



## PNOZ e3vp

**PILZ**  
THE SPIRIT OF SAFETY

► Safety relays

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SD means Secure Digital

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## Introduction

### Validity of documentation

This documentation is valid for the product PNOZ e3vp. It is valid until new documentation is published.

This operating manual explains the function and operation, describes the installation and provides guidelines on how to connect the product.

### Using the documentation

This document is intended for instruction. Only install and commission the product if you have read and understood this document. The document should be retained for future reference.

### Definition of symbols

Information that is particularly important is identified as follows:



#### **DANGER!**

This warning must be heeded! It warns of a hazardous situation that poses an immediate threat of serious injury and death and indicates preventive measures that can be taken.



#### **WARNING!**

This warning must be heeded! It warns of a hazardous situation that could lead to serious injury and death and indicates preventive measures that can be taken.



#### **CAUTION!**

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.



#### **NOTICE**

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken. It also highlights areas within the text that are of particular importance.

**INFORMATION**

This gives advice on applications and provides information on special features.


**Safety****Intended use**

The safety relay PNOZ e3vp provides a safety-related interruption of a safety circuit.

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

- ▶ the safety sensors PSEN 2.1p-10 and PSEN 2.1p-11 in safety circuits in accordance with EN 60947-5-3:2005, PDF-M
- ▶ as an evaluation device for position switches with N/C/N/O combination

The following is deemed improper use in particular

- ▶ Any component, technical or electrical modification to the product,
- ▶ Use of the product outside the areas described in this manual,
- ▶ Use of the product outside the technical details (see [Technical details](#)  27]).

**NOTICE****EMC-compliant electrical installation**

The product is designed for use in an industrial environment. The product may cause interference if installed in other environments. If installed in other environments, measures should be taken to comply with the applicable standards and directives for the respective installation site with regard to interference.

## Safety regulations

### Safety assessment

Before using a device, a safety assessment in accordance with the Machinery Directive is required.

The product as an individual component fulfils the functional safety requirements in accordance with EN ISO 13849 and EN 62061. However, this does not guarantee the functional safety of the overall plant/machine. To achieve the relevant safety level of the overall plant/machine's required safety functions, each safety function needs to be considered separately.

### Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by persons who are competent to do so.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. To be able to inspect, assess and operate devices, systems and machines, the person has to be informed of the state of the art and the applicable national, European and international laws, directives and standards.

It is the company's responsibility only to employ personnel who

- ▶ Are familiar with the basic regulations concerning health and safety / accident prevention,
- ▶ Have read and understood the information provided in the section entitled Safety
- ▶ Have a good knowledge of the generic and specialist standards applicable to the specific application.

### Warranty and liability

All claims to warranty and liability will be rendered invalid if

- ▶ The product was used contrary to the purpose for which it is intended,
- ▶ Damage can be attributed to not having followed the guidelines in the manual,
- ▶ Operating personnel are not suitably qualified,
- ▶ Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering work etc.).

### Disposal

- ▶ In safety-related applications, please comply with the mission time  $T_M$  in the safety-related characteristic data.
- ▶ When decommissioning, please comply with local regulations regarding the disposal of electronic devices (e.g. Electrical and Electronic Equipment Act).

### Unit features

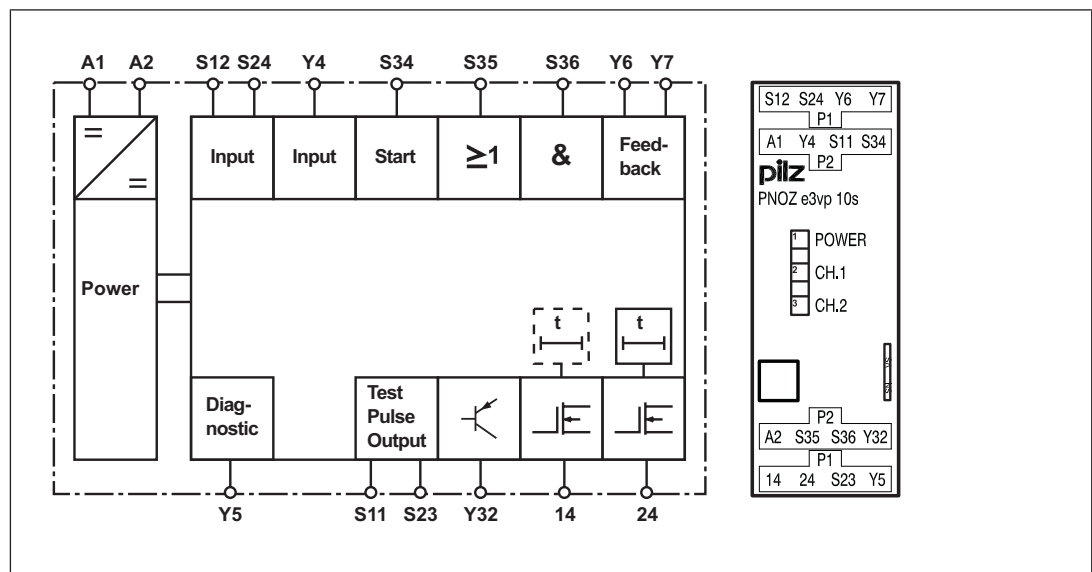
- ▶ Outputs using semiconductor technology:
  - 1 safety output, either instantaneous or delayed
  - 1 safety output, delayed
  - 1 auxiliary output
  - 2 test pulse outputs
- ▶ Connection options:
  - Safety sensors PSEN 2.1p-10 and PSEN 2.1p-11
  - Position switch with N/C / N/O combination
- ▶ Selectable delay time
- ▶ LED display for:
  - Supply voltage
  - Switch state of safety outputs
- ▶ 2 logic inputs (AND/OR) for logic connections between several units
- ▶ Feedback loop for monitoring external contactors
- ▶ Detection of shorts across contacts via test pulse outputs

### Safety features

The relay meets the following safety requirements:

- ▶ The circuit is redundant with built-in self-monitoring.
- ▶ The safety device remains effective in the case of a component failure.
- ▶ The safety outputs are tested periodically using an off-test.

### Block diagram/terminal configuration






## Function description

When supply voltage is applied and the set operating mode is detected (initialisation phase), the "POWER" LED is lit. The unit is ready for operation when the feedback loops are closed.

- ▶ Input circuit: Contact at S12 closed and contact at S24 open (e.g. safety gate closed)
  - There are high signals at safety outputs 14 and 24 and auxiliary output Y32.
  - LEDs "CH.1" and "CH.2" are lit.
- ▶ Input circuit: Contact at S12 open and contact at S24 closed (e.g. safety gate open)
  - There are low signals at safety output 14 and auxiliary output Y32.
  - LED "CH.1" goes out.
  - There is a low signal at safety output 24 once the set delay time has elapsed.
  - LED "CH.2" goes out.

Safety output 14 can also be delayed (see [Logic input S35 and S36](#)  16]).




### NOTICE

There is a low signal at the delayed safety output, at the latest after the set delay time + 40 ms + 10 % of the set value, even in the case of a component failure.

## Feedback loop

Before a safety output is switched on, a test is run to establish whether the contacts at feedback loop inputs Y6 and Y7 are closed. If a contact is open, an error is detected and LEDs CH.1 and CH.2 will flash alternately. It will not be possible to switch the unit back on until the feedback loops are closed and the safety function has been reset.

The feedback loop contacts are also checked when the signal at the output changes from high to low. After this signal change, the contacts at the feedback loop inputs must close within 150 ms. If a contact is still open after 150 ms has elapsed, an error is detected and is displayed as a flashing code 1,8 (see [Faults – Interference](#)  22]). It will not be possible to switch the unit back on until the error has been rectified and the supply voltage has been switched off and then on again.

## AND/OR connection

The PNOZ e3vp has two logic inputs S35 (OR) and S36 (AND) for logic connections between several units.

### Operating modes

- ▶ Dual-channel operation: Earth faults in the input circuit and shorts between the input circuit contacts will be detected.
- ▶ Automatic start: Unit becomes active once the contact at S12 has been closed and the contact at S24 has been opened in the input circuit.
- ▶ Monitored start: Unit is not active until the start button has been operated and then released.
- ▶ The start-up test prevents automatic restarting after a power failure and subsequent return of voltage. The unit checks whether safety gates that are closed have been opened and then closed again when supply voltage is applied.
- ▶ Increase in the number of available contacts by connecting contact expansion modules or external contactors/relays.

