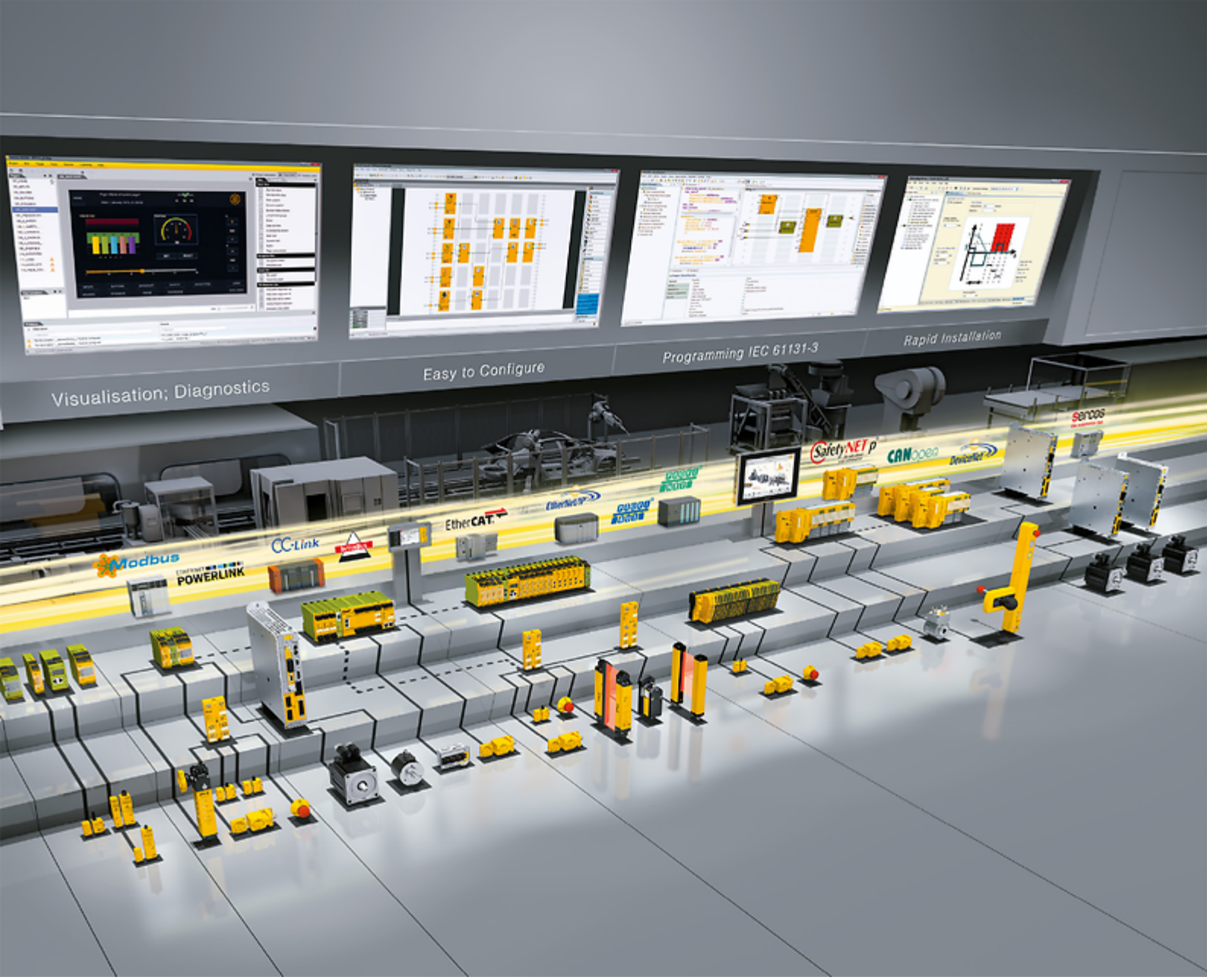

PNOZ s50

PILZ
THE SPIRIT OF SAFETY

Safety relays

Operating Manual-1002194-EN-09

This document is the original document.

Where unavoidable, for reasons of readability, the masculine form has been selected when formulating this document. We do assure you that all persons are regarded without discrimination and on an equal basis.

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1 Introduction

1.1 Validity of documentation

This documentation is valid for the product PNOZ s50 from Version 1.1.

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

INFORMATION

The device is suitable for activating inductive loads within the specification. The terminology in this documentation is based on a safe mechanical holding brake. This terminology can easily be transferred to the physical circumstances of other applications.

1.1.1 Retaining the documentation

This documentation is intended for instruction and should be retained for future reference.

1.2 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.

2 Overview

2.1 Unit structure

2.1.1 Scope of supply

- PWM relay PNOZ s50
- Connection terminals (spring-loaded terminals)
- Chip card
- Chip card holder

2.1.2 Unit features

Application of the product PNOZ s50:

PWM relay for the safe activation of inductive loads, e.g. valves, mechanical holding brakes.

The product has the following features:

- Semiconductor outputs
  - 2 dual-pole failsafe power outputs, rated voltages 24 V or 48 VDC, e.g. for mechanical holding brakes, valves
  - Output voltage can be reduced through pulse width modulation (PWM)
  - Potential of the power outputs connected to the supply voltage B1/B2
  - 1 single-pole failsafe output for error
  - 2 single-pole failsafe outputs for status of the power circuits
  - 2 test pulse outputs
  - Potential of the single-pole outputs connected to supply voltage A1/A2
- Semiconductor inputs
  - 4 failsafe inputs for activating the power outputs (fast shutdown of power circuits)
  - 2 single-pole standard inputs for activating the power outputs (slow shutdown of power circuits)
  - 2 single-pole standard inputs for feedback loops

  Potential of the semiconductor inputs connected to supply voltage A1/A2
- Supply voltage
  - 24 VDC for device
  - For power circuits, rated voltage 24 V, 48 VDC

  Supply voltage for device and power circuit are isolated from each other

- Voltage output 24 VDC
  Potential connected to supply voltage A1/A2
- Can be configured via the display on the device
- Configuration is stored on a chip card
- Display
  - Number of operations
  - System information
  - Status of the inputs and outputs
  - Warning and error messages
- Status and fault LEDs
- Plug-in connection terminals (spring-loaded terminals)

2.2 Front/side view

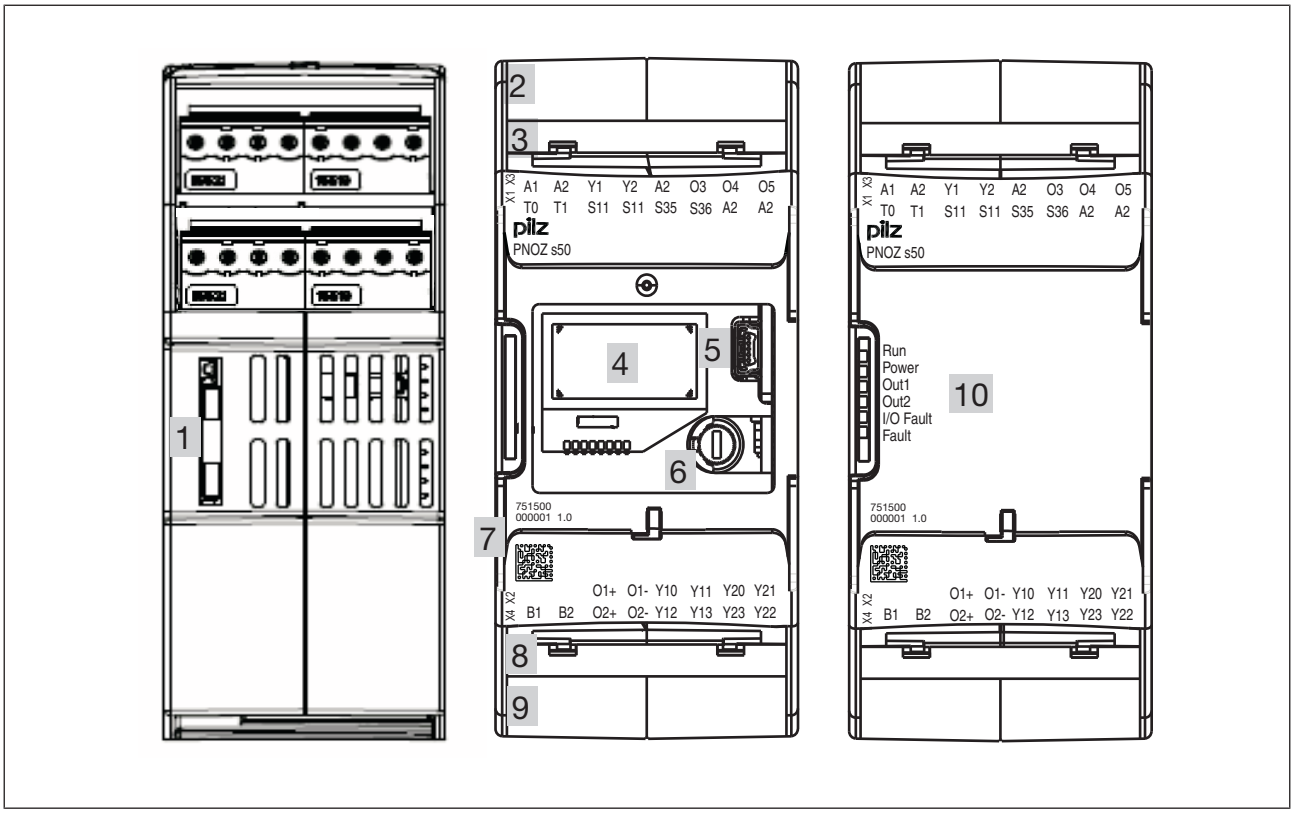


Fig.: Left: Side view, centre: Front view without cover, right: Front view with cover

Legend:

- 1: Chip card
- 2: Connection terminal X3
- 3: Connection terminal X1
- 4: Display
- 5: 4-pin socket (service only)
- 6: Rotary knob

- 7: Labelling strip with:
  - Order number
  - Serial number
  - Hardware version number
  - 2D code
- 8: Connection terminal X2
- 9: Connection terminal X4
- 10: LEDs

3 Safety

3.1 Intended use

The PWM relay PNOZ s50 is designed for use in safety-related applications.

The device meets the requirements of EN ISO 13849-1 up to PL e and EN IEC 62061 up to SIL CL 3. For example, it is designed for use with

- Mechanical holding brakes.
- Valves.

Improper use

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 operating manual,
- Use of the product outside the technical details (see Technical details [📖 68]).

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.

Please note the following safety guidelines:

Hazard analysis

- The machine manufacturer must produce a hazard analysis for the machine. He must take appropriate measures to ensure that unexpected movements do not lead to hazardous situations for either people or equipment.

Demands on the safety controller

- The PNOZ s50 may only be operated in conjunction with a higher level safety controller.
- The outputs on the safety controller used to activate fast shutdown must be tested to detect shorts across contacts and earth faults.
- The fault signal output O3 must be evaluated together with status outputs O4 (if O1+/O1- is used) and O5 (if O2+/O2- is used), if this is demanded by the plant/machine's safety requirements. Processing of these signals is used to check the feasibility of the signal states. Evaluation of these signals must be suitable to achieve a safe condition for the application.

Demands on the connected, inductive load

- The inductive load must guarantee the demands on the safety function in a de-energised state. For example, in a de-energised state a connected safe brake must always be applied, must stop a hazardous movement and must prevent unintended start-up.

Slow shutdown in the event of a fault

- When designing a safe application, you should consider that a slow shutdown instead of a fast shutdown may be effective in the event of a fault. A connected brake may have a longer stopping distance.

Slow shutdown

- The power circuit's slow shutdown is not safety-related. It may only be used when permitted by the hazard analysis.
- To shut down the inductive load safely, the fast shutdown must be activated after the slow shutdown. That way the load has a dual-pole shutdown.

Measures against unexpected start-up

- Appropriate measures must be taken to prevent unexpected start-up or unexpected movements from plant standstill.

Wiring measures

- The effective current at terminals B1/B2 to supply the power circuits must not exceed 11 A. The cables must be fitted with a 13 A fuse, characteristic B/C.
- The cables for the unit's supply voltage (A1/A2) must be fitted with a 4 A fuse, characteristic B/C.
- The wiring must be designed to achieve sufficient noise immunity and protection against noise emissions in terms of EMC. Please also refer to DIN EN 60204-1 (Electrical equipment of machines).
- Appropriate wiring measures should be taken to avoid earth faults and shorts between contacts.

Display

- The correct display of configuration data and messages are part of the device's safety concept. If the display is faulty (e.g. pixels are missing, faulty letters or numbers), the device must be taken out of service.

Checking the safety function

The machine manufacturer must check and verify the functionality of the employed safety functions.

- The safety function may only be checked by qualified personnel.

The safety function must be checked

- After initial commissioning
- After changing the configuration of the safety functions
- After swapping the PNOZ s50 or connected equipment

A full check comprises

- Proper execution of the employed safety functions
- Inspection of the parameters

The result of the check on each safety function must be documented in a test report. This test report must be signed.

Regular checks

The PNOZ s50 uses appropriate tests to guarantee that it functions safely (see chapter entitled "Function description", under "Output test [📖 24]"). It does not test the entire safety function. You should check this at regular intervals. The aim of these regular checks is to uncover any changes to the plant/machine, safety functions and ambient conditions. In particular you should regularly check the function of the connected brake.

You must comply with the requirements of the applicable national regulations.

The intervals you select will depend on the application, the overall system and the associated risk analysis.

3.2 Safety regulations

3.2.1 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.

3.2.2 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.

3.2.3 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.).

3.2.4 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).

4 Function description

4.1 Introduction

The PWM relay PNOZ s50 is used for the safety-related shutdown of inductive loads.

It has two power outputs to activate two independent, inductive loads. Each power circuit is switched independently by two inputs. Two feedback loops monitor the switch status of the inductive loads. Two failsafe outputs signal the switch status of the inductive loads to the higher level safety controller. A failsafe fault signal output signals any fault to a higher level safety controller.

The device is configurable. All the parameters can be set via a rotary knob with pushbutton. The state of the inputs and outputs, the configuration and any faults are shown on a display. The configuration is stored on a chip card.

There is an integrated counter, which records the number of operations for each power circuit. The counter can be used to monitor the brake's service life.

