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INDI4.0

## **PNOZmulti Programming and Service**

Chapter 8  
„Diagnostics and Troubleshooting“

**PILZ**  
THE SPIRIT OF SAFETY

# ► Diagnostic-LED's of the Base Units

## General meaning



PILZ | 08-3+

### LED's

- Error Stack
- Dynamic Programm Display
- Diagnostic Word
- Checksum comparison chip card
- Replace devices
- Exercises

### Base unit



### Online

Status	
<span style="color: green;">■</span>	RUN
<span style="color: gray;">■</span>	DIAG
<span style="color: gray;">■</span>	FAULT
<span style="color: gray;">■</span>	I FAULT
<span style="color: gray;">■</span>	O FAULT

LED	State	Description
RUN	Lights	When no error is present or the error does not lead to a safe condition.
	Off	When the error leads to a "safe condition".
DIAG	Lights constantly or flashes	User program was deleted or internal device error.
FAULT	Lights constantly or flashes	General device error
IFAULT	Lights constantly or flashes	Error at an input
OFAULT	Lights constantly or flashes	Error at an output

# ► Diagnostic-LED's „Base unit 1st generation“



PILZ | 08-4+

## LED's

Error Stack
Dynamic Programm Display
Diagnostic Word
Checksum comparison chip card
Replace devices
Exercises

Base unit								1)	Error description:
POWER	RUN	DIAG	FAULT	I FAULT	O FAULT	IO..I19	CO/CI	FAULT	
☒	☒								Base unit is operating without error.
									Internal error in the base unit or supply voltage is missing.
☒								☒	Faulty configuration of the expansion modules (failsafe).
									The base unit has been subjected to a general reset.
☒		☒	☒						Internal error in the base unit or chip card faulty.
				☒					Internal error at the inputs of the base unit.
					☒				Internal error at the outputs of the base unit.
☒		☒							Base unit has been stopped by the user.
☒			☒						External error at the base unit: > Chip-card not inserted. > Jumper or terminator not inserted. > Faulty configuration of the expansion modules (standard)
								☒	Terminator not inserted.
☒									Internal error at the base unit inputs. Defective inputs internally in the unit.
				☒				☒	External error in the test pulse wiring of the inputs of the base unit: > Shorts across contacts in the test pulse wiring. > Short circuit to +24 V or 0 V in the test pulse wiring.

**Legend:**

- ☒ LED lights
- ☒ LED flashes
- ⌚ LED arbitrarily

# ▶ Diagnostic-LED's „Base unit PNOZ m B0 (2nd generation)“



PILZ | 08-6

## LED's

- Error Stack
- Dynamic Programm Display
- Diagnostic Word
- Checksum comparison chip card
- Replace devices
- Exercises

Base unit						Error description:	Legend: LED lights LED flashes LED arbitrarily
POWER	RUN	DIAG	FAULT	I FAULT	O FAULT		
						<b>Base unit is operating without error.</b>	
						Internal error in the base unit or supply voltage is missing.	
						The base unit has been subjected to a general reset.	
						Internal error in the base unit or chip card is faulty.	
						Internal error at the inputs of the base unit.	
						Internal error at the outputs of the base unit.	
						Base unit has been stopped by the user.	
						External error at the base unit: ▶ Voltage supply of the semiconductor outputs ▶ Faulty configuration of the expansion modules. ▶ Chip-card not inserted. ▶ Jumper or terminator not inserted.	
						Internal or external error at the base unit inputs. For example: ▶ Cross-connection in the test pulse wiring. ▶ Short circuit against + 24 V or 0 V in the test pulse wiring. ▶ Defective inputs internally in the device	
						Internal or external error at the base unit outputs. For example: ▶ Short circuit to +24 V ▶ Shorts across contacts at outputs ▶ Defective outputs internally in the unit	

# ▶ Diagnostic-LED's „ Base unit PNOZ m B1 (2nd generation)“



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## LED's

Error Stack
Dynamic Programm Display
Diagnostic Word
Checksum comparison chip card
Replace devices
Exercises

Base unit											Legende: LED leuchtet LED blinkt LED beliebig		
LED 1	LED 2			LED 3			LED 4		LED 5			Error description:	
24 V	FS Initialize	FS Run	FS Stop	ST Initialize	ST Run	ST Stop	Program Reset	Identify	DIAG	I FAULT			O FAULT
													Supply voltage is not present or base unit is defective.
													Supply voltage is present.
													The active project was deleted by the base unit.
													The base unit is identified by the PNOZmulti Configurator
													Start of FS program
													Start of ST program
													Executing FS program
													Executing ST program
													FS program in STOP condition
													ST program in STOP condition
													Fault in the FS program
													Fault in the ST program
													System fault in the FS program
													System fault in the ST program
													Recoverable error by the user in FS mode
													Recoverable error by the user in ST mode



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## LED's

Error Stack

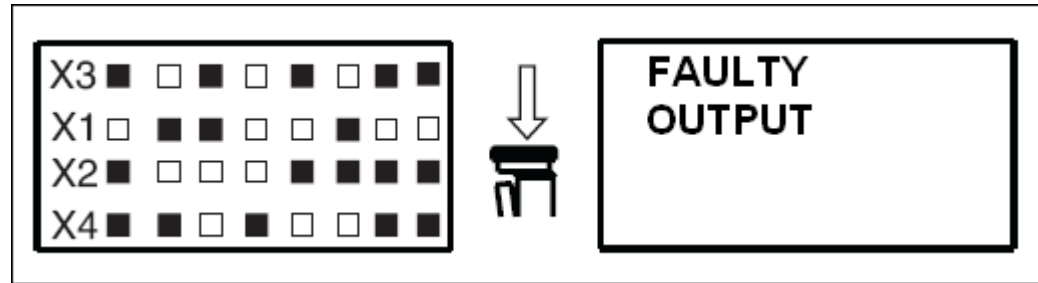
Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises



