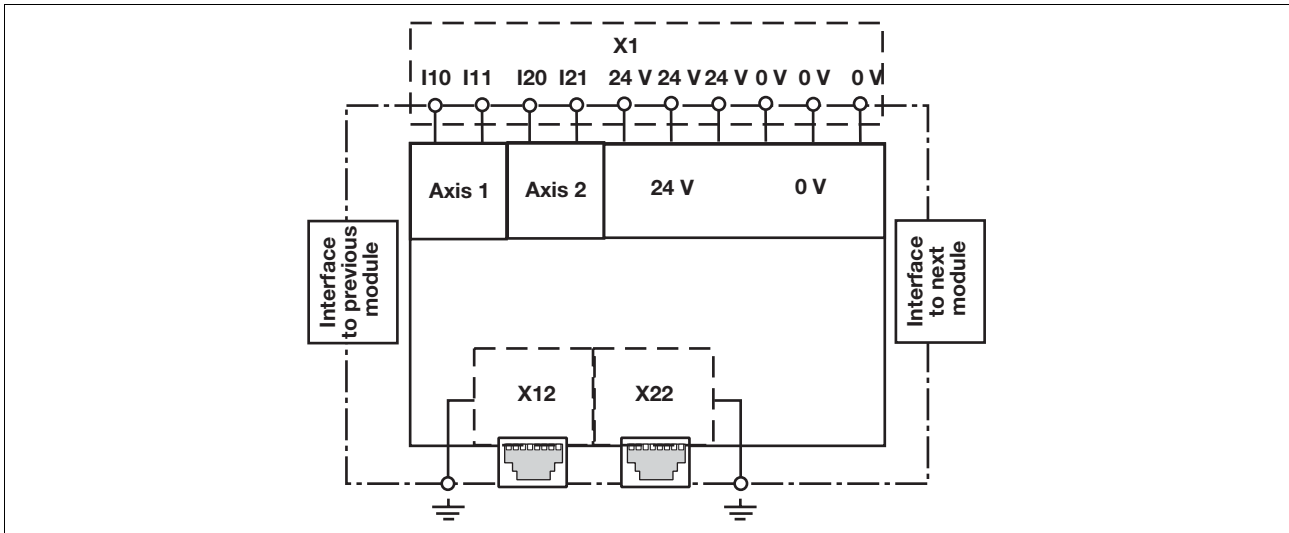
The relay conforms to the following safety criteria:
▸ The circuit is redundant with built-in self-monitoring.
▸ The safety function remains effective in the case of a component failure.

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NSG-D-2-379-2006-02

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Block diagram

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Function description

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

Wiring

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

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

Incremental encoder:
▶ Only incremental encoders with a differential output of the following type are permitted
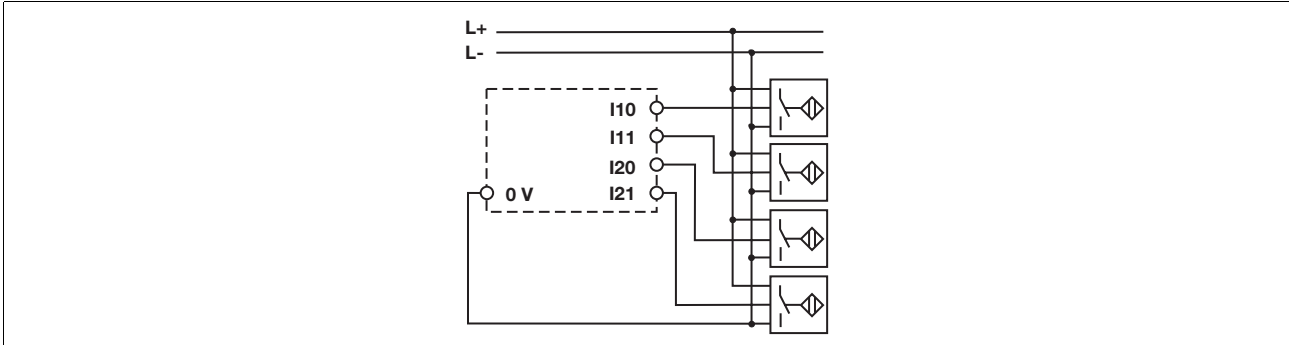 – Sin/Cos
  – TTL (RS 422)
The incremental encoders are connected via an adapter or are connected directly to the speed monitor (see data sheets: "Connection cable, adapter for PNOZ ms1p"). The adapter is connected between the incremental encoder and the drive. The output on the adapter is connected to the RJ-45 female connector on the speed monitor. The incremental encoder on connector X12 monitors axis 1; the incremental encoder on connector X22 monitors axis 2.

