

Up to PL e of EN ISO 13849-1 PNOZ V



Safety relay for monitoring E-STOP pushbuttons

Approvals

	PNOZ V
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Unit features

- ▶ Positive-guided relay outputs:
 - 3 safety contacts (N/O), instantaneous
 - 1 safety contact (N/O), delay-on de-energisation
 - 1 auxiliary contact (N/C), instantaneous
- ▶ Connection options for:
 - E-STOP pushbutton
 - Safety gate limit switch
- ▶ Delay-on de-energisation, fixed or adjustable
- ▶ LED indicator for:
 - Switch status channel 1/2
 - Supply voltage
- ▶ See order reference for unit types

Safety features

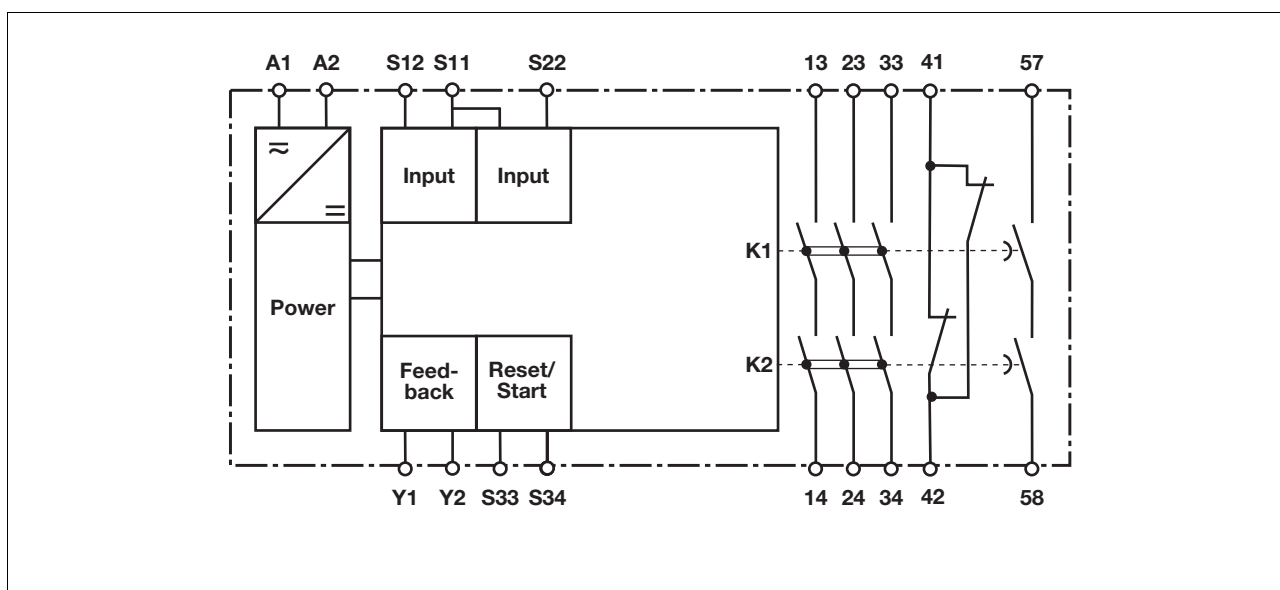
- The relay meets the following safety requirements:
- ▶ The circuit is redundant with built-in self-monitoring.
 - ▶ The safety function remains effective in the case of a component failure.
 - ▶ The correct opening and closing of the safety function relays is tested automatically in each on-off cycle.
 - ▶ The unit has an electronic fuse.

Unit description

The safety relay meets the requirements of EN 60947-5-1, EN 60204-1 and VDE 0113-1 and may be used in applications with