Error message	Error description
FAULTY PROJECT	Chip card contains a project that is faulty or incompatible.
CHIP CARD ?	Chip card not inserted, empty or not readable
FAULT TEST PULSE	Error by test pulse
PARTIALLY OPERATED	Input element was or is partially actuated
FEED BACK LOOP	External error at the inputs of the feedback loop
OPERATING MODE SELECTOR SWITCH	Error at input element Operating mode selector switch
FAULTY OUTPUT	External error at output
OUTPUT WITH ADVANCED FAULT DETECTION	External error at output with extended error detection
LOAD SUPPLY	Error in the supply voltage for the semiconductor outputs
FAULTY DEVICE	Internal error of the base unit.
SUPPLY LOW	Supply voltage tolerance undercut
SUPPLY HIGH	Supply voltage tolerance exceeded
CONFIGURATION	Equipment does not match the configuration
TEMPERATURE	Operating temperature is outside the permitted range

# ▶ Error Stack

## General description



PILZ | 08-9

LED's

**Error Stack**

Dynamic Programm Display

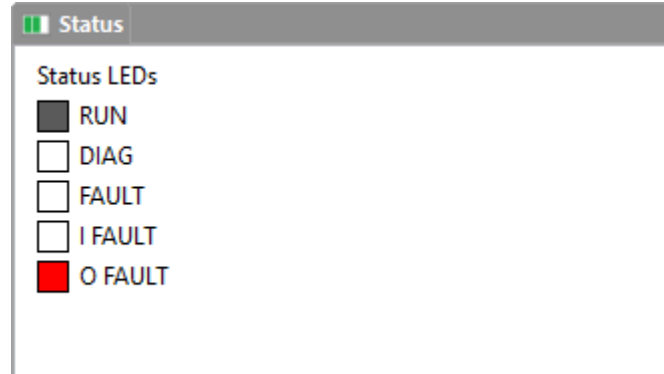
Diagnostic Word

Checksum comparison chip card

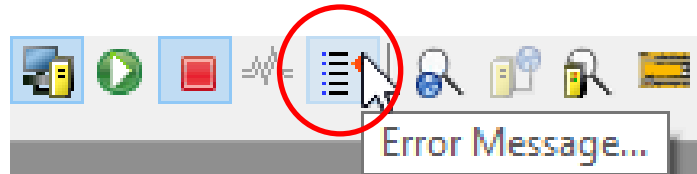
Replace devices

Exercises

When one of the Fault-LED's or the DIAG-LED is on



then it is useful to read out the error stack first!



# ▶ Error Stack

## General description



PILZ | 08-10

LED´s

**Error Stack**

Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises

## 64 Error messages by FIFO principle

Heading	Meaning
Time	Time between Power ON of PNOZmulti and the fault occurring.
Number	Error number of the affected error class. Error class and error number give precise information on the possible cause of the fault. e.g.: "13" ⇒ "Partially operated safety switch".
Class:	Error class codes that appear on the CPU display (see Error list). e.g.: "F-83" ⇒ Periphery fault
Messages	Fault's plain text message. Formed from the error class and error number.
Address	States the elements' ID
Priority	The entries are categorised into 3 priorities. Error, message and status.
Scope	Defined in the elements in the "PVIS" tab.
Equip-ID	The equipment identifier is entered in the module selection and in the elements.



# ▶ Error Stack Show



PILZ | 08-11

LED's

## Error Stack

Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

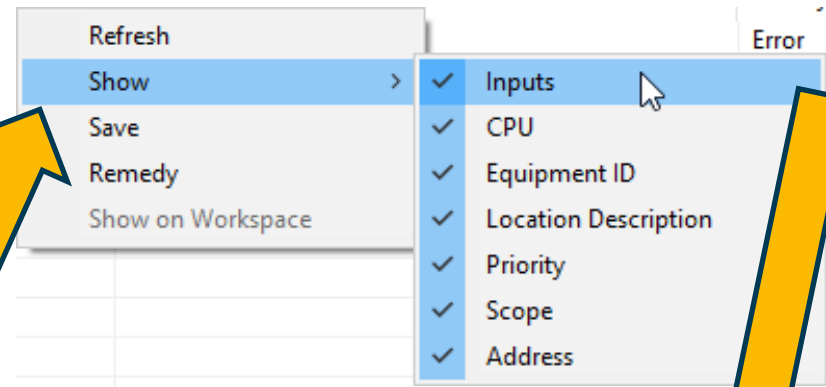
Replace devices

Exercises

## Show → Inputs:

- ▶ Absolute HW address of inputs of a elements with element-ID
  - ▶ Current state: Input. 1 = 0 -> i0 of Basic unit (BMK-3A1)
  - ▶ Input. 2 = 1 -> i1 of Basic unit (BMK-3A1)

„right-click“



Date	Time	No.	Class	CPU	Message	Inputs	Address	Priority	Scope
2010/01/01	00:08:24	29	98	A	Function element was or is partially operated (affected inputs: 1st input =i 0 on module -3A1.Basis ; 2nd input =i 1 on module -3A1.Basis)	-3A1.Basis.i0, -3A1.Basis.i1	SBID 1	Error	Plant/device
2010/01/01	00:06:03	04	89	A	No connection to the decentralised module.			Warning	Plant/device
2010/01/01	00:06:03	0A	40	A	Error caused by test pulse T 0.			Error	Plant/device

# ▶ Error Stack Saving



PILZ | 08-11

LED´s

**Error Stack**

Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises

## ▶ Saving the error stack

Date	Time	No.	Class	CPU	Message	Inputs	Address	Priority	Scope	Eq...
2010/01/01	00:08:24	29	98	A	Function element was or is partially operated (affected inputs: 1st input =i 0 on module -3A1.Basis; 2nd input =i 1 on module -3A1.Basis)	-3A1.Basis.i0, -3A1.Basis.i1	SBID 1	Error	Plant/device	-3A1.E
2010/01/01	00:06:03	04	89	A	No connection to the decentralised module.			Warning	Plant/device	
2010/01/01	00:06:03	0A	40	A	Error caused by test pulse T 0.			Error	Plant/device	a1
2010/01/01	00:05:52	13	02	A, B +	The system has adopted the project with the overall check sum 48 E0/ 00 00. (FS program's check sum safe: C1 E8).			Status	Plant/device	a1