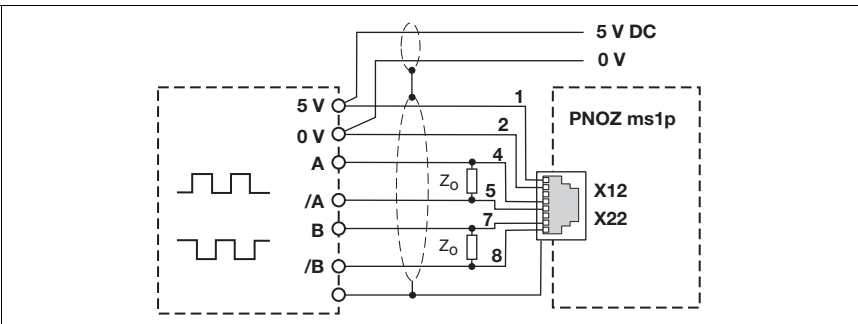Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straße 2, 73760 Ostfildern, Germany
Telephone: +49 711 3409-0, Telefax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

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Products

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Preparing for operation

▸ Proximity switch

```
L+
L-
          I10
          I11
          I20
0 V       I21
```

▸ Incremental encoder

Encoder type 1 Vss, 5 V-TTL Terminate incremental encoder mit $Z_o = 120$ Ohm	
	5 V DC
	0 V
	PNOZ ms1p
5 V	1
0 V	2
A	4
/A Z_O	5
B	7 X12
/B Z_O	8 X22

▸ Proximity switches and incremental encoders

```
L+
L-
0 V       I10
          I11
          I20
          I21
          X12
          X22      Axis 2
```

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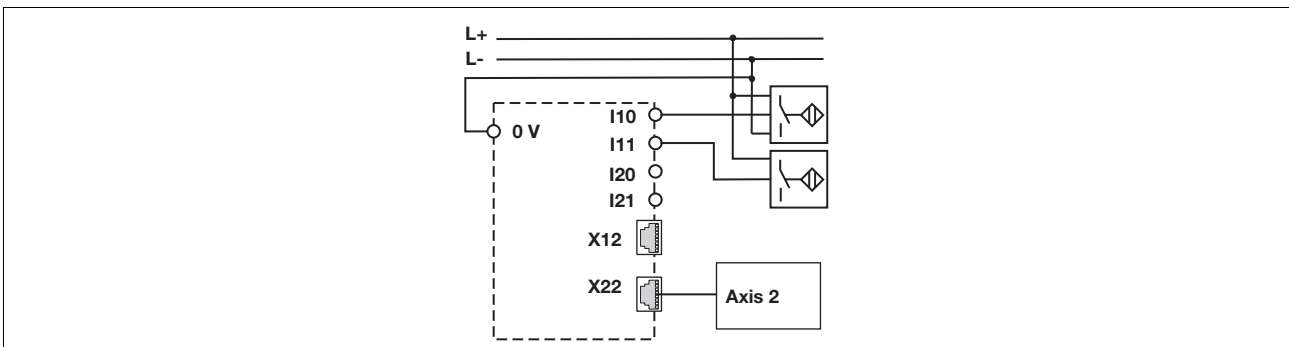
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**Terminal configuration**
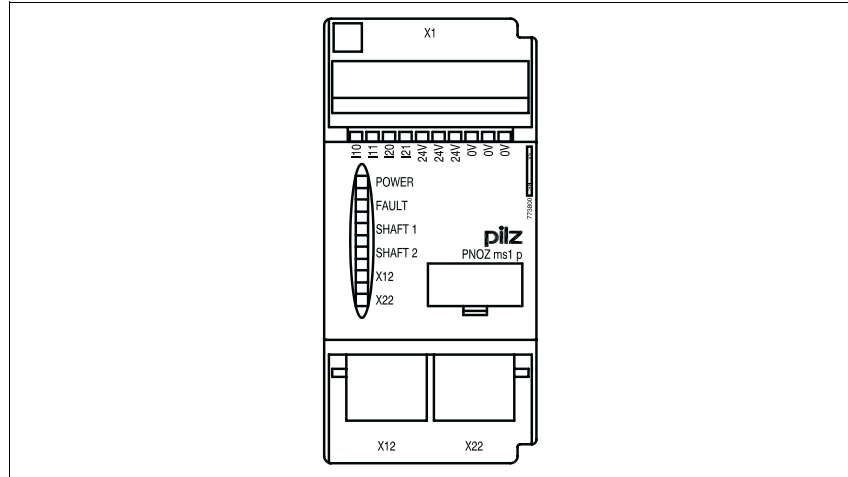
Installation

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

▶ Use the notches on the back of the unit to attach it to a DIN rail. Connect the safety system to the DIN rail in an upright position, so that the earthing springs on the safety system are pressed on to the DIN rail.

