




Category 4, EN 954-1 PNOZ Ex



Safety relay for monitoring E-STOP pushbuttons and safety gates in potentially explosive atmospheres

Approvals

	PNOZ Ex
	◆
	◆
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Unit features

- ▶ Positive-guided relay outputs:
 - 3 safety contacts (N/O), instantaneous
 - 1 instantaneous auxiliary contact (N/O) in the intrinsically safe area
 - 1 instantaneous auxiliary contact (N/O) for fusing in the intrinsically safe area
 - 1 instantaneous auxiliary contact (N/C) in the non-intrinsically safe area
- ▶ Connection options for:
 - E-STOP pushbutton
 - Safety gate limit switch
 - Reset button
- ▶ LED indicator for:
 - Switch status channel 1/2
 - Supply voltage
- ▶ Ex area II (1)GD [EEx ia] IIB/IIC
- ▶ See order reference for unit types

as (standards used: EN 50014 +A1-A2 and EN 50020).

The unit is suitable for non-contact barriers (e.g. light curtains) because a dynamic start is possible.

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 correct opening and closing of the safety function relays is tested automatically in each on-off cycle.

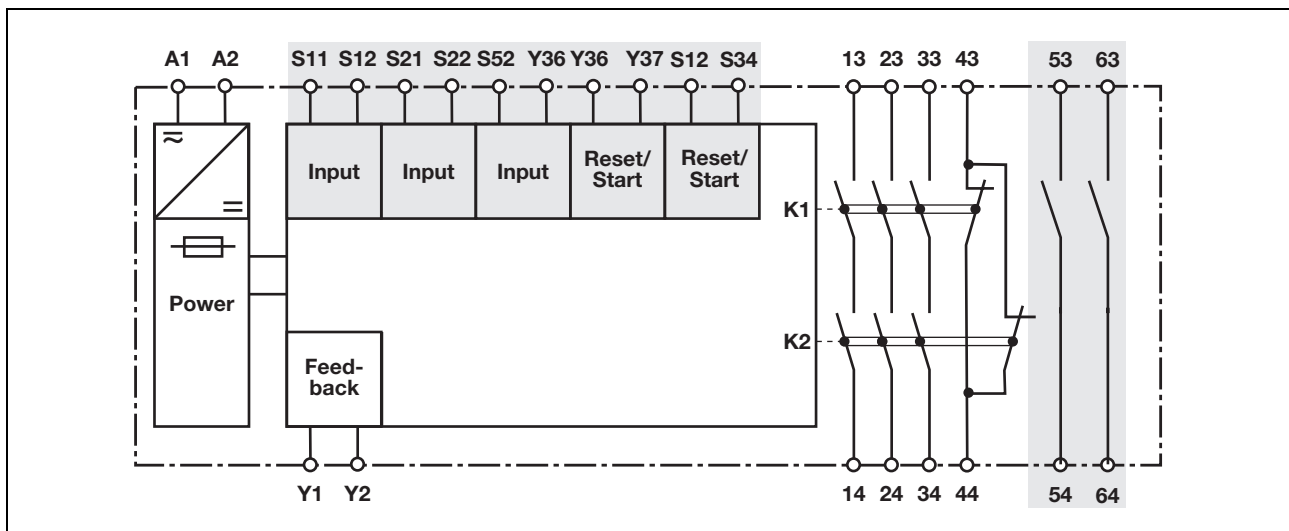
Unit description

The safety relay meets the requirements of EN 60204-1 and IEC 60204-1 and may be used in applications with

- ▶ E-STOP pushbuttons
- ▶ Safety gates

The safety relay provides an intrinsically safe output circuit and volt-free contacts for potentially explosive are-