- ▶ Error stack is saved as .mperr
- ▶ View in text editor

# ▶ Error Stack Remedy



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LED´s

**Error Stack**

Dynamic Programm Display

Diagnostic Word

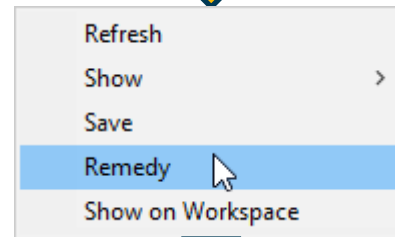
Checksum comparison chip card

Replace devices

Exercises

Date	Time	No.	Class	CPU	Message	Inputs	Address
2010/01/01	00:08:24	29	98	A	Function element was or is partially operated (affected inputs: 1st input =i 0 on module -3A1.Basis; 2nd input =i 1 on module -3A1.Basis)	-3A1.Basis.i0, -3A1.Basis.i1	SBID 1
2010/01/01	00:06:03	04	89	A	No connection to the decentralised mod		

„right-klick“



**Remedy**

Remedy for error class 98, error number 29:

Action	Description	Address	Device Name
1	Ensure that the contacts on the input element operate correctly.		E-Stop
2	Ensure that the contacts are wired correctly.		E-Stop
3	Ensure that the input element is wired in accordance with the configuratio...		E-Stop
4	Please contact Pilz. (Error code: F0, 00, 01, 00, 2D, 20, 00, 20, 01, 00, 00, 00, 00)		

OK

# ▶ Error Stack Workspace



PILZ | 08-12

LED's

## Error Stack

Dynamic Programm Display

Diagnostic Word

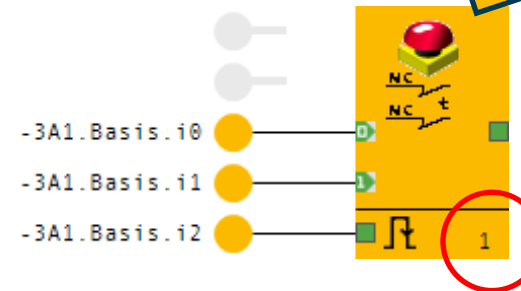
Checksum comparison chip card

Replace devices

Exercises

If an SBID is displayed in the address column, the corresponding software element can be viewed directly

Date	Time	No.	Class	CPU	Message	Inputs	Address
2010/01/01	00:24:58	29	98	A	Function element was or is partially operated (affected inputs: 1st input =i 0 on module -3A1.Basis ; 2nd input =i 1 on module -3A1.Basis)	-3A1.Basis.i0, -3A1.Basis.i1, -3A1.Basis.i2	SBID 1
2010/01/01	00:24:55	04	89	A	No connection to the decentralised module.		
2010/01/01	00:24:44	13	02	A, B +	The system has adopted the project with the overall check sum F2 98/ 00 00. (FS program's check sum safe: F8 98/ 00 00)		
2010/01/01	00:24:43	0B	02	A, B +	System restarted by user.		
2010/01/01	00:24:10	12	02	A, B +	The project has been deleted from the base unit's memory (Reset Project) The active project is automatically reloaded.		
2010/01/01	00:23:44	0D	02	A, B +	System stopped by user.		
2010/01/01	00:08:24	29	98	A	Function element was or is partially operated (affected inputs: 1st input =i 0 on module -3A1.Basis ; 2nd input =i 1 on module -3A1.Basis)	-3A1.Basis.i0, -3A1.Basis.i1, -3A1.Basis.i2	SBID 1



# ▶ Error Stack Refresh



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LED's

**Error Stack**

Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises

▶ The error stack must be refreshed manually

Date	Time	No.	Class	CPU	Message	Inputs	Address	Priority	Scope	Eq...	Location Description
2010/01/01	00:24:58	29	98	A	Function element was or is partially operated (affected inputs: 1st input =i 0 on module -3A1.Basis ; 2nd input =i 1 on module -3A1.Basis)	-3A1.Basis.i0, -3A1.Basis.i1, -3A1.Basi	SBID 1	Error	Plant/device	-3A1.E	
2010/01/01	00:24:55	04	89	A	No connection to the decentralised module.			Warning	Plant/device		
2010/01/01	00:24:44	13	02	A, B +	The system has adopted the project with the overall check sum F2 98/ 00 00. (FS program's check sum safe: F8 08).			Status	Plant/device	a1	
2010/01/01	00:24:43	08	02	A, B +	System restarted by user.			Status	Plant/device	a1	

or

Address	Priority	Scope
SBID	Refresh	
	Show	>
	Save	
	Remedy	
	Show on Workspace	

# ▶ Error Stack

## Example 1 – error test pulse



PILZ | 08-13

LED's

**Error Stack**

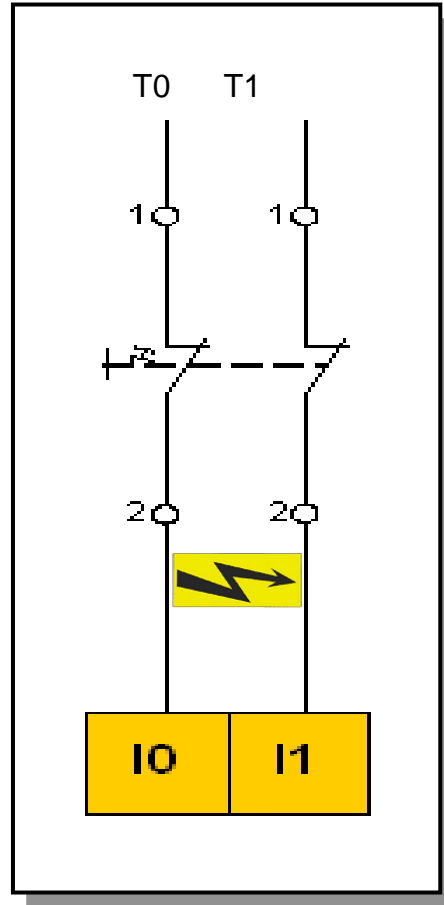
Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises



**Status**

Status LEDs

- RUN
- DIAG
- FAULT
- I FAULT
- O FAULT

**Remedy**

Remedy for error class 40, error number 0A:

