



► Modular safety relay myPNOZ

PILZ
THE SPIRIT OF SAFETY

Getting started-1005615-EN-05

- Safety relays



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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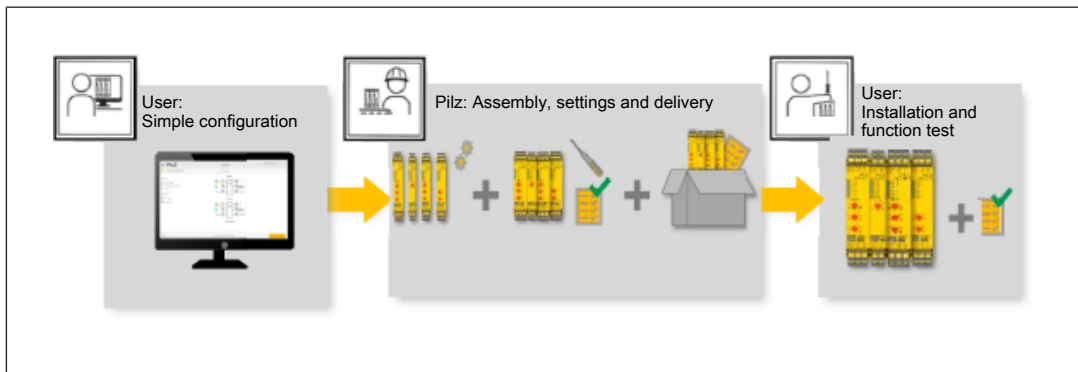
SD means Secure Digital

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1

The modular safety relay myPNOZ

myPNOZ is a modular safety relay, which can be used to implement various safety functions without the need for programming. A safety function can be achieved through the combination, settings and wiring of the respective myPNOZ components. With myPNOZ, safety functions can be implemented up to PL e of EN ISO 13849-1/2, SIL 3 of EN IEC 62061 and SIL 3 of EN/IEC 61508.



You can create your individual myPNOZ yourself or easily with the support of the web application **myPNOZ Creator** (<http://mypnoz.com/creator>). All you need to do is define the required safety functions and how they are linked.

Once ordered, Pilz will assemble your myPNOZ from the various modules, before setting it up and testing it.

Your myPNOZ arrives "ready-to-install". All you need to do is install myPNOZ in the control cabinet, wire it up and test the safety functions, then your myPNOZ is ready for operation.

2

Introduction to Getting Started manual

This Getting Started manual uses an example to describe how to create and commission a myPNOZ. The Getting Started manual shows you the elementary steps and familiarises you with the myPNOZ.

A detailed description of the myPNOZ and the individual modules can be found in the operating manual “**Modular Safety Relay myPNOZ**”.



WARNING!

Loss of safety function due to incorrect use of the myPNOZ

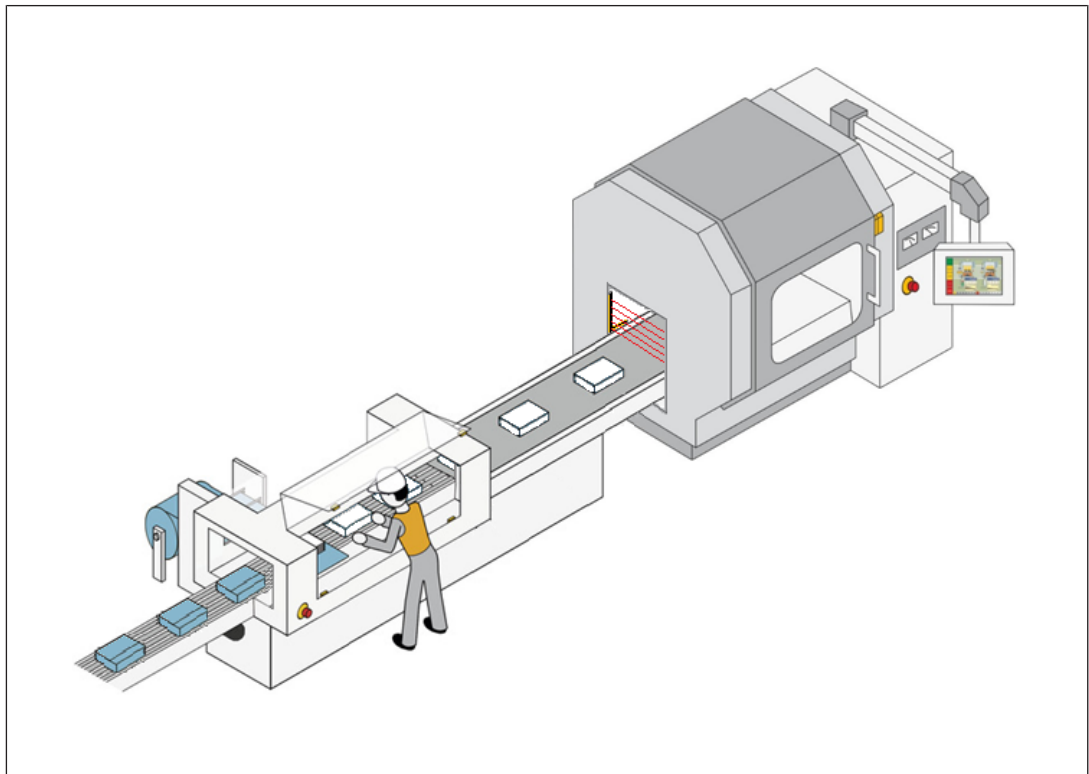
This Getting Started manual does not contain the safety guidelines needed for safe installation and operation.

It is essential that you read the operating manual “Modular Safety Relay myPNOZ”.

3

Task

- ▶ A processing machine has two protection zones. One processing unit and a packaging unit with inspection area.
- ▶ In an emergency it should be possible to stop the whole machine. It should be possible to trigger the emergency stop from both units.
- ▶ Staff must be able to reach into the processing unit to change the tool or for cleaning work.
It must be guaranteed that the processing unit is in a stop state whenever a staff member reaches into the danger zone.
- ▶ Maintenance staff must be able to reach into the inspection area for maintenance work.
It must be guaranteed that the conveyor is stopped whenever a staff member reaches into the danger zone.
- ▶ Only the unit on which work needs to be carried out should be stopped. The other unit should continue running.
- ▶ After a stop, the units should only restart following confirmation on the operator panel.
- ▶ It must be guaranteed that nobody reaches into the product outlet area while the production unit is running. However, products must be able to exit.



