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Base units
PNOZ m1p



Base units from the PNOZmulti modular safety system

Approvals

	PNOZ m1p
c UL us LISTED	◆
GS-geprüft	◆
CCC	◆

Unit features

- Can be configured in the PNOZmulti Configurator
- Positive-guided relay outputs:
  - 1 safety output in accordance with EN 954-1, Cat. 4 or 2 safety outputs in accordance with EN 954-1, Cat. 2
- Semiconductor outputs:
  - 2 safety outputs in accordance with EN 954-1, Cat. 4 or 4 safety outputs in accordance with EN 954-1, Cat. 3
  - 1 auxiliary output
- 4 test pulse outputs
- 1 cascading input and output can also be used as a standard output
- 20 inputs for connecting:
  - E-STOP pushbutton
  - Two-hand button
  - Safety gate limit switch
  - Reset button
  - Light barrier
  - Scanner
  - Enable switch
  - PSEN
  - Operating mode selector switch
  - Safety mat
- Muting function
- Max. 8 expansion modules and 1 fieldbus module can be connected
- LED indicator for:
  - Diagnostics
  - Supply voltage
  - Output circuits
  - Input circuits
- Test pulse outputs used to detect shorts across the inputs
- Monitors shorts between the safety outputs
- Plug-in connection terminals (either cage clamp terminal or screw terminal)

Unit description

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

Chip card

Chip cards are available with memories of 8 kByte and 32 kByte. For large-scale projects we recommend the 32 kByte chip card (see chapter containing the order references).
The chip card with a memory of 32 kByte can only be used from PNOZ m1p Version 2.0.

Safety features

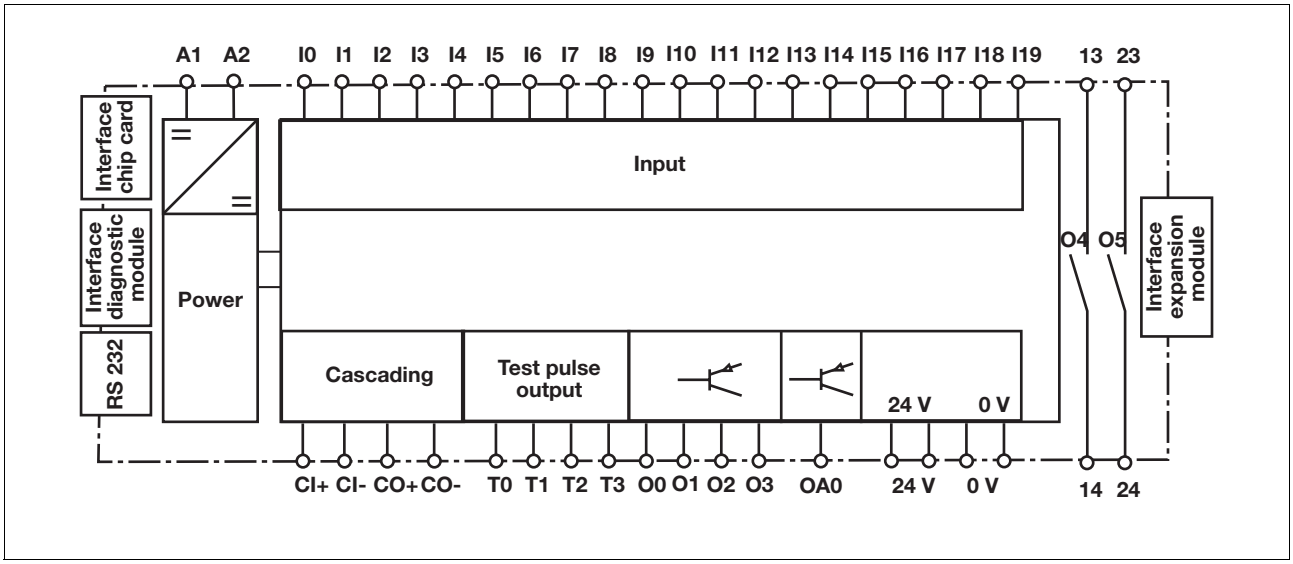
The relay conforms to the following safety criteria:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- The relay contacts meet the requirements for safe separation through increased insulation compared with all other circuits in the safety system.
- The safety outputs are tested periodically using a disconnection test.