Block diagram



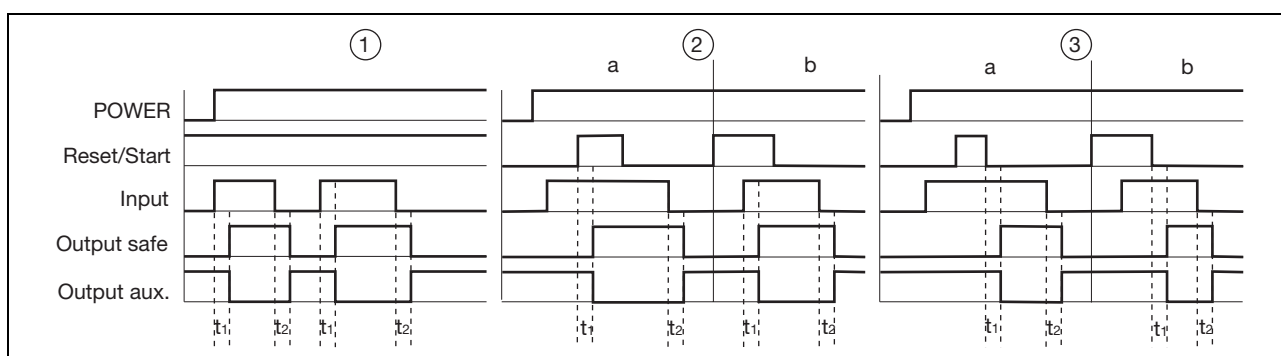
Grey area = intrinsically safe area

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Function description

- ▶ Dual-channel operation with detection of shorts across contacts: redundant input circuit, detects
 - earth faults in the reset and input circuit,
 - short circuits in the input circuit and, with a monitored reset, in the reset circuit too,
- shorts between contacts in the input circuit.
- ▶ 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.
- ▶ Monitored reset: Unit is active once
 - the input circuit is closed and then the reset circuit is closed
 - and opened again.
 - the reset circuit is closed and then opened again once the input circuit is closed.
- ▶ Increase in the number of available contacts by connecting contact expander modules or external contactors/relays.

Timing diagram



Key

- ▶ Power: Supply voltage
- ▶ Reset/start: Reset circuit S12-S34, Y36-Y37, Y1-Y2
- ▶ Input: Input circuits S11-S12, S21-S21, S52, Y36
- ▶ Output safe: Safety contacts 13-14, 23-24, 33-34
- ▶ Output aux: Auxiliary contacts 41-42, 53-54, 63-64
- ▶ ①: Automatic reset
- ▶ ②: Manual reset
- ▶ ③: Monitored reset
- ▶ a: Input circuit closes before reset circuit
- ▶ b: Reset circuit closes before input circuit
- ▶ t₁: Switch-on delay
- ▶ t₂: Delay-on de-energisation

Wiring

Please note:

- ▶ Information given in the “Technical details” must be followed.
- ▶ Outputs 13-14, 23-24, 33-34 are safety contacts, outputs 41-42, 53-54, 63-64 are auxiliary contacts (e.g. for display).
- ▶ To prevent contact welding, a fuse should be connected before the output contacts (see technical details).
- ▶ Calculation of the max. cabling runs I_{max} in the input circuit:

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

$R_{I_{max}}$ = max. overall cable resistance (see technical details)

R_l / km = cable resistance/km

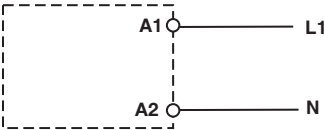

- ▶ Use copper wire that can withstand 60/75 °C.

- ▶ Sufficient fuse protection must be provided on all output contacts with capacitive and inductive loads.