Block diagram

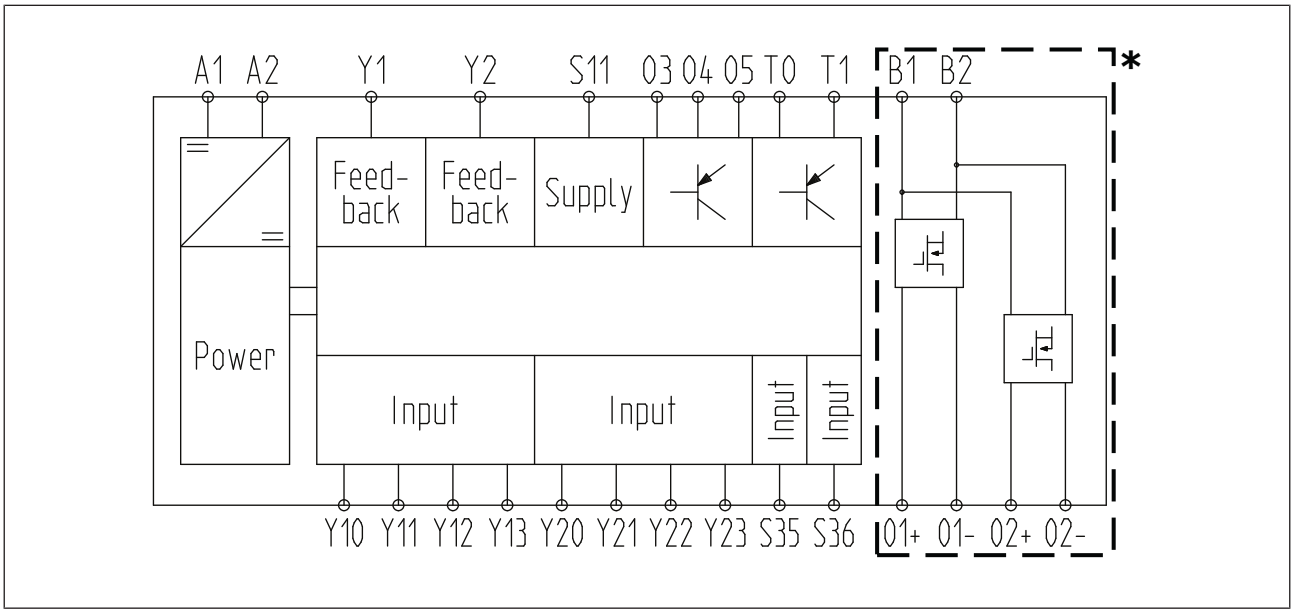


Fig.: Block diagram

* Potential isolation, potential connection:

- Potential isolation between the supply voltages A1/A2 and B1/B2.
- Potential connection between the power outputs O1+/O1-, O2+/O2- and the supply voltage B1/B2.
- Potential connection between the semiconductor inputs and single-pole outputs, voltage output and supply voltage A1/A2.

4.2 Functions

4.2.1 Switching the power circuits on and off (fast shutdown)

The device has two safe dual-pole outputs O1+/O1- (power circuit 1) and O2+/O2-(power circuit 2), which can be switched using inputs Y10/Y11 (power circuit 1) and Y20/Y21 (power circuit 2):

- Switch-on (brake is released):
  - O1+/O1- is switched on when there is a "1" signal (24 VDC) at Y10 **and** Y11.
  - O2+/O2- is switched on when there is a "1" signal (24 VDC) at Y20 **and** Y21.
  - Partial operation is not time-monitored. An output will not switch until both the corresponding inputs are "1".
- Switch-off (brake is applied):
  - O1+/O1- is switched off safely when there is a "0" signal (0 VDC) at Y10 **and/or** Y11.
  - O2+/O2- is switched off safely when there is a "0" signal (0 VDC) at Y20 **and/or** Y21.

INFORMATION

Please note that when using fast shutdown, the inputs for slow shutdown (S35 and S36) must have a "1" signal.

Power circuit 1	**Y10**	**Y11**	**O1+, O1-**	
	1	1	1	Load under current (power circuit 1 switched on)
	1	0	0	Load without current (power circuit 1 switched off)
	0	1	0	
	0	0	0	
Power circuit 2	**Y20**	**Y21**	**O2+, O2-**	
	1	1	1	Load under current (power circuit 2 switched on)
	1	0	0	Load without current (power circuit 2 switched off)
	0	1	0	
	0	0	0	

The power circuits are supplied via the terminals B1/B2 with the voltage U_{B1B2} (voltage range: rated voltage 24 V, 48 VDC).

Both poles are switched (e.g. O1+, O1-).

INFORMATION

Max. current at the power circuits

It is essential to note that the effective current at terminals B1/B2 to supply the power circuits must not exceed 11 A. The cables must be fitted with a 13 A fuse, characteristic B/C.

At the safe inputs Y10 and Y11 / Y20 and Y21, a "0" signal must be present before the corresponding output O1+/O1- / O2+/O2- can be switched by a "1" signal at both inputs, otherwise a fault is signalled. The following diagram illustrates this point, using the dual-pole input Y10/Y11 and output O1+/O1- as an example.

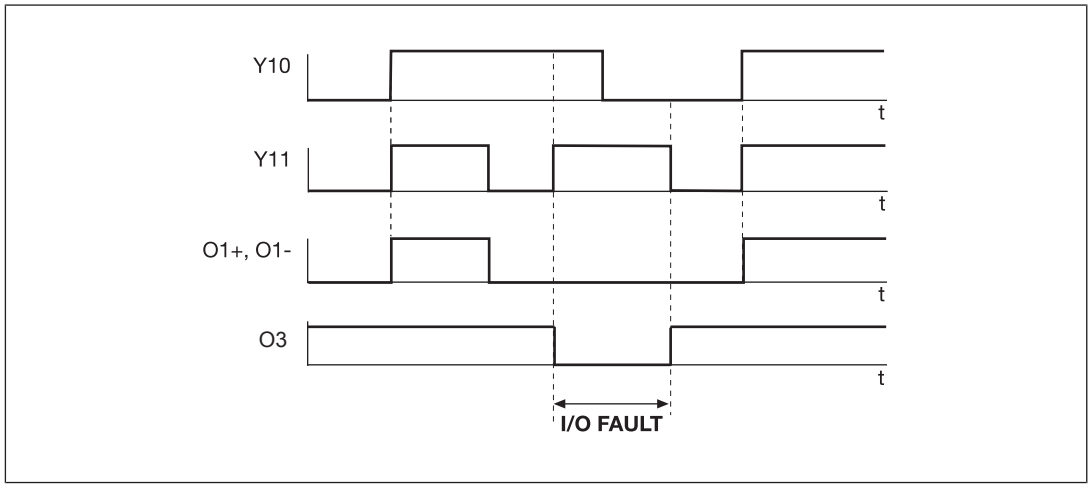


Fig.: Start-up condition for inputs Y10/Y11

INFORMATION

Please note: Inputs Y10/Y11 switch output O1+/O1-; inputs Y20/Y21 switch output O2+/O2-. In the event of a fault, however, both outputs will switch off. Status outputs O4/O5 also switch off, irrespective of the switch status of the inductive load. At the time an input, e.g. Y11, is switched on, if the other input, e.g. Y10, is not at "0", the fault signal output O3 will signal a fault via a "0" signal.

After the output O1+/O1- and/or O2+/O2- is switched on, the voltage U_{B1B2} is available for a configurable overexcitation time U_{over}. Once the overexcitation time t_{over} has elapsed, the voltage is reduced through pulse width modulation (PWM). The overexcitation time t_{over} and the reduced voltage U_{Avg} are configured via the display.

INFORMATION

The overexcitation time t_{over} can also be switched off for each power circuit. In this case, the output voltage of the power circuits O1+/O1- and/or O2+/O2- equals the supply voltage U_{B1B2}.

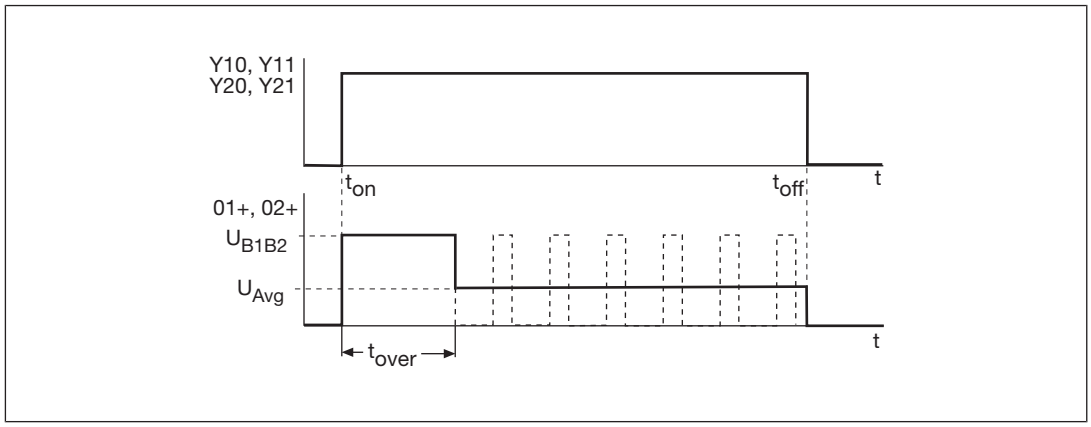


Fig.: Switching the power circuits on and off

Legend:

- Y10, Y11, Y20, Y21: Safe inputs to switch the outputs O1+, O2+
- O1+, O2+: Safe outputs, power circuit 1 and 2
- U_{B1B2}: Supply voltage to the power circuits
- t_{on}: Switch on power circuit
- t_{over}: Configured overexcitation time
- t_{off}: Switch off power circuit
- U_{Avg}: Configured reduced voltage (arithmetic mean of the voltage at the outputs once the overexcitation time has elapsed)

Inputs Y10, Y11 (or Y20, Y21) can be activated via single-pole or dual-pole safe outputs.

INFORMATION

Details of the wiring can be found in the chapter entitled "Commissioning", under "Wiring [28]".

4.2.2 Switching the power circuits on and off (slow shutdown S35, S36)

If the switching times are not critical, the loads at the power circuits can also be shut down slowly. A connected brake is permitted to have longer application times, for example. The brake switches with lower noise and is lower wearing.

NOTICE

The power circuit's slow shutdown is not safety-related. It may only be used when permitted by the hazard analysis.

To shut down the inductive load safely, the fast shutdown must be activated after the slow shutdown. That way the brake has a dual-pole shutdown.

A 1/0 pulse edge at one of the slow shutdown inputs (S35 or S36) switches off the corresponding power circuit (O1+, O2+) in single-pole mode. A flywheel diode means that the current only dissipates the magnetic field slowly.

INFORMATION

Please note that when using slow shutdown, the inputs for fast shutdown (Y10/Y11 and Y20/21) must have a "1" signal.

Power circuit 1	**S35**	**O1+, O1-**	
	1	1	Load under current (power circuit 1 switched on)
	0	0	Load without current (power circuit 1 switched off)
Power circuit 2	**S36**	**O2+, O2-**	
	1	1	Load under current (power circuit 2 switched on)
	0	0	Load without current (power circuit 2 switched off)

INFORMATION

Please note: Input S35 switches output O1+/O1-; input S36 switches output O2+/O2-. In the event of a fault, however, both outputs will switch off.

INFORMATION

If slow shutdown is not being used, 24 VDC must be permanently applied to terminals S35 and S36 (see section entitled "Conditions for fast and slow shutdown").

4.2.3 Conditions for fast and slow shutdown

To shut down the power circuits, the following conditions must be met:

Shutdown O1+, O1-	Y10/Y11	S35
Fast	1/0 pulse edge	1
Slow	1	1/0 pulse edge

Shutdown O2+, O2-	Y20/Y21	S36
Fast	1/0 pulse edge	1
Slow	1	1/0 pulse edge

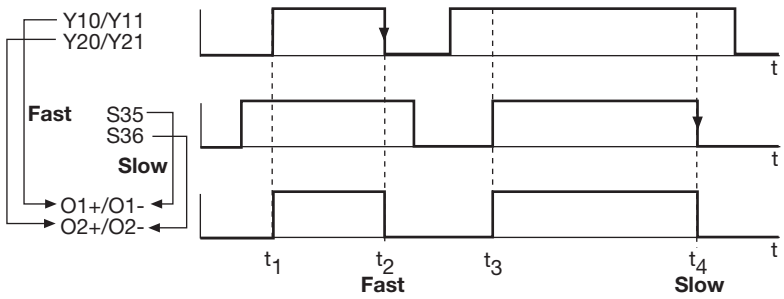


Fig.: Conditions for fast and slow shutdown

NOTICE

Please note that a fast shutdown has priority over a slow shutdown. Only a fast shutdown is safety-related.

Legend:

- Fast: Fast shutdown
- Slow: Slow shutdown
- t_1:and t_3 Switch-on: Y10, Y11, S35 = 1, O1+/O1- switches on; Y20, Y21, S36 = 1, O2+/O2- switches on
- t_2: Fast shutdown via 1/0 pulse edge from Y10/Y11 or Y20/Y21
- t_4: Slow shutdown via 1/0 pulse edge from S35 or S36

NOTICE

Please note that if there is a fault on the negative pole (O1-, O2-) of the power circuit, the load only shuts down in single-pole mode. The load will only execute a slow shutdown. The reaction time of the overall application may be extended accordingly.

4.2.4 Feedback loop Y1, Y2

The operating state of the inductive load can be uploaded, for example, via

- Micro switches
- Proximity switches
- Hall sensors

NOTICE

The device may only be operated if the feedback loops Y1 and Y2 evaluate the switch state of the connected equipment. The device may not be operated unless the feedback loops are connected.

Equipment with a reaction time of < 3 ms cannot be used. The device switches to the "I/O Fault" state.

The feedback loop can be configured for N/C or N/O contacts.

The 24 V voltage outputs S11 of the PNOZ s50 can be used to provide the 24 V DC supply to the equipment in the feedback loop. This is only permitted if no test pulses are configured for the feedback loops, otherwise a fault is signalled.

The feedback loop will only be evaluated after a max. release and application time, which is to be configured. Contact bounce during application or release of the equipment is ignored.

- Max. release time: Period within which the load must be released once the power circuit is switched on.
- Max. application time: Period within which the load must be applied once the power circuit is switched off.

The max. release and application time, plus the switch-on behaviour (N/C / N/O) are configured via the display. The max. application time is configured separately for slow and fast shutdown. The max. release time is configured jointly for slow and fast shutdown.

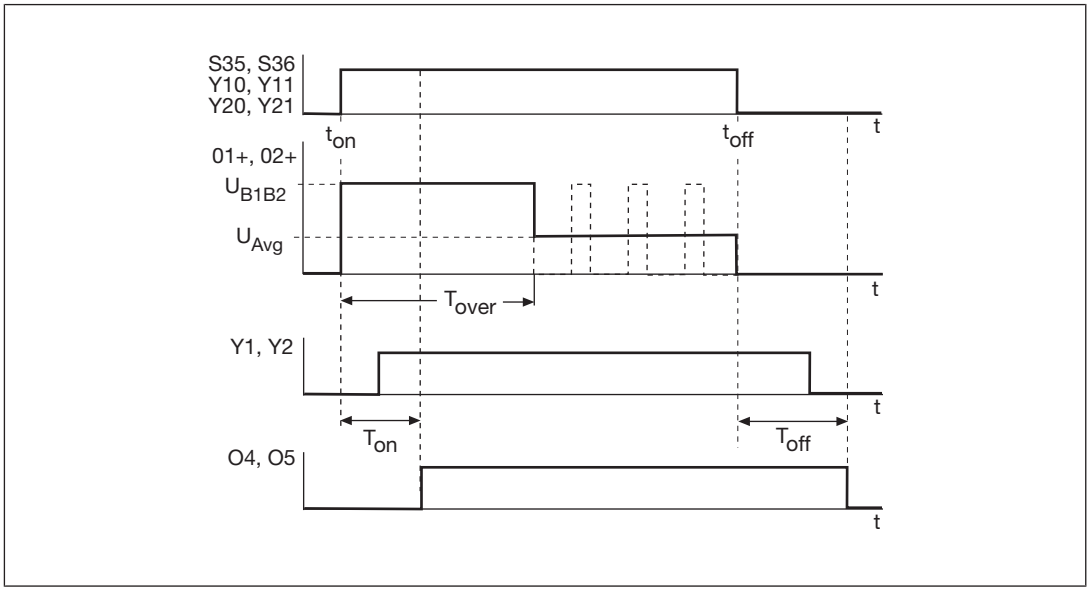


Fig.: Release and application time

Legend:

- Y10, Y11, Y20, Y21: Safe inputs to switch the outputs O1+/O1-, O2+/O2-
- O1+, O2+: Safe outputs, power circuit 1 and 2
- U_{B1B2}: Supply voltage to the power circuits
- t_{on}: Switch on power circuit
- t_{over}: Configured overexcitation time
- t_{off}: Switch off power circuit
- U_{Avg}: Configured reduced voltage (arithmetic mean of the voltage at the outputs once the overexcitation time has elapsed)
- Y1, Y2: Feedback loops
- T_{on}: Configured duration of max. release time
- T_{off}: Configured duration of max. application time
- O4, O5: Failsafe outputs for status of the load, change in state after T_{on} and T_{off} have elapsed

4.2.5 Test pulse outputs T0, T1

Feedback loops Y1 and Y2 can be assigned test pulses. The PNOZ s50 has 2 test pulse outputs, T0 and T1.