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Base units
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Block diagram



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Base units
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Function description

The function of the inputs and outputs on the safety system depends on the safety circuit created using the PNOZmulti Configurator. A chip card is used to download the safety circuit to the base unit. The base unit has 2 microcontrollers that monitor each other. They evaluate the input circuits on the base unit and expansion modules and switch the outputs on the base unit and expansion modules accordingly.

The online help on the PNOZmulti Configurator contains descriptions of the operating modes and all the functions of the PNOZmulti safety system, plus connection examples.

Wiring

The wiring is defined in the circuit diagram in the Configurator. There you can select the inputs that are to perform a particular safety function and the outputs that will switch this safety function.
Please note:

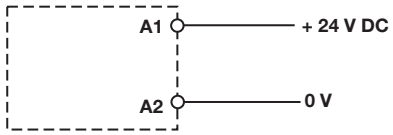
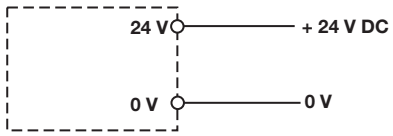
- Information given in the "Technical details" must be followed.
- Outputs:
  - O0 to O5 are safety outputs.
  - O4 and O5 are relay outputs
  - O0 to O3 are semiconductor outputs
  - OA0 is an auxiliary output.
- To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- Use copper wire that can withstand 75 °C.
- Sufficient fuse protection must be provided on all output contacts with inductive loads.
- Power for the safety system and input circuits must always be provided from a single power supply. The power supply must meet the regulations for extra low voltages with safe separation.
- Two connection terminals are available for each of the supply connections 24 V and 0 V (semiconductor outputs), plus A1 and A2 (power supply). This means that the supply voltage can be looped through several connections. The current at each terminal may not exceed 9 A.
- Test pulse outputs must exclusively be used to test the inputs. They must not be used to drive loads. Do not route the test pulse lines together with actuator cables within an unprotected multicore cable.
- Test pulse outputs are also used to supply safety mats that trigger a short circuit.
  Where test pulses are used for the safety mat, they may not be reused for other purposes.
  Safety mats are supported from Version 4.3 of the base unit.

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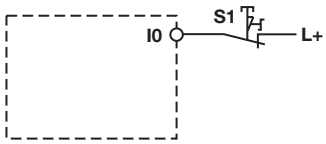
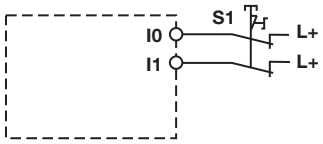
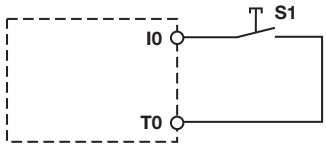
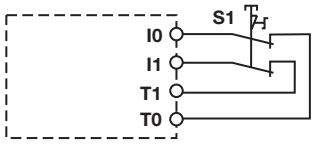
Preparing for operation

▸ Supply voltage

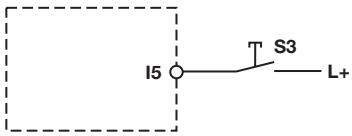
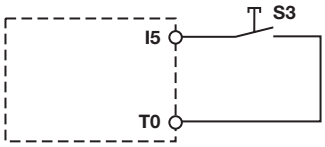
Supply voltage	AC	DC
For the safety system (connector X7)		
For the semiconductor outputs (connector X2) Must always be present, even if the semiconductor outputs are not used		

Connection examples

▸ Input circuit

Input circuit	Single-channel	Dual-channel
E-STOP **without** detection of shorts across contacts		
E-STOP **with** detection of shorts across contacts		

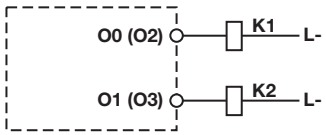
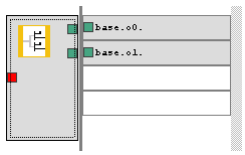
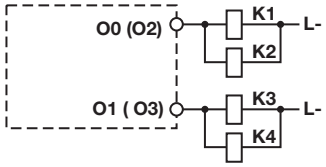
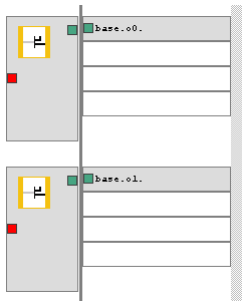
▸ Reset circuit