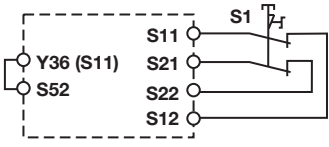

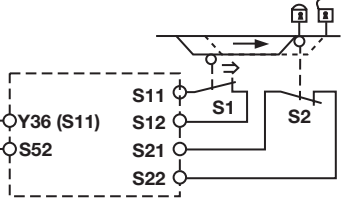
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Preparing for operation


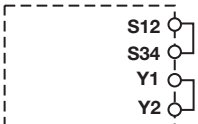
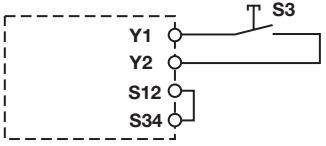
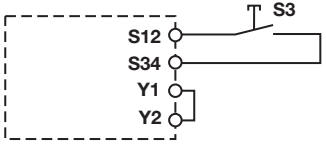
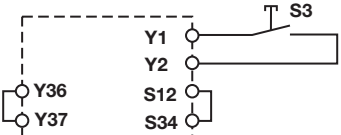
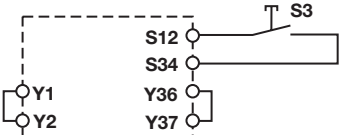
► Supply voltage

Supply voltage	AC	DC
		

► Input circuit

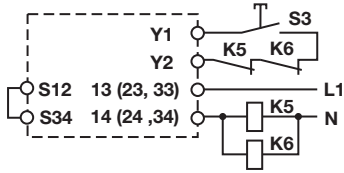
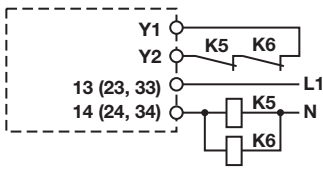
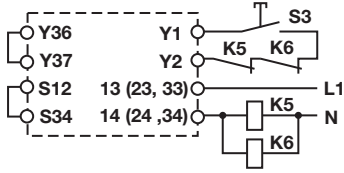
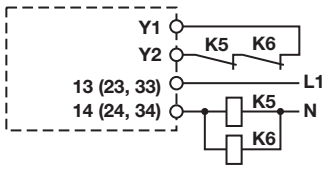
Input circuit	Single-channel	Dual-channel
E-STOP with detection of shorts across contacts		
Safety gate with detection of shorts across contacts		

► Reset circuit




Reset circuit	Reset from the non-intrinsically safe area	Reset from the intrinsically safe area
Automatic reset		
Manual reset		
Monitored reset		

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► Feedback loop

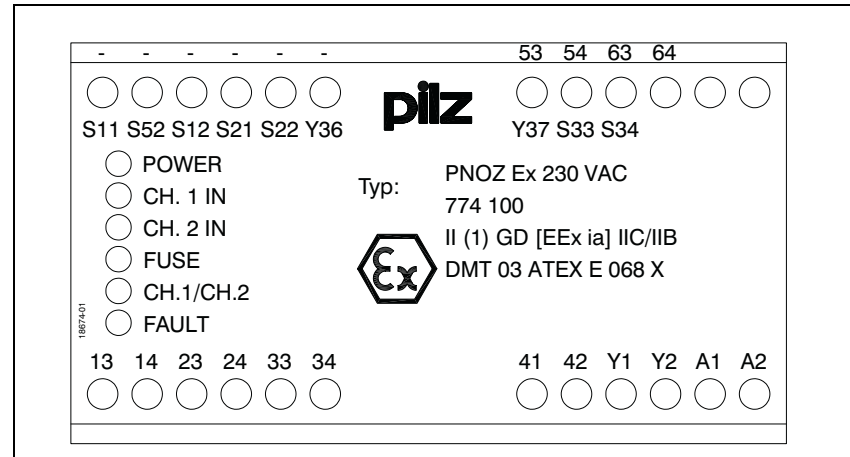
Feedback loop	Reset from the non-intrinsically safe area	Reset from the intrinsically safe area
Contacts from external contactors (manual reset)		
Contacts from external contactors (monitored reset)		

► Key

S1/S2	E-STOP pushbutton/ safety gate switch
S3	Reset button
	Switch operated
	Gate open
	Gate closed