INFORMATION

The feedback loop can only use test pulses if mechanical switches are used to feed back the switch status.

The test pulses can be activated via the display. The test pulses are activated in the default setting.

The test pulses are permanently assigned to the feedback loop inputs:

- T0 pulses the feedback loop Y1
- T1 pulses the feedback loop Y2

NOTICE

The test pulses can only be activated simultaneously for both feedback loops Y1 and Y2.

4.2.6 Signal and status outputs O3, O4, O5

Single-pole failsafe semiconductor outputs signal the operating status of the load and indicate a fault.

NOTICE

The fault signal output O3 must be evaluated together with status outputs O4 (if O1+/O1- is used) and O5 (if O2+/O2- is used), if this is demanded by the plant/machine's safety requirements. Processing of these signals is used to check the feasibility of the signal states. The signals must be evaluated in such a way that they lead to a safe condition for the application.

Fault signal output	**O3**	
	1	No fault, LED "I/O Fault" and "Fault" is off
	0	Fault, LED "I/O Fault" or "Fault" is lit
Status outputs They signal the status of the load after the release or application time has elapsed.	**O4**	
	1	Load at O1+/O1- released
	0	Load at O1+/O1- applied
	O5	
	1	Load at O2+/O2- released
	0	Load at O2+/O2- applied

4.2.7 Output test

Outputs that are switched on are checked via regular off tests.

- Test pulses for outputs that are switched on, see Technical details [📖 68]
- Outputs that are switched on are switched off for the duration of the test pulse.
- The reaction time of the load must be greater than the duration of the off test pulse.
- The load must not drop because of the test.
- The off tests cannot be turned off.

Outputs that are switched off are checked via regular on tests.

- Test pulses for outputs that are switched off, see Technical details [📖 68]
- Outputs that are switched off are switched on for the duration of the test pulse.
- The load must not be released because of the test.

Testing for shorts

- A test is regularly carried out to check for shorts between the outputs.

4.3 Status display, configuration and messages

4.3.1 Overview

The configuration is set using the device's rotary knob with pushbutton and is then displayed. Access to the configuration menu is password-protected.

The following device properties can be configured:

- Supply voltage to the power circuits
- Signals to the outputs of the power circuits:
  - Overexcitation time
  - Reduced voltage
- Feedback loop:
  - Max. ventilation and application time
  - High or low logic (N/O or N/C)
  - Evaluation of test pulses
- Offset (start value) for the number of operations

Additional information on the display:

- Status display
- Number of operations
- States of inputs and outputs
- Information on the device
- Software versions
- Error messages

INFORMATION

Further information on the configuration can be found in the section entitled "Commissioning", under "Display menu and configuration [34]".

4.3.2 Chip card

The set parameters, the device ID and the check sum for device configuration are stored on the chip card (for further information see chapter entitled "Commissioning", under "Use chip card [36]").

4.4 Reaction time

The reaction time (see Technical details [68]) of the PNOZ s50 is the time between a signal changing at the inputs for fast (Y10/Y11, Y20/Y21) or slow shutdown (S35, S36) and the signal changing at the outputs of the power circuit (O1+/O1-, O2+/O2-). The reaction time takes into account the input filter time, temperature drift and spread of components.

To determine the plant's overall reaction times, the corresponding internal processing times of the higher level safety control system and connected load must also be considered.

5 Installation

5.1 General installation guidelines

Control cabinet installation

- The unit should be installed in a control cabinet with a protection type of at least IP54.
- Fit the unit to a horizontal mounting rail. The venting slots must face upward and downward. Other mounting positions could destroy the device.
- Use the locking element on the rear of the unit to attach it to the mounting rail.
- Push the unit upwards or downwards before lifting it from the mounting rail.

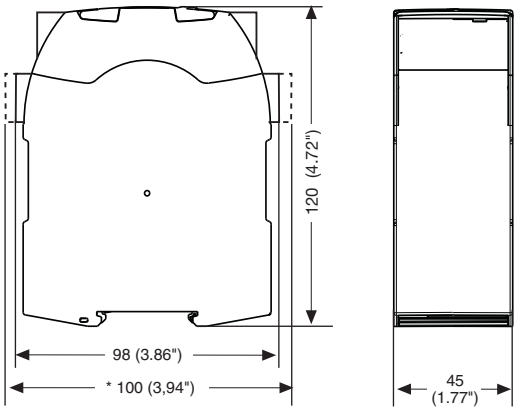
NOTICE

Damage due to electrostatic discharge!

Electrostatic discharge can damage components. Ensure against discharge before touching the product, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.

5.1.1 Dimensions

*with spring-loaded terminals



5.2 Mounting distances

Depending on the ambient temperature, with control cabinet installation it may be necessary to maintain a certain distance from the top and bottom, as well as to other heat-producing devices (see diagram).

The values stated for the mounting distances are minimum specifications. Details of whether a distance needs to be maintained can be found in the section entitled "Supplementary data [📖 74]".

Air conditioning may otherwise be required.

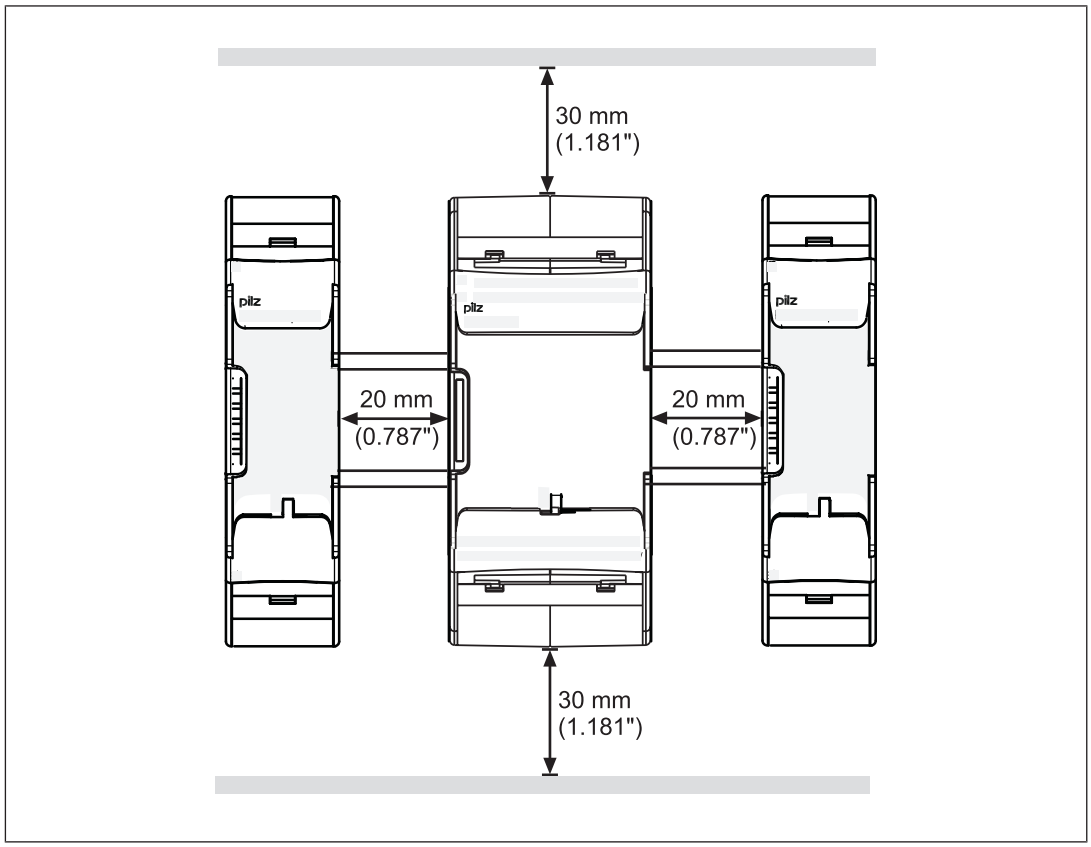


Fig.: Mounting distances for the PNOZ s50

6 Commissioning

6.1 Wiring

6.1.1 General wiring guidelines

Please note:

- Information given in the Technical details [📖 68] must be followed.
- Use copper wiring with a temperature stability of 75 °C.
- The wiring must be designed to achieve sufficient noise immunity and protection against noise emissions in terms of EMC. Please also refer to DIN EN 60204-1 (Electrical equipment of machines).

Inputs

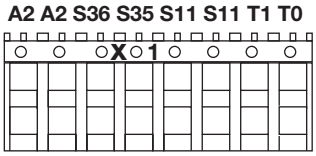
- Short circuits between the inputs or to a supply line must be excluded through appropriate wiring or must be managed through the higher level controller.

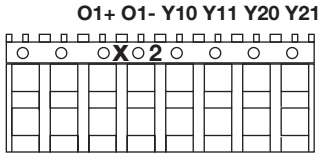
Outputs

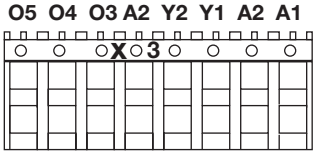
- If short circuits occur between the cable from the output to the load and a supply line, it will no longer be possible to switch off the load.

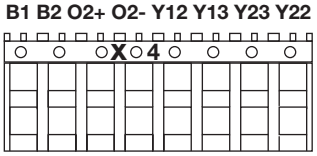
  Possible remedy: Exclude the error by using separate multicore cable for supply voltages
- Use appropriate wiring to exclude short circuits between the outputs!

6.1.2 Pin assignment

Female connector X1	Terminal	Description
	A2	Reference potential for - Device's supply voltage - Inputs - Fault signal and status outputs
	S36	Standard input for slow shutdown, power circuit 2
	S35	Standard input for slow shutdown, power circuit 1
	S11	Voltage output 24 VDC
	S11	Voltage output 24 VDC
	T1	Test pulse output 1
	T0	Test pulse output 0

Female connector X2	Terminal	Description
	O1+	Failsafe output for power circuit 1, positive
	O1-	Failsafe output for power circuit 1, negative
	Y10	Failsafe input for fast shutdown, power circuit 1
	Y11	Failsafe input for fast shutdown, power circuit 1
	Y20	Failsafe input for fast shutdown, power circuit 2
	Y21	Failsafe input for fast shutdown, power circuit 2

Female connector X3	Terminal	Description
	O5	Failsafe output for status, power circuit 2
	O4	Failsafe output for status, power circuit 1
	O3	Failsafe output for fault signal
	A2	0 V supply voltage for device
	Y2	Standard input for feedback loop 2
	Y1	Standard input for feedback loop 1
	A2	0 V supply voltage for device
	A1	24 VDC supply voltage for device

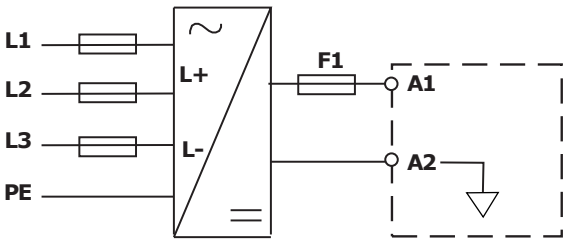
Female connector X4	Terminal	Description
	B1	Supply voltage of power circuits
	B2	Reference potential of the supply voltage to the power circuits
	O2+	Failsafe output for power circuit 2, positive
	O2-	Failsafe output for power circuit 2, negative
	Y12	Reference potential for failsafe inputs for fast shutdown, power circuit 1
	Y13	Reference potential for failsafe inputs for fast shutdown, power circuit 1
	Y23	Reference potential for failsafe inputs for fast shutdown, power circuit 2
	Y22	Reference potential for failsafe inputs for fast shutdown, power circuit 2

6.1.3 Supply voltage for device

WARNING!

Electric shock!

Safe electrical isolation must be ensured for the external power supply that generates the supply voltage. Failure to do so could result in electric shock.

Supply voltage to the device	
Please note: The supply voltage must be protected with a fuse. Fuse F1: Circuit breaker, 24 VDC, 4 A, characteristic B/C	

Requirements:

- When selecting the power supply, please refer to the requirements stated under Technical details [📖 68].

  Make sure that the supply voltage for the unit (A1/A2) complies with the specified tolerance.

6.1.4 Supply voltage for power circuits

Requirements:

- When selecting the power supply, please refer to the requirements stated under Technical details [📖 68].

  Make sure that the supply voltage for the power circuits (B1/B2) complies with the specified tolerance. If the voltage is outside this tolerance, then

  – the device will change to a fault condition, if the outputs are switched on.

  – a message will be entered in the error stack if the outputs are switched off.

- The power supply must be able to bridge a power outage of 20 ms.

WARNING!

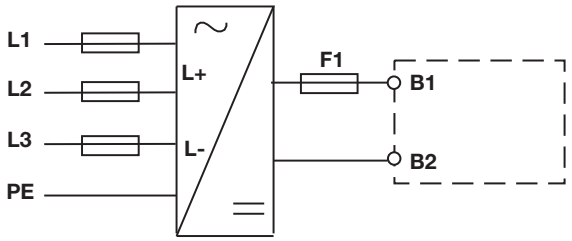
Electric shock!

Safe electrical isolation must be ensured for the external power supply that generates the supply voltage. Failure to do so could result in electric shock.

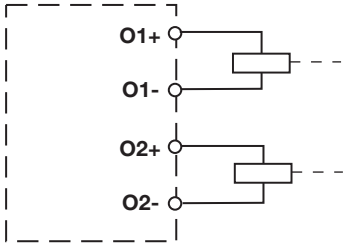
INFORMATION

Max. current at the power circuits

It is essential to note that the effective current at terminals B1/B2 to supply the power circuits must not exceed 11 A. The cables must be fitted with a 13 A fuse, characteristic B/C.