Reset circuit	Input circuit without detection of shorts across contacts	Input circuit with detection of shorts across contacts
		

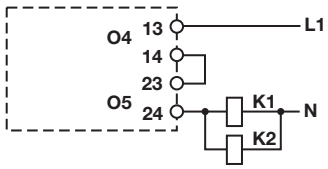
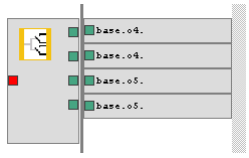
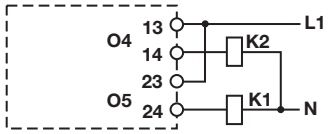
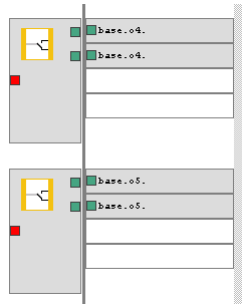
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PNOZ m1p

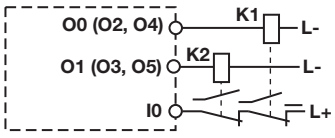
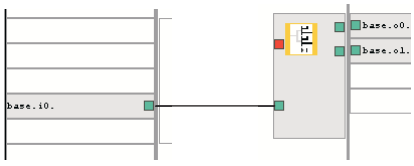
Semiconductor outputs

Redundant output		
Single output		

Relay outputs

Redundant output		
Single output		

Feedback loop

Feedback loop	Redundant output	
Contacts from external contactors		

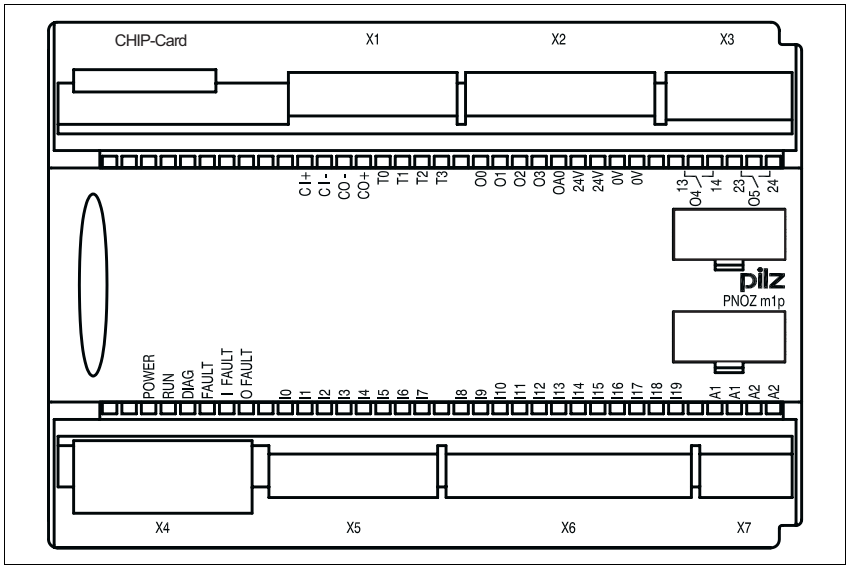
Key

S1	E-STOP pushbutton
S3	Reset button

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Base units
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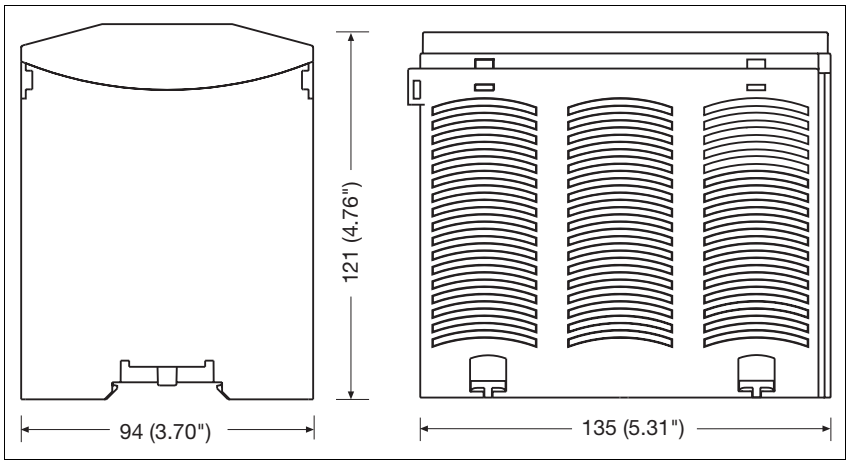
Terminal configuration