4 Safety functions

Global E-STOP function

In an emergency, the whole machine (processing unit and conveyor) can be stopped from both areas via the E-STOP pushbuttons (ES1 and ES2).

Monitored start with rising and falling edge

If the E-STOP function has been triggered, confirmation must be given on the operator panel in order for the machine to restart.

Zone 1 [Z1]: Processing unit

The processing unit is secured using a safety gate and light curtain.

► Safety gate safety function (SG1)

If the safety gate is opened, then the processing unit is stopped.

The safety function is started with a monitored start with rising and falling edge. If the safety function has been triggered, confirmation must be given on the operator panel in order for the processing unit to restart.

► Light curtain safety function (LC)

If the light curtain is interrupted, then the processing unit is stopped.

The safety function of the light curtain is temporarily suspended through integrated L-muting, so that the products can exit the processing area without the processing unit being stopped.

The safety function is started with a monitored start with rising and falling edge. If the safety function has been triggered, confirmation must be given on the operator panel in order for the processing unit to restart.

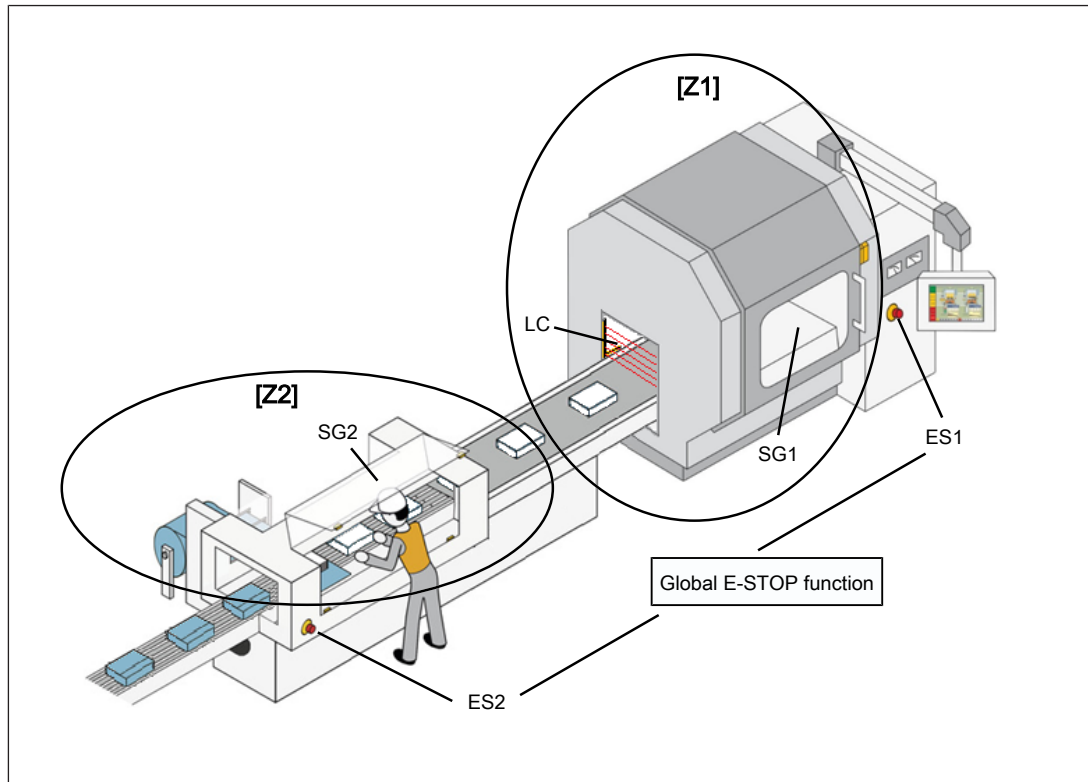
Zone 2 [Z2]: Packaging unit with inspection area

The inspection area is equipped with a hatch for maintenance work. The hatch is secured using a safety switch.

► Safety gate safety function (SG2)

The conveyor is stopped via a safety switch as soon as the hatch is opened.

The safety function is started with a monitored start with rising and falling edge. If the safety function has been triggered, confirmation must be given on the operator panel in order for the conveyor to restart.



5 Configure myPNOZ with myPNOZ Creator

The safety functions and their logic connections can be mapped out in the web application myPNOZ Creator.

The web application myPNOZ Creator enables configuration to be carried out based on a logic plan or through the combination of modules. The web application automatically assembles an individual myPNOZ based on this system configuration.

It selects the required modules, defines the sequence and defines the position of the rotary switches. The result is a pre-configured myPNOZ, which can be ordered directly.

5.1 Create logic configuration

Open the web application myPNOZ Creator (<http://mypnoz.com/creator>) and map out the safety functions and their logic connections.

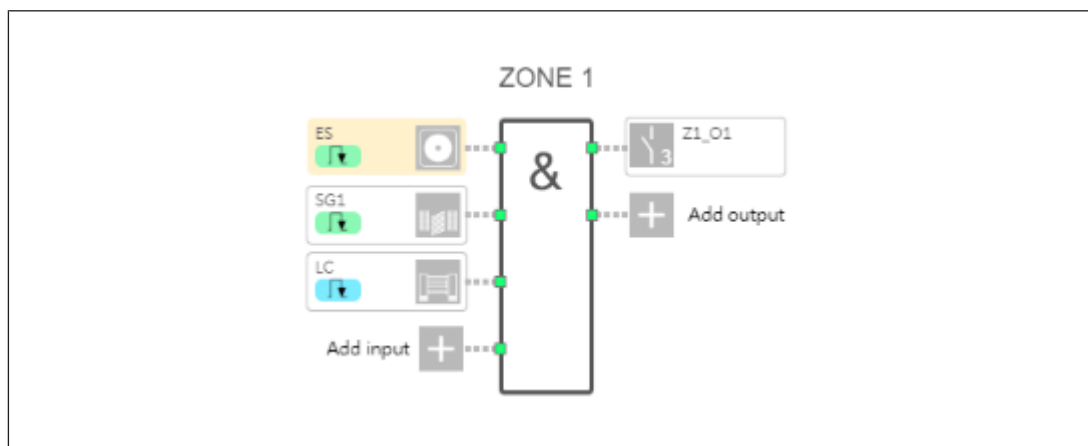
► Global E-STOP function

Each myPNOZ contains the global safety function. It affects the outputs in each zone and is AND-linked to the inputs on the input modules. The global safety function is pre-configured as an input in each zone; changes to the properties affect all zones.

