pilz

Expansion modules
PNOZ ms2p HTL

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

Approvals

	PNOZ ms2p HTL
c(UL)us LISTED	◆
BG-PRÜFZERT	◆
CCC	◆

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)
▶ 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. 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 PNOZmulti modular safety system is used for the safety-related interruption of safety circuits and is designed for use on:
▶ E-STOP equipment
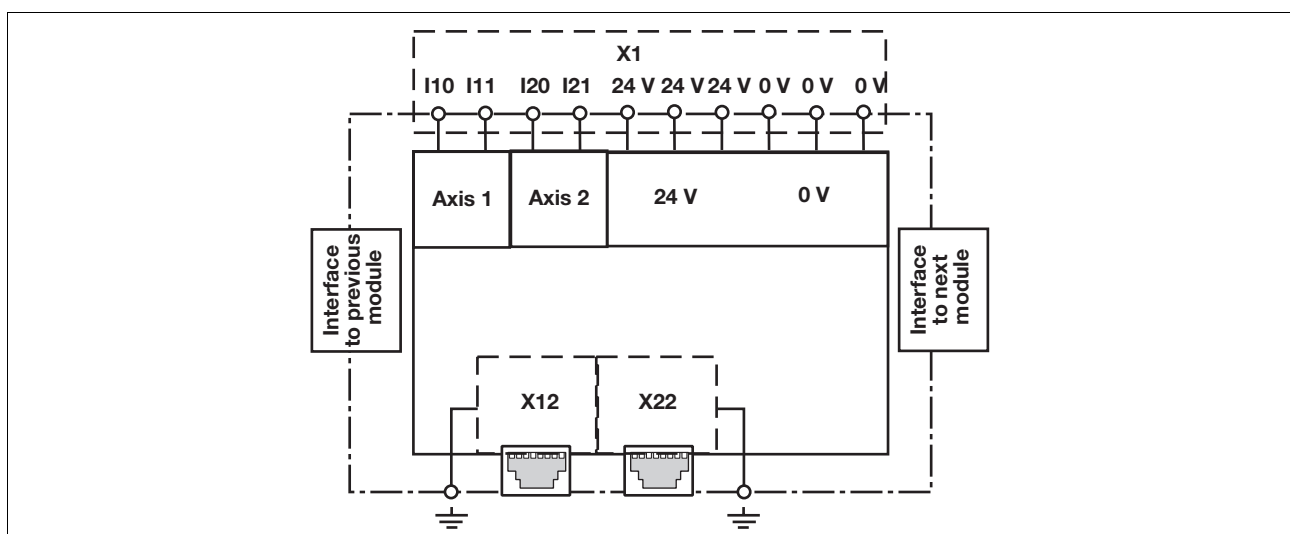▶ Safety circuits in accordance with VDE 0113 Part 1 and EN 60204-1

System requirements

▶ PNOZmulti Configurator: From Version 6.4.0
▶ Base unit PNOZ m1p: From Version 6.0
▶ Base unit PNOZ m2p: From Version 3.0
▶ PNOZ m3p base unit from Version 1.0
Please contact Pilz if you have an older version.

Safety features

The relay conforms to the following

Block diagram

Expansion modules
PNOZ ms2p 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 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 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.

Proximity switch

▸ Only proximity switches of type "pnp" are allowed to be used (N/O contact, switching to positive).
▸ The proximity switches require a 24 VDC supply.
▸ The proximity switches must be fitted such that at least one is always activated (provides a high signal).
▸ The proximity switches must be fitted so that the recorded signals overlap.
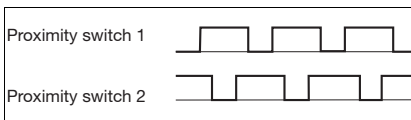
CAUTION!
Appropriate installation measures should be taken to prevent a foreign body coming between the signal input device and the proximity switch. The foreign body could cause one of the proximity switches to be constantly energised (constant high signal).
▸ Pay attention to the values in the technical details

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 one 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)

Incremental encoder

▸ Only incremental encoders with a differential output of the following type are permitted
  – HTL (12 V – 30 V)
▸ Pay attention to the values in the technical details

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.