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



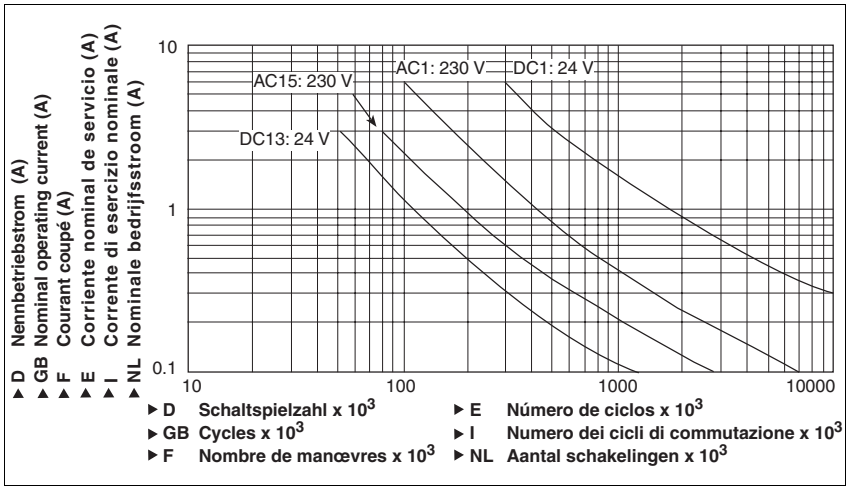
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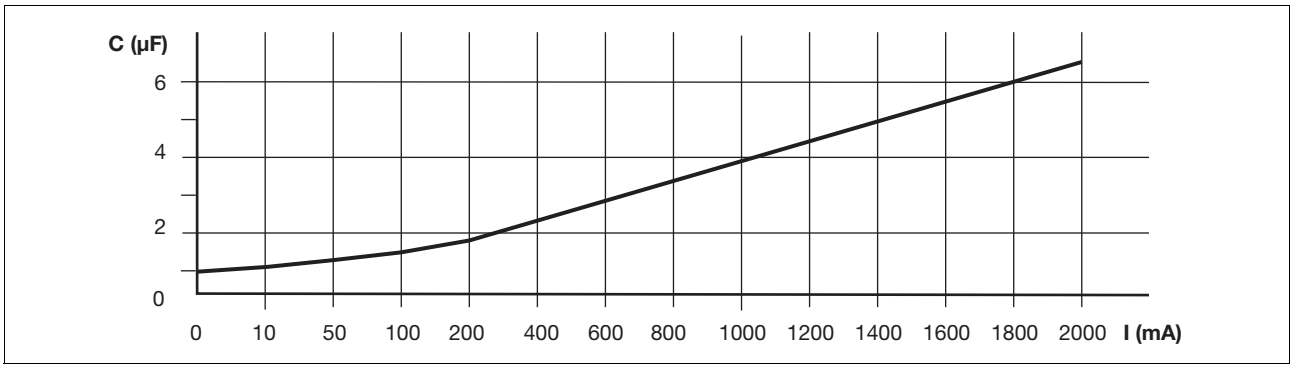
Notice

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

Service life graph



Maximum capacitive load C (µF) with load current I (mA) at the semiconductor outputs