### Installation



#### CAUTION!


**Electrostatic discharge can damage components on the safety system!**

Ensure against discharge before touching the safety system, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.

- ▶ The unit 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 (35 mm).
- ▶ When installed vertically: Secure the unit by using a fixing element (e.g. retaining bracket or end angle).



#### NOTICE

If you are connecting several units logically, please note the guidelines in the section entitled [Logic connection between several units](#) [ 15].

## Wiring

Please note:

- ▶ Information given in the "[Technical details \[27\]](#)" must be followed.
- ▶ Use copper wiring with a temperature stability of 60/75 °C.
- ▶ To prevent EMC interferences (particularly common-mode interferences) the measures described in EN 60204-1 must be executed. This includes the separate routing of cables of the control circuits (input, start and feedback loop) from other cables for energy transmission or the shielding of cables, for example.
- ▶ Calculation of the max. cable length  $l_{\max}$  in the input circuit:

$$l_{\max} = \frac{R_{l_{\max}}}{R_l / \text{km}}$$

$R_{l_{\max}}$  = max. overall cable resistance (see [Technical details \[27\]](#))

$R_l / \text{km}$  = cable resistance/km

- ▶ Cables that have to be laid outside the control cabinet must be protected from mechanical damage, e.g. by installing them in a conduit.
- ▶ The unit and the input circuits must always be supplied by a single power supply.
- ▶ Safety outputs 14 and 24 should exclusively be used for safe applications.
- ▶ The safety outputs must **not** be connected to control inputs.
- ▶ To suppress the pulse on switching off at safety outputs 14 and 24, use the terminal block with filter (see [Order reference \[35\]](#)).
- ▶ You must comply with the idling capacity at safety outputs 14 and 24 (see [Technical details \[27\]](#)).
- ▶ Output Y32 is an auxiliary output, e.g. for communication with a PLC or text display.
- ▶ Auxiliary output Y32 should **not** be used for safety circuits!
- ▶ Only contactors with positive-guided contacts should be used for safety functions.
- ▶ Use freewheel diodes to drive inductive loads (e.g. contactors or relays) with the safety/auxiliary outputs.
- ▶ When connecting magnetically operated, reed proximity switches, ensure that the max. peak inrush current (on the input circuit) does not overload the proximity switch.
- ▶ The power supply must comply with the regulations for extra low voltages with protective electrical separation (SELV, PELV) in accordance with VDE 0100, Part 410.
- ▶ Terminal Y5 is provided for Pilz-internal diagnostic purposes.

## Preparing for operation

### Supply voltage

| Supply voltage | AC | DC |
|----------------|----|----|
|                |    |    |

### Input circuit

Connect the N/C and N/O contact from the trigger element to the input circuit.

The table describes how the input circuit is wired when the unit is used individually (without logic input). If units are linked together logically, Y4 must be wired as described in the table in the section entitled "[Logic connection between several units](#) [ 17]".

| Input circuit                               | Dual-channel |
|---|--------------|
| without detection of shorts across contacts |              |
| with detection of shorts across contacts    |              |

### Start circuit

|                                   | Automatic start | Monitored start |
|-----------------------------------|-----------------|-----------------|
| Safety gate without start-up test |                 |                 |
| Safety gate with start-up test    |                 |                 |

**NOTICE****With a delayed safety output 24, operation of the start button is saved.**

If the safety function is cancelled while the delay time is running (e.g. safety gate closed) and the start button is operated, then the unit will be active immediately once the delay time has elapsed.

**NOTICE****With automatic start**

The unit starts up automatically when the safeguard is reset, e.g. when the E-STOP pushbutton is released. Use external circuit measures to prevent an unexpected restart.

**Feedback loop/delay time**

Terminals Y6 and Y7 are used to connect the feedback loops and also to define the delay time of safety output 24.

**Connect feedback loop:**

The unit has two feedback loop inputs, one (Y6) for safety output 14 and one (Y7) for safety output 24:

- ▶ Safety output 14 (instantaneous):  
Connect the contacts from external contactors to terminal Y6.
- ▶ Safety output 24 (delayed):  
Connect the contacts from external contactors to terminal Y7.
- ▶ Both safety outputs instantaneous or both safety outputs delayed:  
Connect the contacts from both external contactors in series to terminal Y6 or Y7.
- ▶ Feedback loop unconnected:  
If you do not wish to connect any contacts to the feedback loop, Y6 and Y7 must be connected to A1 or S11/S23, depending on the required delay time.

**CAUTION!**

Do **not** connect the contacts from external contactors in series to the start circuit.

**Set delay time:**

Set the delay time  $t_v$  by connecting Y6 and Y7 to terminals A1, S11 and S23 in accordance with the table.

|                                |    |      |     |     |     |     |     |     |     |
|--------------------------------|----|------|-----|-----|-----|-----|-----|-----|-----|
| Y6                             | A1 | A1   | A1  | S11 | S11 | S11 | S23 | S23 | S23 |
| Y7                             | A1 | S11  | S23 | A1  | S11 | S23 | A1  | S11 | S23 |
| $t_v$ [s] with PNOZ e3vp 10 s  | 0  | 0.15 | 0.5 | 1   | 2   | 3   | 5   | 7   | 10  |
| $t_v$ [s] with PNOZ e3vp 300 s | 0  | 15   | 25  | 50  | 100 | 150 | 200 | 250 | 300 |

**Examples:**

If you wish to set a delay time of 1 s for the unit type PNOZ e3vp 10 s, connect Y6 to S11 and Y7 to A1. If you wish to set a delay time of 100 s for the unit type PNOZ e3vp 300 s, connect Y6 to S11 and Y7 to S11.

**Examples**

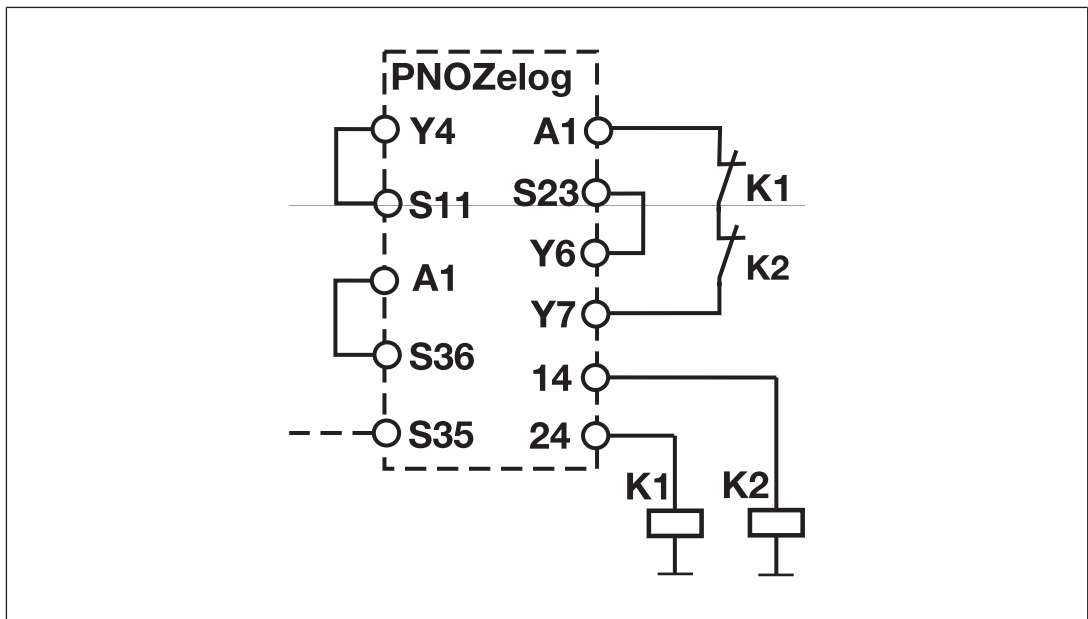
► Example 1:

Both outputs are delayed (bridge A1-S36)