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 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.

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

NSG-D-2-421-2009-06

Expansion modules
PNOZ ms2p HTL

Preparing for operation

▶ Proximity switch
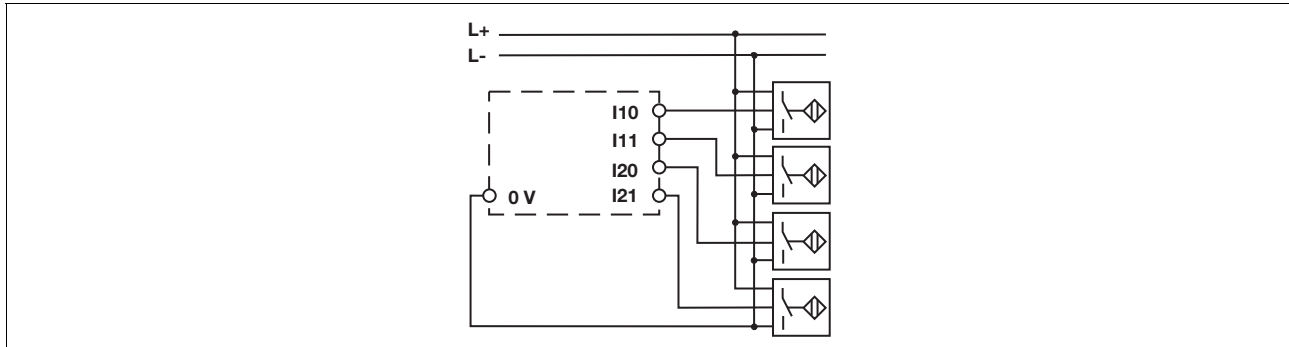
▶ Incremental encoder

Encoder type 24 V-HTL Do **not** terminate incremental encoder with $Z_o = 120$ Ohm	