Action	Description
1	Test pulse T 1: Ensure that there are no short circuits to 24 VDC in the wiring of the test pulse.
2	Test pulse T 1: Ensure that there are no short circuits to other test pulses in the wiring of the test pulse.
3	Ensure that the test pulse T 1 is wired in accordance with the configuration and circuit diagram. To do this, disconnect...
4	Please contact Pilz. (Error code: F0, 01, 00, 02, 00, 00, 00, 00, 00, 00, 00, 00)

OK

Refresh Save

Date	Time	No.	Class	CPU	Message	Inputs	Address	Priority	Scope	Eq...
2020/08/19	12:23:24	0A	40	A	Error caused by test pulse T 1.			Error	Plant/device	a1
2010/01/01	00:42:34	0A	40	A	Error caused by test pulse T 0.			Error	Plant/device	a1

# ▶ Error Stack

## Example 2 - partially operated



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LED's

**Error Stack**

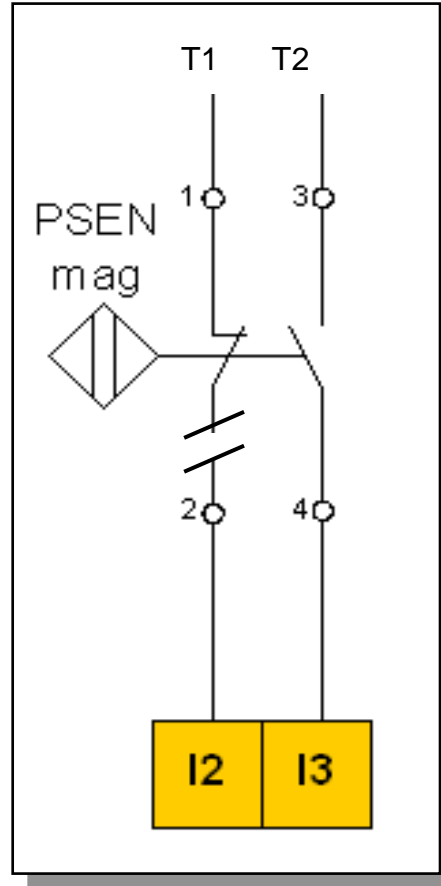
Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises



**Status**

Status LEDs

- RUN
- DIAG
- FAULT
- I FAULT
- O FAULT

**Remedy**

Remedy for error class 98, error number 29:

Action	Description	Address
1	Ensure that the contacts on the input element operate correctly.	
2	Ensure that the contacts are wired correctly.	
3	Ensure that the input element is wired in accordance with the configuration and circuit diagram.	
4	Please contact Pilz. (Error code: F0, 00, 01, 00, 2D, 20, 00, 20, 01, 00, 00, 00)	

**OK**

Refresh Save

Date	Time	No.	Class	CPU	Message	Inputs	Address	Priority
2020/08/19	12:25:33	29	98	A	Function element was or is partially operated (affected inputs: 1st input =i 0 on module -3A1.Basis ; 2nd input =i 1 on module -3A1.Basis)	-3A1.Basis.i0, -3A1.Basis.i1, -3A1.Basi	SBID 1	Error

# ▶ Error Stack

## Example 3 – short circuit at output



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LED's

**Error Stack**

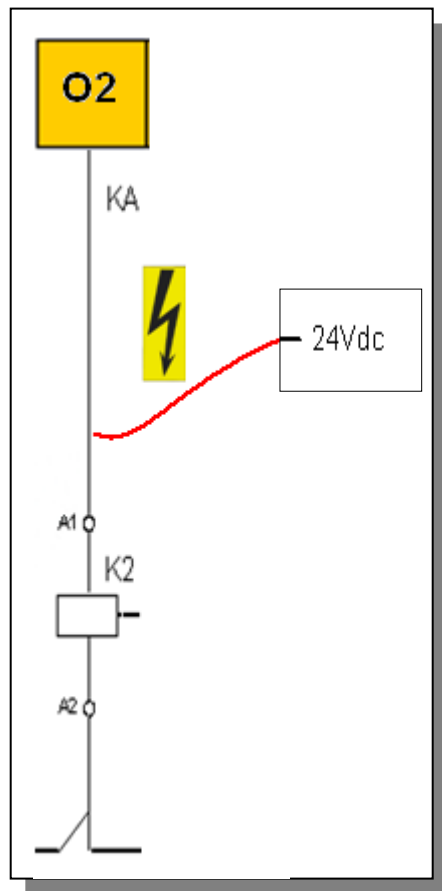
Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises



**Status**

Status LEDs

- RUN
- DIAG
- FAULT
- I FAULT
- O FAULT

**Remedy**

Remedy for error class 95, error number 07:

Action	Description
1	Output " 0" on expansion module -3A1.Basis. Ensure that there are no short circuits to 0 V or 24 VDC in the output w
2	Change the module.
3	Please contact Pilz. (Error code: 20, 00, 00, 01, 03, 00, 00, 00, 00, 00, 00, 00, 00)

OK

Refresh Save

Date	Time	No.	Class	CPU	Message
2020/08/19	12:27:23	07	95	A	Error caused by output "o 0" at -3A1.Basis.