- ▶ E-STOP pushbuttons
- ▶ Safety gates

Block diagram

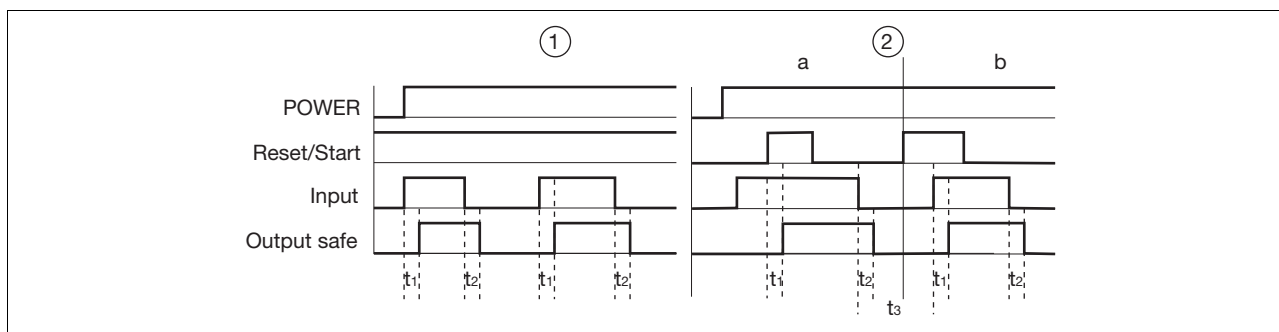


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Function description

- ▶ Single-channel operation: no redundancy in the input circuit, earth faults in the reset circuit are detected.
- ▶ Dual-channel operation without detection of shorts across contacts:
 - earth faults in the reset and input circuit,
 - short circuits in the input circuit and, with a monitored reset, in the reset circuit too.
- ▶ Automatic start: Unit is active once the input circuit has been closed.
- ▶ Manual reset: Unit is active once the input circuit is closed and then the reset circuit is closed.

Timing diagram



Key

- ▶ Power: Supply voltage
- ▶ Reset/Start: Reset circuit S33-S34
- ▶ Input: Input circuits S11-S12
- ▶ Output safe: Safety contacts
- ▶ ①: Automatic reset
- ▶ ②: Manual reset
- ▶ a: Input circuit closes before reset circuit
- ▶ b: Reset circuit closes before input circuit
- ▶ t_1 : Switch-on delay
- ▶ t_2 : Delay-on de-energisation
- ▶ t_3 : Recovery time

Wiring

Please note:

- ▶ Information given in the “Technical details” must be followed.
- ▶ Outputs 13-14, 23-24, 33-34, 57-58 are delay-on de-energisation safety contacts.
- ▶ To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- ▶ Calculation of the max. cable runs I_{max} in the input circuit:

$$I_{max} = \frac{R_{lmax}}{R_l / km}$$

R_{lmax} = max. overall cable resistance (see technical details)
 R_l / km = cable resistance/km

- ▶ Use copper wire that can withstand 60/75 °C.
- ▶ Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.

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Preparing for operation

► Supply voltage

Supply voltage	AC	DC

► Input circuit

Input circuit	Single-channel	Dual-channel
E-STOP without detection of shorts across contacts		
Safety gate without detection of shorts across contacts		

► Reset circuit

Reset circuit	E-STOP wiring (single-channel, dual-channel) Safety gate (single-channel)	Safety gate (dual-channel)
Automatic reset		
Manual reset		

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► Feedback circuit

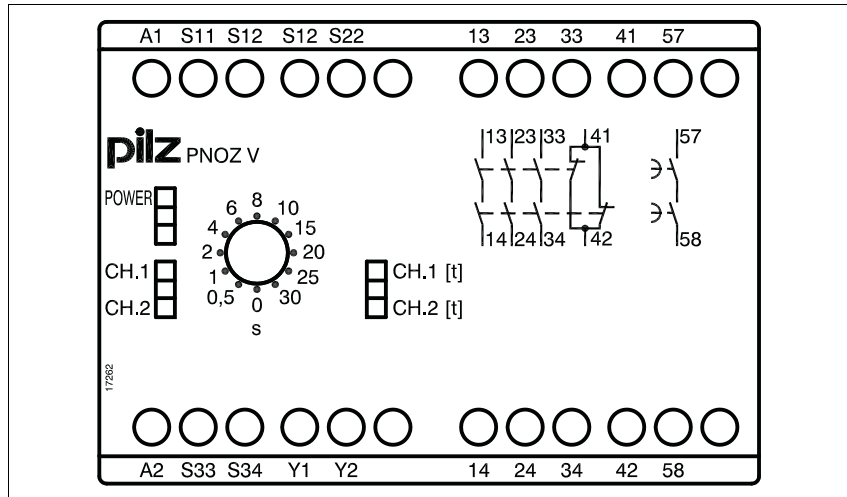
Feedback circuit	without feedback loop	with feedback loop
Link or contacts from external contactors		

► Key

S1	E-STOP pushbutton
S3	Reset button
	Switch operated
	Gate open
	Gate closed

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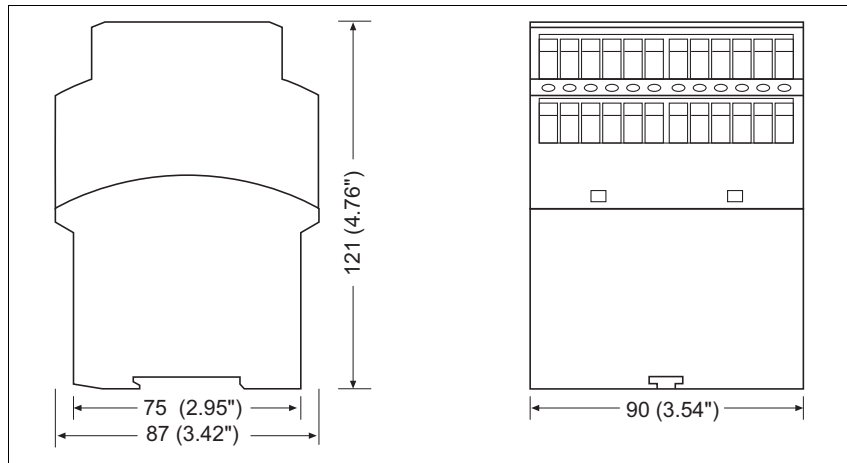
Terminal configuration