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

Dimensions
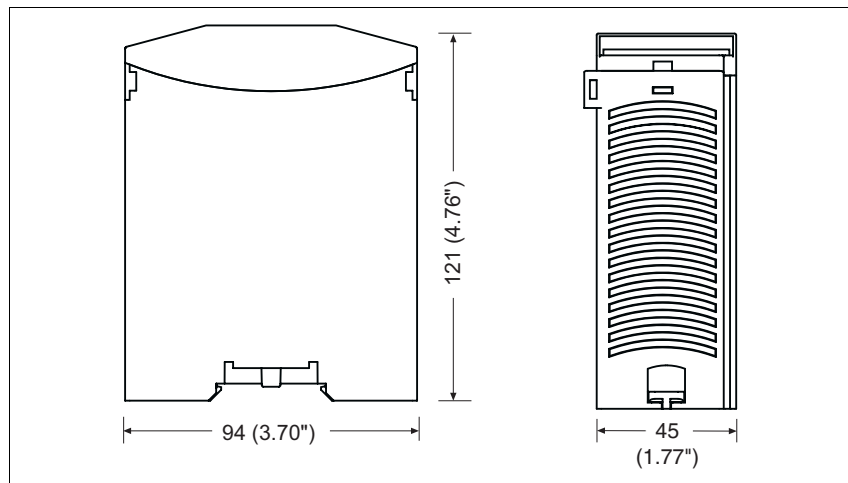
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Notice

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

Technical details

Electrical data

Supply voltage (U_B) via base unit	**24 VDC**
Voltage tolerance	**-15% ... 10%**
Power consumption at U_B via base unit	**Typ. 1 W**
Residual ripple U_B	**+/- 5 %**

Times

Supply interruption before de-energisation	**Min. 20 ms**
Reaction time	
F ≥ 100 Hz: Switch-off delayPNOZ m1p +	**10 ms**
F < 100 Hz: Switch-off delayPNOZ m1p +	**10 ms + 1/f**

Proximity switch input

Number of inputs	**4 (2 axes)**
Signal level at the inputs	
"1" Signal (high)	**11 V … 30 V**
"0" Signal (low)	**-3 … 5 V**
Input resistance	**3 kOhm**
Input's frequency range	**0 … 3 kHz**
Configurable monitoring frequency	
Without hysteresis	**1 Hz ... 3 kHz**
With hysteresis	**2 Hz ... 3 kHz**
Connection type	**Cage clamp terminals**
Cable cross section	
Rigid single-core, flexible multi-core or multi-core with crimp connector	**0.5 ... 2.5 mm2**
Flexible multi-core with plastic sleeve	**0.5 ... 1.5 mm2**

Incremental encoder input

Number of inputs	**2 (2 axes)**
Supply voltage for incremental encoders	**5 V +/-10 %, typ. 30 mA**
Signal level at the inputs	**0.5 V_{SS} … 5 V_{SS}**
Phase position for the differential signals A, /A and B	**90° ±30°**
Overload protection	**-30 V ... +30 V**
Input resistance	**10 kOhm**
Input's frequency range	**0 … 500 kHz**
Configurable monitoring frequency	
Without hysteresis	**1 Hz ... 500 kHz**
With hysteresis	**2 Hz ... 500 kHz**
Connection type	**RJ-45 female connector**

Environmental data

Airgap creepage	**DIN VDE 0110-1, 04/97**
Vibration in accordance with **EN 60068-2-6, 04/95**	
Frequency:	**10 ... 55 Hz**
Amplitude:	**0.35 mm**
Climatic suitability	**DIN IEC 60068-2-3, 12/86**
	DIN CEI 60068-2-3, 12/86
EMC	**EN 60947-5-1, 01/00**
Ambient temperature	**0 ... + 55 °C**
Storage temperature	**-25 ... + 70 °C**

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

Order reference

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