# ► Dynamic Programm Display General



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LED's

Error Stack

## Dynamic Programm Display

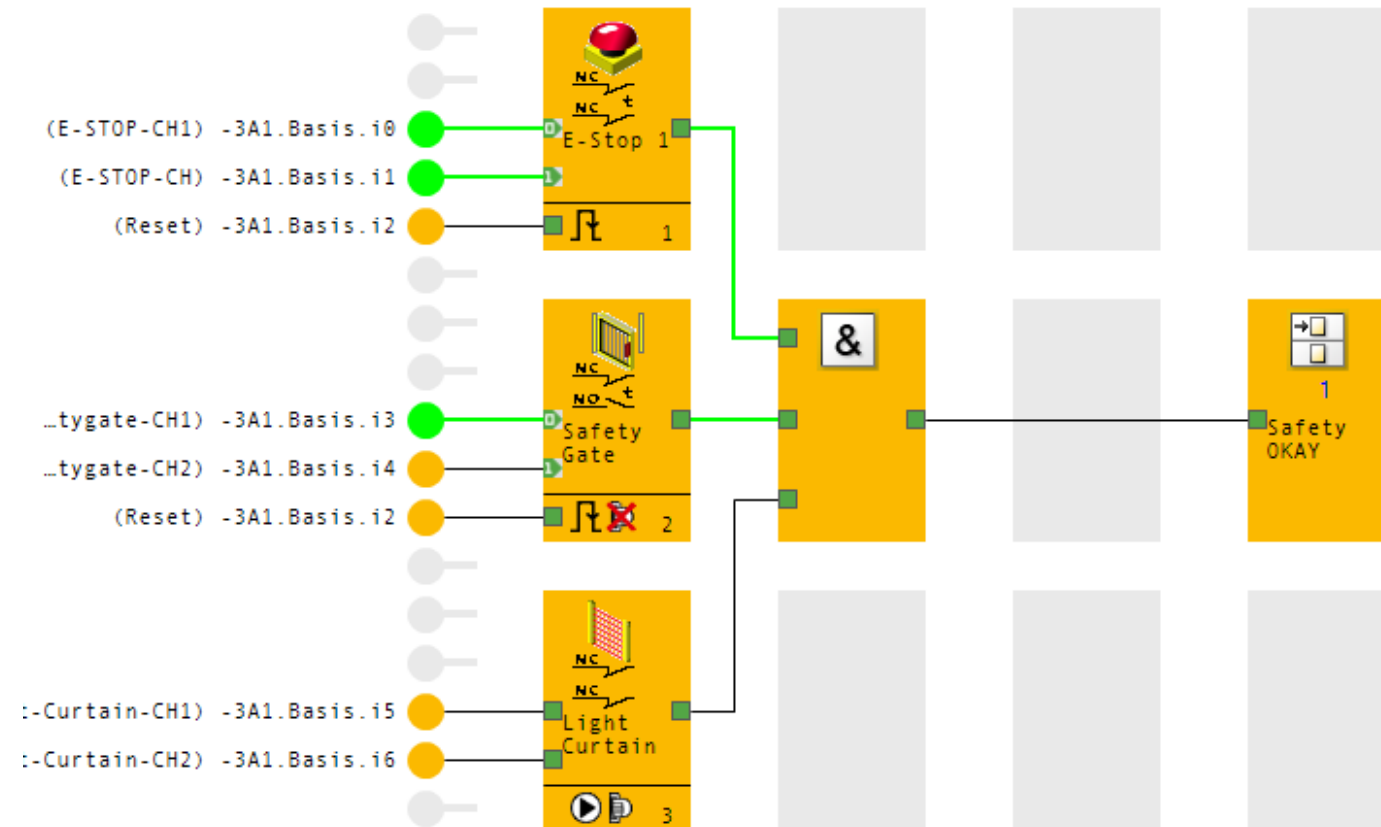
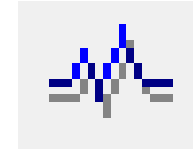
Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises

- Viewing/tracing the program
- Viewing the current status of inputs and outputs
- View only possible in RUN mode



# ► Dynamic Programm Display

## Cross reference

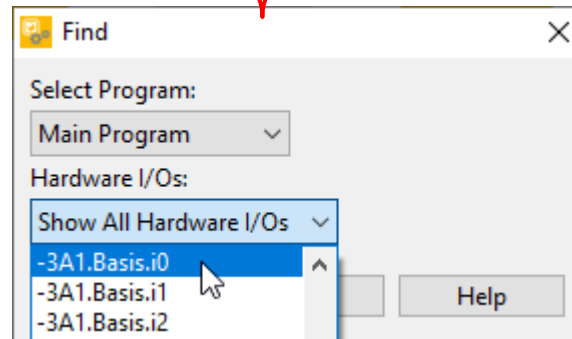
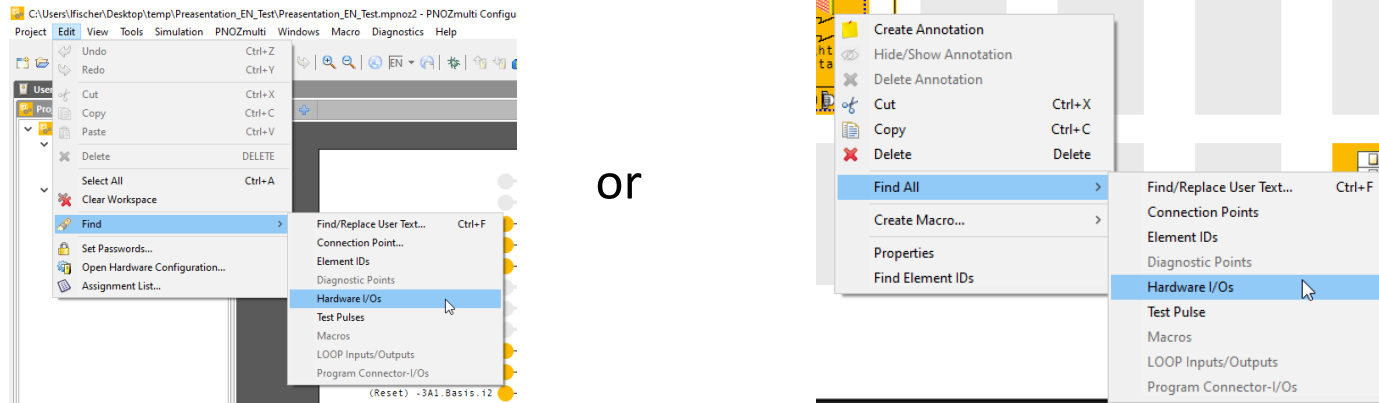


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- LED's
- Error Stack
- Dynamic Programm Display**
- Diagnostic Word
- Checksum comparison chip card
- Replace devices
- Exercises