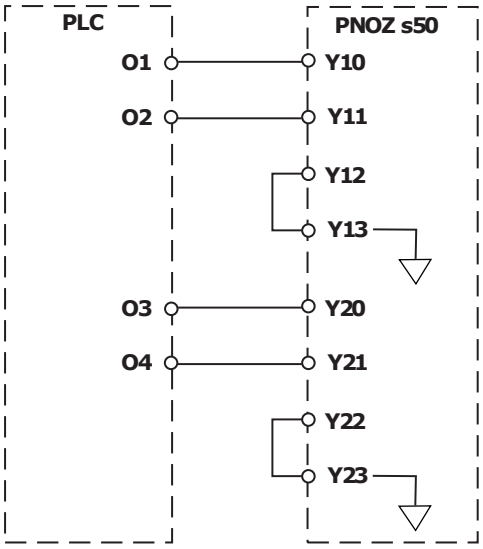
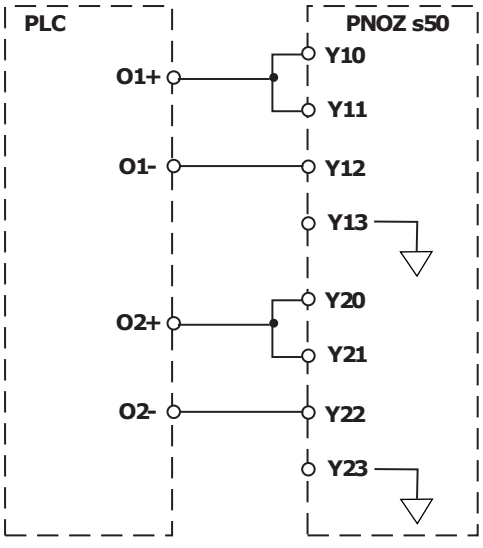
Supply voltage for power circuits	
Please note: The supply voltage must be protected with a fuse. Fuse F1: Circuit breaker 24 V, 48 V DC, 13 A, characteristic B/C	

6.1.5 Power circuit

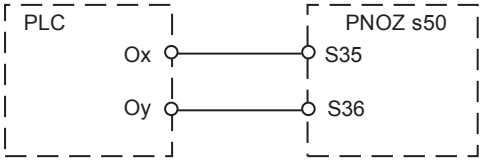
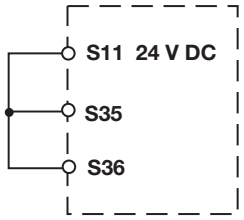
Power circuit	
Dual-pole outputs Use a separate cable for each brake.	

6.1.6 Inputs

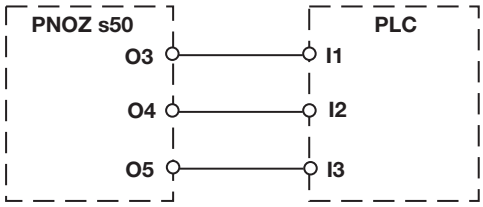
6.1.6.1 Fast shutdown

Activation via safe single-pole outputs	
Link Y12 – Y13 Link Y22 – Y23 PLC: Safety control system	
Activation via safe dual-pole outputs	
Link Y10 – Y11 Link Y20 – Y21 PLC: Safety control system	

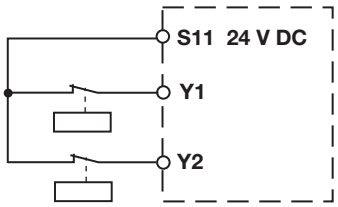
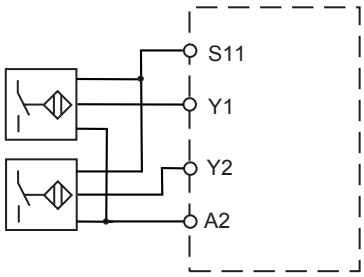
6.1.6.2 Slow shutdown

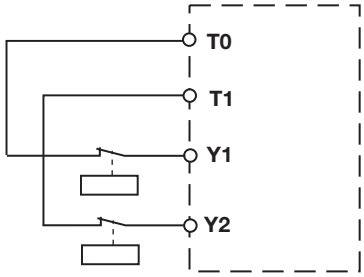
Activation via single-pole outputs	
Controller	
Connect the inputs to 24 VDC if slow shutdown is not being used. S11: Voltage output 24 VDC	

6.1.7 Outputs

Status outputs	
PLC: Safety control system It is **not** possible to supply the outputs with test pulses or with an external voltage.	

6.1.8 Feedback loop

Feedback loop	
A N/O contact can be configured instead of the N/C contact.	
Example using pnp N/O contact.	
Feedback loop with test pulses	

Please note the allocation of the test pulses and feedback loops: T0 <-> Y1 T1 <-> Y2	

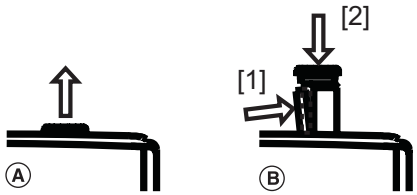
6.2 Display menu and configuration

The menu settings are made on the unit's display via a rotary knob. You have the option to make the settings on the knob by hand or with a screwdriver. If you make the settings with a screwdriver, the knob can remain within the unit.

NOTICE

The correct display of configuration data and messages are part of the device's safety concept. If the display is faulty (e.g. pixels are missing, faulty letters or numbers), the device must be taken out of service.

6.2.1 Operate rotary knob



Knob :

- (A) pull out until it locks into position
- (B) release and push it back into the unit:
  - Press the bar on the side of the knob [1] towards the centre of the knob. This releases the knob.
  - Press the knob downwards [2] while keeping the bar pressed in

6.2.2 Configure device

The settings are made via the rotary knob, as follows:

Press knob

- Confirm selection/setting
- Switch to menu

Rotate knob

- Select menu level
- Set the parameter/numeric value

The display is backlit. It is

- switched on by turning or pressing the rotary knob.
- switched off if the rotary knob has not been operated for 30 seconds.

NOTICE

Please note that all parameters are set to their default values on delivery.

Please check all the safety-related parameters at least, and enter the values that correspond to your application.

6.2.3 Password protection

The configuration is password-protected.

- Parameters can only be changed once a password has been entered.
- Factory setting for the password: 000000
- The pasword consists of 6 figures in the range 000000 … 999999.
- The password can be changed at any time in the menu.

INFORMATION

– Please note: Remember the assigned password. Without this password you will not be able to change the configuration.

– For details of how to enter the password, see the section entitled "Status display and configuration [📖 44]", Level 2: Entering the password.

– For details of how to change the password, see the section entitled "Status display and configuration [📖 44]", Level 3: Configuration.

6.2.4 Use chip card

The parameters that are set on a device are stored on the chip card. The data is stored along with a device identifier and check sum. We recommend that you always operate the unit with a chip card.

When the chip card is inside the unit,

- The chip card is checked to verify the device identifier, valid parameters, and ensure that the data is identical.
- Device parameters are automatically saved to the chip card during configuration. As a result, the chip card always contains a copy of the unit's current internal data.

When the device is switched on in the Power On operating state (all LEDs illuminate briefly) a test is carried out to check whether

- a chip card is inserted or just an empty chip card holder.
- data on the chip card matches the data in the device.
- data on the chip card is valid.

INFORMATION

For details of the procedure when a message appears on the display, please see the section entitled "Display menu at cold start".

In the Configuration operating state ("Run" LED flashes):

- The data is written to the chip card during configuration.

In the RUN operating state ("Run" LED is lit):

- The chip card containing a valid configuration must be inserted.
- The chip card must not be removed during operation.

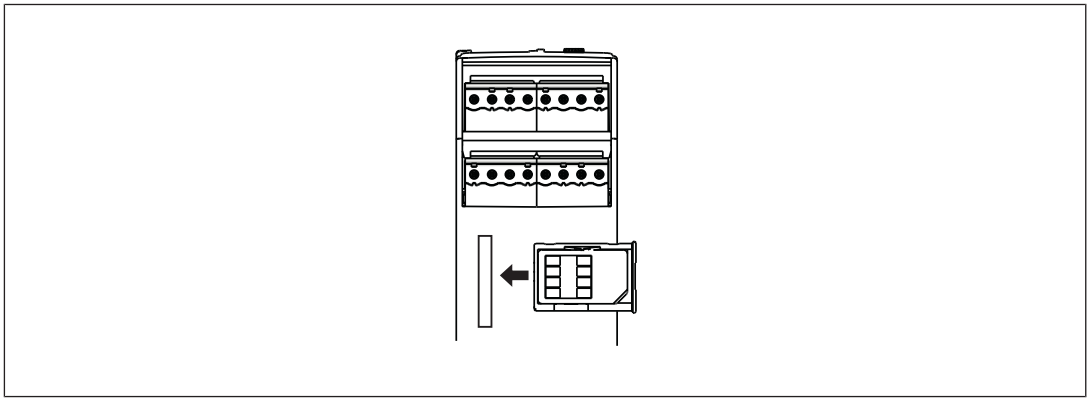
6.2.4.1 Insert chip card

NOTICE

The chip card contact is only guaranteed if the contact surface is clean and undamaged. For this reason please protect the chip card's contact surface from

- Contamination
- Contact
- Mechanical impact, such as scratches.

Make sure that you do not bend the chip card as you insert it into the chip card slot.



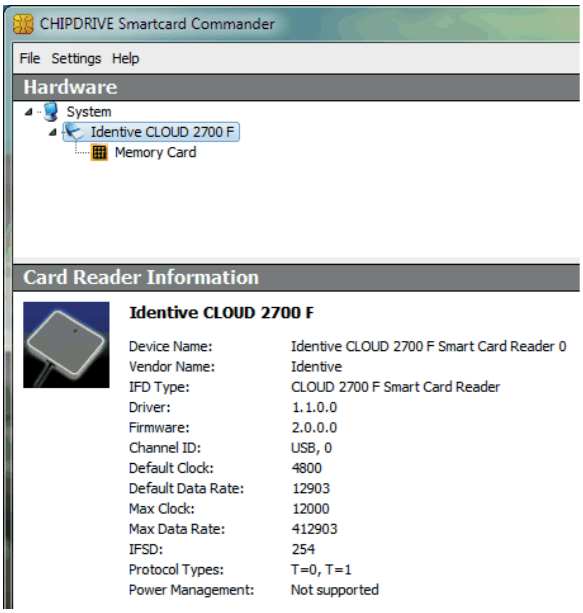
6.2.5 Save configuration with Software SmartCardCommander

You have the option to save a PNOZ s50 configuration from the chip card to your computer. The configuration can be saved on the computer and then downloaded to other chip cards.

To do this you will need the chip card reader **PNOZ Chip Card Reader** with the corresponding **SmartCardCommander** software. Both are available from Pilz as accessories, individually or as part of a set (see Order references Accessories [📖 75]).

Save PNOZ s50 configuration on the computer

1. Make a note of the configuration's CRC in the PNOZ s50. It is shown on the display in the **Information/ Configuration CRC** menu. This will be needed later to check whether the correct configuration is saved on the device.
2. Remove the chip card from the PNOZ s50 and insert it into the holder for the chip card reader.
3. Start the **SmartCardCommander** software.
4. Insert the holder containing the chip card into the chip card reader.
5. The **Memory Card** directory is displayed in a list under **Hardware** on the software interface of the **SmartCardCommander**.



6. To read the data on the chip card, click on the **Memory Card** directory and then select **Read Data from Card**.
7. When **Data read successfully** is displayed on the software interface, the data can be saved as a hex file in any directory on the computer.
8. Make sure that the corresponding configuration CRC, which you noted down, is saved in the same directory.

Download configuration from the computer to the PNOZ s50

1. Insert a chip card into the holder for the chip card reader and insert this into the chip card reader.
2. Start the **SmartCardCommander** software.
3. To write the chip card, select **Write Data to Card** and confirm with **Yes**.
4. Insert the chip card in the PNOZ s50.
5. To ensure that the configuration has been transferred correctly, check that the CRC for the configuration in the PNOZ s50 matches the configuration CRC you noted down on the computer.

CAUTION!

With each transfer, you must check that the appropriate configuration for an application is transferred to a device!

6.2.6 Display and configuration

6.2.6.1 Menu overview

The following diagrams illustrate the principle structure of the configuration menu on the display.

The menu consists of

- Messages at cold start, if there are problems with the chip card.
- Level 1: Status indicators, error stack
- Level 2: Password entry
- Level 3: Configuration

The displayed symbols illustrate the operation of the rotary knob.

	Rotate knob
	Press knob

Level 1 and 2: Status indicators and password entry

Status information is displayed when the device is switched on. This level is not password-protected.

The state of the signals is displayed as follows:

Icon	Description
⛶	Signal inactive
⧖	Signal active

The password is entered in Level 2. It authorises configuration of the device in Level 3.

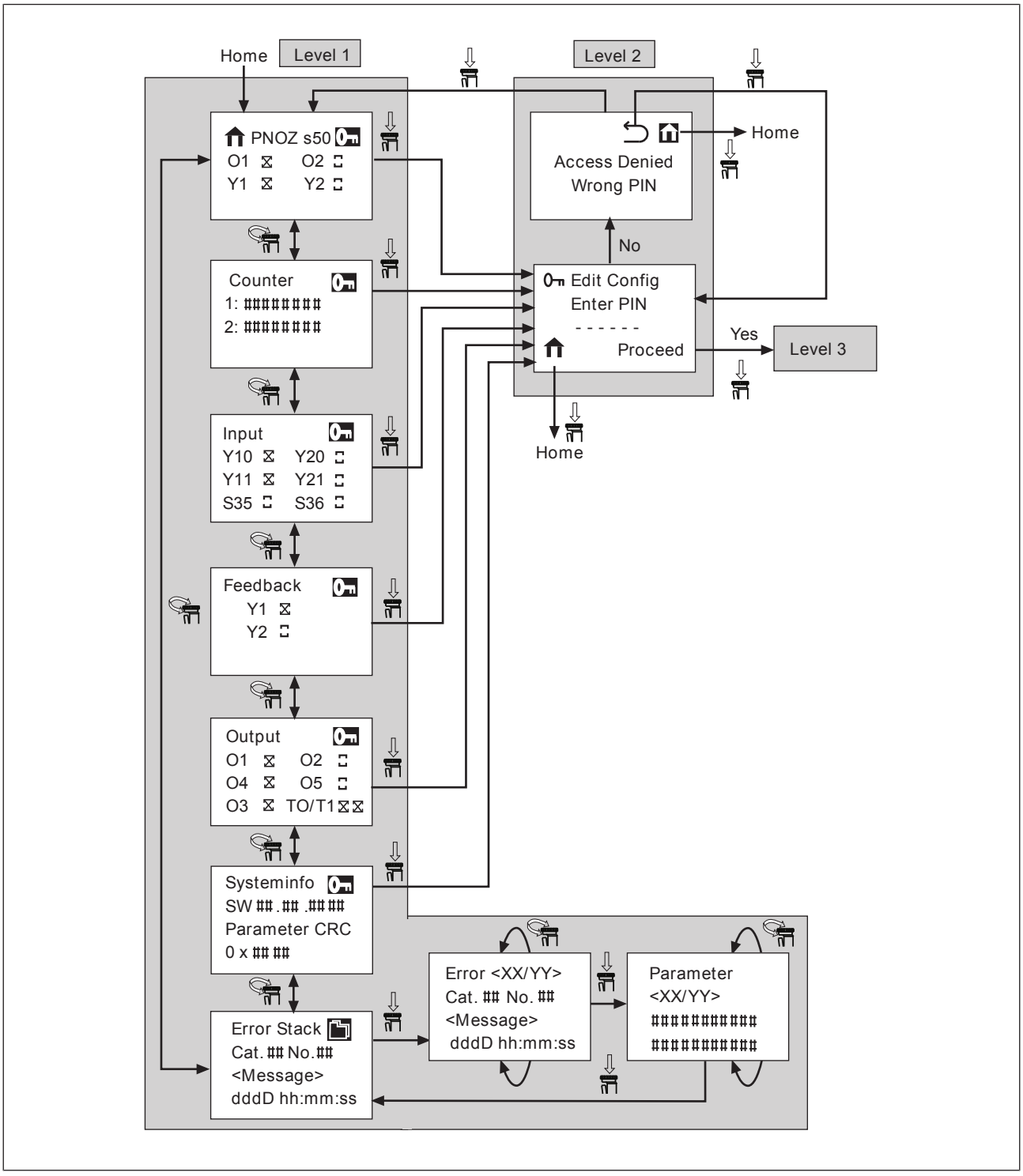


Fig.: Menu overview of Levels 1 and 2

Level 3: Configuration

The device is configured in Level 3.