So the global E-STOP function ES is only configured once for ES1 and ES2.

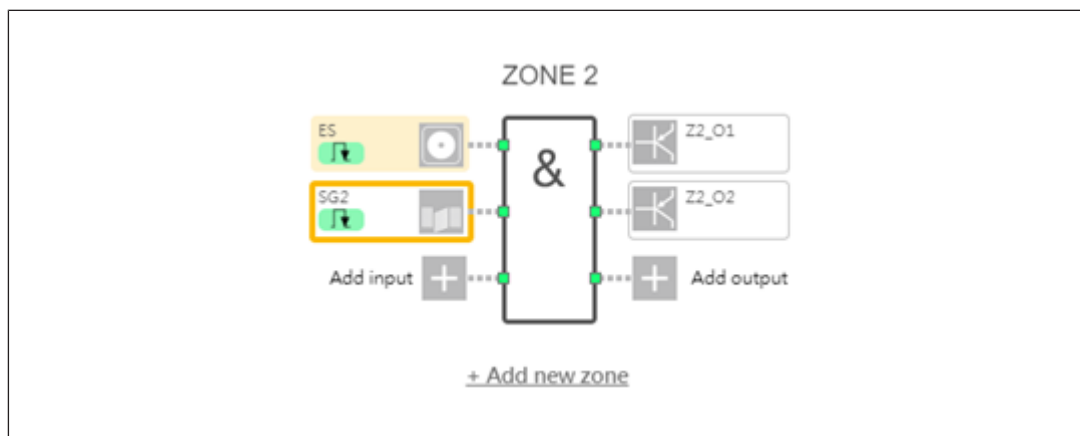
► ZONE 1:

- Global E-STOP function (ES),
monitored start with rising and falling edge
with test pulse evaluation for detection of shorts across contacts
- Safety gate input function (SG1),
monitored start with rising and falling edge
with test pulse evaluation for detection of shorts across contacts
- Light curtain input function (LC),
monitored start with rising and falling edge
- Relay output, instantaneous



► **ZONE 2:**

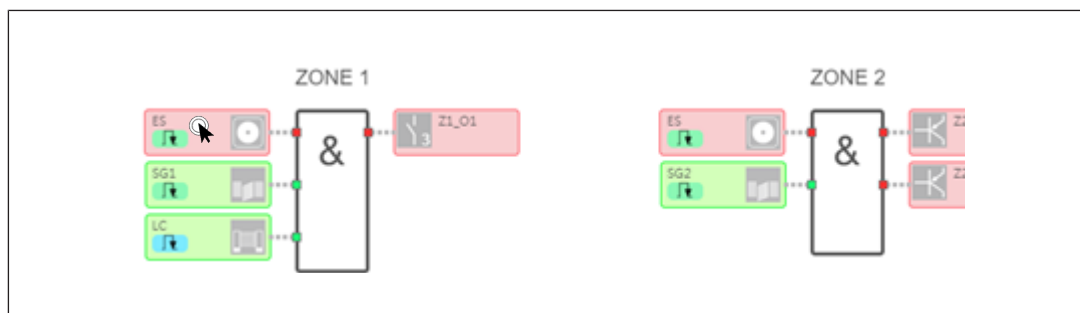
- Global E-STOP function (ES),
monitored start with rising and falling edge
with test pulse evaluation for detection of shorts across contacts
- Safety gate input function (SG2),
monitored start with rising and falling edge
with test pulse evaluation for detection of shorts across contacts
- 2 semiconductor outputs, instantaneous



Simulate configuration

A simulation can then be started for test purposes, during which the potential interactions can be simulated.

Click on an input in simulation view and the switching outputs will then be highlighted.