Installation

- ▶ The safety relay should be installed in a control cabinet with a protection type of at least IP54.
- ▶ Use the notch on the rear of the unit to attach it to a DIN rail.
- ▶ Ensure the unit is mounted securely on a vertical DIN rail (35 mm) by using a fixing element (e.g. retaining bracket or an end angle).

Dimensions

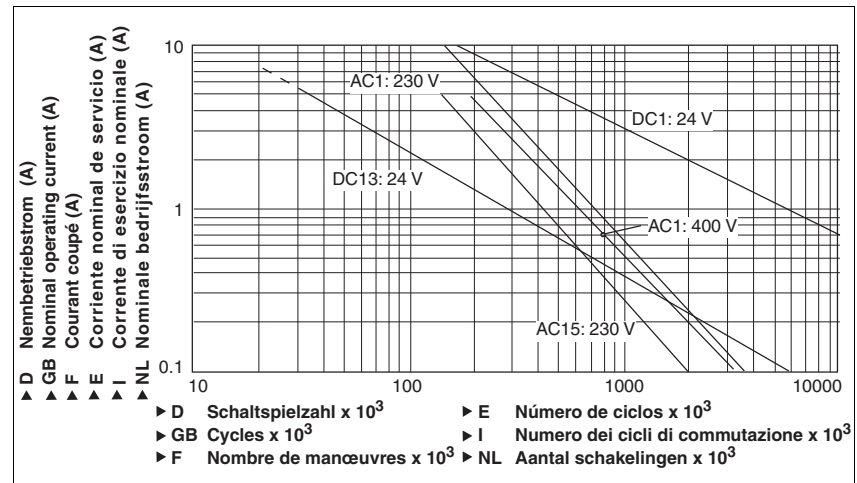


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Notice

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



Technical details

Electrical data

Supply voltage	
Supply voltage U_B DC	24 V
Voltage tolerance	-15 %/+10 %
Power consumption at U_B DC	5.0 W
Residual ripple DC	160 %
Voltage and current at	
Input circuit DC: 24.0 V	50.0 mA
Reset circuit DC: 24.0 V	40.0 mA
Feedback loop DC: 24.0 V	40.0 mA
Number of output contacts	
Safety contacts (S) instantaneous:	3
Safety contacts (N/O), delayed:	1
Auxiliary contacts (N/C):	1
Utilisation category in accordance with EN 60947-4-1	
Safety contacts: AC1 at 240 V	I_{min} : 0.01 A , I_{max} : 8.0 A P_{max} : 2000 VA
Safety contacts: AC1 at 400 V	I_{min} : 0.01 A , I_{max} : 5.00 A P_{max} : 2000 VA
Safety contacts: DC1 at 24 V	I_{min} : 0.01 A , I_{max} : 8.0 A P_{max} : 200 W
Safety contacts, delayed: AC1 at 240 V	I_{min} : 0.01 A , I_{max} : 4.0 A P_{max} : 1000 VA
Safety contacts, delayed: DC1 at 24 V	I_{min} : 0.01 A , I_{max} : 4.0 A P_{max} : 100 W
Auxiliary contacts: AC1 at 240 V	I_{min} : 0.01 A , I_{max} : 8.0 A P_{max} : 2000 VA
Auxiliary contacts: DC1 at 24 V	I_{min} : 0.01 A , I_{max} : 8.0 A P_{max} : 200 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	I_{max} : 5.0 A
Safety contacts: DC13 at 24 V (6 cycles/min)	I_{max} : 7.0 A
Safety contacts, delayed: AC15 at 230 V	I_{max} : 4.0 A
Safety contacts, delayed: DC13 at 24 V (6 cycles/min)	I_{max} : 4.0 A
Auxiliary contacts: AC15 at 230 V	I_{max} : 5.0 A
Auxiliary contacts: DC13 at 24 V (6 cycles/min)	I_{max} : 7.0 A