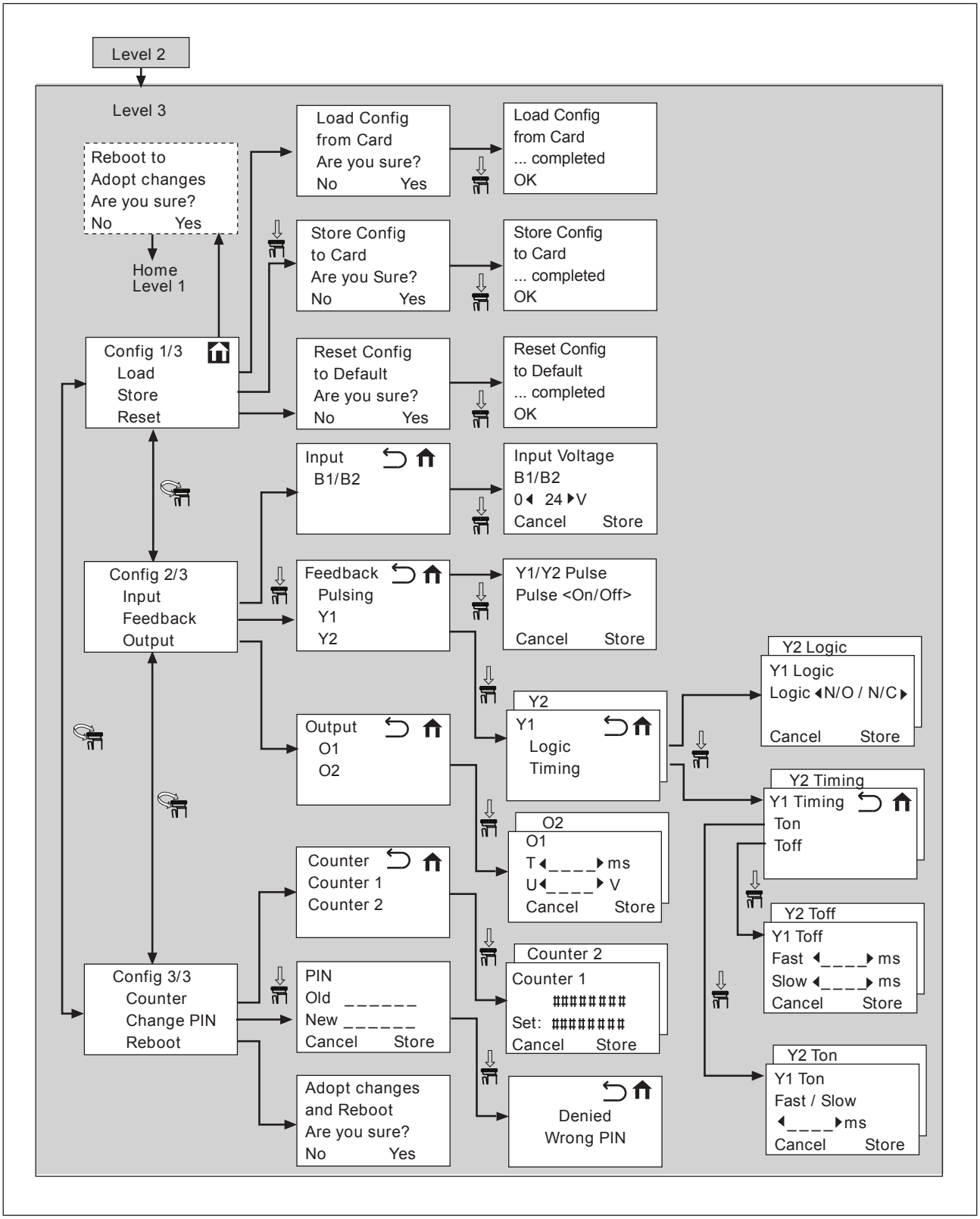


Fig.: Menu overview of Level 3

6.2.6.2 Operate menus and enter values

Various navigational aids are available on the display:

- Tags
- Text fields

Tags

Icon	Description
	Returns to the previous menu
	Exits the configuration menu (Level 3) and switches to the home menu (Level 1)
	Switches from the current error in the error stack
	Switches to the password menu (Level 2)

Text fields

Text field	Description
Cancel or **No**	Rejects all the changes and returns to the previous menu
Proceed	Confirms the password entry and jumps to the configuration menu (Level 3)
Store or **Yes**	Saves all the changes and returns to the previous menu
OK	Confirms the displayed chip card message and jumps to the configuration menu

To move within a menu and switch to another menu, proceed as follows:

1. Turn the rotary knob to jump from line to line.

   The position within the menu is highlighted.

2. Press the rotary knob to move to the next menu or to the previous menu.

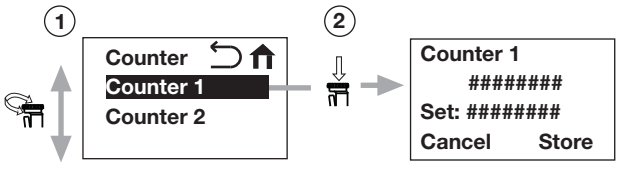


Fig.: Moving from line to line

To change values in a menu, follow the instructions below:

1. Turn the rotary knob to jump from line to line.
2. Press the rotary knob. Only then is it possible to change a numeric value.

   The selected area flashes. Values can now be changed.
3. Turn the rotary knob to switch between numeric values.
4. Press the rotary knob to complete the entry.

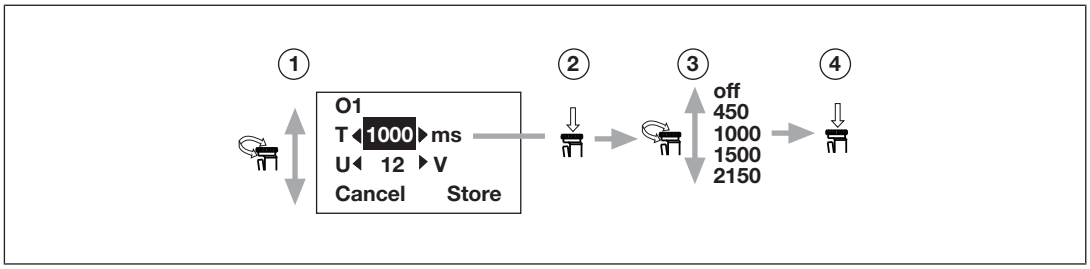
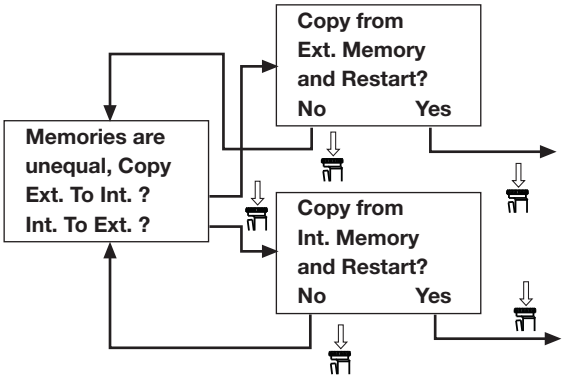


Fig.: Changing numeric values

6.2.6.3 Display menu at cold start

When the unit is switched on and in the Power On operating state (cold start), the memory contents of the unit and the chip card are read and compared. If there are any deviations, messages will appear.

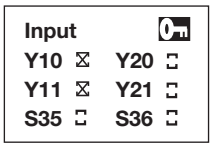
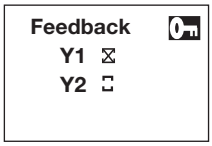
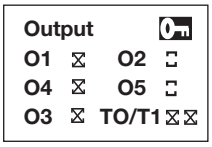
Overview	Display	Description
No Chipcard detected No chip card and no chip card holder in the unit.	No Chipcard detected Proceed? No Yes	**No** – Restart the unit **Yes** – Switch to RUN operating state, without a chip card inserted
Chipcard is Defect The chip card is defective or Only the chip card holder is inserted.	Chipcard is defect, remove or replace Proceed	**Proceed** – Restart the unit
Memories are unequal The parameters on the chip card and in the device memory are not identical.		

Overview	Display	Description
	Memories are unequal, Copy Ext. To Int. ? Int. To Ext. ?	**Ext. To Int.** – Switch to the next menu to download parameters from the chip card to the device memory **Int. To Ext.** – Switch to the next menu to upload parameters from the device memory to the chip card
	Copy from Ext. Memory and Restart? No Yes	**No** – Return to the previous menu **Yes** – Download parameters from the chip card to the device memory
	Copy from Int. Memory and Restart? No Yes	**No** – Return to the previous menu **Yes** – Upload parameters from the device memory to the chip card
Chipcard is Invalid The parameters on the chip card are invalid.	Cipcard is Invalid, Copy Int. to Ext.? No Yes	**No** – Restart the unit **Yes** – Upload parameters from the device memory to the chip card

6.2.6.4 Status display and configuration

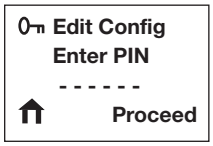
Level 1: Status indicators

Overview	Display	Description
PNOZ s50 C Start-up display	PNOZ s50 O1 ☒ O2 ☐ Y1 ☒ Y2 ☐	**PNOZ s50** – Device name **O1**, **O2** – Outputs of the power circuits O1 and O2 **Y1**, **Y2** – Standard inputs of feedback loops 1 and 2.
Counter Number of operations	Counter 1: ######## 2: ########	**1:** Counter for output O1+/ O1- **2:** Counter for output O2+/ O2-
Systeminfo	Systeminfo SW ##.##.## ## Parameter CRC 0 x ## ##	**SW:** Software version of device, e.g. 01.01.0001 **Parameter CRC:** Check sum covering the device configuration

Overview	Display	Description
Input States of the inputs are displayed		**Y10** – Failsafe input 0 for fast shutdown, power circuit 1 **Y11** – Failsafe input 1 for fast shutdown, power circuit 1 **Y20** – Failsafe input 0 for fast shutdown, power circuit 2 **Y20** – Failsafe input 1 for fast shutdown, power circuit 2 **S35** – Standard input for slow shutdown, power circuit 1 **S36** – Standard input for slow shutdown, power circuit 2
Feedback States of the feedback loops are displayed		**Y1** – Standard input for feedback loop 1 **Y2** – Standard input for feedback loop 2
Output States of the outputs are displayed		**O1** – Failsafe output for power circuit 1 **O2** – Failsafe output for power circuit 2 **O3** – Failsafe output for fault signal **O4** – Failsafe output for status of power circuit 1 **O5** – Failsafe output for status of power circuit 1 **TO/T1** – Test pulse output 0/1

Overview	Display	Description
Error Stack Error messages are displayed	**Error Stack** **Cat. ## No.##** **<Message>** **dddD hh:mm:ss**	Current error stack entry **Cat.** – Error class (hexadecimal) **No.** – Error number (hexadecimal) **<Message>** – Error text **dddD hh:mm:ss** – Power-on time since Power On: Days, hours, minutes, seconds
	Error <XX/YY> **Cat. ## No. ##** **<Message>** **dddD hh:mm:ss**	Error stack entries **<XX/YY>** – Entry number/ number of entries (decimal) **Cat.** – Error class (hexadecimal) **No.** – Error number (hexadecimal) **<Message>** – Error text **dddD hh:mm:ss** – Power-on time since error occurred: Days, hours, minutes, seconds
	Parameter <XX/YY> ########## ##########	Parameters of a selected entry in the error stack **<XX/YY>** – Current parameter/number of available parameters (decimal) Faulty inputs/outputs or **0x########** – Parameters (hexadecimal), grouped by MSB and LSB

Level 2: Password entry

Overview	Display	Description
PIN Password entry		_ _ _ _ _ _ **–** Field for entering the password **Proceed** – Confirm entry and jump to Level 3 **Home** – To start menu, without confirming entry
		You entered an incorrect password. **Back** – Back to password entry **Home** – Back to start menu

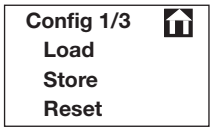
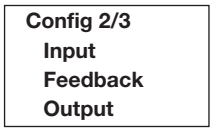
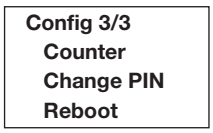
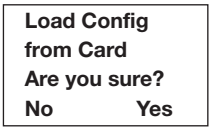
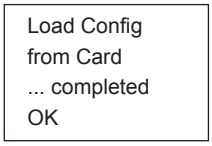
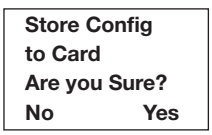
Level 3: Configuration

The device is supplied with the following parameters:

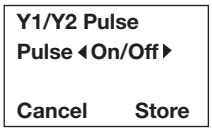
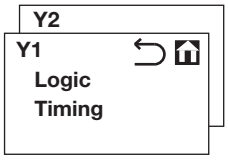
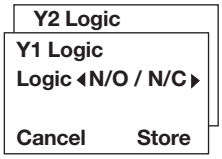
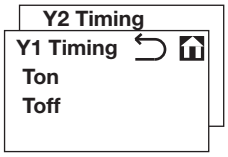
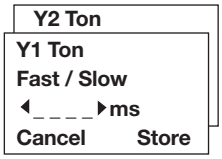
Function	Terminal	Description	Parameter	Value	In display menu
Supply voltage, power circuits 1 and 2	B1/B2	Supply voltage	Input Voltage	24 V	**Input -> Input Voltage**
Test pulse	Y1/Y2	Test pulses on feedback loops	Pulsing	On	**Feedback -> Pulsing -> Y1/Y2 Pulse**
Power circuit 1	O1+/O1-	Reduced voltage	U	6 V	**Output -> O1**
		Overexcitation time	T	100 ms	**Output -> O1**
	Y1	Maximum release time	Ton	30 ms	**Feedback -> Y1 -> Y1 Timing -> Y1 Ton**
		Maximum application time, fast shutdown	Toff fast	30 ms	**Feedback -> Y1 -> Y1 Timing -> Y1 Toff**
		Maximum application time, slow shutdown	Toff slow	30 ms	**Feedback -> Y1 -> Y1 Timing -> Y1 Toff**
		Logic of feedback loop 1	Logic	N/C	**Feedback -> Y1 -> Logic -> Y1 Logic**
Power circuit 2	O2+/O2-	Reduced voltage	U	6 V	**Output -> O2**
		Overexcitation time	T	100 ms	**Output -> O2**
	Y2	Maximum release time	Ton	30 ms	**Feedback -> Y2 -> Y1 Timing -> Y2 Ton**
		Maximum application time, fast shutdown	Toff fast	30 ms	**Feedback -> Y2 -> Y1 Timing -> Y2 Toff**
		Maximum application time, slow shutdown	Toff slow	30 ms	**Feedback -> Y2 -> Y1 Timing -> Y2 Toff**
		Logic of feedback loop 2	Logic	NC	**Feedback -> Y2 -> Logic -> Y2 Logic**

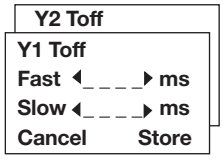
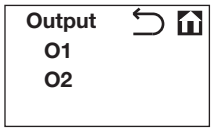
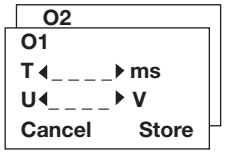
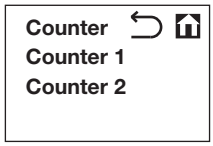
INFORMATION

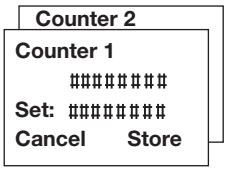
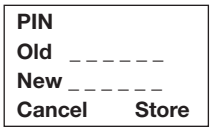
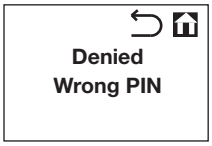
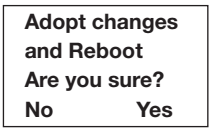
The device must be restarted if the configuration has been changed (see section entitled "Restart device [📖 54]").