PNOZ e3vp **10**:  $t_v = 5$  s

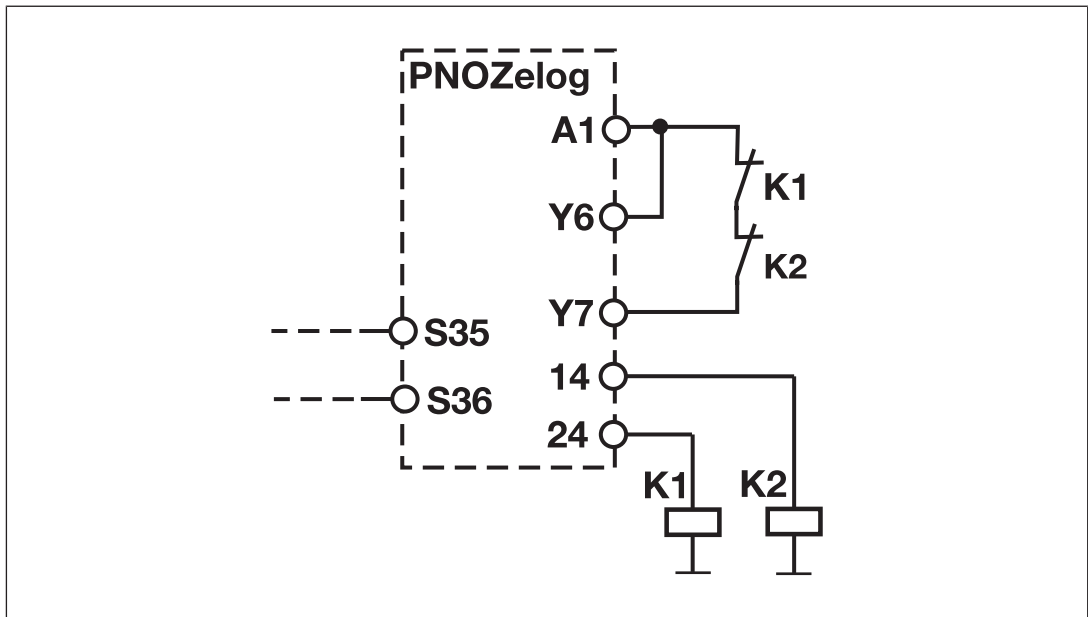
PNOZ e3vp **300**:  $t_v = 200$  s

Feedback loop is connected to Y7. Only a logic OR connection is possible with this wiring.



► Example 2:

Both outputs are instantaneous, the feedback loop is connected to Y7. This wiring enables a logic AND and an OR connection.



### Logic connection between several units

Units from the PNOZelog product range can be logically connected to each other and to units from the PNOZmulti product range. On the PNOZelog, input S35 is intended for the logic OR connection and input S36 for the logic AND connection. Safety outputs 14 and 24 on the PNOZelog are suitable for logic connections.

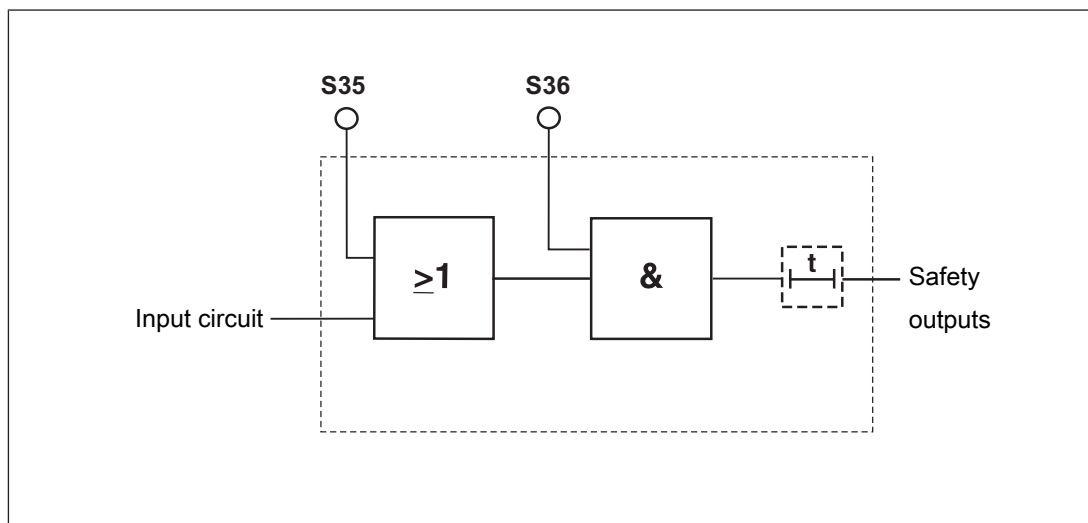
#### When linking several units logically, please note:

- When PNOZelog units are linked logically to each other, a safety output from a PNOZelog unit may be connected to logic inputs from one or more PNOZelog units.
- When linking PNOZelog units logically to PNOZmulti units
  - a cascading output from PNOZmulti units may be connected to logic inputs on PNOZelog units
  - or
  - a safety output from PNOZelog units may be connected to cascading inputs on PNOZmulti units.
- The unit with the lowest SIL/PL value determines the SIL/PL value of the entire circuit.
- PNOZ e1p, PNOZ e8.1p: These units do not have logic inputs. Their safety outputs can be used to logically link the units to the logic inputs of other PNOZelog units or to the cascading inputs from PNOZmulti units.
- Safety outputs from the PNOZ e1p are suitable for logic connections from unit version 3.0.
- Each safety output on a PNOZelog unit that is connected to the load may also be connected to the logic inputs of a maximum of four PNOZelog units (Example 1 [18]).
- Up to 50 logic inputs from PNOZelog units can be connected to safety outputs with no load.

- ▶ Logically linking the units leads to delays when switching on and off (see on-delay and response time in the [Technical details](#) [27]). These are added up with each unit that is logically linked ([Example 3](#) [20]).
- ▶ Install all the logically linked units in the same control cabinet or ensure that faults regarding the units' connection are excluded, e.g. via protected installation of the connection cables.
- ▶ All linked units must be connected to the same supply voltage.

### Logic input S35 and S36

The logic inputs are connected to each other as follows:





Logic inputs S35 and S36 from the PNOZ e3vp enable additional PNOZelog or PNOZmulti units to be logically AND/OR connected.

| Input circuit                                      | Logic AND + OR connection | Logic AND connection | Logic OR connection |
|--|---------------------------|----------------------|---------------------|
| <b>without</b> detection of shorts across contacts |                           |                      |                     |
| <b>with</b> detection of shorts across contacts    |                           |                      |                     |
| Safety output 14 delayed                           | /                         |                      |                     |

\*1 Where units are linked logically, Y4 must be wired as shown here (differs from the portrayal on the input circuit).

### Examples



#### WARNING!

#### Muting the safety function

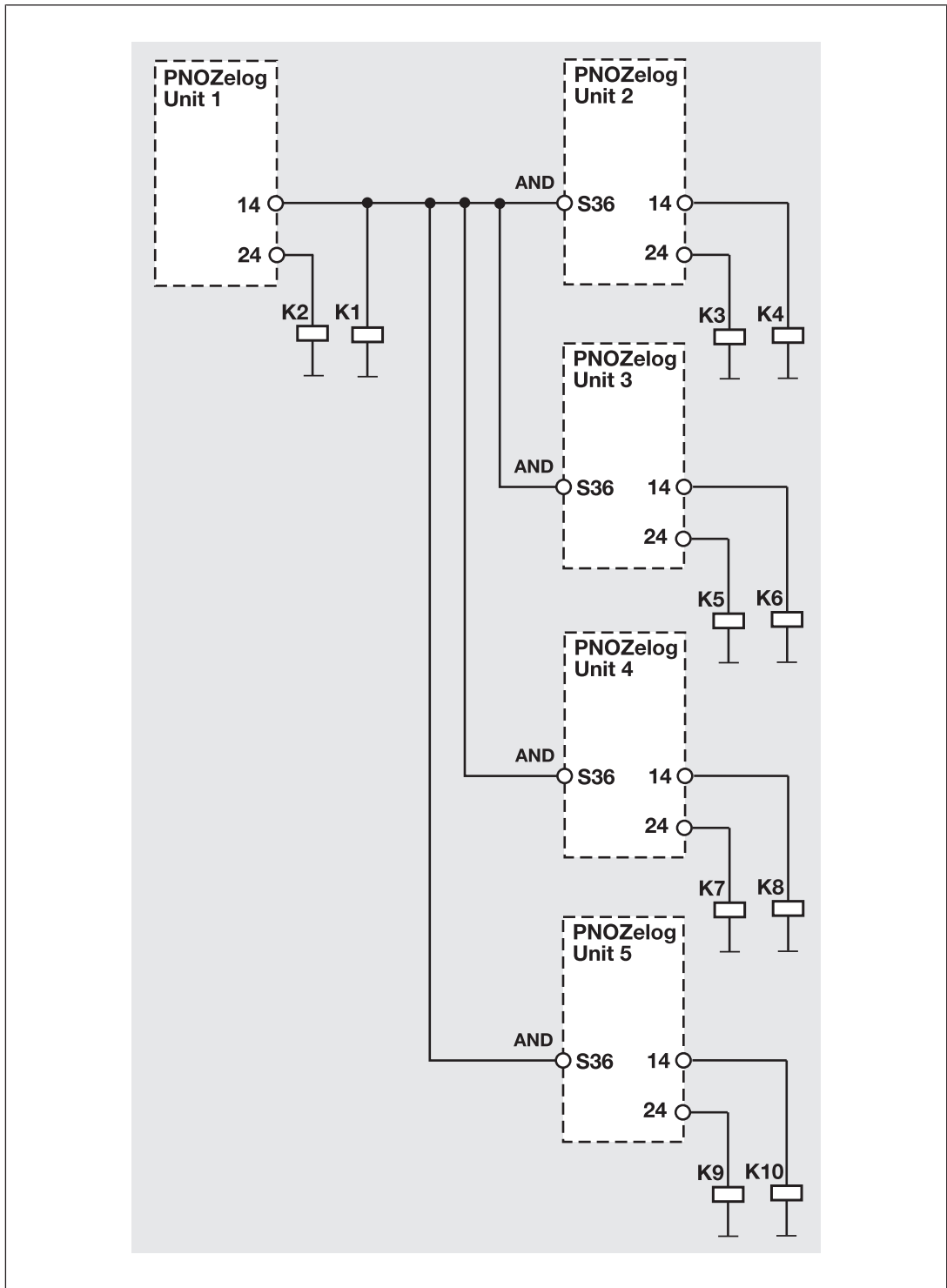
A valid signal at the OR input of a PNOZelog unit mutes its safety function and can lead to the most serious injuries and death.