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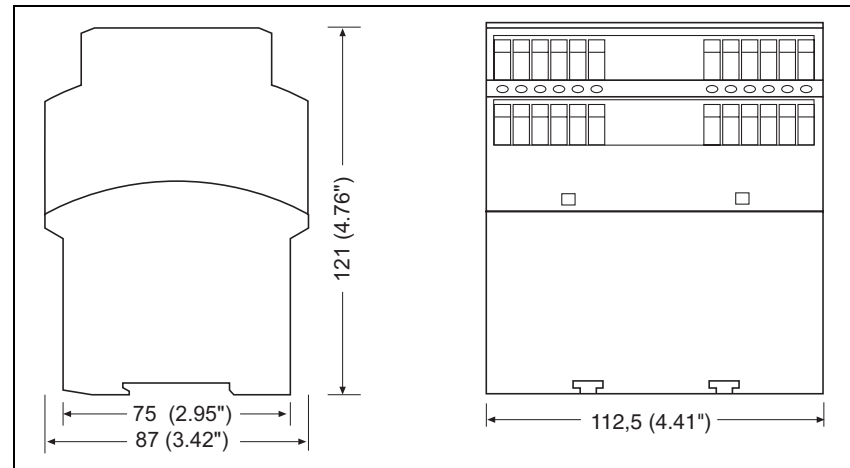
Terminal configuration



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).
- ▶ Always install the unit outside the potentially explosive area. Only the intrinsically safe output circuit (terminals S11, S12, S21, S22, S34, S52, Y36, Y37 and GND) and the volt-free contacts (terminals 53, 54 and 63, 64) may be brought into the potentially explosive area.
- ▶ Air gaps between uninsulated parts of intrinsically safe circuits and earthed metal parts must be a minimum of 3 mm; air gaps between uninsulated parts of intrinsically safe circuits and uninsulated parts of non-intrinsically safe circuits must at least conform with the values required in Table 4, Amendment 4 of EN 50020