Expansion modules
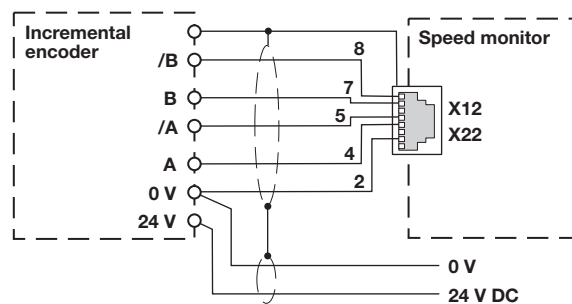## PNOZ ms2p HTL

▶ Connect incremental encoder to the speed monitor via the adapter

Connection via adapter and drive	
Connection via adapter	
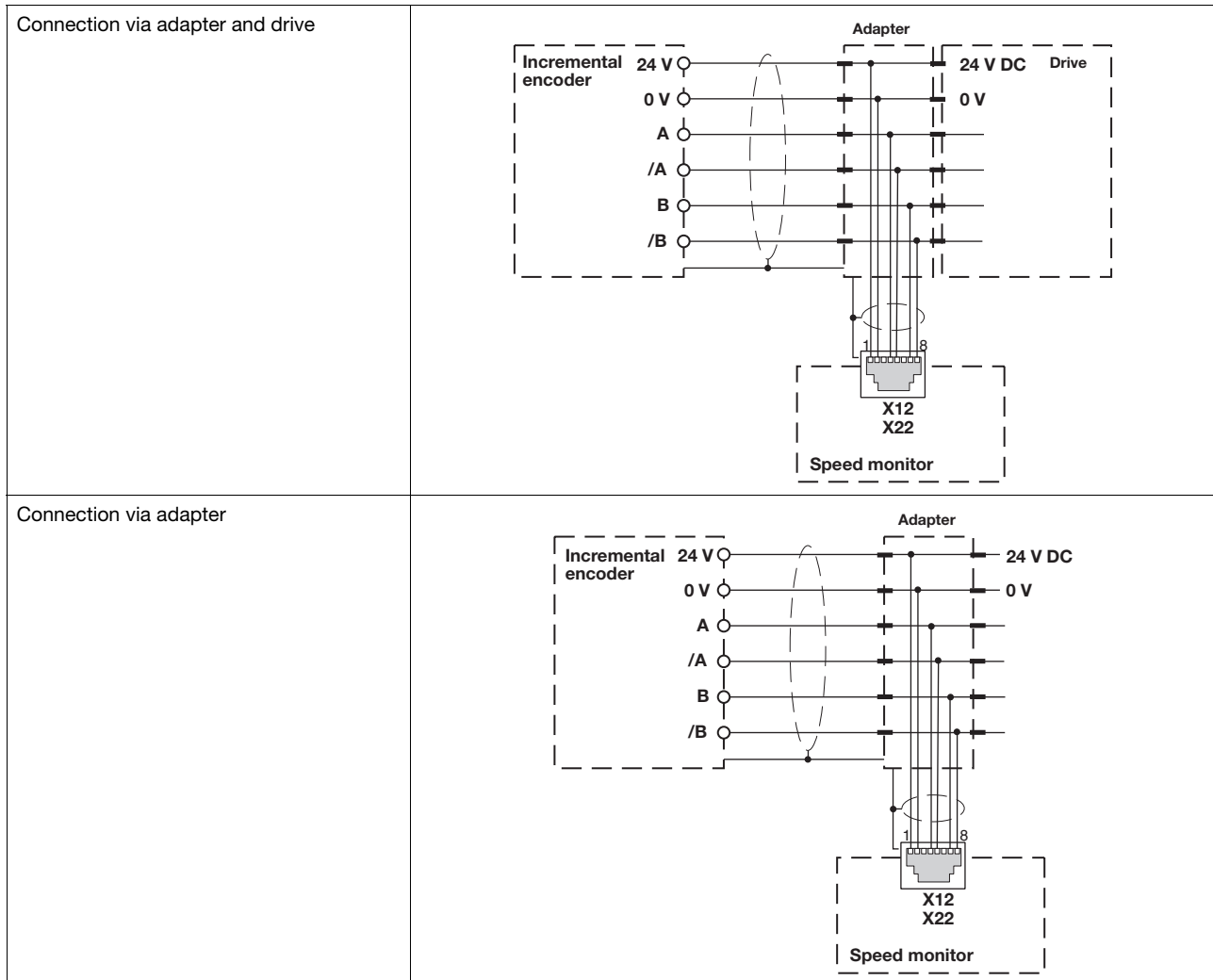
▶ The adapter (e.g. PNOZ msi6p) is connected between the incremental encoder and the drive. The output on the adapter is connected to the RJ-45 female connector on the speed monitor.

▶ Proximity switch and incremental encoder

▶ The adapter also can 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 7.2.2.1 and in the adapter operating manual must be ob-

served 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.

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

NSG-D-2-421-2009-06

Expansion modules
PNOZ ms2p HTL

Proximity switch and incremental encoder on various axes Axis 1: Proximity switch at I10, I11 **or** Incremental encoder at X12 Axis 2: Proximity switch at I20, I21 **or** Incremental encoder at X22	
Proximity switch and incremental encoder on one axis Axis 1: Proximity switch at I10 (I11 remains free) **and** Incremental encoder at X12 Axis 2: Proximity switch at I20 (I21 remains free) **and** Incremental encoder at X22	