- Before using the OR function, carry out a risk analysis and use other measures to establish a safe condition.

The following examples represent various ways in which PNOZelog units can be logically connected. In all the application examples, 2 loads may also be connected to the safety outputs.

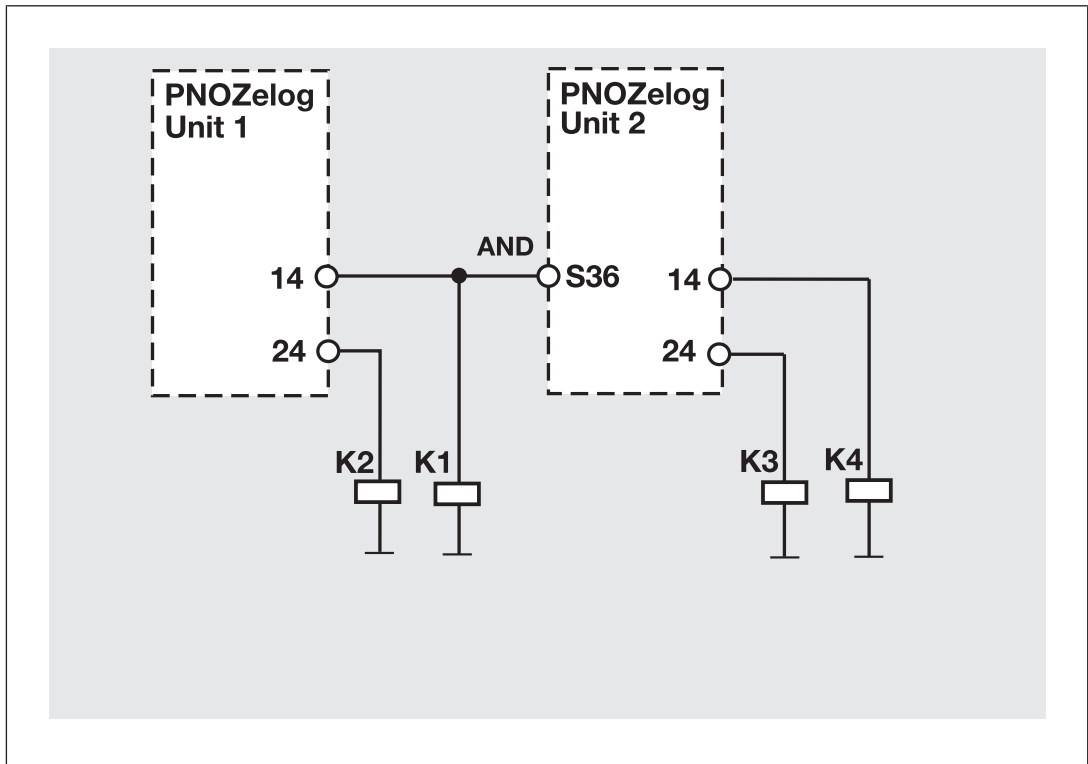
► Example 1:

Loads are connected to the safety outputs of Unit 1. In addition, a safety output is AND-linked to 4 other PNOZelog units via the logic input S36.



► Example 2:

Loads are connected to the safety outputs of Unit 1. In addition, a safety output is AND-linked to another PNOZelog unit via the logic input S36.





## Operation



### NOTICE

The safety function should be checked after initial commissioning and each time the plant/machine is changed. The safety functions may only be checked by qualified personnel.



### INFORMATION

The safety outputs are constantly checked via test pulses. This may generate a humming noise on the connected contactors, which does not affect the function. The test pulses also mean that, when measured with a multi-meter, the voltage at the safety outputs is displayed to be less than it actually is.

The unit detects the set operating mode once supply voltage is applied. During this time (initialisation phase) the "POWER" LED will flash. The unit is ready for operation when the "POWER" LED is lit continuously.

LEDs indicate the status and errors during operation:



LED on



LED flashes

### Status indicators



#### POWER

Supply voltage is present, operating mode is detected.



#### POWER

Initialisation phase



#### CH.1

There is a high signal at safety output 14.



#### CH.2

There is a high signal at safety output 24.

## Faults – Interference



### INFORMATION

#### Delay time

The delay time can be reduced in the event of a fault.



### INFORMATION

Supply interruptions lasting longer than 20 ms are detected as an error. The LEDs indicate an error and the safety outputs carry a low signal. The plant or machinery driven via the safety outputs will be shut down. The unit can only be restarted when the supply voltage is switched off for at least 1 s and then switched on again.

## Fault

Fault conditions are indicated by flashing the LEDs. There are faults that are displayed via periodic flashing (see table "Display of fault conditions") and faults where an error code can be determined via the number of flashes (see table "Relationship between the number of flashes and the decimal error code"). These faults are always indicated by three short flashes at LED CH.1 or CH.2. After a longer pause, the LED will then flash at one second intervals. The number of LED flashes corresponds to a digit in the error code. The error code can consist of up to 4 digits. The digits are separated by a longer period without flashing. The entire sequence is constantly repeated.



### INFORMATION

Error code 0: 16 flashes

**Display of fault conditions**

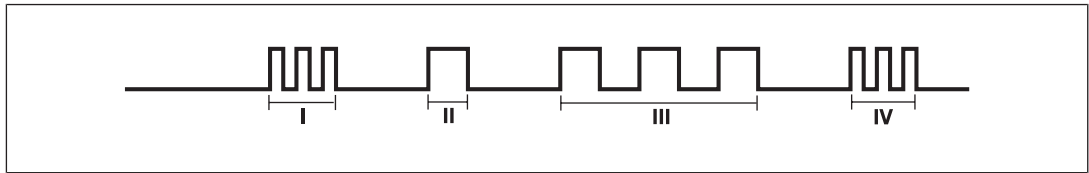
| LED                       | Fault  | Remedy  |
|---------------------------|--|---|
| LEDs unlit                | Supply voltage is missing, too low, wrongly connected            | Connect supply voltage: A1 - +24 VDC and A2 - 0 VDC<br>Permitted voltage range: 19.2 ... 30 VDC |
| POWER flashes             | Unknown operating mode, initialisation phase, start not executed | Depending on operating mode: Press start button or perform start-up test                        |
| CH.1 or CH.2 flash a code | Error coding, see table "Error code [📖 25]"                      | See table "Error code [📖 25]"   |

**Examples**

Error code 1, 3:

LED CH.1 or CH.2 flashes

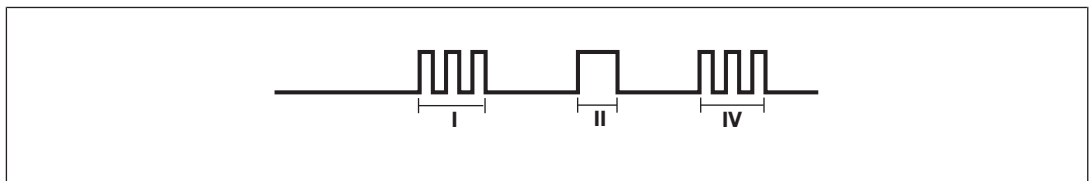
- ▶ 3 times, short
- ▶ Pause
- ▶ Once for one second
- ▶ Pause
- ▶ 3 times, for one second each