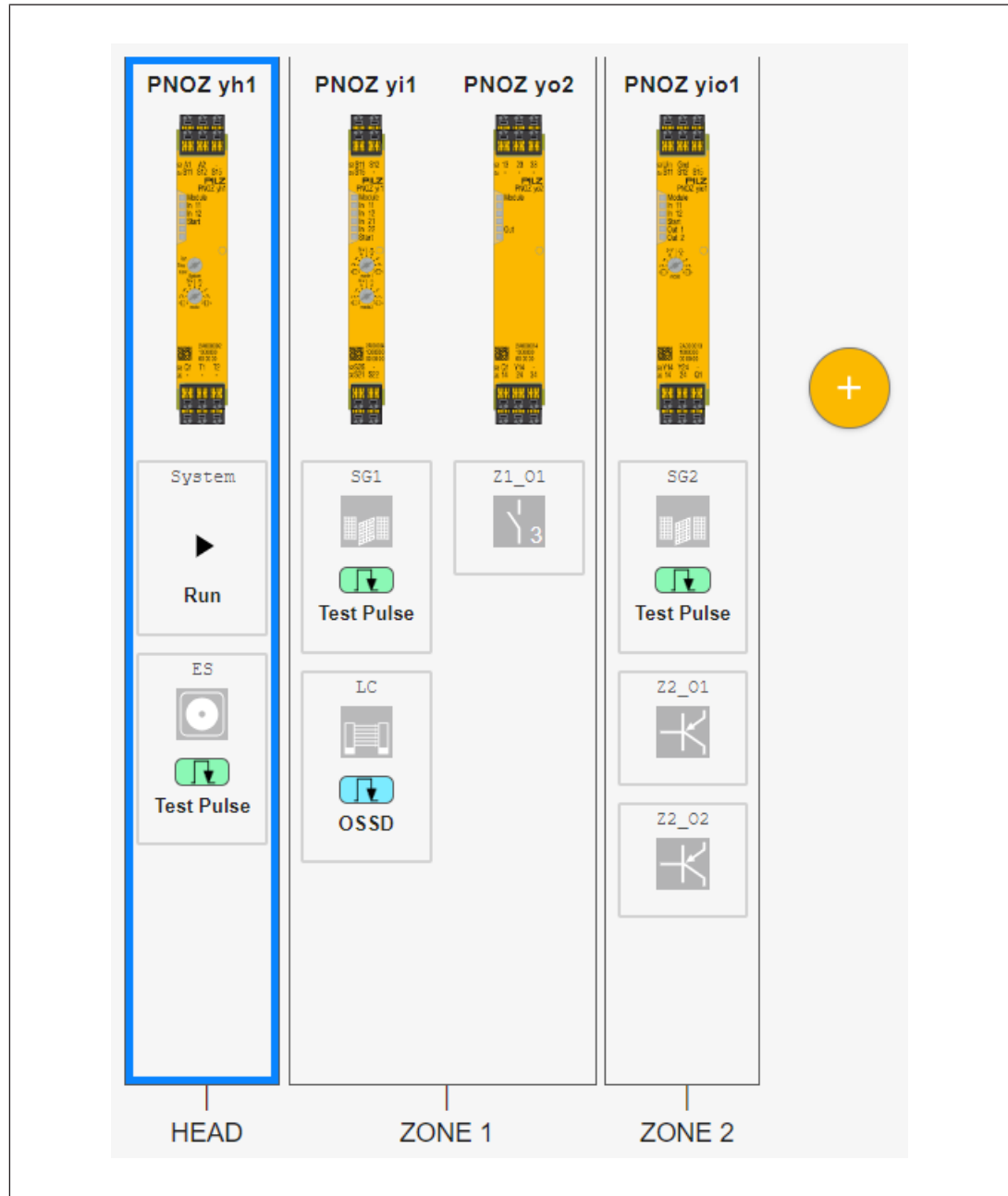
5.2 Hardware configuration

When you have created the logic configuration, the logic structure is optimised and automatically converted into the appropriate hardware system.

The hardware configuration is mapped out in the myPNOZ Creator. It contains all the necessary modules and the corresponding settings

If you already know which hardware modules you need prior to configuration, you can assemble and configure your myPNOZ here directly from the various modules.

The following hardware configuration was generated for this example:



HEAD

- Head module PNOZ yh1 for the two E-STOP pushbuttons ES1 and ES2 (connected in series)

ZONE 1

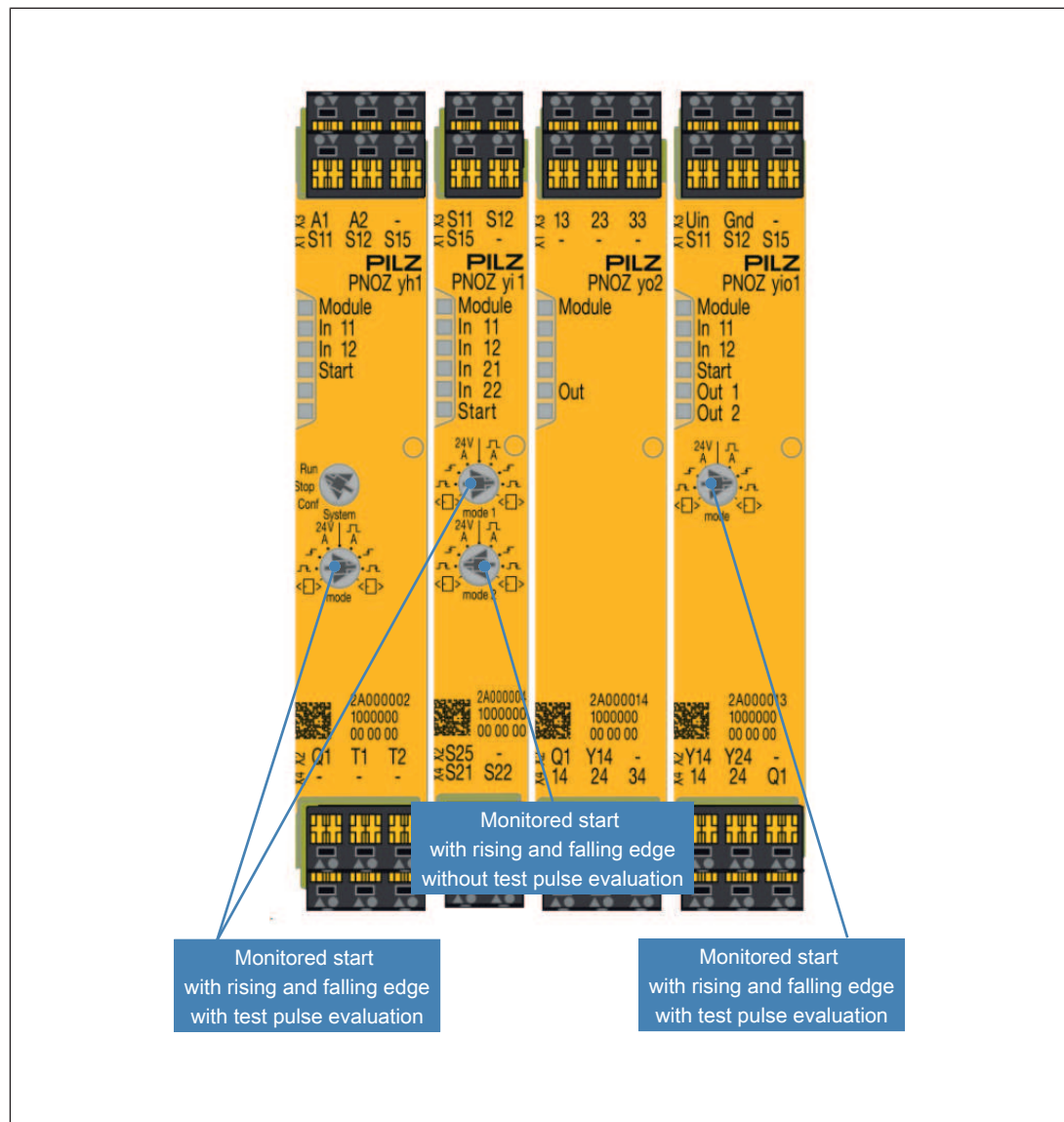
- ▶ Input module PNOZ yi1 for the safety gate SG1 and the light curtain LC
- ▶ Output module PNOZ yo2 for the relay output

ZONE 2

- ▶ Input/output module PNOZ yio1 for the safety gate switch SG2 and the semiconductor outputs

The head module and expansion modules are connected in the above sequence using the bus connectors. Through the plug-in sequence, the input on the head module is AND-linked to the inputs on the expansion module PNOZ yi1. The link affects the safe relay output on the expansion module PNOZ yo2. Likewise, the input on the head module is AND-linked to the input on the expansion module PNOZ yio1, and affects the safe semiconductor output on the PNOZ yio1.