Overview	Display	Description
Switch to submenus		
Config 1/3		**Load** – Switches to the **Load** menu to download the configuration from the chip card **Store –** Switches to the **Store** menu to save the configuration to the chip card **Reset –** Switches to the **Reset** menu to reset the configuration to the default settings
Config 2/3		**Input –** Switches to the **Input** menu to configure the supply voltage for the power element **Feedback –** Switches to the **Feedback** menu to configure the feedback loops **Output** – Switches to the **Output** menu to configure the properties of the power outputs O1+/O1- and O2+/O2-
Config 3/3		**Counter** – Switches to the **Counter** menu to enter a start value for the counter **Change PIN –** Switches to the **Change PIN** menu to change the password **Reboot –** Switches to the **Reboot** menu to restart the device
Load configuration from chip card		
Load Config from Card Download parameters from the chip card to the device		**Are you sure?** – Security prompt **No** – Do not download parameters from chip card **Yes** – Download parameters from chip card
Load Config from Card completed Download of parameters is complete		**OK** – Confirm
Save configuration to chip card		
Store Config to Card Download parameters from the device to the chip card		**Are you sure?** - Security prompt **No** – Do not save parameters to chip card **Yes** – Save parameters to chip card

Overview	Display	Description
Store Config to Card completed Saving of parameters from the unit is complete	Store Config to Card ... completed OK	**OK** - Confirm
Restore default settings		
Reset Config to Default Reset configuration to default settings	**Reset Config** **to Default** **Are you sure?** **No** **Yes**	**Are you sure?** – Security prompt **No** – Do not load default settings **Yes** – Load default settings
Reset Config to Default completed Resetting of the configuration to the default settings is complete	Reset Config to Default ... completed OK	**OK** – Confirm
Configure supply voltage B1/B2 to the power circuits		
Input Switch to the menu for the supply voltage to the power circuits	**Input** **B1/B2**	**B1/B2** – Switch to the **Input Voltage** menu to configure the inputs B1/B2
Input Voltage Configure the supply voltage to the power circuits	**Input Voltage** **B1/B2** **U ◂ 24 ▸ V** **Cancel** **Store**	**U < 24 > V** – Select supply voltage for power circuit, values: 24 V, 48 V **Cancel** – Exit menu without confirming the entry **Store** – Confirm entry
Configure feedback loops Y1 and Y2		
Feedback Configure feedback loops	**Feedback** **Pulsing** **Y1** **Y2**	**Pulsing** – Configure test pulses **Y1** – Switch to the **Y1** menu to configure feedback loop Y1 **Y2** – Switch to the **Y2** menu to configure feedback loop Y2

Overview	Display	Description
Y1/Y2 Pulse Activate test pulse		**Pulse On**: Test pulse on **Pulse Off**: Test pulse off **Cancel** – Exit menu without confirming the entry **Store** – Confirm entry Please note: The test pulses can only be activated simultaneously for both feedback loops Y1 and Y2.
Y1 or Y2 Switch to sub-menus for configuration of the feedback loops		**Logic** – Switch to **Logic Y1** or **Logic Y2** menu **Timing** – Switch to **Timing Y1** or **Timing Y2** menu
Y1 Logic or **Y2 Logic** Define N/C or N/O contact in the feedback loop		**Logic < N/O /N/C> -** Input logic for feedback loop Y1 or Y2: **N/O**: N/O contact **N/C**: N/C contact **Cancel** – Exit menu without confirming the entry **Store** – Confirm entry
Y1 Timing or Y2 Timing		**Ton** – Switch to submenu for configuration of the max. release time **Toff** – Switch to submenu for configuration of the max. application time
Y1 Ton or Y2 Ton Configure max. release time for fast and slow shutdown		**Slow / Fast < 500 > ms –** Max. release time Values: 30 … 4000 ms configurable in steps The max. release times are the same for fast and slow shutdown. **Cancel** – Exit menu without confirming the entry **Store** – Confirm entry

Overview	Display	Description
Y1 Toff or Y2 Toff Configure max. application time for fast and slow shutdown		**Fast < 500 > ms** – Max. application time for fast shutdown **Slow < 500 > ms** – Max. application time for slow shutdown Values: 30 … 4000 ms configurable in steps **Cancel** – Exit menu without confirming the entry **Store** – Confirm entry
Configure power circuits O1+/O1- and O2+/O2-		
Output Configure power circuits		**O1** – Switch to the **O1** menu to configure power circuit 1 **O2** – Switch to the **O2** menu to configure power circuit 2
O1 or **O2** Configure overexcitation time and reduced voltage		**O1** or **O2** **T < 1000 > ms** – Configure overexcitation time, values: off, 100 … 2500 ms configurable in steps. If "off" is configured, the voltage at B1/B2 is connected directly to outputs O1 or O2 without reduction. Any value entered for the reduced voltage will not be evaluated. **U < 12 > V** – Configure reduced voltage, values: 6, 8, 12, 16, 24, 32, 48 V **Store** – Confirm entry **Cancel** – Exit menu without confirming the entry
Configure counter		
Counter Specify offset for number of operations		**Counter 1** – Event counter 1 - Switch to the **Counter 1** menu to configure the number of operations for power circuit O1+/O1- **Counter 2** – Event counter 2 - Switch to the **Counter 2** menu to configure the number of operations for power circuit O2+/O2-

Overview	Display	Description
Counter 1 or **Counter 2** Switch to menu to set the counter for the number of operations for power circuits O1+/O1- or O2+/O2-		**Counter 1** – Event counter 1 - Configure number of operations for load at power circuit O1+/O1- **Counter 2** – Event counter 2 - Configure number of operations for load at power circuit O2+/O2- **########** – Old counter status **Set:** – Enter new counter status, e.g. when a used load is applied Value range: 0 … 99999999 **Store** – Confirm entry **Cancel** – Exit menu without confirming the entry
Change password		
PIN Change password		**Old** – Enter the old password **New** – Enter the new password **Cancel** – Exit menu without confirming the entry **Store** – Adopt new password
Denied Wrong PIN Error message		You entered an incorrect password
Restart after changing configuration		
Adopt changes and reboot Restart and adopt configuration		**No** – Do not restart **Yes** – Restart

6.2.6.5 Restart device

Restart the device if you have changed the configuration. The changed configuration is adopted during a restart.

There are two options for restarting the device once the configuration is complete.

Option one:

1. Switch off the device's supply voltage (terminals A1 and A2).
2. Switch the device's supply voltage back on.

   The configuration is adopted.

Option two:

1. Select **Reboot** in menu level 3.
2. Select **Yes** and press the rotary knob.

   The device is restarted and the configuration is adopted.

7 Operation

7.1 Troubleshooting

Faults are divided into

- Recoverable faults: see List of recoverable faults [📖 56]

and

- Internal faults: after an internal fault, the device must be switched on and off in order to restart it. If the fault occurs again, please contact Pilz.

All faults lead to a safe condition. If a fault is detected, the "I/O Fault" or "Fault" LED will light up on the device:

- "I/O Fault": Fault at inputs or outputs. Fault that can be repaired by the user, leading to a safe condition.
- "Fault": Internal fault leading to a safe condition.

The fault is entered in the error stack. Once a fault has been rectified and the device has been restarted, the error message is retained in the error stack.

The most recent error message is shown on the display.

7.2 Display elements for device diagnostics

7.2.1 LED display

The device has LEDs to display states and errors.

LED						Error
Run	Power	Out 1	Out 2	I/O Fault	Fault	
Green	Green	Green	Green	Red	Red	
☼	☼	☼	☼	☼	☼	Device is in "Power On" state (start-up phase)
◐	●	●	●	●	●	Device is in "Configuration" state
☼						Device is in "RUN" state.
☼	☼	☼/●	☼/●	●	●	Supply voltage to the power circuits is within the permitted range.
☼	◐	●	●	●	●	Supply voltage to the power circuits is outside the permitted range.
☼	☼	☼	☼/●	●	●	Output O1+/O1- is switched on.
☼	☼	☼/●	☼	●	●	Output O2+/O2- is switched on.
☼	◐/☼	◐	◐/●	●	●	Inputs Y10 and/or Y11 for fast shutdown are not at "0" after Power On or after a fault has been reset.

LED						Error
				●	●	Inputs Y20 and/or Y21 for fast shutdown are not at "0" after Power On or after a fault has been reset.
	●	●	●		●	Fault at inputs and/or outputs. Fault that can be repaired by the user, leading to a safe condition.
●	●	●	●	●		Internal fault. Fault that cannot be repaired by the user, leading to safe condition.

Legend

 LED on

 LED flashes

● LED off

7.2.2 Display

Up to 32 status and error messages are stored. They can be called up via the display (see chapter entitled "Commissioning", under "Status display and configuration [📖 44]").

The following information is shown on the display:

- Sequential number of an error stack entry (1 ... 32), the most recent error is displayed under number 1.
- Error number
- Error category
- Up to 3 parameters to one error entry
- Time stamp: Time since system start ("Power On")

7.2.2.1 List of recoverable faults

Cat.	No.	Error message	Description	Remedy
0	2	Enter Stop	System is in "STOP" state	Purely for information
0	3	Enter Run	System is in "RUN" state	Purely for information
1	0	ACK IO-Fault	The "IO-Fault" error has been reset with the inputs Y10/Y11 and/or Y20/Y21 (1/0 pulse edge)	Purely for information
4	0	Copy Config	The configuration has been loaded from the chip card to the device.	Purely for information
4	1	Copy Config	The device has saved the configuration to the chip card.	Purely for information
4	2	Missing Card	There is no chip card in the card slot.	Insert a valid chip card into the card slot

Cat.	No.	Error message	Description	Remedy
4	3	Invalid Card	The data on the chip card is invalid	▸ Check Chip Card ▸ Insert a valid chip card into the card slot
4	4	Mems. Differ	The data on the chip card differs from the data in the device	▸ Use a chip card containing the device configuration ▸ Write the device configuration to chip card
4	5	Card Removed	The chip card has been removed during operation	Insert a valid chip card into the card slot
4	6	Unknown Card	The chip card does not contain device data for the PNOZ s50	Insert a valid chip card into the card slot
5	0	Wrong Pin	The password is invalid	Enter a valid password
5	1	Pin Changed	The password has been changed	Purely for information
5	2	Count. at Max	The event counter has reached the maximum value 99999999. The event counter is not reset automatically.	Reset event counter
5	3	Chan. Differ	Error in the device's parameter settings	Check parameter settings
6	0	Supply NOK	Supply voltage B1/B2 to the power circuits is outside the permitted range. Parameter 1: <Error location>	Check the supply voltage
6	1	Supply OK	Supply voltage B1/B2 to the power circuits is once again within the permitted range. Parameter 1: <Error location>	Purely for information
7	0	Reset Config	The device has been reset to its default settings.	Purely for information
7	1	Reinit Memory	The device memory has been reinitialised. All parameters have been set to the default settings.	Purely for information
20	0	Short Circuit	Short circuit at power circuit O1+/O1- or O2+/O2- Parameter 1: <Error location>	▸ Ensure that the power circuit is wired correctly ▸ Rectify short circuit

Cat.	No.	Error message	Description	Remedy
20	1	Readback fail	Output voltage of power circuit O1+/O1- or O2+/O2- does not correspond to the configured output voltage. Parameter 1: <Error location> Parameter 2: <I/O Status> Parameter 3: Status of both power circuits ▸ High Word: Power circuit 2 0x0001: Overexcited 0x0002: Fallen 0x0003: Fast-Off 0x0004: Slow-Off ▸ Low Word: Power circuit 1 0x0001: Overexcited 0x0002: Fallen 0x0003: Fast-Off 0x0004: Slow-Off	▸ Ensure that the power circuit is wired correctly ▸ Rectify short circuits or shorts between contacts
20	2	Open Circuit	Open circuit at power circuit O1+/O1- or O2+/O2-. Current is too low in the on state. Parameter 1: <Error location> Parameter 2: <I/O Status>	▸ Ensure that the power circuit is wired correctly ▸ Rectify open circuit
20	3	Test fail	Error during off test of power circuits O1+/O1- or O2+/O2-. Parameter 1: <Error location> Parameter 2: <I/O Status>	▸ Ensure that the power circuit is wired correctly ▸ Rectify short circuits or shorts between contacts
20	4	Test fail	Error during on test of power circuits O1+/O1- or O2+/O2-. Parameter 1: <Error location> Parameter 2: <I/O Status>	▸ Ensure that the power circuit is wired correctly ▸ Rectify short circuits or shorts between contacts
21	0	Readback fail	The signal at output O3, O4 or O5 does not correspond to the expected value. Parameter 1: <Error location> Parameter 2: <I/O Status>	Ensure that the outputs are wired correctly
21	1	Test fail	Error during off test of outputs O3, O4 or O5. Parameter 1: <Error location> Parameter 2: <I/O Status>	Ensure that the outputs are wired correctly

Cat.	No.	Error message	Description	Remedy
22	0	Input Not Off	At least one of the inputs Y10/ Y11 or Y20/Y21 has a "1" signal following a restart or after resetting an error Parameter 1: <Error location>	Set the inputs for fast shutdown to a "0" signal
22	1	Input Sin. On	Prior to the 0/1 pulse edge, neither of the inputs for fast shutdown were set to a "0" signal. Parameter 1: <Error location>	Set the inputs for fast shutdown to a "0" signal
22	2	Test fail	Input for feedback loop Y1 or Y2 was not at "0" during test pulse Parameter 1: <Error location> Parameter 2: <I/O Status>	▸ Ensure that the test pulses are wired correctly ▸ Rectify short circuits or shorts between contacts
23	0	Feedback On	State of the feedback loop is not as expected when the power circuits are switched on Parameter 1: <Error location>	Ensure that ▸ the feedback loops are wired correctly ▸ the feedback loops are configured correctly ▸ the application time has elapsed before the brake is released after shutdown ▸ the logic (N/C, N/O) of the feedback loop is configured correctly ▸ the pulse suppression [📖 68] of the test pulses at Y10/ Y11 / Y20/Y21 is maintained
23	1	Feedback Err	State of the feedback loop is not as expected after the power circuits are switched on Parameter 1: <Error location>	Ensure that ▸ the feedback loops are wired correctly ▸ the feedback loops are configured correctly ▸ the load is applied