Error code 1:

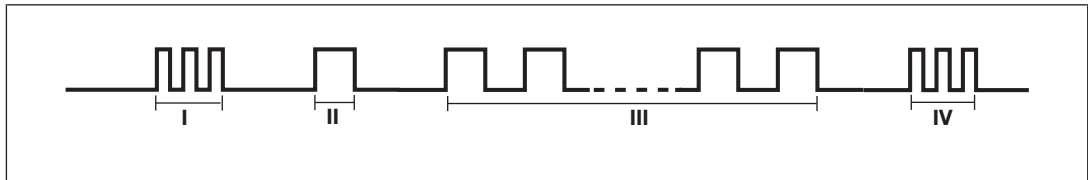
LED CH.1 or CH.2 flashes

- ▶ 3 times, short
- ▶ Pause
- ▶ Once for one second



Error code 1, 0:  
LED CH.1 or CH.2 flashes

- ▶ 3 times, short
- ▶ Pause
- ▶ Once for one second
- ▶ Pause
- ▶ 16 times, for one second each



- I Code for error message
- II Code for 1st digit
- III Code for 2nd digit
- IV Code for error message repeated

The table below shows the relationship between the number of flashes and the error code. The key to the error codes is described in the Error coding table.

|                    |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |
|--------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| Number of flashes  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Decimal error code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 0  |



## Error coding

**INFORMATION**

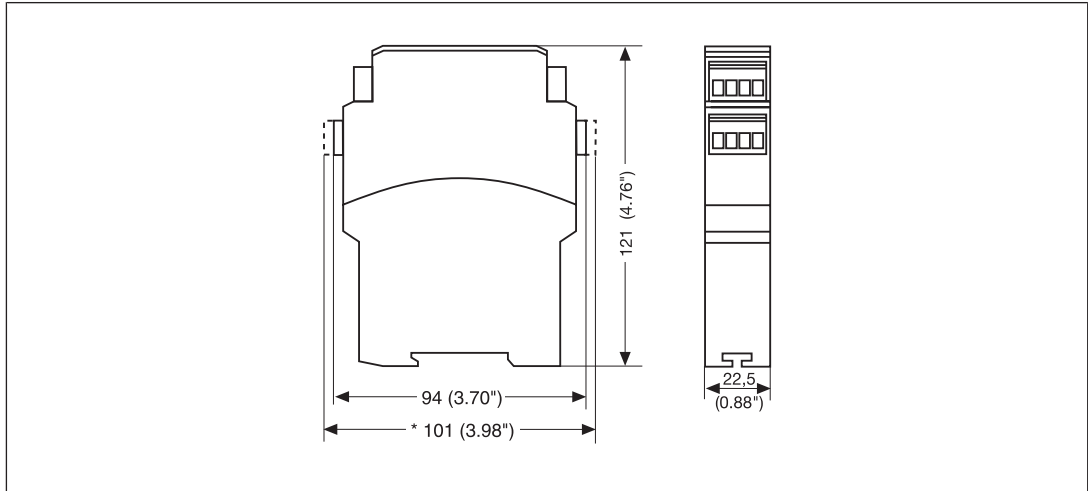
Each time a fault is rectified, switch the supply voltage off for at least 1 s and then switch it back on.

| Decimal error code | Number of flashes                           | Description   | Remedy  |  |  |
|--------------------|---|---|---|--|--|
| 1                  | 3x short – 1x long<br>– 3x short            | Faulty wiring, short circuit  | Wiring error at start input, input circuits, feedback loop or programming input |  |  |
| 2                  | 3x short – 2x long<br>– 3x short            |   |   |  |  |
| 3                  | 3x short – 3x long<br>– 3x short            |   |   |  |  |
| 4                  | 3x short – 4x long<br>– 3x short            | In the initialisation phase, short circuit between the safety outputs and +24 VDC | Rectify wiring error at terminals 14, 24  |  |  |
| ...                | ...   |   |   |  |  |
| 9                  | 3x short – 9x long<br>– 3x short            |   |   |  |  |
| 10                 | 3x short – 10x long<br>– 3x short           |   |   |  |  |
| ...                | ...   | During operation, short circuit between the safety outputs and +24 VDC            | Rectify wiring error at terminals 14, 24  |  |  |
| 1, 0               | 3x short – 1x long<br>– 16x long – 3x short |   |   |  |  |
| 1, 1               | 3x short – 1x long<br>– 1x long – 3x short  |   |   |  |  |
| 1, 9               | 3x short – 1x long<br>– 9x long – 3x short  |   |   |  |  |
| 10.1               | 3x short – 10x long<br>– 1x long – 3x short |   |   |  |  |
| 14.5               | 3x short – 14x long<br>– 5x long – 3x short |   |   |  |  |
| 1, 2               | 3x short – 1x long<br>– 2x long – 3x short  |   |   | During operation, short circuit between the safety outputs and 0 VDC or $U_B < 19.2$ VDC | Rectify wiring error at terminals 14, 24;<br>Keep within the supply voltage range of 19.2 ... 30 VDC |
| 1, 3               | 3x short – 1x long<br>– 3x long – 3x short  |   |   |  |  |
| 1, 12              | 3x short – 1x long<br>– 12x long – 3x short |   |   |  |  |
| 1, 13              | 3x short – 1x long<br>– 13x long – 3x short |   |   |  |  |
| 1, 4               | 3x short – 1x long<br>– 4x long – 3x short  | Operating mode changed during operation   | Check wiring for the operating mode and rectify fault                           |  |  |

| Decimal error code     | Number of flashes  | Description  | Remedy   |
|------------------------|--|--|--|
| 1, 5                   | 3x short – 1x long<br>– 5x long – 3x short   | Unexpected status at S36   | Check wiring at terminal S36   |
| 1, 6<br>1, 7           | 3x short – 1x long<br>– 6x long – 3x short<br>3x short – 1x long<br>– 7x long – 3x short   | Wiring of operating mode “with detection of shorts across contacts” faulty   | Rectify wiring error at input circuits   |
| 1, 8<br>1, 11          | 3x short – 1x long<br>– 8x long – 3x short<br>3x short – 1x long<br>– 11x long – 3x short  | 1. Maximum time of feedback loop monitoring exceeded<br>2. PNOZ e6.1p, PNOZ e6vp: External feedback loop closed, but internal feedback loop faulty | 1. Check contactor for contact welding<br>2. No user remedy possible. Change the unit. |
| 1, 10                  | 3x short – 1x long<br>– 10x long – 3x short  | Open circuit   | Check safety mat wiring  |
| 5, 10                  | 3x short – 5x long<br>– 10x long – 3x short  | $U_B < 19.2$ VDC   | Keep within the supply voltage range of 19.2 ... 30 VDC                                |
| 8, 1                   | 3x short – 8x long<br>– 1x long – 3x short   | Invalid operating mode   | Check wiring for the operating mode and rectify fault                                  |
| 8, 2<br>8, 3<br>14, 13 | 3x short – 8x long<br>– 2x long – 3x short<br>3x short – 8x long<br>– 3x long – 3x short<br>3x short – 14x long<br>– 13x long – 3x short | Supply interrupted, possibly caused by a short to earth  | Rectify wiring error at terminal A1 or check supply voltage                            |
| 2, 0, 0<br>2, 0, 1     | 3x short – 2x long<br>– 16x long – 16x long<br>– 3x short<br>3x short – 2x long<br>– 16x long – 1x long<br>– 3x short                    | $U_B < 19.2$ VDC   | Keep within the supply voltage range of 19.2 ... 30 VDC                                |
| 2, 0, 2                | 3x short – 2x long<br>– 16x long – 2x long<br>– 3x short   | In the initialisation phase, short circuit between the safety outputs and +24 VDC  | Rectify wiring error at terminals 14, 24   |
| 2, 0, 3                | 3x short – 2x long<br>– 16x long – 3x long<br>– 3x short   | $U_B < 19.2$ VDC   | Keep within the supply voltage range of 19.2 ... 30 VDC                                |