### Cross-reference via inputs and outputs

#### Using the "Search" menu



I/O	Equipment ID	Page
-3A1.Basis.i0	E-STOP-CH1	1

Display at the bottom of the window

# ► Dynamic Programm Display

## Cross references of connection points



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LED´s

Error Stack

**Dynamic Programm Display**

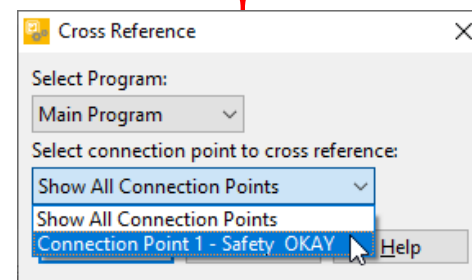
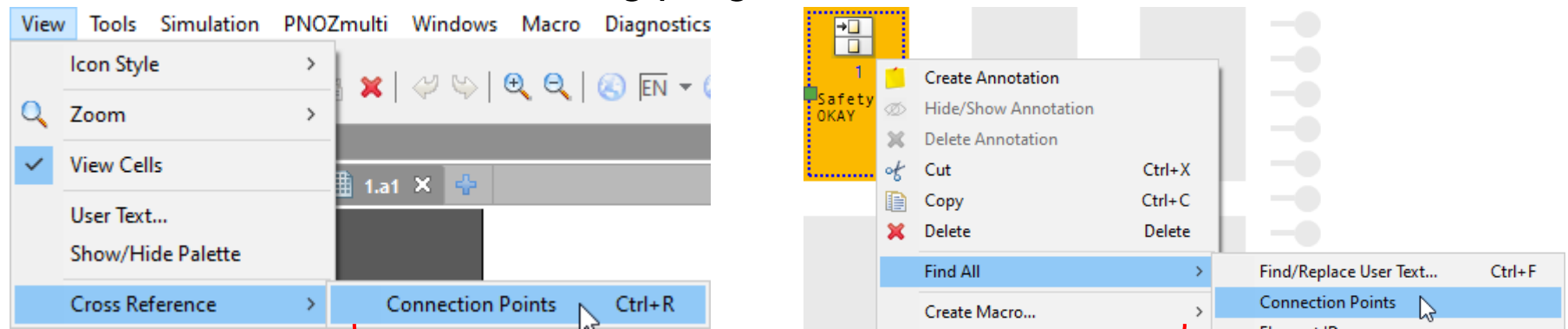
Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises

Cross-reference of the connection points  
Using the "**Cross Reference**" menu  
For a better overview in confusing programs



Connection Point 1 - Safety OKAY

Connection Point	Equipment ID	Page
Source	Safety OKAY	1
Destination	Safety OKAY	1

Display at the bottom of the window

# ► Dynamic Programm Display

## Diagnostic data



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LED´s

Error Stack

### Dynamic Programm Display

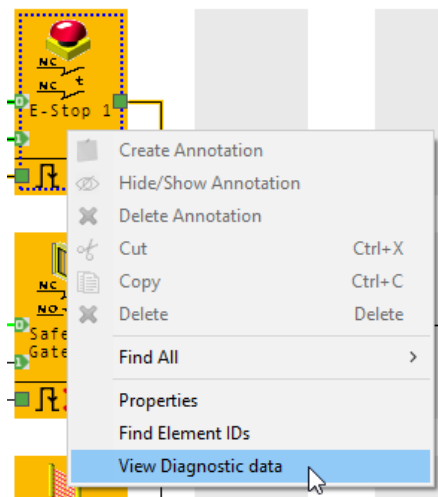
Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises

- Viewing the status of elements via the computer (if online)
- Call up the status once (is not automatically updated)



Diagnostic word	Description
0000000000000100	E-STOP pushbutton is ready for reset.
0001000000000000	There is a 1 signal at input 1.
0010000000000000	There is a 1 signal at input 2.



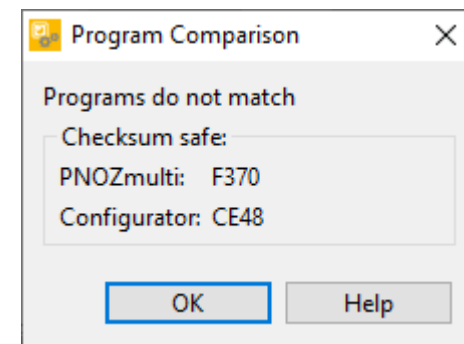
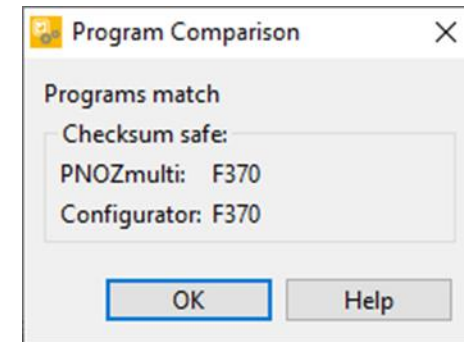
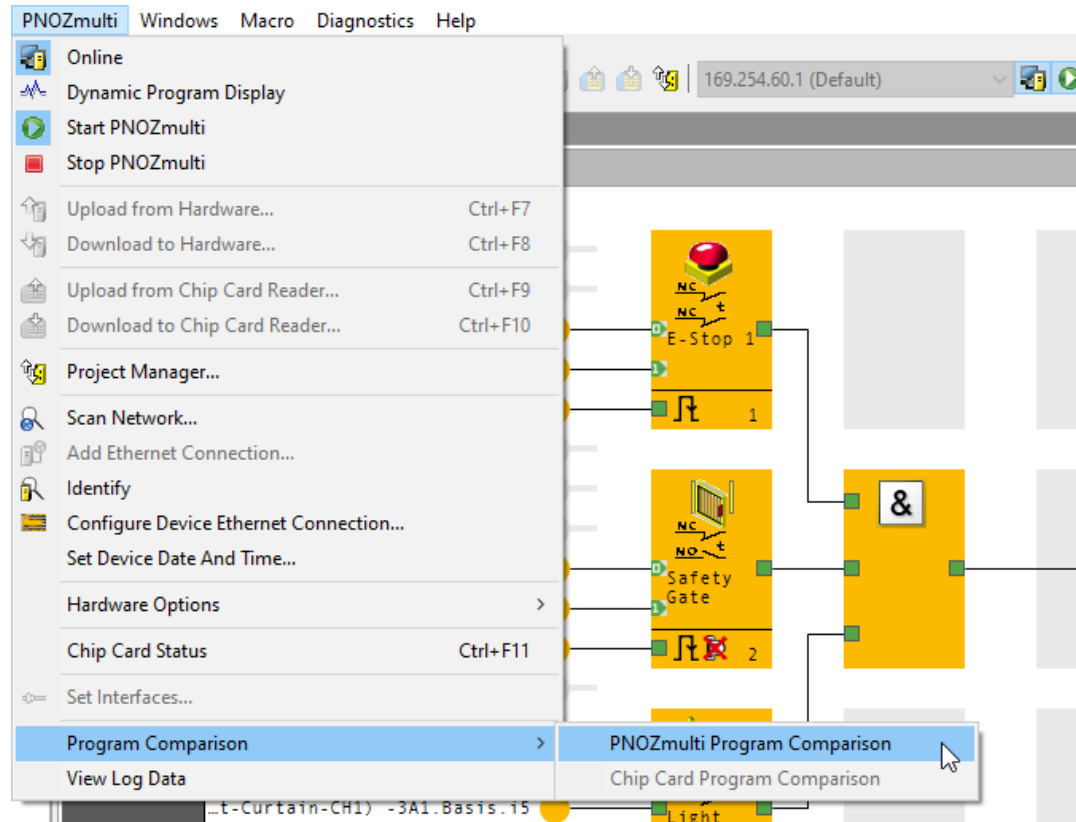
# ▶ Program Comparison