Cat.	No.	Error message	Description	Remedy
23	2	Feedback Ton	State of the feedback loop is not as expected after the release time has elapsed Parameter 1: <Error location> Parameter 2 (type of testing): 0x00000001: As release time elapses 0x00000002: After release time has elapsed	Ensure that ▸ the feedback loops are wired correctly ▸ the feedback loops are configured correctly ▸ the load is applied ▸ the release time is configured correctly
23	3	Feedback Toff	State of the feedback loop is not as expected after the application time has elapsed Parameter 1: <Error location> Parameter 2 (type of application time): 0x00000001: Toff fast shutdown 0x00000002: Toff slow shutdown 0x00000003: Toff fast shutdown before release time has elapsed 0x00000004: Slow shutdown before release time has elapsed 0x00000005: Fast shutdown after release time for slow shutdown has elapsed	Ensure that ▸ the feedback loops are wired correctly ▸ the feedback loops are configured correctly ▸ the load is applied ▸ the application time is configured correctly
24	0	Defect Card	Cannot read chip card.	▸ Check Chip Card ▸ Insert a valid chip card into the card slot
26	0	Supply Error	After switching on O1+/O1- or O2+/O2-, the supply voltage to the power circuits B1/B2 is outside the permitted range Parameter 1: <Error location>	Check the supply voltage
26	1	Supply Error	After on test at O1+/O1- or O2+/O2-, the supply voltage to the power circuits B1/B2 is outside the permitted range Parameter 1: <Error location>	Check the supply voltage

Cat.	No.	Error message	Description	Remedy
27	0	Overtemp.	Temperature within the device has exceeded the permitted value	▸ Switch off device and switch it back on once it has cooled ▸ Minimise load

Parameter I/O-Status

In the case of some error stack entries, a parameter will indicate the status of the inputs/outputs when the fault occurred.

The parameter consists of 32 Bits (8 digits with 4 Bits each) and is hexadecimal coded:

Digit		7	6	5	4	3	2	1	0
	0x	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Digit	Value	Terminal	Designation of the input/output state
0	0	---	No error
	1	A1/A2	Device's supply voltage
	2	B1/B2	Supply voltage to the power circuits
	4	---	Reserved
	8	---	Reserved
1	0	---	No error
	1	Y10	Input for fast shutdown of power circuit 1
	2	Y11	Input for fast shutdown of power circuit 1
	4	S35	Input for slow shutdown of power circuit 1
	8	Y1	Input for feedback loop of power circuit 1
2	0	---	No error
	1	Y20	Input for fast shutdown of power circuit 2
	2	Y21	Input for fast shutdown of power circuit 2
	4	S36	Input for slow shutdown of power circuit 2
	8	Y2	Input for feedback loop of power circuit 2
3	0	---	Reserved
4	0	---	No error
	1	O3	Output for fault signal
	2	T0	Output for test pulse 0
	4	T1	Output for test pulse 1
	8	---	Reserved
5	0	---	No error
	1	O1+	Output of power circuit 1 (High Side)
	2	O1-	Output of power circuit 1 (Low Side)
	4	O4	Output of status for power circuit 1

Digit	Value	Terminal	Designation of the input/output state
	8	---	Reserved
6	0	---	No error
	1	O2+	Output of power circuit 2 (High Side)
	2	O2-	Output of power circuit 2 (Low Side)
	4	O5	Output of status for power circuit 2
	8	---	Reserved
7	0	---	Reserved

Example

Digit		7	6	5	4	3	2	1	0
	0x	**0**	**0**	**7**	**7**	**0**	**0**	**7**	**0**
		MSB							LSB

Status as the fault occurred:

- Digit 1: there is a "1" signal at Y10, Y11 and S35
- Digit 4: the power output O1+/O1- and its status output O4 are switched on. There is a "1" signal at the fault signal output (no fault)
- Digit 5: There is a "1" signal at the test pulse outputs T0 and T1

7.3 Reset I/O Fault

The device switches to the "I/O Fault" state if a fault has been detected at the inputs or outputs. Once it has been rectified, the fault must be reset.

There are three options for resetting an "I/O Fault" and restarting the device.

Option one: Switch supply voltage A1/A2 off and then on again

1. Switch off the device's supply voltage (terminals A1 and A2)
2. Switch the device's supply voltage back on.

   The device restarts.

Option two: Reboot display menu

1. Select **Reboot** in menu level 3.
2. Select **Yes** and press the rotary knob.

   The device restarts.

Option three: Switch inputs Y10/Y11 or Y20/Y21

This option should be considered if you wish to reset the fault from the higher level controller.

Using one power circuit:

- The fault is reset by a 1/0 pulse edge at Y10 and Y11 or a 1/0 pulse edge at Y20 and Y21.
- A 0/1 pulse edge switches on the corresponding power circuit.

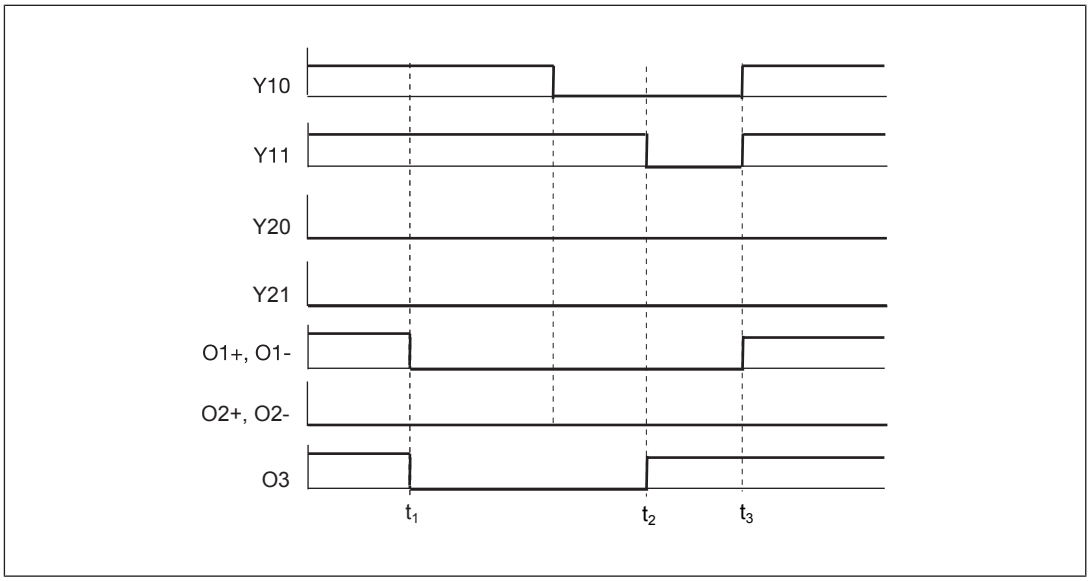


Fig.: Resetting faults when using one power circuit

Legend:

- t_1: Fault at Y10/Y11, load shuts down
- t_2: Q 1 -> 0: Reset fault at Y11
- t_3: On O1+, O1-: Switch load on; before switching on, Y10 and Y11 must both be at "0"
- O3: Fault signal output

Using two power circuits:

- With dual-channel activation, the fault can be reset through a 1/0 pulse edge at Y10/Y11 or Y20/Y21.
- In order to switch the load on, the relevant inputs must both already be at "0".

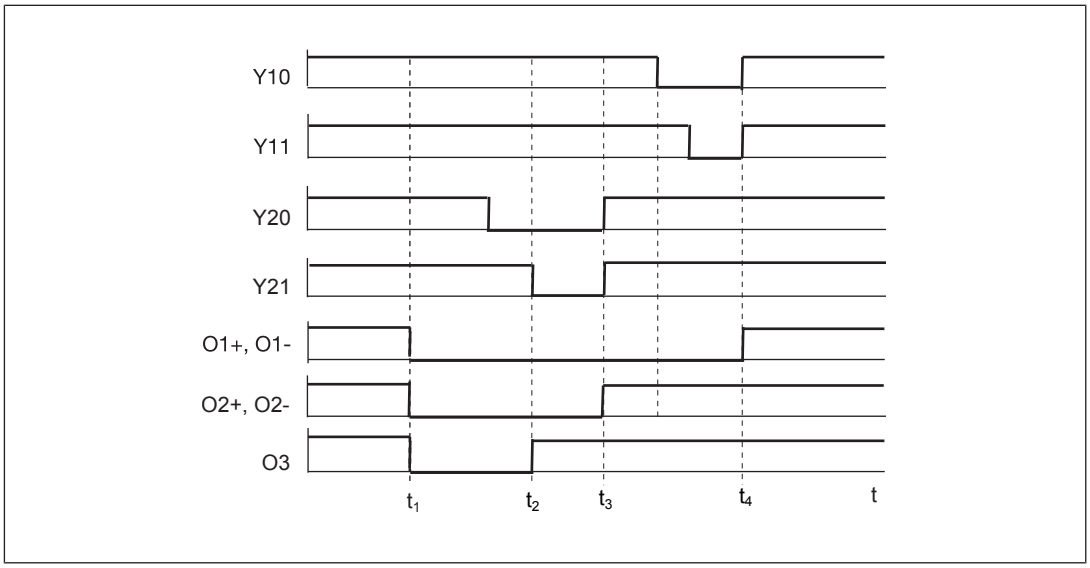


Fig.: Resetting faults when using two power circuits

Legend:

- t_1: Fault at Y10/Y11, load shuts down
- t_2: Q 1 -> 0: Reset fault at Y21
- t_3: On O2+, O2-: Switch load on; before switching on, Y20 and Y21 must both be at "0"
- t_4: On O1+, O1-: Switch load on; before switching on, Y10 and Y11 must both be at "0"
- O3: Fault signal output

8 Example

8.1 Overview

This chapter provides information on how to connect the PNOZ s50 to a safety controller. The connections illustrated are independent of any specific controller.

INFORMATION

The following example is intended to help you configure the application using the display.

These settings and parameters should be regarded as example settings. It's possible that your own specific application may require different settings or parameters under certain circumstances.

CAUTION!

When considering the example, please note that Pilz accepts no responsibility for the specific application. In particular, it may not be used without testing and approval.

The constructor is responsible for creating appropriate safety concepts for the overall plant and for connection to the safety controller (including configuration). The applicable standards and regulations must be considered and observed.

In each case it is necessary to consider the input and output requirements from the chapter entitled "Function description [📖 15]". This is also true when using the applied safety controllers.

8.2 Mechanical holding brake

8.2.1 Properties

PNOZ s50

- Safe activation of two independent mechanical holding brakes
- Release and application times are monitored
- Fast and slow shutdown of both brakes
- Feedback loop for brake B1 is monitored via input Y1
- Feedback loop for brake B2 is monitored via input Y2

Supply voltage

- Fuses
  - F1: 24 V DC, 4 A, characteristic B/C
  - F2: 24 V DC, 13 A, characteristic B/C

Safety controller

- Inputs
  - Fault signal O3
  - State of brakes O4, O5 (applied, released) is monitored
- Outputs
  - Activation of fast and slow shutdown of brake

Brake

- Micro switch S1 to signal the state of brake B1
- Micro switch S2 to signal the state of brake B2

8.2.2 Configuration overview

The following parameters must be set in the display menu:

Function	Terminal	Description	Parameter	Value	In display menu
Supply voltage, power circuits 1 and 2	B1/B2	Supply voltage	Input Voltage	24 V	**Input -> Input Voltage**
Test pulse	Y1/Y2	Test pulses on feedback loops	Pulsing	On	**Feedback -> Pulsing -> Y1/Y2 Pulse**
Power circuit 1	O1+/O1-	Reduced voltage	U	12 V	**Output -> O1**
		Overexcitation time	T	450 ms	**Output -> O1**
	Y1	Maximum ventilation time	Ton	60 ms	**Feedback -> Y1 -> Y1 Timing -> Y1 Ton**
		Maximum application time, fast shutdown	Toff fast	30 ms	**Feedback -> Y1 -> Y1 Timing -> Y1 Toff**
		Maximum application time, slow shutdown	Toff slow	150 ms	**Feedback -> Y1 -> Y1 Timing -> Y1 Toff**
		Logic of feedback loop 1	Logic	N/C	**Feedback -> Y1 -> Logic -> Y1 Logic**
Power circuit 2	O2+/O2-	Reduced voltage	U	12 V	**Output -> O2**
		Overexcitation time	T	450 ms	**Output -> O2**
	Y2	Maximum ventilation time	Ton	60 ms	**Feedback -> Y2 -> Y1 Timing -> Y2 Ton**
		Maximum application time, fast shutdown	Toff fast	30 ms	**Feedback -> Y2 -> Y1 Timing -> Y2 Toff**
		Maximum application time, slow shutdown	Toff slow	150 ms	**Feedback -> Y2 -> Y1 Timing -> Y2 Toff**
		Logic of feedback loop 2	Logic	NC	**Feedback -> Y2 -> Logic -> Y2 Logic**