### Dimensions in mm

\* With spring-loaded terminals



### Technical details

Order no. 774 137 – 774 138

See below for more order numbers

| General   | 774137                                | 774138                                |
|---|---------------------------------------|---------------------------------------|
| Certifications                                  | CE, EAC (Eurasian), TÜV, cULus Listed | CE, EAC (Eurasian), TÜV, cULus Listed |
| Electrical data                                 | 774137                                | 774138                                |
| Supply voltage                                  |                                       |                                       |
| Voltage   | 24 V                                  | 24 V                                  |
| Kind  | DC                                    | DC                                    |
| Voltage tolerance                               | -20 %/+25 %                           | -20 %/+25 %                           |
| Output of external power supply (DC) at no load | 2 W                                   | 2 W                                   |
| Residual ripple DC                              | 20 %                                  | 20 %                                  |
| Duty cycle                                      | 100 %                                 | 100 %                                 |
| External unit fuse protection F1 max.           | 6 A slow/10 A quick                   | 6 A slow/10 A quick                   |
| Inputs  | 774137                                | 774138                                |
| Voltage at                                      |                                       |                                       |
| Input circuit DC                                | 24 V                                  | 24 V                                  |
| Start circuit DC                                | 24 V                                  | 24 V                                  |
| Feedback loop DC                                | 24 V                                  | 24 V                                  |
| Logic input                                     | 24 V                                  | 24 V                                  |

| <b>Inputs</b>  | <b>774137</b>    | <b>774138</b>    |
|--|------------------|------------------|
| Current at   |                  |                  |
| Input circuit DC                                       | <b>5 mA</b>      | <b>5 mA</b>      |
| Start circuit DC                                       | <b>5 mA</b>      | <b>5 mA</b>      |
| Feedback loop DC                                       | <b>5 mA</b>      | <b>5 mA</b>      |
| Logic input  | <b>5 mA</b>      | <b>5 mA</b>      |
| Max. overall cable resistance R <sub>I</sub> -<br>max  |                  |                  |
| Start circuit and feedback loop                        | <b>2.000 Ohm</b> | <b>2.000 Ohm</b> |
| Input circuit, dual-channel                            | <b>2.000 Ohm</b> | <b>2.000 Ohm</b> |
| Max. line capacitance                                  | <b>450 nF</b>    | <b>450 nF</b>    |
| <b>Semiconductor outputs</b>                           | <b>774137</b>    | <b>774138</b>    |
| Overall performance ext. loading,<br>semiconductor     | <b>130 W</b>     | <b>130 W</b>     |
| Number of safety outputs                               |                  |                  |
| Delayed  | <b>1</b>         | <b>1</b>         |
| Instantaneous  | <b>1</b>         | <b>1</b>         |
| Number of auxiliary outputs                            | <b>1</b>         | <b>1</b>         |
| Number of test pulse outputs                           | <b>2</b>         | <b>2</b>         |
| Residual current at "0" signal                         | <b>4 mA</b>      | <b>4 mA</b>      |
| Max. internal voltage drop                             | <b>1 V</b>       | <b>1 V</b>       |
| Switching capability, 2 safety out-<br>puts under load |                  |                  |
| Current at UB ≤ 26.5 V                                 | <b>2 A</b>       | <b>2 A</b>       |
| Current at UB > 26,5 V                                 | <b>1,5 A</b>     | <b>1,5 A</b>     |
| Power at UB ≤ 26.5 V                                   | <b>50 W</b>      | <b>50 W</b>      |
| Power at UB > 26,5 V                                   | <b>45 W</b>      | <b>45 W</b>      |
| Switching capability, 1 safety out-<br>put under load  |                  |                  |
| Current at UB ≤ 26.5 V                                 | <b>2,7 A</b>     | <b>2,7 A</b>     |
| Current at UB > 26,5 V                                 | <b>2,2 A</b>     | <b>2,2 A</b>     |
| Power at UB ≤ 26.5 V                                   | <b>70 W</b>      | <b>70 W</b>      |
| Power at UB > 26,5 V                                   | <b>65 W</b>      | <b>65 W</b>      |
| Conditional rated short circuit cur-<br>rent           | <b>100 A</b>     | <b>100 A</b>     |
| Lowest operating current                               | <b>3 mA</b>      | <b>3 mA</b>      |
| Utilisation category in accordance<br>with EN 60947-1  | <b>DC-12</b>     | <b>DC-12</b>     |
| Max. line capacitance at the out-<br>puts without load | <b>2 nF</b>      | <b>2 nF</b>      |
| Voltage auxiliary and test pulse<br>outputs            | <b>24 V</b>      | <b>24 V</b>      |
| Current auxiliary and test pulse<br>outputs            | <b>0,5 A</b>     | <b>0,5 A</b>     |

| <b>Times</b>                               | <b>774137</b>   | <b>774138</b>  |
|--|---|--|
| Switch-on delay                            |   |  |
| After power on                             | <b>3 s</b>  | <b>3 s</b>   |
| With automatic start typ.                  | <b>100 ms</b>   | <b>100 ms</b>  |
| With automatic start max.                  | <b>180 ms</b>   | <b>180 ms</b>  |
| With monitored start typ.                  | <b>180 ms</b>   | <b>180 ms</b>  |
| With monitored start max.                  | <b>260 ms</b>   | <b>260 ms</b>  |
| Logic inputs typ.                          | <b>120 ms</b>   | <b>120 ms</b>  |
| Logic inputs max.                          | <b>200 ms</b>   | <b>200 ms</b>  |
| Response time $t_r$ semiconductor outputs  |   |  |
| typ.                                       | <b>40 ms</b>  | <b>40 ms</b>   |
| max.                                       | <b>43 ms</b>  | <b>43 ms</b>   |
| Maximum time of feedback loop monitoring   | <b>150 ms</b>   | <b>150 ms</b>  |
| Delay time $t_v$                           | <b>0,00 s, 0,15 s, 0,5 s, 1 s, 2 s, 3 s, 5 s, 7 s, 10 s</b>   | <b>0,00 s, 15 s, 25 s, 50 s, 100 s, 150 s, 200 s, 250 s, 300 s</b> |
| Time accuracy                              | <b>+/-10 % + 40 ms</b>  | <b>+/-10 % + 40 ms</b>   |
| Repetition accuracy                        | <b>5 %</b>  | <b>5 %</b>   |
| Supply interruption before de-energisation | <b>20 ms</b>  | <b>20 ms</b>   |
| Simultaneity, channel 1 and 2 max.         | $\infty$  | $\infty$   |
| <b>Environmental data</b>                  | <b>774137</b>   | <b>774138</b>  |
| Climatic suitability                       | <b>EN 60068-2-78</b>  | <b>EN 60068-2-78</b>   |
| Ambient temperature                        |   |  |
| Temperature range                          | <b>-10 - 55 °C</b>  | <b>-10 - 55 °C</b>   |
| Storage temperature                        |   |  |
| Temperature range                          | <b>-25 - 70 °C</b>  | <b>-25 - 70 °C</b>   |
| Climatic suitability                       |   |  |
| Humidity                                   | <b>93 % r. h. at 40 °C</b>                                    | <b>93 % r. h. at 40 °C</b>   |
| Condensation during operation              | <b>Not permitted</b>  | <b>Not permitted</b>   |
| EMC  | <b>EN 60947-5-1, EN 61000-6-2, EN 61000-6-4, EN 61326-3-1</b> | <b>EN 60947-5-1, EN 61000-6-2, EN 61000-6-4, EN 61326-3-1</b>      |
| Vibration                                  |   |  |
| In accordance with the standard            | <b>EN 60068-2-6</b>   | <b>EN 60068-2-6</b>  |
| Frequency                                  | <b>10 - 55 Hz</b>   | <b>10 - 55 Hz</b>  |
| Amplitude                                  | <b>0,35 mm</b>  | <b>0,35 mm</b>   |
| Airgap creepage                            |   |  |
| In accordance with the standard            | <b>EN 60947-1</b>   | <b>EN 60947-1</b>  |
| Overvoltage category                       | <b>III</b>  | <b>III</b>   |
| Pollution degree                           | <b>2</b>  | <b>2</b>   |
| Rated insulation voltage                   | <b>30 V</b>   | <b>30 V</b>  |
| Rated impulse withstand voltage            | <b>0,8 kV</b>   | <b>0,8 kV</b>  |