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Electrical data	
Contact material	AgSnO ₂ + 0.2μ Au
External contact fuse protection (I _K = 1 kA) to EN 60947-5-1	
Blow-out fuse, quick	
Safety contacts:	10 A
Safety contacts, delayed:	6 A
Auxiliary contacts:	10 A
Blow-out fuse, slow	
Safety contacts:	6 A
Safety contacts, delayed:	4 A
Auxiliary contacts:	6 A
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	6 A
Safety contacts, delayed:	4 A
Auxiliary contacts:	6 A
Max. overall cable resistance R _{lmax} input circuits, reset circuits	
single-channel at U _B DC	100 Ohm
dual-channel without detect. of shorts across contacts at U _B DC	200 Ohm
Safety-related characteristic data	
PL in accordance with EN ISO 13849-1: 2006	
Safety contacts, instantaneous	PL e (Cat. 4)
Safety contacts, delayed <30 s	PL d (Cat. 3)
Safety contacts, delayed ≥30 s	PL c (Cat. 1)
Category in accordance with EN 954-1	
Safety contacts, instantaneous	Cat. 4
Safety contacts, delayed <30 s	Cat. 3
Safety contacts, delayed ≥30 s	Cat. 1
SIL CL in accordance with EN IEC 62061	
Safety contacts, instantaneous	SIL CL 3
Safety contacts, delayed <30 s	SIL CL 3
Safety contacts, delayed ≥30 s	SIL CL 1
PFH in accordance with EN IEC 62061	
Safety contacts, instantaneous	2.31E-09
Safety contacts, delayed <30 s	2.64E-09
Safety contacts, delayed ≥30 s	2.87E-09
SIL in accordance with IEC 61511	
Safety contacts, instantaneous	SIL 3
Safety contacts, delayed <30 s	SIL 3
Safety contacts, delayed ≥30 s	SIL 2
PFD in accordance with IEC 61511	
Safety contacts, instantaneous	2.03E-06
Safety contacts, delayed <30 s	1.26E-05
Safety contacts, delayed ≥30 s	4.64E-05
T _M [year] in accordance with EN ISO 13849-1: 2006	20
Times	
Switch-on delay	
with automatic reset typ.	140 ms
with automatic reset max.	200 ms
with automatic reset after power on typ.	150 ms
with automatic reset after power on max.	220 ms
with manual reset typ.	160 ms
with manual reset max.	200 ms
Delay-on de-energisation	
with E-STOP typ.	15 ms
with E-STOP max.	30 ms
with power failure typ.	50 ms
with power failure max.	100 ms

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Times	
Recovery time at max. switching frequency 1/s after E-STOP	50 ms +tv
after power failure	150 ms
Delay time t_V : selectable	0,10 s; 0,20 s; 0,30 s; 0,40 s; 0,50 s; 0,60 s; 0,70 s; 0,80 s; 1,00 s; 1,50 s; 2,00 s; 3,00 s No. 774789 0,00 s; 0,50 s; 1,00 s; 2,00 s; 4,00 s; 6,00 s; 8,00 s; 10,00 s; 15,00 s; 20,00 s; 25,00 s; 30,00 s No. 774790 0,00 s; 5,00 s; 10,00 s; 20,00 s; 40,00 s; 60,00 s; 80,00 s; 100,00 s; 150,00 s; 200,00 s; 250,00 s; 300,00 s No. 774791
Repetition accuracy	2 %
Time accuracy	-15 %/+15 % +50 ms
Simultaneity, channel 1 and 2	75 ms
Supply interruption before de-energisation	20 ms
Environmental data	
EMC	EN 60947-5-1, EN 61000-6-2
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 60947-1	
Pollution degree	2
Overvoltage category	III
Rated insulation voltage	250 V
Rated impulse withstand voltage	4.00 kV
Ambient temperature	-10 - 55 °C
Storage temperature	-40 - 85 °C
Protection type	
Mounting (e.g. cabinet)	IP54
Housing	IP40
Terminals	IP20
Mechanical data	
Housing material	
Housing	PPO UL 94 V0
Front	ABS UL 94 V0
Cross section of external conductors with screw terminals	
1 core flexible	0.20 - 4.00 mm ² , 24 - 10 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.20 - 2.50 mm ² , 24 - 14 AWG
without crimp connectors or with TWIN crimp connectors	0.20 - 2.50 mm ² , 24 - 14 AWG
Torque setting with screw terminals	0.60 Nm
Dimensions	
Height	87.0 mm
Width	90.0 mm
Depth	121.0 mm
Weight	471 g No. 774791 480 g No. 774789, 774790

No. stands for order number.

The standards current on 2008-10 apply.

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Conventional thermal current

I_{th} (A) at U_B DC

1 contact **8.00 A**

2 contacts **7.40 A**

3 contacts **6.00 A**

4 contacts **4.00 A**

Order reference

Type	Features		Terminals	Order no.
PNOZ V	24 V DC	3 s selectable	Screw terminal	774 789
PNOZ V	24 V DC	30 s selectable	Screw terminal	774 790
PNOZ V	24 V DC	300 s selectable	Screw terminal	774 791