Expansion modules
PNOZ ms2p HTL

Terminal configuration
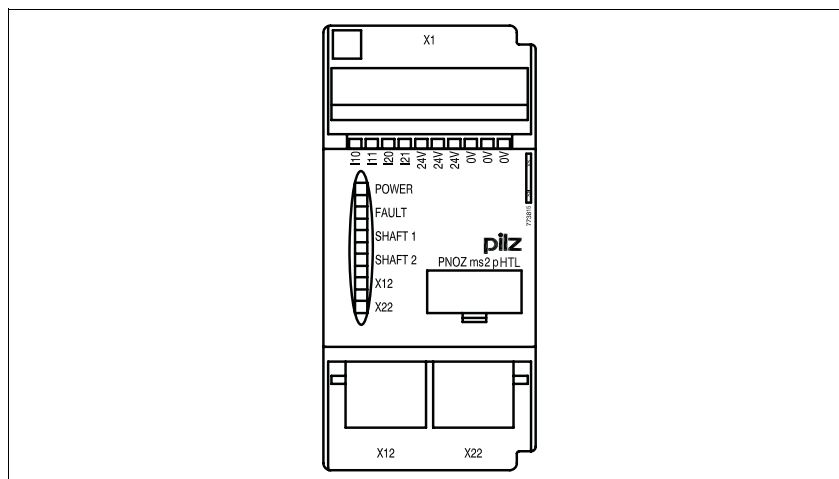
Installation

▸ 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 destroy 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.

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

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

Dimensions
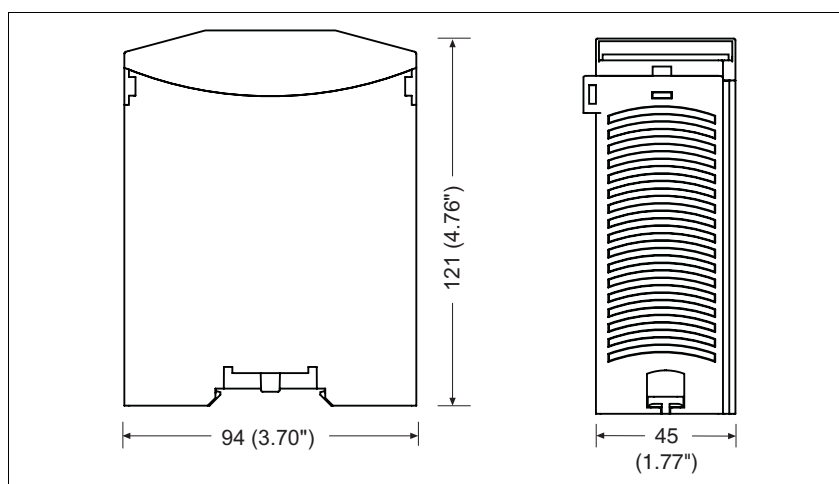
Expansion modules
PNOZ ms2p HTL

| **Notice** | This data sheet is only intended for use during configuration. For installation and operation, please refer to the op- | erating instructions supplied with the unit. |

Technical details

Electrical data

Supply voltage U_B DC	
via base unit	**5 V, 24 V**
Voltage tolerance	**-15 %/+20 %**
Power consumption at U_B DC	
via base unit	**1.0 W**
Residual ripple DC	**5 %**
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 terminals, screw terminals**
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 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 - 200 kHz**
Configurable monitoring frequency	
without hysteresis	**0,1 Hz - 200 kHz**
with hysteresis	**0,2 Hz - 200 kHz**
Connection type (incremental encoder)	**RJ-45-socket, 8-pin**

Environmental data

EMC	**EN 60947-5-1**
Vibration to **EN 60068-2-6**	
Frequency	**10 - 55 Hz**
Amplitude	**0.35 mm**
Climatic suitability	**EN 60068-2-78**
Airgap creepage in accordance with **EN 60664-1**	
Ambient temperature	**0 - 60 °C**
Storage temperature	**-25 - 70 °C**

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

NSG-D-2-421-2009-06

pilz

Expansion modules
PNOZ ms2p HTL

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

Order reference			
Type	Features		Order no.
PNOZ ms2p HTL	Expansion module	Speed monitor	773 815