Dimensions

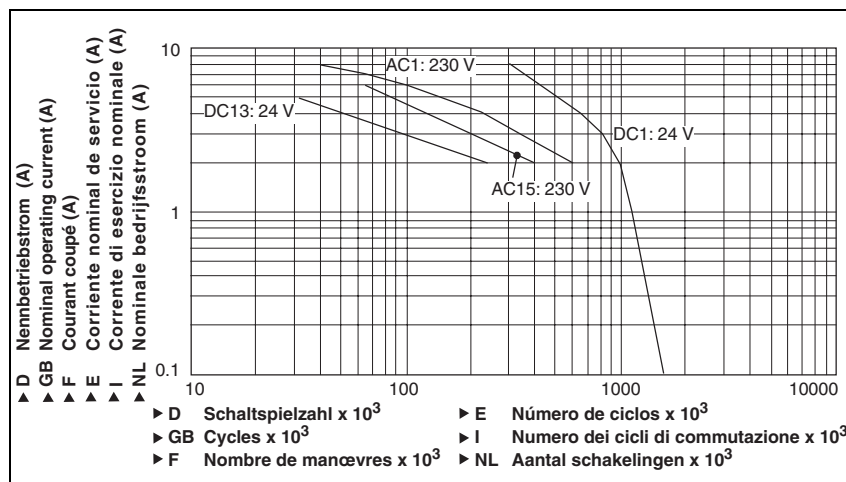


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Notice

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 AC	115 V, 120 V, 230 V
Voltage tolerance	-15 %/+10 %
Power consumption at U _B AC	8.0 VA
Frequency range AC	50 - 60 Hz
Voltage and current at input circuit DC: 6.0 V	25.0 mA
reset circuit DC: 6.0 V	15.0 mA
feedback loop DC: 24.0 V	20.0 mA
Output contacts in accordance with EN 954-1 Category 4	Safety contacts (N/O): 3 Auxiliary contacts, intrinsically safe (N/O): 2 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} : 4.00 A P _{max} : 1000 VA
Safety contacts: DC1 at 24 V	I _{min} : 0.01 A , I _{max} : 2.0 A P _{max} : 48 W
Auxiliary contacts (intrinsically safe): DC1 at 30 V	I _{min} : 0.01 A , I _{max} : 0.5 A P _{max} : 10 W
Auxiliary contacts: AC1 at 240 V	I _{min} : 0.01 A , I _{max} : 4.0 A P _{max} : 1000 VA
Auxiliary contacts: DC1 at 24 V	I _{min} : 0.01 A , I _{max} : 2.0 A P _{max} : 48 W
Utilisation category in accordance with EN 60947-5-1	
Safety contacts: AC15 at 230 V	I _{max} : 4.0 A
Safety contacts: DC13 at 24 V (6 cycles/min)	I _{max} : 2.0 A
Auxiliary contacts: AC15 at 230 V	I _{max} : 4.0 A
Auxiliary contacts: DC13 at 24 V (6 cycles/min)	I _{max} : 2.0 A
Contact material	AgSnO2 + 0.2 µm Au

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Electrical data	
External contact fuse protection to EN 60947-5-1	
Blow-out fuse, quick	
Safety contacts:	4 A
Auxiliary contacts:	4 A
Blow-out fuse, slow	
Safety contacts:	4 A
Auxiliary contacts:	4 A
Circuit breaker 24 VAC/DC, characteristic B/C	
Safety contacts:	4 A
Auxiliary contacts:	4 A
Max. overall cable resistance R_{lmax} input circuits, reset circuits	
single-channel at U_B AC	40 Ohm
dual-channel without detect. of shorts across contacts at U_B AC	80 Ohm
dual-channel with detect. of shorts across contacts at U_B AC	15 Ohm
Max. line capacitance	
EX IIB	2 μF
EX IIC	1 μF
Max. line inductance	
EX IIB	200 μH
EX IIC	100 μH
Times	
Switch-on delay	
with automatic reset typ.	150 ms
with automatic reset max.	200 ms
with automatic reset after power on typ.	165 ms
with automatic reset after power on max.	210 ms
with manual reset typ.	145 ms
with manual reset max.	200 ms
with monitored reset typ.	115 ms
with monitored reset max.	150 ms
Delay-on de-energisation	
with E-STOP typ.	10 ms
with E-STOP max.	30 ms
with power failure typ.	110 ms
with power failure max.	150 ms
Recovery time at max. switching frequency 1/s	
after E-STOP	50 ms
after power failure	200 ms
Min. start pulse duration with a monitored reset	30 ms
Simultaneity, channel 1 and 2	150 ms
Supply interruption before de-energisation	35 ms
Environmental data	
EMC	EN 60947-5-1, EN 61000-6-2
Vibration in accordance with EN 60068-2-6	
Frequency	10 - 55 Hz
Amplitude	0.35 mm
Climatic suitability	EN 60068-2-78
Airgap creepage	VDE 0110-1
Ambient temperature	-20 - 55 °C
Storage temperature	-40 - 85 °C
Protection type	
Mounting (e.g. control cabinet)	IP54
Housing	IP40
Terminals	IP20

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Mechanical data

Housing material	
Housing	PPO UL 94 V0
Front	ABS UL 94 V0
Max. cross section of external conductors with screw terminals	
1 core flexible	0.20 - 4.00 mm² , 24 - 10 AWG
2 core, same cross section, flexible:	
with crimp connectors, without insulating sleeve	0.20 - 2.50 mm² , 24 - 14 AWG
without crimp connectors or with TWIN crimp connectors	0.20 - 2.50 mm² , 24 - 14 AWG
Torque setting with screw terminals	0.60 Nm
Dimensions	
Height	87.0 mm
Width	112.5 mm
Depth	121.0 mm
Weight	720 g

The standards current on **05/04** apply.

Order reference

Type	Features	Terminals	Order no.
PNOZ Ex	230 VAC	Screw terminals	774 100
PNOZ Ex	115 VAC	Screw terminals	774 104
PNOZ Ex	120 VAC	Screw terminals	774 105