You can check the settings on the rotary switch for the start type:



5.3 Display, save and order myPNOZ configuration

The pre-configured myPNOZ is mapped out in the myPNOZ Creator, including parts list, and can be saved, shared, printed as a PDF and ordered.

► Wiring

A diagram in the myPNOZ Creator shows how to wire your myPNOZ (see [Wire myPNOZ](#) [14]).

► Shutdown matrix

The shutdown matrix shows how the outputs switch depending on the inputs

Cause			Effect
ES	SG1	LC	ZONE 1
1	1	1	1
0	1	1	0
1	0	1	0
1	1	0	0

Cause		Effect
ES	SG2	ZONE 2
1	1	1
0	1	0
1	0	0

Save and share configuration

You can create a URL for the project and save or share it. This will enable you to load the whole project and all its parameters at another time. Our example has the URL:

<https://www.pilz.com/mypnoz-creator?product=8Z000002&typeKey=myPNOZ.72.CK-A380EB820AD000XB800&documentID=IG9IY3nST5yWJ48zBhGdHA>

What's more, each configuration has a unique type code. Our example has the type code: myPNOZ.72.CKA380EB820AD000XB800

The type code can be used to call up the configuration again at any time.

However, only the modules and the settings on the rotary switches are saved.

All other details, such as any descriptions that have been entered, are not included in the type code.

► Create PDF

You can create a PDF file, which contains all the information about your configuration.

► Display order overview, select connection terminals

All the modules in your myPNOZ are displayed in the order overview.

You can choose between two different plug-in connection terminals for the wiring

- Spring-loaded terminals
- Screw terminals

► Submit order

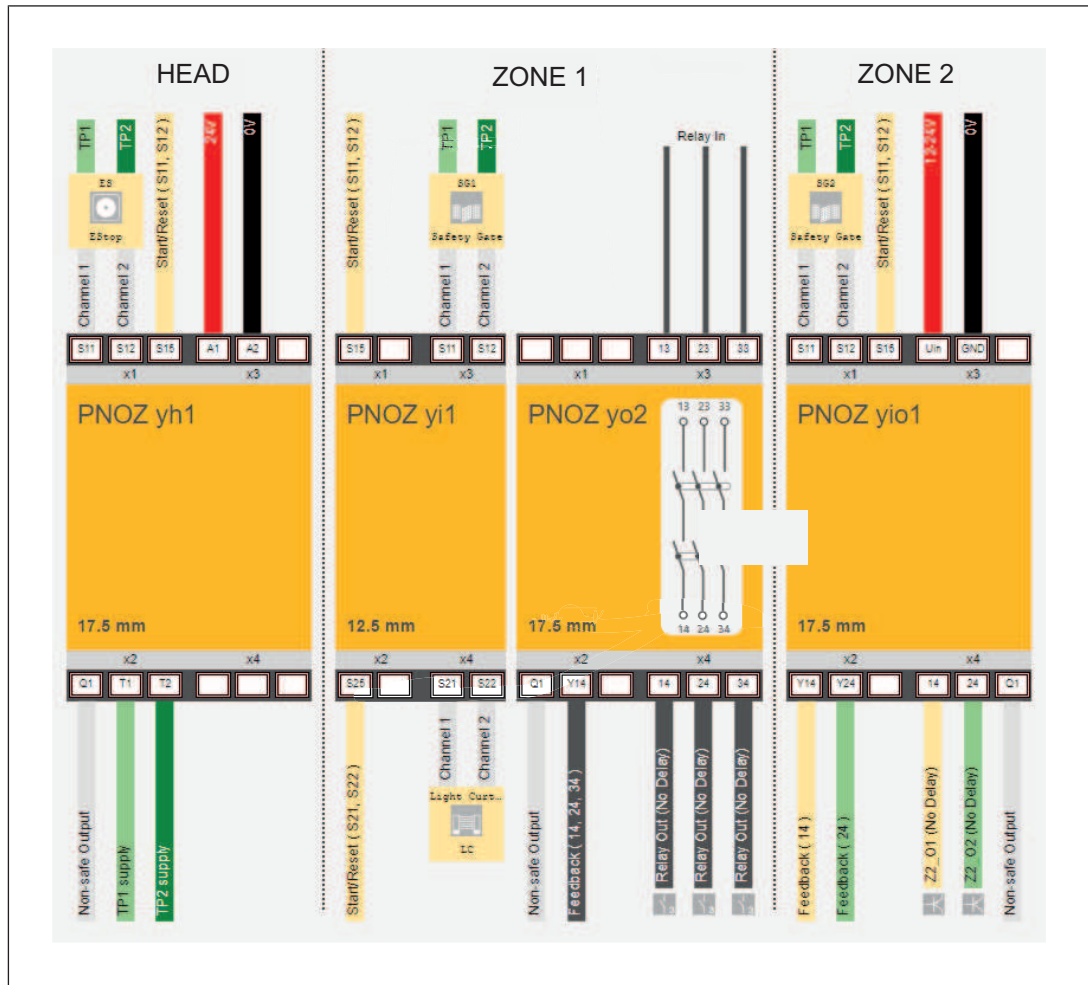
You can then place an order directly via the Pilz E-Shop.

Once you've ordered you'll receive a fully configured and tested myPNOZ. All you need to do then is install myPNOZ in the control cabinet, wire it up and test the safety functions. myPNOZ is then ready for operation.

There is a QR code on the left-hand side of the head module so that you can change or re-order the configuration at a later date. The QR code leads directly to the myPNOZ configuration, in the web application myPNOZ Creator.