Technical details	
Electrical data	
Supply voltage (U_B)	**24 VDC**
Voltage tolerance	**-15% ... 10%**
Power consumption at U_B without load	**Max. 8.0 W + 2.5 W per expansion module**
Residual ripple U_B	**+/- 5 %**
Times	
Switch-on delay	**5 s (after U_B is applied)**
Simultaneity channel 1/2/3	**3 s, two-hand control relay: 0.5 s**
Supply interruption before de-energisation	**Min. 20 ms**
Inputs	
Number	**20**
Voltage and current	**24 VDC/8 mA**
Galvanic isolation	**No**
Cascading input	**500 VAC**
Signal level at “0”	**-3 ... +5 VDC**
Signal level at “1”	**15 ... 30 VDC**

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Base units
PNOZ m1p

Inputs	
Input delay	**0.6 ... 4 ms**
Status indicator	**LED**
Pulsed outputs	
Number	**4**
Voltage and current	**24 VDC/0.5 A**
Off time during self test	**< 5 ms**
Galvanic isolation	**No**
Short circuit protection	**Yes**
Status indicator	**LED**
Semiconductor outputs	
Number for EN 954-1, 12/96, Cat. 4 for EN 954-1, 12/96, Cat. 3	 **2** **4**
Switching capability	**24 VDC / max. 2 A / max. 48 W**
Max. capacitive load	**See diagram**
External supply voltage (U_B)	**24 VDC**
Voltage tolerance	**-15% - 10%**
Off time during self test	**< 300 µs**
Galvanic isolation	**Yes**
Short circuit protection	**Yes**
Switch-off delay	**< 30 ms**
Residual current at “0”	**< 0.5 mA**
Signal level at “1”	**U_B - 0.5 VDC at 2 A**
Status indicator	**LED**
Relay outputs	
Number for EN 954-1, 12/96, Cat. 4 for EN 954-1, 12/96, Cat. 2	 **1** **2**
Utilisation category in accordance with EN 60947-4-1, 02/01 EN 60947-5-1, 11/97	 **AC1: 240 V / 6 A / 1440 VA** **DC1: 24 V / 6 A / 144 W** **AC15: 230 V / 3 A / 690 VA** **DC13: 24 V / 3 A / 72 W**
Contact fuse protection in accordance with EN 60947-5-1, 08/00 Blow-out fuse Circuit breaker 24 VDC	 **6 A quick or slow** **6 A (characteristic B + C)**
Switch-off delay	**50 ms**
Status indicator	**LED**
Auxiliary outputs	
Number	**1**
Voltage and current	**24 VDC / max. 0.5 A / max. 12 W**
External supply voltage (U_B)	**24 VDC**
Voltage tolerance	**-15% ... +10%**
Galvanic isolation	**Yes**
Short circuit protection	**Yes**
Residual current at “0”	**< 0.5 mA**
Signal level at “1”	**U_B - 0.5 VDC at 0.5 A**
Status indicator	**LED**
Cascading output as auxiliary output	
Number	**1**
Voltage and current	**24 VDC / max. 0.2 A / max. 4.8 W**
Galvanic isolation	**No**
Short circuit protection	**Yes**
Residual current at “0”	**< 0.5 mA**

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Base units
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Environmental data	
Airgap creepage between	**DIN VDE 0110-1, 04/97**
relay contacts	**3 mm**
Relay contacts and other safe circuits	**5.5 mm**
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**
EMC	**EN 60947-5-1, 01/00**
Ambient temperature	
With UL approval	**0 ... + 55 °C**
Without UL approval (with forced convection)	**0 ... + 60 °C**
Storage temperature	**-25 ... + 70 °C**
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**
Maximum cable runs	
Per input	**1 km**
Sum of individual cable runs at the test pulse output	**40 km**
Cable cross section	
Rigid single-core, flexible multi-core or multi-core with crimp connector	
Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1)	
auxiliary output (X2), cascading output	**0.5 ... 1.5 mm2**
Relay outputs (X3)	**0.5 ... 2.5 mm2**
Flexible multi-core with plastic sleeve	
Relay outputs (X3)	**0.5 ... 1.5 mm2**
Torque setting for connection terminals (screws)	
Power supply (X7), inputs (X5, X6), semiconductor outputs (X2), test pulse outputs (X1),	
auxiliary output (X2), cascading output	**0.2 ... 0.25 Nm**
Relay outputs (X3)	**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 135 x 121 mm**
Weight with connector	**530 g**

Order reference

Type	Features	Order no.
PNOZ m1p	Base unit	773 100

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