| <b>Environmental data</b>   | <b>774137</b>                                 | <b>774138</b>                                 |
|---|---|---|
| Protection type   |   |   |
| Housing   | <b>IP40</b>                                   | <b>IP40</b>                                   |
| Terminals   | <b>IP20</b>                                   | <b>IP20</b>                                   |
| Mounting area (e.g. control cabinet)  | <b>IP54</b>                                   | <b>IP54</b>                                   |
| <b>Mechanical data</b>  | <b>774137</b>                                 | <b>774138</b>                                 |
| Mounting position   | <b>Any</b>                                    | <b>Any</b>                                    |
| Material  |   |   |
| Bottom  | <b>PPO UL 94 V0</b>                           | <b>PPO UL 94 V0</b>                           |
| Front   | <b>ABS UL 94 V0</b>                           | <b>ABS UL 94 V0</b>                           |
| Top   | <b>PPO UL 94 V0</b>                           | <b>PPO UL 94 V0</b>                           |
| Connection type   | <b>Screw terminal</b>                         | <b>Screw terminal</b>                         |
| Mounting type   | <b>plug-in</b>                                | <b>plug-in</b>                                |
| Conductor cross section with screw terminals  |   |   |
| 1 core flexible   | <b>0,25 - 2,5 mm<sup>2</sup>, 24 - 12 AWG</b> | <b>0,25 - 2,5 mm<sup>2</sup>, 24 - 12 AWG</b> |
| 2 core with the same cross section, flexible with crimp connectors, no plastic sleeve               | <b>0,25 - 1 mm<sup>2</sup>, 24 - 16 AWG</b>   | <b>0,25 - 1 mm<sup>2</sup>, 24 - 16 AWG</b>   |
| 2 core with the same cross section, flexible without crimp connectors or with TWIN crimp connectors | <b>0,2 - 1,5 mm<sup>2</sup>, 24 - 16 AWG</b>  | <b>0,2 - 1,5 mm<sup>2</sup>, 24 - 16 AWG</b>  |
| Torque setting with screw terminals   | <b>0,5 Nm</b>                                 | <b>0,5 Nm</b>                                 |
| Stripping length with screw terminals   | <b>8 mm</b>                                   | <b>8 mm</b>                                   |
| Dimensions  |   |   |
| Height  | <b>94 mm</b>                                  | <b>94 mm</b>                                  |
| Width   | <b>22,5 mm</b>                                | <b>22,5 mm</b>                                |
| Depth   | <b>121 mm</b>                                 | <b>121 mm</b>                                 |
| Weight  | <b>130 g</b>                                  | <b>130 g</b>                                  |

Where standards are undated, the 2020-07 latest editions shall apply.

**Order no. 784 137 – 784 138**

| <b>General</b>                                  | <b>784137</b>                                | <b>784138</b>                                |
|---|--|--|
| Certifications                                  | <b>CE, EAC (Eurasian), TÜV, cULus Listed</b> | <b>CE, EAC (Eurasian), TÜV, cULus Listed</b> |
| <b>Electrical data</b>                          | <b>784137</b>                                | <b>784138</b>                                |
| Supply voltage                                  |  |  |
| Voltage   | <b>24 V</b>                                  | <b>24 V</b>                                  |
| Kind  | <b>DC</b>                                    | <b>DC</b>                                    |
| Voltage tolerance                               | <b>-20 %/+25 %</b>                           | <b>-20 %/+25 %</b>                           |
| Output of external power supply (DC) at no load | <b>2 W</b>                                   | <b>2 W</b>                                   |
| Residual ripple DC                              | <b>20 %</b>                                  | <b>20 %</b>                                  |

| <b>Electrical data</b>                             | <b>784137</b>       | <b>784138</b>       |
|--|---------------------|---------------------|
| Duty cycle   | 100 %               | 100 %               |
| External unit fuse protection F1 max.              | 6 A slow/10 A quick | 6 A slow/10 A quick |
| <b>Inputs</b>                                      | <b>784137</b>       | <b>784138</b>       |
| Voltage at   |                     |                     |
| Input circuit DC                                   | 24 V                | 24 V                |
| Start circuit DC                                   | 24 V                | 24 V                |
| Feedback loop DC                                   | 24 V                | 24 V                |
| Logic input  | 24 V                | 24 V                |
| Current at   |                     |                     |
| Input circuit DC                                   | 5 mA                | 5 mA                |
| Start circuit DC                                   | 5 mA                | 5 mA                |
| Feedback loop DC                                   | 5 mA                | 5 mA                |
| Logic input  | 5 mA                | 5 mA                |
| Max. overall cable resistance R <sub>I-max</sub>   |                     |                     |
| Start circuit and feedback loop                    | 2.000 Ohm           | 2.000 Ohm           |
| Input circuit, dual-channel                        | 2.000 Ohm           | 2.000 Ohm           |
| Max. line capacitance                              | 450 nF              | 450 nF              |
| <b>Semiconductor outputs</b>                       | <b>784137</b>       | <b>784138</b>       |
| Overall performance ext. loading, semiconductor    | 130 W               | 130 W               |
| Number of safety outputs                           |                     |                     |
| Delayed  | 1                   | 1                   |
| Instantaneous                                      | 1                   | 1                   |
| Number of auxiliary outputs                        | 1                   | 1                   |
| Number of test pulse outputs                       | 2                   | 2                   |
| Residual current at "0" signal                     | 4 mA                | 4 mA                |
| Max. internal voltage drop                         | 1 V                 | 1 V                 |
| Switching capability, 2 safety outputs under load  |                     |                     |
| Current at UB ≤ 26.5 V                             | 2 A                 | 2 A                 |
| Current at UB > 26,5 V                             | 1,5 A               | 1,5 A               |
| Power at UB ≤ 26.5 V                               | 50 W                | 50 W                |
| Power at UB > 26,5 V                               | 45 W                | 45 W                |
| Switching capability, 1 safety output under load   |                     |                     |
| Current at UB ≤ 26.5 V                             | 2,7 A               | 2,7 A               |
| Current at UB > 26,5 V                             | 2,2 A               | 2,2 A               |
| Power at UB ≤ 26.5 V                               | 70 W                | 70 W                |
| Power at UB > 26,5 V                               | 65 W                | 65 W                |
| Conditional rated short circuit current            | 100 A               | 100 A               |
| Lowest operating current                           | 3 mA                | 3 mA                |
| Utilisation category in accordance with EN 60947-1 | DC-12               | DC-12               |

| <b>Semiconductor outputs</b>                      | <b>784137</b>  | <b>784138</b>   |
|---|--|---|
| Max. line capacitance at the outputs without load | 2 nF   | 2 nF  |
| Voltage auxiliary and test pulse outputs          | 24 V   | 24 V  |
| Current auxiliary and test pulse outputs          | 0,5 A  | 0,5 A   |
| <b>Times</b>                                      | <b>784137</b>  | <b>784138</b>   |
| Switch-on delay                                   |  |   |
| After power on                                    | 3 s  | 3 s   |
| With automatic start typ.                         | 100 ms   | 100 ms  |
| With automatic start max.                         | 180 ms   | 180 ms  |
| With monitored start typ.                         | 180 ms   | 180 ms  |
| With monitored start max.                         | 260 ms   | 260 ms  |
| Logic inputs typ.                                 | 120 ms   | 120 ms  |
| Logic inputs max.                                 | 200 ms   | 200 ms  |
| Response time $t_r$ semiconductor outputs         |  |   |
| typ.  | 40 ms  | 40 ms   |
| max.  | 43 ms  | 43 ms   |
| Maximum time of feedback loop monitoring          | 150 ms   | 150 ms  |
| Delay time $t_v$                                  | 0,00 s, 0,15 s, 0,5 s, 1 s, 2 s, 3 s, 5 s, 7 s, 10 s   | 0,00 s, 15 s, 25 s, 50 s, 100 s, 150 s, 200 s, 250 s, 300 s |
| Time accuracy                                     | +/-10 % + 40 ms  | +/-10 % + 40 ms   |
| Repetition accuracy                               | 5 %  | 5 %   |
| Supply interruption before de-energisation        | 20 ms  | 20 ms   |
| Simultaneity, channel 1 and 2 max.                | $\infty$   | $\infty$  |
| <b>Environmental data</b>                         | <b>784137</b>  | <b>784138</b>   |
| Climatic suitability                              | EN 60068-2-78  | EN 60068-2-78   |
| Ambient temperature                               |  |   |
| Temperature range                                 | -10 - 55 °C  | -10 - 55 °C   |
| Storage temperature                               |  |   |
| Temperature range                                 | -25 - 70 °C  | -25 - 70 °C   |
| Climatic suitability                              |  |   |
| Humidity  | 93 % r. h. at 40 °C                                    | 93 % r. h. at 40 °C   |
| Condensation during operation                     | Not permitted  | Not permitted   |
| EMC   | EN 60947-5-1, EN 61000-6-2, EN 61000-6-4, EN 61326-3-1 | EN 60947-5-1, EN 61000-6-2, EN 61000-6-4, EN 61326-3-1      |
| Vibration   |  |   |
| In accordance with the standard                   | EN 60068-2-6   | EN 60068-2-6  |
| Frequency   | 10 - 55 Hz   | 10 - 55 Hz  |
| Amplitude   | 0,35 mm  | 0,35 mm   |