6 Wire myPNOZ

A connection diagram for your myPNOZ is generated in the myPNOZ Creator.



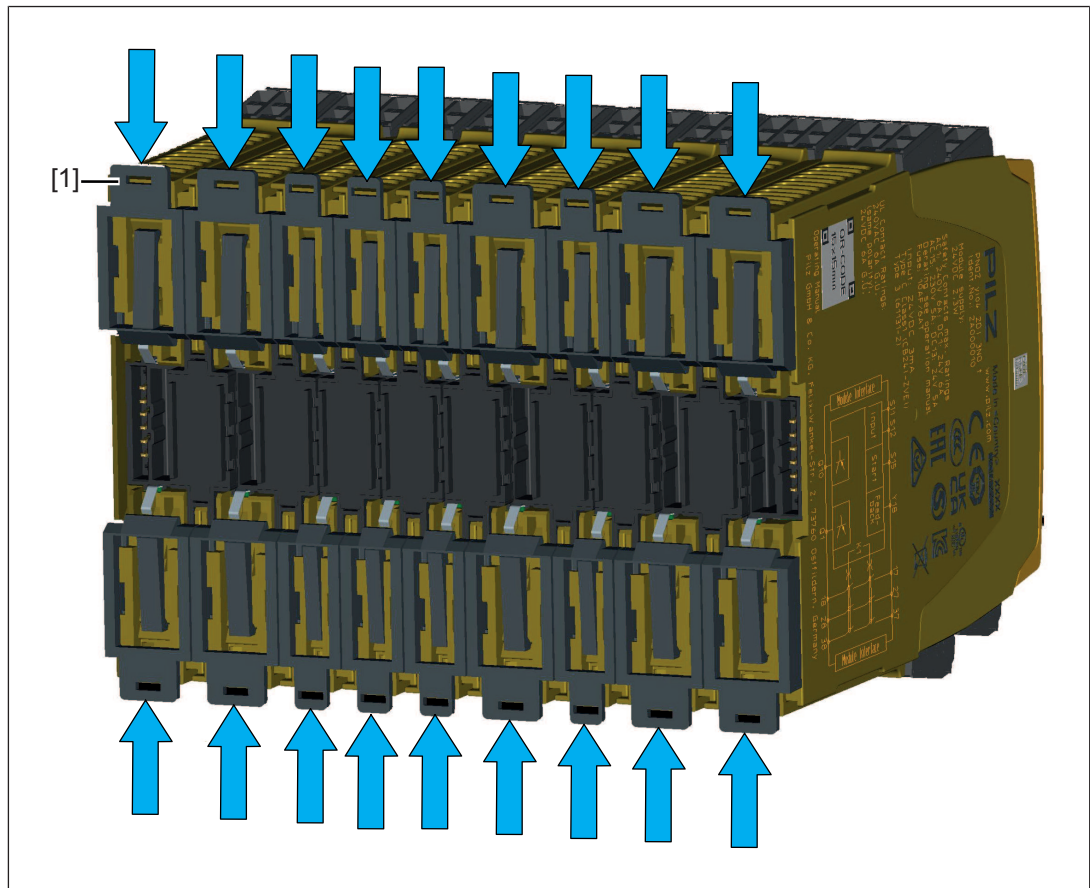
7 Install myPNOZ

The modules are supplied pre-connected. All that's needed is to install the myPNOZ on the mounting rail.

Prerequisites

- ▶ The control cabinet must be at least protection type IP54.
- ▶ The mounting distances are maintained, see operating manual "Modular safety relay myPNOZ".

Procedure



- ▶ Ensure that all locking slides [1] are closed. If necessary, slide the locking slides [1] in the direction of the arrow until they click into place.
- ▶ Place the connected modules on the mounting rail and press the modules towards the mounting rail until you hear the locking slides [1] click into place.
- ▶ Check that all the locking slides [1] are still closed. If necessary, slide the locking slides [1] in the direction of the arrow until they click into place.
- ▶ Install the retaining element.

When installed vertically or in environments exposed to heavy vibration, the myPNOZ should be secured using a retaining element (e.g. retaining bracket or end angle).

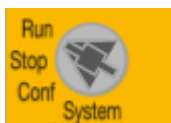
8 Commission myPNOZ

Prerequisites

- ▶ myPNOZ is configured and the configuration is saved.
- ▶ myPNOZ is installed and wired correctly.
- ▶ All input terminals are assigned.

Procedure

1. Switch on the supply voltage.
2. On the head module, set the **System** rotary switch to the **Run** position.



myPNOZ runs through an initialisation phase. It carried out self checks, establishes the connection between the modules and tests the configuration. The **Module** LED on the head module flashes green quickly.

Once initialisation is completed successfully, the myPNOZ goes into operation and switches all the outputs in accordance with the configured logic. The **Module** LEDs light up green. Potential status and error messages can be found under Diagnostics.



NOTICE

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

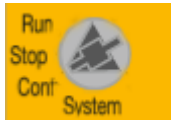
9 Change configuration

The head module can be exchanged, and the expansion modules can be exchanged, removed or added. The settings on the rotary switches can be changed. Always refer to the rules for the structure of the myPNOZ. Further information is available in the operating manual "Modular safety relay myPNOZ".

Procedure

When carrying out the configuration, make sure that all required rotary switches are correctly engaged (see operating manual "Modular safety relay myPNOZ", under "Checking that the rotary switches are correctly engaged").

1. On the head module, set the **System** rotary switch to **Conf.**
All the outputs are switched off.



2. Carry out the necessary settings on the expansion modules. To do this, set the rotary switch to the desired position.
3. Switch on the supply voltage, if this is still switched off.
4. Save configuration: once a setting/change has been made, wait 5 s; the **System** rotary switch on the head module must be set to **Conf.**

If the configuration is correct:

all the LEDs flash briefly. The settings are then stored. Afterwards the LEDs switch to the function display that is currently valid.

If the configuration is faulty:

All the module LEDs flash orange-green and the function LEDs indicate the reason for the faulty configuration (see [Status and error messages](#) [18]). The configuration was not saved. Correct the configuration and save it again.

5. Set the **System** rotary switch to **Run** and check the safety functions, such as the E-STOP pushbutton, safety gate switch, for example.