8.2.3 Connection

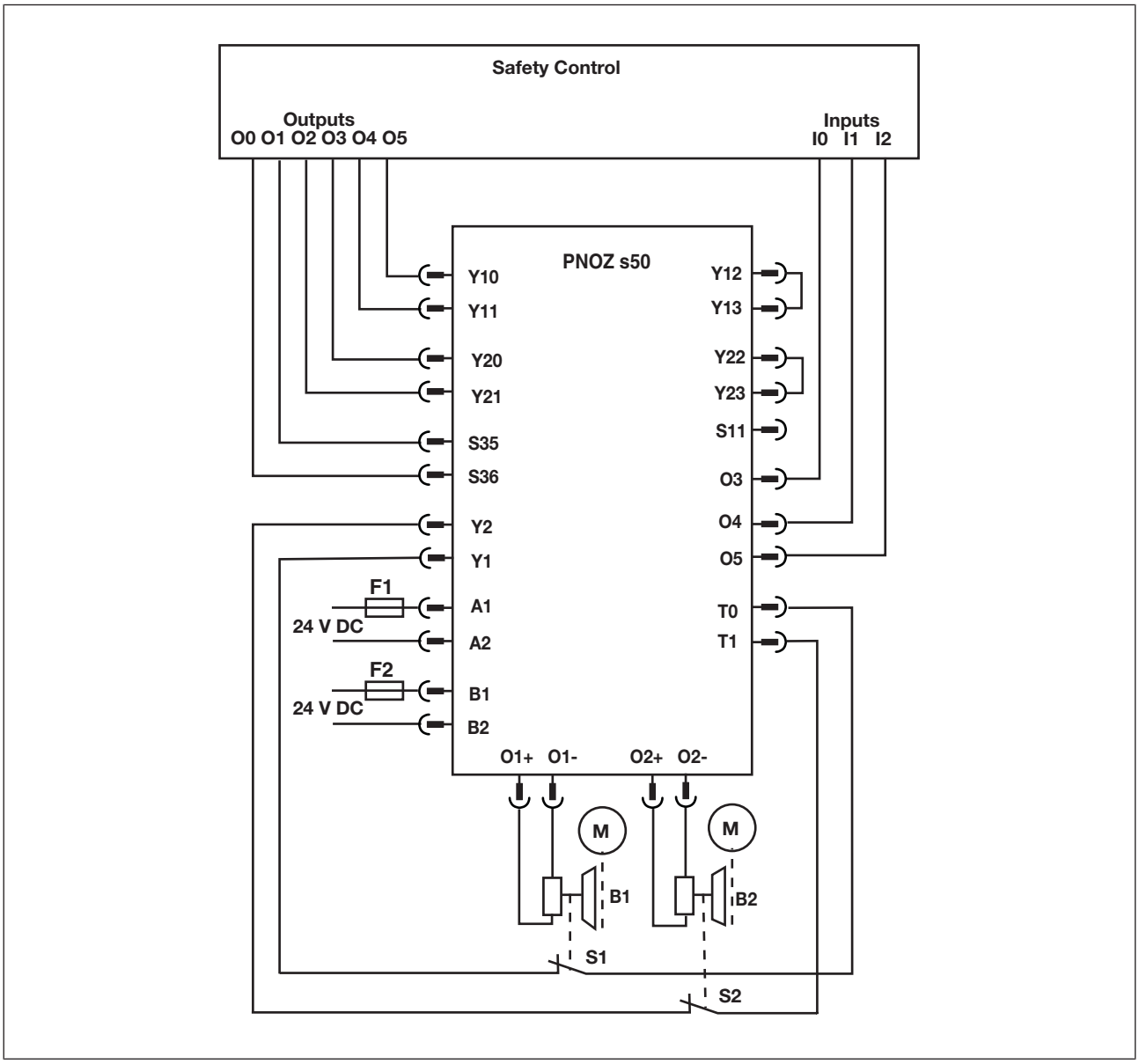


Fig.: Connection example: Two mechanical holding brakes

9 Technical details

General	751500	751509
Certifications	CE, EAC, TÜV, UKCA, cULus Listed	CE, EAC, TÜV, UKCA, cULus Listed
Electrical data	**751500**	**751509**
Supply voltage		
for	Supply to the system	Supply to the system
Voltage	24 V	24 V
Kind	DC	DC
Voltage tolerance	-15 %/+20 %	-15 %/+20 %
Output of external power supply (DC)	18 W	18 W
Output of external power supply (DC) at no load	3 W	3 W
Residual ripple DC	5 %	5 %
External unit fuse protection F1	4 A, circuit breaker 24 V DC, characteristic B/C	4 A, circuit breaker 24 V DC, characteristic B/C
Potential isolation	No	No
Supply voltage		
for	Supply to 2-pole SC outputs	Supply to 2-pole SC outputs
Voltage	24 V, 48 V	24 V, 48 V
Kind	DC	DC
Voltage tolerance	-10 %/+20 %	-10 %/+20 %
Max. permitted current	11 A	11 A
Output of external power supply (DC)	264 W	264 W
External unit fuse protection F2	13 A, circuit breaker 48 V DC, characteristic B/C	13 A, circuit breaker 48 V DC, characteristic B/C
Potential isolation	yes	yes
Inputs	**751500**	**751509**
Number	8	8
Number of safe inputs	4	4
Number of standard inputs	4	4
Input current, safe inputs	3 - 10 mA	3 - 10 mA
Input current, standard inputs	3 - 10 mA	3 - 10 mA
Min. threshold voltage when signal changes from "1" to "0", safe inputs	8 V	8 V
Max. threshold voltage when signal changes from "0" to "1", safe inputs	11 V	11 V
Min. threshold voltage when signal changes from "1" to "0", standard inputs	8 V	8 V
Max. threshold voltage when signal changes from "0" to "1", standard inputs	11 V	11 V
Pulse suppression	1,5 ms	1,5 ms

Inputs	751500	751509
Voltage at		
Input circuit DC	24 V	24 V
Feedback loop DC	24 V	24 V
Potential isolation	No	No
Semiconductor outputs	**751500**	**751509**
Number of positive-switching single-pole semiconductor outputs	3	3
Switching capability		
Voltage	24 V	24 V
Current	0,1 A	0,1 A
Max. duration of off time during self test	300 µs	300 µs
Short circuit-proof	yes	yes
Potential isolation	No	No
Permitted loads	inductive, capacitive, resistive	inductive, capacitive, resistive
Semiconductor outputs, 2-pole	**751500**	**751509**
Number of dual-pole semiconductor outputs	2	2
Maximum output power during continuous duty	96 W	96 W
Maximum output power during overexcitation	156 W	156 W
Reduced voltages	6 V, 8 V, 12 V, 16 V, 24 V, 32 V, 48 V	6 V, 8 V, 12 V, 16 V, 24 V, 32 V, 48 V
Voltage tolerance of reduced voltages	-10 %/+10 %	-10 %/+10 %
Max. output current at "1" signal, 24 V, continuous duty	4 A	4 A
Max. output current at "1" signal, 48 V, continuous duty	2 A	2 A
Max. output current at "1" signal, 24 V, overexcitation	6,5 A	6,5 A
Max. output current at "1" signal, 48 V, overexcitation	3,25 A	3,25 A
Short circuit-proof	yes	yes
Permitted loads	Inductive	Inductive
Max. duration of on time during self test	500 µs	500 µs
Max. duration of off time during self test	500 µs	500 µs
Voltage outputs	**751500**	**751509**
Number	1	1
Voltage	24 V DC	24 V DC
Max. current	0,1 A	0,1 A
Short circuit-proof	yes	yes
Potential isolation	No	No

Test pulse outputs	751500	751509
Number of test pulse outputs	**2**	**2**
Voltage, test pulse outputs	**24 V DC**	**24 V DC**
Max. duration of off time during self test	**6 ms**	**6 ms**
Short circuit-proof	**yes**	**yes**
Max. output current at "1" signal	**0,1 A**	**0,1 A**
Potential isolation	**No**	**No**
Times	**751500**	**751509**
Supply interruption before de-energisation	**20 ms**	**20 ms**
Max. reaction time when the input signal changes	**8 ms**	**8 ms**
Ventilation time configurable in steps	**30 ms ... 4000 ms**	**30 ms ... 4000 ms**
Application time during fast shut-down configurable in steps	**30 ms ... 4000 ms**	**30 ms ... 4000 ms**
Application time during slow shut-down configurable in steps	**30 ms ... 4000 ms**	**30 ms ... 4000 ms**
Overexcitation time configurable in steps	**100 ms ... 2500 ms**	**100 ms ... 2500 ms**
Environmental data	**751500**	**751509**
Climatic suitability	**EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-78**	**EN 60068-2-1, EN 60068-2-14, EN 60068-2-2, EN 60068-2-78**
Ambient temperature		
Temperature range	**0 - 55 °C**	**0 - 55 °C**
Storage temperature		
Temperature range	**-40 - 85 °C**	**-40 - 85 °C**
Climatic suitability		
Humidity	**93 % r. h. at 40 °C**	**93 % r. h. at 40 °C**
Condensation during operation	**Not permitted**	**Not permitted**
Max. operating height above sea level	**2000 m**	**2000 m**
EMC	**EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61326-3-1**	**EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, 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**
Airgap creepage		
In accordance with the standard	**EN 60664-1**	**EN 60664-1**
Overvoltage category	**III**	**III**

Environmental data	751500	751509
Protection type		
Housing	**IP20**	**IP20**
Terminals	**IP20**	**IP20**
Mounting area (e.g. control cabinet)	**IP54**	**IP54**
Potential isolation	**751500**	**751509**
Potential isolation between	**2-pole semiconductor outputs and system voltage**	**2-pole semiconductor outputs and system voltage**
Type of potential isolation	**Basic insulation**	**Basic insulation**
Mechanical data	**751500**	**751509**
Mounting position	**horizontally on mounting rail**	**horizontally on mounting rail**
Material		
Bottom	**PC**	**PC**
Front	**PC**	**PC**
Top	**PC**	**PC**
Connection type	**Spring-loaded terminal**	**Spring-loaded terminal**
Mounting type	**plug-in**	**plug-in**
Conductor cross section with spring-loaded terminals: Flexible with/without crimp connector	**0,2 - 2,5 mm², 24 - 12 AWG**	**0,2 - 2,5 mm², 24 - 12 AWG**
Spring-loaded terminals: Terminal points per connection	**2**	**2**
Stripping length with spring-loaded terminals	**9 mm**	**9 mm**
Dimensions		
Height	**100 mm**	**100 mm**
Width	**45 mm**	**45 mm**
Depth	**120 mm**	**120 mm**
Weight	**257 g**	**258 g**

The standards current on 2022-05 apply.

9.1 Safety characteristic data

Operating mode	EN ISO 13849-1: 2015 PL	EN ISO 13849-1: 2015 Category	EN IEC 62061 SIL CL/ maximum SIL	EN IEC 62061 PFH_D [1/h]	EN/IEC 61511 SIL	EN/IEC 61511 PFD	EN ISO 13849-1: 2015 T_M [year]
All	**PL e**	**Cat. 4**	**SIL CL 3**	**1,05E-09**	**SIL 3**	**9,09E-05**	**20**

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.

The safety-related characteristic data (PFH, PFD) are mean values. They have been calculated at an average ambient component temperature of 40 °C and apply for the ambient temperature range stated in the technical details.

10 Classification according to ZVEI, CB24I

The following tables describe the classes and specific values of the product interface and the classes of interfaces compatible with it. The classification is described in the ZVEI position paper "Classification of Binary 24 V Interfaces - Functional Safety aspects covered by dynamic testing".

Input	
Interfaces	
Drain	
Interface	Module
Class	C1
Source	
Class	C1, C2, C3
Drain parameters	
Max. test pulse duration	1,5 ms
Min. test pulse interval	40 ms
Min. input resistance	2,2 kOhm
Max. capacitive load	68 nF

Single-pole output	
Interfaces	
Source	
Interface	Module
Class	C2
Drain	
Interface	Evaluation device
Class	C1, C2
Source parameters	
Max. test pulse duration	300 µs
Max. rated current	0,1 A
Max. capacitive load	1 µF

11 Supplementary data

The max. permitted load current at the power circuits O1+/O1- and O2+/O2- depends on the

- Ambient temperature.
- Distance between the PNOZ s50 and adjacent devices.
- Number of power circuits connected (one or two).
- Size of the supply voltage to the power circuits at B1/B2.

INFORMATION

You may need to consider the distance from adjacent devices!

If a distance needs to be maintained between adjacent devices, please refer to the information in the chapter entitled "Installation", under "Mounting distances [📖 27]".

Distance required between adjacent devices	Ambient temperature	Number of power circuits	Max. permitted output current at $U_{B1/B2}$ = 24 V	Max. permitted output current at $U_{B1/B2}$ = 48 V
Yes	45°C	1	6.5 A	3.25 A
Yes	55°C	1	6.5 A	3.25 A
Yes	45°C	2	5.5 A	2.75 A
Yes	55°C	2	5.0 A	2.5 A
No	45°C	1	6.5 A	3.25 A
No	55°C	1	6.0 A	3.0 A
No	45°C	2	4.5 A	2.25 A
No	55°C	2	4.0 A	2.0 A

Use of the devices in accordance with UL

Ambient temperature	Number of power circuits	Max. permitted output current at $U_{B1/B2}$ = 24 V	Max. permitted output current at $U_{B1/B2}$ = 48 V	Utilisation category
45°C	1	6.5 A	3.25 A	Pilot Duty
55°C	1	5.5 A	2.75 A	
45°C	2	4.5 A	2.25 A	
55°C	2	4.0 A	2.0 A	

When using the devices in accordance with UL, please note the following:

- The ambient temperature is understood to be the *Surrounding Air Temperature*.
- Appropriate measures e.g (tempering of the control cabinet) should be used to ensure that the stated values are maintained when devices are installed without a distance.

12 Order reference

12.1 Order references Module

Product type	Terminals	Order no.
PNOZ s50 C	Spring-loaded terminals	751500
PNOZ s50 C	Spring-loaded terminals	751509

12.2 Order references Accessories

Chip cards and chip card reader

Product type	Features			Order no.
PNOZmulti Chipcard	Chip card	32kB		779211
PNOZmulti Chipcard Set	Chip card	32kB	10 pieces	779212
Chipcard Holder	Chip card holder			779240
PNOZmulti Seal	Chip card seal		10 pieces	779250
PNOZ Chip Card Reader	Chip card reader for saving the configuration on the computer			779230
SmartCardCommander with SIM card adapter	Software for the chip card reader 779 230, for saving the configuration on the computer			750031
PNOZsigma Chip Card manager set	Set consisting of the PNOZ Chip Card Reader and SmartCardCommander with SIM card adapter (779 230 and 750 030)			750030

Terminals

Product type	Features			Order no.
PNOZ s Set1 Spring Loaded Terminals 45 mm	Set of plug-in spring-loaded terminals		1 pieces	751008

13 Appendix

13.1 Check list

Enter the device parameters in the following check list. It is intended as a guide to provide support when commissioning and recommissioning the PNOZ s50 and when carrying out the regular inspection as required.

We recommend that you keep the completed check list and store it with the machine documentation for reference.

Function	Terminal	Description	Parameter	Value
Supply voltage, power circuits 1 and 2	B1/B2	Supply voltage	Input Voltage	……..V
Test pulse	Y1/Y2	Test pulses on feedback loops	Pulsing On = Test pulse on Off = Test pulse off	
Power circuit 1	O1+/O1-	Reduced voltage	U	……..V
		Overexcitation time	T	……..ms
	Y1	Maximum release time	Ton	……..ms
		Maximum application time Fast shutdown	Toff fast	……..ms
		Maximum application time Slow shutdown	Toff slow	……..ms
		Logic of feedback loop 1	Logic N/O = Normally open N/C = Normally closed	
Power circuit 2	O2+/O2-	Reduced voltage	U	……..V
		Overexcitation time	T	……..ms
	Y2	Maximum release time	Ton	……..ms
		Maximum application time Fast shutdown	Toff fast	……..ms
		Maximum application time Slow shutdown	Toff slow	……..ms
		Logic of feedback loop 2	Logic N/O = Normally open N/C = Normally closed	

Check sum (CRC):……
(from "Systeminfo" menu page)

Date:…….

Signature:…….....……..

14 EC declaration of conformity

This product/these products meet the requirements of the directive 2006/42/EC for machinery of the European Parliament and of the Council. The complete EC Declaration of Conformity is available on the Internet at www.pilz.com/downloads.
Authorised representative: Norbert Fröhlich, Pilz GmbH & Co. KG, Felix-Wankel-Str. 2, 73760 Ostfildern, Germany

15 UKCA-Declaration of Conformity

This product(s) complies with following UK legislation: Supply of Machinery (Safety) Regulation 2008.
The complete UKCA Declaration of Conformity is available on the Internet at www.pilz.com/downloads.

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Quality Management ISO 9001:2015 REG. NO. 2462
Environmental Management ISO 14001 REG. NO. 2462
Energy Management ISO 50001 REG. NO. 2462

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PILZ
THE SPIRIT OF SAFETY