| <b>Environmental data</b>   | <b>784137</b>                                | <b>784138</b>                                |
|---|--|--|
| Airgap creepage   |  |  |
| In accordance with the standard   | <b>EN 60947-1</b>                            | <b>EN 60947-1</b>                            |
| Overvoltage category  | <b>III</b>                                   | <b>III</b>                                   |
| Pollution degree  | <b>2</b>                                     | <b>2</b>                                     |
| Rated insulation voltage  | <b>30 V</b>                                  | <b>30 V</b>                                  |
| Rated impulse withstand voltage   | <b>0,8 kV</b>                                | <b>0,8 kV</b>                                |
| Protection type   |  |  |
| Housing   | <b>IP40</b>                                  | <b>IP40</b>                                  |
| Terminals   | <b>IP20</b>                                  | <b>IP20</b>                                  |
| Mounting area (e.g. control cabinet)  | <b>IP54</b>                                  | <b>IP54</b>                                  |
| <b>Mechanical data</b>  | <b>784137</b>                                | <b>784138</b>                                |
| Mounting position   | <b>Any</b>                                   | <b>Any</b>                                   |
| Material  |  |  |
| Bottom  | <b>PPO UL 94 V0</b>                          | <b>PPO UL 94 V0</b>                          |
| Front   | <b>ABS UL 94 V0</b>                          | <b>ABS UL 94 V0</b>                          |
| Top   | <b>PPO UL 94 V0</b>                          | <b>PPO UL 94 V0</b>                          |
| Connection type   | <b>Spring-loaded terminal</b>                | <b>Spring-loaded terminal</b>                |
| Mounting type   | <b>plug-in</b>                               | <b>plug-in</b>                               |
| Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector | <b>0,2 - 1,5 mm<sup>2</sup>, 24 - 16 AWG</b> | <b>0,2 - 1,5 mm<sup>2</sup>, 24 - 16 AWG</b> |
| Spring-loaded terminals: Terminal points per connection                                     | <b>2</b>                                     | <b>2</b>                                     |
| Stripping length with spring-loaded terminals   | <b>8 mm</b>                                  | <b>8 mm</b>                                  |
| Dimensions  |  |  |
| Height  | <b>101 mm</b>                                | <b>101 mm</b>                                |
| Width   | <b>22,5 mm</b>                               | <b>22,5 mm</b>                               |
| Depth   | <b>121 mm</b>                                | <b>121 mm</b>                                |
| Weight  | <b>125 g</b>                                 | <b>125 g</b>                                 |

Where standards are undated, the 2020-07 latest editions shall apply.

**Safety characteristic data**



**NOTICE**

You must comply with the safety characteristic data in order to achieve the required safety level for your plant/machine.

| Operating mode                    | EN ISO 13849-1: 2015<br>PL | EN ISO 13849-1: 2015<br>Category | EN 62061<br>SIL CL | EN 62061<br>PFH <sub>D</sub> [1/h] | IEC 61511<br>SIL | IEC 61511<br>PFD | EN ISO 13849-1: 2015<br>T <sub>M</sub> [year] |
|-----------------------------------|----------------------------|----------------------------------|--------------------|------------------------------------|------------------|------------------|---|
| SC output via logic input         | PL e                       | Cat. 4                           | SIL CL 3           | 3,61E-09                           | SIL 3            | 5,82E-05         | 20  |
| SC output via 2-ch. input circuit | PL e                       | Cat. 4                           | SIL CL 3           | 3,44E-09                           | SIL 3            | 4,53E-05         | 20  |

Explanatory notes for the safety-related characteristic data:

- ▶ The SIL CL value in accordance with EN 62061 corresponds to the SIL value in accordance with EN 61508.
- ▶ T<sub>M</sub> is the maximum mission time in accordance with EN ISO 13849-1. The value also applies as the retest interval in accordance with EN 61508-6 and IEC 61511 and as the proof test interval and mission time in accordance with EN 62061.

All the units used within a safety function must be considered when calculating the safety characteristic data.



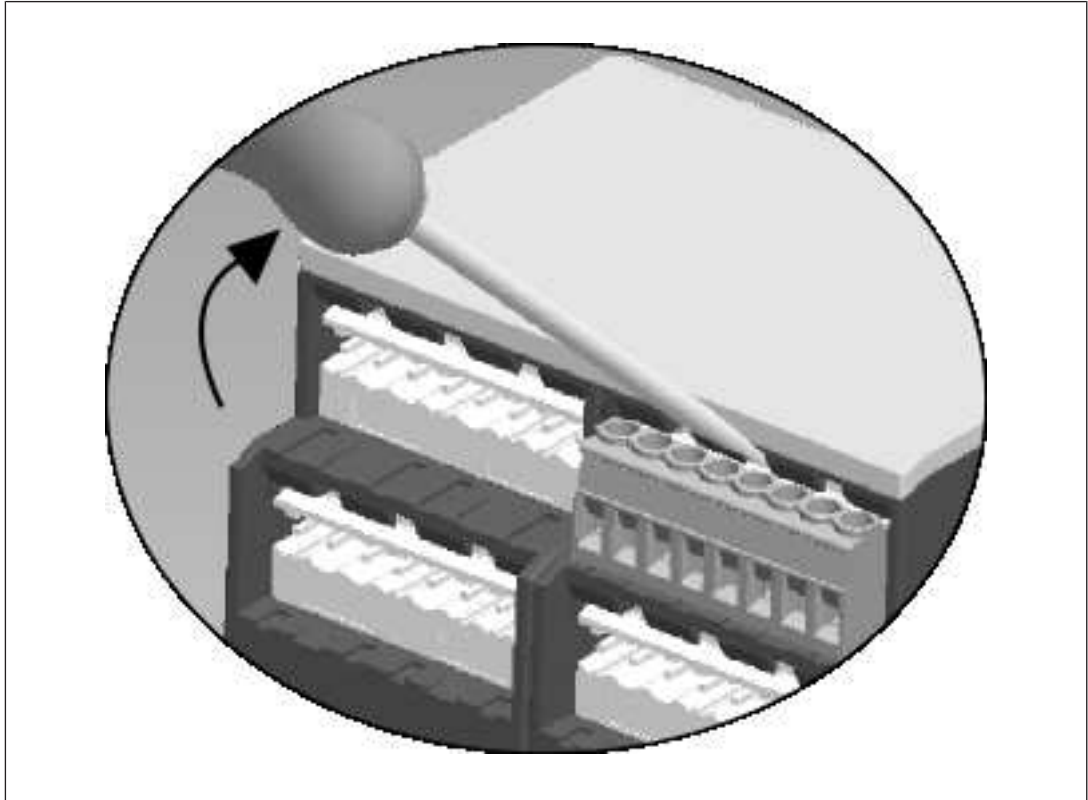
**INFORMATION**

A safety function's SIL/PL values are **not** identical to the SIL/PL values of the units that are used and may be different. We recommend that you use the PAScal software tool to calculate the safety function's SIL/PL values.

## Remove plug-in terminals

Procedure: Insert the screwdriver into the housing recess behind the terminal and lever the terminal out.

Do **not** remove the terminals by pulling the cables!



## Order reference

### Product

| Product type | Features      | Connection type         | Order no. |
|--------------|---------------|-------------------------|-----------|
| PNOZ e3vp    | 24 VDC, 10 s  | Screw terminals         | 774137    |
| PNOZ e3vp C  | 24 VDC, 10 s  | Spring-loaded terminals | 784137    |
| PNOZ e3vp    | 24 VDC, 300 s | Screw terminals         | 774138    |
| PNOZ e3vp C  | 24 VDC, 300 s | Spring-loaded terminals | 784138    |

### Accessories

| Product type            | Features   | Order no. |
|-------------------------|--|-----------|
| Terminal block filter 1 | Terminal block with filter for 3-10 kOhm load range  | 774195    |
| Terminal block filter 2 | Terminal block with filter for 10-30 kOhm load range | 774196    |