NOTICE

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



INFORMATION

When the "Off delay" is set, the output may switch off before the delay time has elapsed, if

- the configuration is being saved or
- an error occurs.

10 Status and error messages

The LEDs on the head module and expansion modules indicate the status of the modules and report on operating states as well as external and internal errors. The **Module** LED indicates the status of the module; the function LEDs (**In**, **Out**, **Start**) indicate the status of the inputs and outputs.

Legend

- LED off
- ☉ LED on
- LED flashes in one colour (500 ms on, 500 ms off)
- LED flashes in two colours (500 ms in colour 1, 500 ms in colour 2)
- LED flashes quickly (50 ms on, 950 ms off)

10.1 Status messages

These messages provide information about the status of the myPNOZ and the inputs/outputs.

Status messages during initialisation

After the myPNOZ is started there is a brief initialisation phase.

Module LED	Function LED	Meaning
 Quickly flashes green	 All LEDs off	Initialisation

Status messages during operation (RUN)

During operation, where there are no errors present, the status of the inputs and outputs are displayed. The **Module** LED lights up green.

If the colour of the **Module** LED turns orange, one of the following errors is present:

- ▶ Supply voltage increased or low
- ▶ Supply voltage to semiconductor outputs increased or low
- ▶ Temperature increased or low
- ▶ Connection between modules disturbed by external influences

myPNOZ only switches to an error state when the error means that a limit value is exceeded. If the error is no longer present, the **Module** LED switches back to green.

Module LED	Function LED	Meaning
 Lights up green	 LED In , Locked or Safe State lights up green	Input active
	 LED In , Locked or Safe State off	Input inactive
	 LED In , Locked or Safe State flashes green	Depending on the module, one LED flashes or both LEDs flash alternately: ▶ Only one input was operated (partial operation) ▶ With two-hand control: simultaneity not maintained ▶ With two-hand control: not all contacts are deactivated ▶ Two-hand operated, but start condition is not met (e.g. E-STOP pushbutton operated or off-delay active) ▶ With several two-hand functions in one zone: not all the two-hand functions were deactivated ▶ Test pulse wired, but test pulse evaluation not configured These messages are reset by repeating the function correctly.
	 Lock Unlock LED flashes green	Guard locking ▶ Activation failed ▶ Deactivation failed ▶ Activated without request ▶ Deactivated without request
	 Start LED lights up green	One of the assigned start inputs is active.

Module LED	Function LED	Meaning
 Lights up green	 Start LED off	All start inputs inactive
	 Start LED flashes green	▶ One or more input functions can be started, waiting for start signal ▶ When starting with start-up test: start-up test not performed yet
	 Out LED lights up green	Output active
	 Out LED off	Output inactive
 Lights up orange		In addition to the meanings when the Module LED "lights up green", one of the following errors is present: ▶ Supply voltage to semiconductor outputs increased or low ▶ Supply voltage increased or low ▶ Temperature increased or low ▶ Connection between modules disturbed by external influences

Status messages in the STOP state

If myPNOZ is in a STOP state, the states of the inputs and outputs are displayed. All the **Module** LEDs in one zone flash identically. The **Module** LEDs in the following zone flash inversely.

If an error occurs, the **Module** LED switches colour from green to orange. Errors may be:

- ▶ Supply voltage increased or low
- ▶ Supply voltage to semiconductor outputs increased or low
- ▶ Temperature increased or low

If the error is no longer present, the **Module** LED switches back to green. If the error means that a limit value is exceeded, myPNOZ switches to an error state.

Module LED	Function LED	Meaning
 Flashes green	 LED <i>In</i> , <i>Locked</i> or <i>Safe State</i> lights up green	When several inputs are assigned: at least one input is active
	 LED <i>In</i> , <i>Locked</i> or <i>Safe State</i> off	Input inactive
	 <i>Start</i> LED lights up green	Start input active
	 <i>Start</i> LED off	Start input inactive
	 <i>Out</i> LED lights up green	Output active (delay time not yet elapsed)
	 <i>Out</i> LED off	Output inactive
 Flashes orange		In addition to the meanings when the Module LED "flashes green", one of the following errors is present: ▶ Supply voltage to semiconductor outputs increased or low ▶ Supply voltage increased or low ▶ Temperature increased or low Connection between modules disturbed by external influences

10.2 Error messages

The **Module** LED on the affected module displays various types of error messages. The function LEDs provide additional information about the cause of the error. If an error occurs on the head module, then all modules are affected by the error. If the error occurs on an expansion module, then only the zone to which the expansion module belongs is affected.

If several errors occur, only one error at a time is displayed. As soon as the error is rectified, the next error is displayed.

“Error” error messages

“Error” type error messages are mostly wiring errors or errors based on a failure to comply with the technical details.

With this error type

- ▶ All safe outputs are switched off within the reaction time.
- ▶ All instantaneous safe outputs that are affected by the error are switched off immediately.
- ▶ All delayed safe outputs are switched off once the delay time has elapsed.
- ▶ All signal outputs are switched off within the reaction time.

Once the error has been recovered:

- ▶ The **System** rotary switch must be set first to **Stop** and then to **Run**

or

- ▶ The supply voltage must be switched off and then on again.

Module LED	Function LED	Meaning	Remedy
 Flashes red	 No LED flashes	LED on the head module flashes red	
		▶ Supply voltage on the head module >28.8 V	▶ Keep within the permitted supply voltage range (see module's technical details).
		▶ Supply voltage on the head module <19.2 V	
		▶ System rotary switch in invalid intermediate position	▶ Correct the position of the rotary switch.
		LED on the head module or expansion module flashes red	
		▶ Temperature too high or too low	▶ Keep within the permitted temperature range (see module's technical details), otherwise air conditioning may be required.
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State</i> lights up green	When several inputs are assigned: at least one input is active	
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State</i> off	Input inactive	

Module LED	Function LED	Meaning	Remedy
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State</i> 1 flashes green	Test pulse T1 not detected at the input	► Check the test pulse wiring for short circuits to 24 VDC and to other test pulses (shorts across contacts). ► Recover the error.
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State</i> 2 flashes green	Test pulse T2 not detected at the input	
 Flashes red	 LED <i>In, Locked</i> or <i>Safe State</i> flashes green	Test pulse not detected at the input	
 Flashes red	 Start LED lights up green	Start input is active	
 Flashes red	 Start LED off	Start input inactive	
 Flashes red	 Out LED lights up green	Output active (delay time not yet elapsed)	
 Flashes red	 Out LED off	Output inactive	