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- LED's
- Error Stack
- Dynamic Programm Display
- Diagnostic Word
- Checksum comparison chip card**
- Replace devices
- Exercises

- ▶ Comparison of the program on the chip card with the currently open program in the PNOZmulti Configurator (if online on PNOZmulti)
- ▶ Menu item "PNOZmulti" → "Program Comparison"



# ► Replace Devices

## 1st generation



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LED's

Error Stack

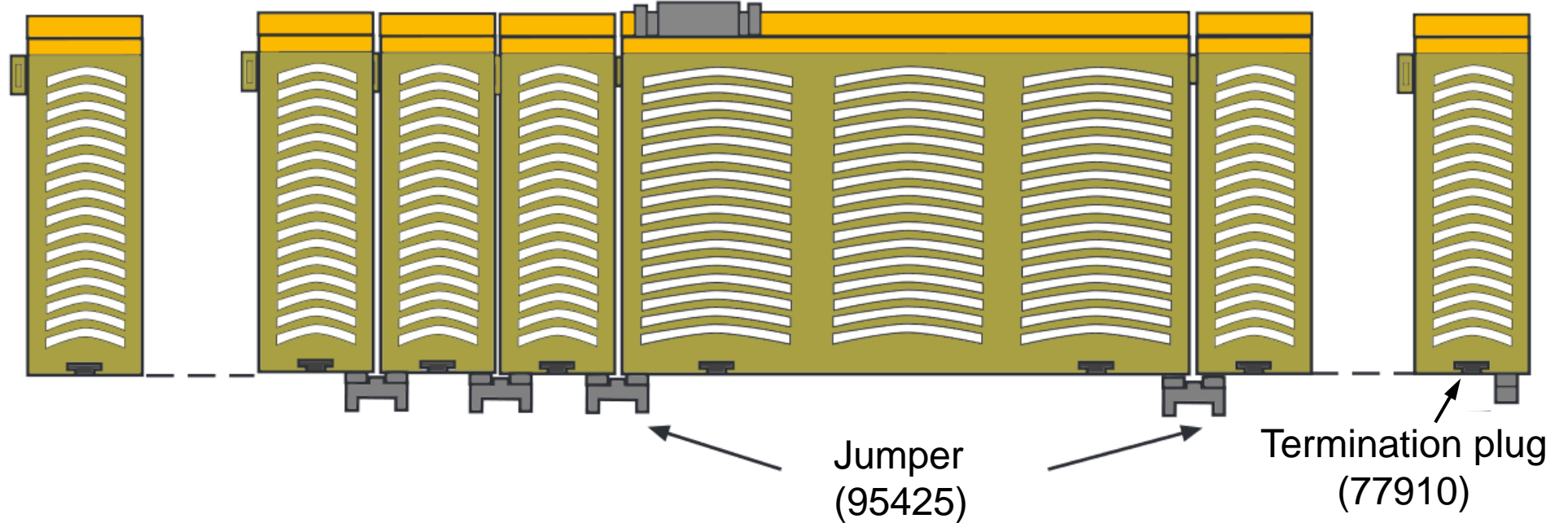
Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

**Replace devices**

Exercises



To be observed:  
Termination and jumper plug  
Device type  
Version number  
Order

# ► Replace Devices Mini



PILZ | 08-28

LED´s

Error Stack

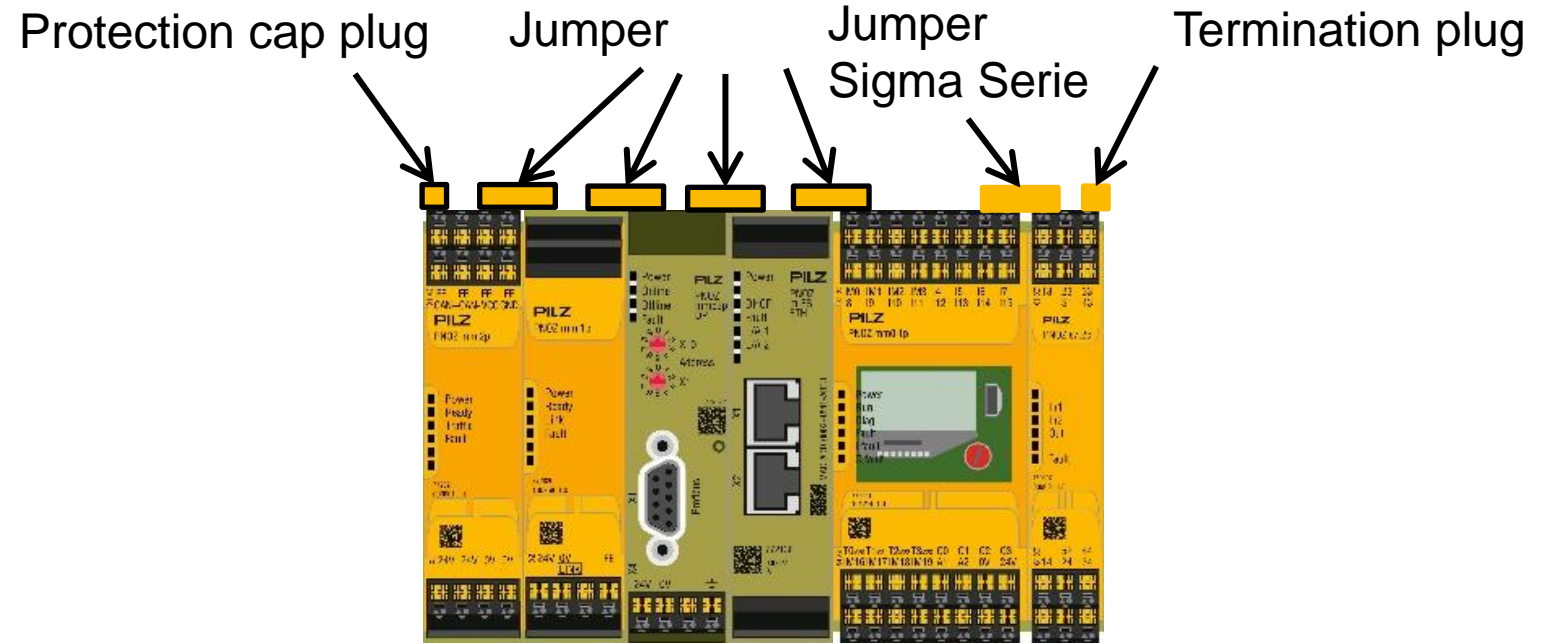
Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

**Replace devices**

Exercises



To be observed:

- Termination, jumper plug and protective cap
- Device type
- Version number
- Order

# ► Replace Devices 2nd generation



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LED's

Error Stack

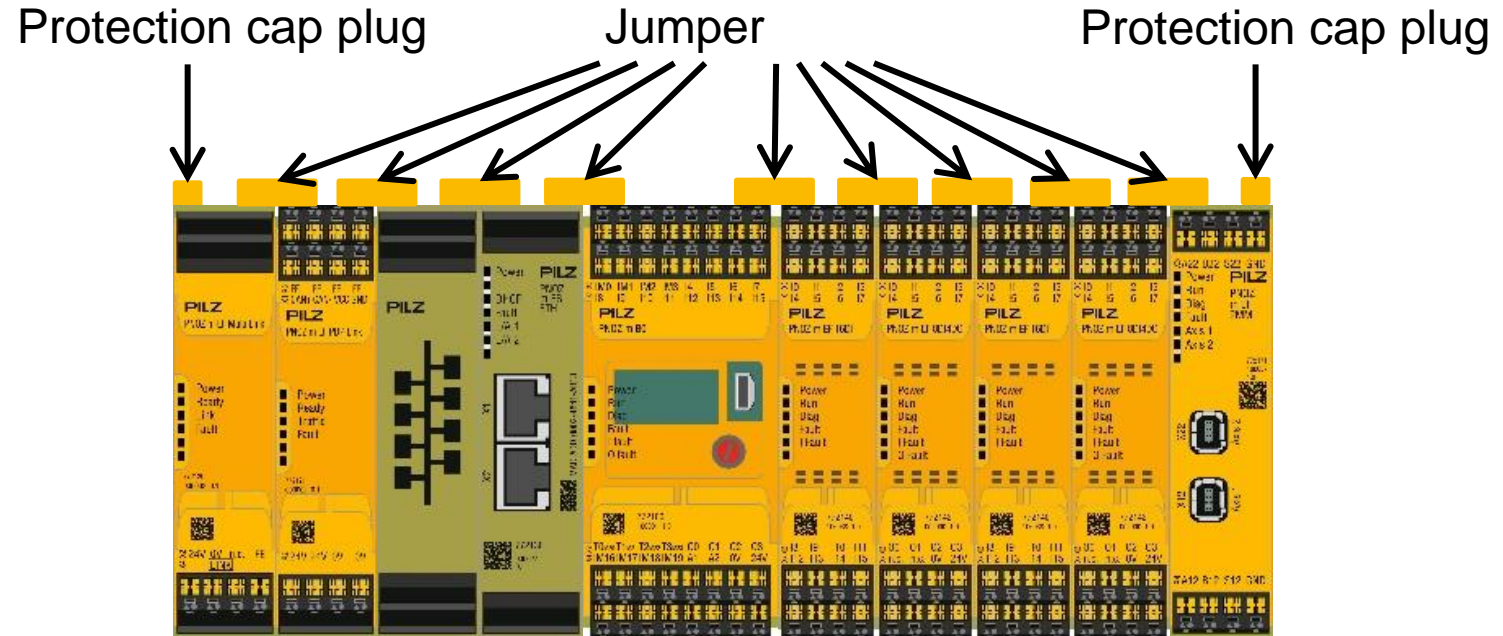
Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

Replace devices

Exercises



To be observed:

- Jumper plugs and protective caps
- Device type
- Version number
- Order



# ► Troubleshooting

## Practice sheet 1-6



PILZ | 08-30+

LED's

Error Stack

Dynamic Programm Display

Diagnostic Word

Checksum comparison chip card

Replace devices

**Exercises**

### 1. LED

Base Unit								Extension unit		State of the LED's	
POWER	RUN	DIAG	FAULT	I FAULT	O FAULT	I0..I19	CI	CO	FAULT		I0..I7
✗				✗							On
						✗					Blinks

Hint:  
The shown solution is only a sample !!!

### 2. Diagnostics table on page 6-6 :

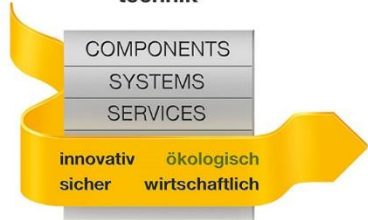
- |   |  |
|---|--|
| <input type="checkbox"/> Internal error in the base unit.               | <input type="checkbox"/> Internal or external error at the outputs.  |
| <input type="checkbox"/> Internal error at the inputs.                  | <input type="checkbox"/> External error at the outputs.  |
| <input type="checkbox"/> External error at the inputs.                  | <input type="checkbox"/> Basic or extension unit works without errors. A release is missing in the user program! |
| <input checked="" type="checkbox"/> External error in the clock wiring. |  |

### 3. Error description :

My error description / Procedure / Own notes:

*Short circuit between T2 and T3. Probably due to a crushed cable.*

## Automatisierungs- technik



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