Module LED	Function LED	Meaning	Remedy
 Flashes red	 Out LED flashes green	Error at the output: one <i>Out</i> LED flashes or both <i>Out</i> LEDs flash simultaneously	
		▶ Feedback loop is not closed when starting or attempting to switch on	▶ Check the wiring of the feedback loop. ▶ Recover the error.
		▶ Output is switched off, but there is still voltage at the output	▶ Check the wiring at the output for short circuits. ▶ Recover the error.
		▶ Input capacitance of the connected device is too high	▶ Install a terminal block filter with Pilz order number 772290 or 772291, see operating manual under Accessories, "Terminal block filter".
		Error at the output: Both <i>Out</i> LEDs flash alternately	
		▶ Total current at a module's semiconductor outputs too high	▶ Reduce the total current on the I/O module, e.g. by installing an additional module.
		▶ Supply voltage at a module's semiconductor output too high	▶ Keep within the permitted supply voltage range (see module's technical details).
		▶ Total current at a module's semiconductor outputs briefly very high ▶ Short circuit between two semiconductor outputs on a module ▶ Short circuit between semiconductor output and GND	▶ Rectify the short circuit.

Configuration error messages

myPNOZ regularly checks the configuration. If any deviation from the saved configuration is established, myPNOZ signals a configuration error. Configuration errors generally arise due to an unsaved configuration. For example, the position of a rotary switch was changed, but the configuration was not saved afterwards.

With this error type

- ▶ All safe outputs are switched off.
- ▶ All signal outputs are switched off.

Once a configuration error has been recovered, the configuration must be re-saved and then the **System** rotary switch must be set to **Run** (see [Change configuration](#) [17]). If the position of a rotary switch was changed accidentally, the position of the rotary switch must be corrected. It is not necessary to save the configuration again.

Module LED	Function LED	Meaning	Remedy
 Flash orange-green	 No LED flashes	When the configuration is saved: ▶ Module saved in the configuration, but not available	▶ Check that all modules are inserted in the right sequence. ▶ Check whether modules are indicating a communication error, Module LED flashes red-orange. ▶ Select the required configuration. ▶ Save the required configuration.
 Flash orange-green	 All LEDs on a module are quickly flashing green	When the configuration is saved ▶ Module type does not match the saved configuration	▶ Check that all modules are inserted in the right sequence. ▶ Select the required configuration. ▶ Save the required configuration.
		▶ More modules present than are saved in the configuration	
		When saving of the current configuration has failed ▶ Last module is not an output module (PNOZ yi)	▶ Ensure that an output module (PNOZ yo, PNOZ yio) is inserted as the last module.
		▶ More than eight expansion modules inserted	▶ Ensure that no more than eight expansion modules are inserted.
 Flash orange-green	 Both of a module's In LEDs flash green	Configuration error at the input When the configuration is saved: ▶ Position of the mode rotary switch does not match the saved configuration	▶ Correct the position of the rotary switch and save the configuration.
		When saving of the current configuration has failed: ▶ The mode rotary switch is in an invalid intermediate position	▶ Correct the position of the rotary switch.
 Flash orange-green	 PNOZ yi5, PNOZ yi8: all four In LEDs flash green	Incorrect function set on the function rotary switch or function rotary switch at position A but mode rotary switch not at automatic start A	Correct the position of the rotary switch.

Module LED	Function LED	Meaning	Remedy
 Flash orange-green	 PNOZ yi7: Locked LED flashes green	Configuration error at the input	
		When the configuration is saved: ► Position of the mode rotary switch does not match the saved configuration	► Correct the position of the rotary switch and save the configuration.
		When saving of the current configuration has failed: ► The mode rotary switch is in an invalid intermediate position	► Correct the position of the rotary switch.
 Flash orange-green	 PNOZ yi7: safe state LED flashes green	Configuration error at the input	
		When the configuration is saved: ► Position of the safe state rotary switch does not match the saved configuration	► Correct the position of the rotary switch and save the configuration.
		When saving of the current configuration has failed: ► The safe state rotary switch is in an invalid intermediate position	► Correct the position of the rotary switch.
 Flash orange-green	 Out LED lights up green	► Output active (delay time not yet elapsed)	
 Flash orange-green	 A module's Out LED flashes green	Configuration error at the output	
		► Position of the n rotary switch does not match the saved configuration	► Correct the position of the rotary switch and save the configuration.
		► Position of the t[s] rotary switch does not match the saved configuration	
		When saving of the current configuration has failed: ► Rotary switch n or t[s] in invalid intermediate position	► Correct the position of the rotary switch.

Internal error message

With this error type

- All safe outputs are switched off immediately.
- All signal outputs are switched off.
- Communication is interrupted and subsequent modules indicate a communication error.

Module LED	Function LED	Meaning	Remedy
 Lights up red		▶ Firmware version of head module and expansion module not compatible	▶ Check the compatibility of the firmware versions (for head modules, see operating manual "Modular safety relay myPNOZ").
		▶ Internal error	▶ Restart the myPNOZ. ▶ If the error continues to occur, change the module or contact Pilz.

Communication error message

Communication errors occur when communication between the head module and expansion module is disrupted.

With this error type

- ▶ All safe outputs are switched off immediately.
- ▶ All signal outputs are switched off.

Once the connection is stable again and no further errors are present, myPNOZ switches to a STOP state. The **System** rotary switch must be set first to **Stop** and then to **Run**.

Module LED	Function LED	Meaning	Remedy
 Flashes red-orange		▶ No connection to the head module	▶ Ensure that the modules are firmly connected to the bus connectors. ▶ If the modules are firmly connected to the bus connectors: restart myPNOZ. ▶ If the error continues to occur, change the module or contact Pilz.

10.3 Errors on the safe outputs

- ▶ Malfunctions of the relay contacts: if the contacts have welded, reactivation will not be possible after the input circuit has opened.
- ▶ In the case of an error, the delayed outputs may open before the delay time has elapsed.

Support

Technical support is available from Pilz round the clock.

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