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TURCK

TBPN-L1-FDIO1-2IOL

Safety block I/O-module

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1 Using Turck Safety Configurator

1.1 Downloading the software



NOTE

The Turck Safety Configurator online help contains a detailed program description.

- Download the Turck safety Configurator from the Turck homepage here: www.turck.de.

1.2 Installing the software

- Unpack the downloaded ZIP-archive and start the installation via "install.exe".
- ↳ The setup assistant leads through the installation.

1.3 Integrate Turck Safety Configurator in TIA/Step7

The Turck Safety Configurator can be started directly out of TIA-Portal/Step7-software.

- Select the option "register in TIA/step7" in the installation step "Custom Setup".

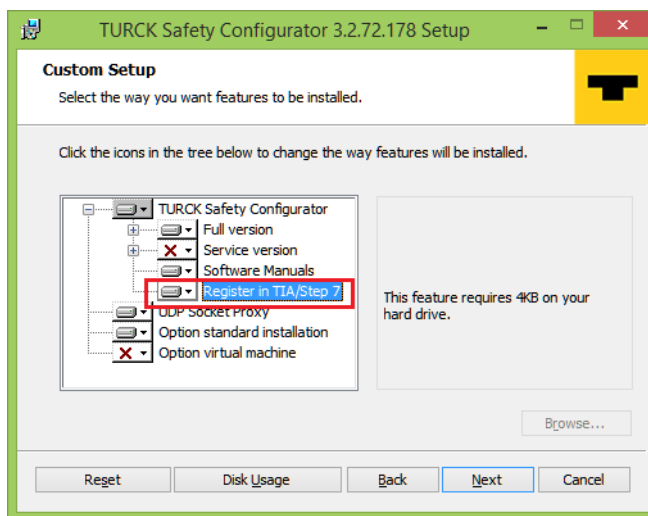


Fig. 1: Register the TSC in TIA/Step7

1.4 Licensing the software

The licensing is done via Coupon code.

- Enter the coupon code on the Turck Homepage following this link:
<http://www.turck.de/en/turck-safety-configurator-license-6174.php>.
- If the coupon code is missing, please order a coupon code via E-mail under the following E-mail address:
TM-BWSoftwareSupport@turck.com

1.4.1 Software incensing for virtual machines (VM)

- Enter the coupon code on the Turck Homepage following this link:
<http://www.turck.de/en/turck-safety-configurator-license-vm-6177.php>.
- If the coupon code is missing, please order a coupon code via E-mail under the following E-mail address:
TM-BWSoftwareSupport@turck.com

1.5 Starting the software

- Start the software via the program icon on the desktop.
- The TURCK Safety Configurator starts with the Start Assistant, which will lead through the first steps after program start.

2 Configuring with Turck Safety Configurator

2.1 Setting up a new configuration

- Select "New configuration" in the Start Assistant and create a new configuration for the safety monitor.

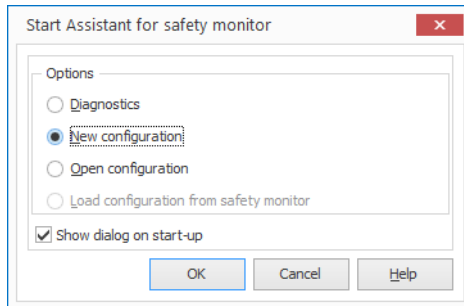


Fig. 2: Start Assistant

2.1.1 Adapting the monitor settings

The dialog box "Monitor settings" is used to enter the basic data for the new configuration.

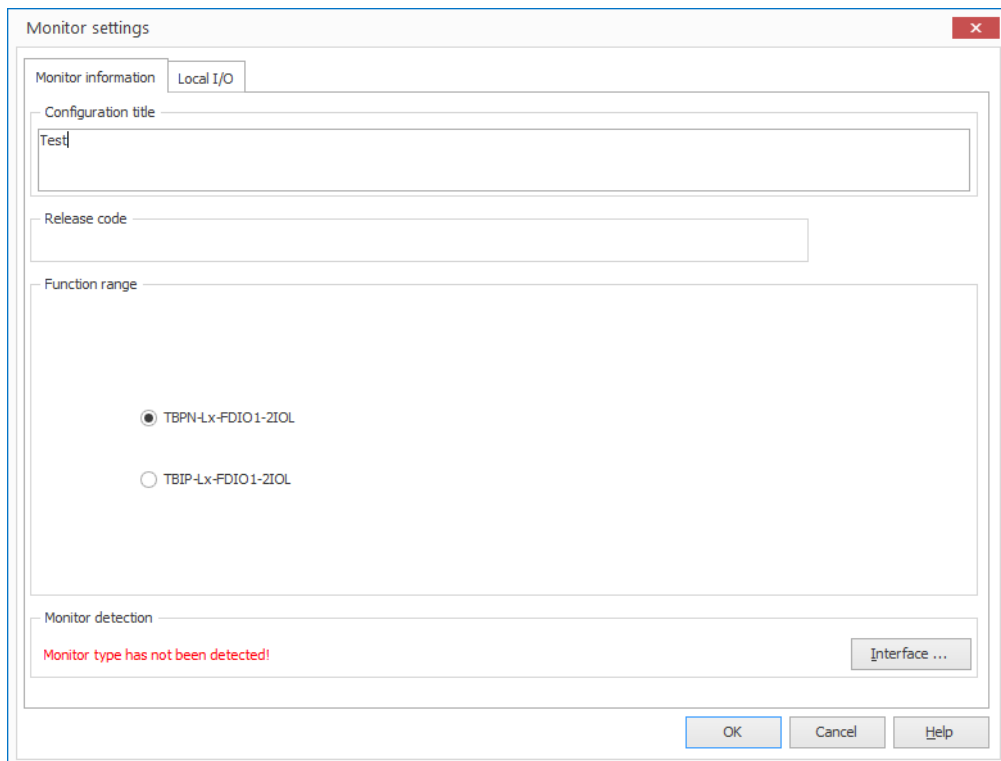


Fig. 3: Monitor settings

- Enter the configuration title in the register tab "Monitor information".
- Select the device type of the safety module (safety monitor) in the section "Function range".

- If no monitor is detected, open the settings for the interface to the connected device via the "Interface..."-button and enter the IP address of the connected device under "UDP".

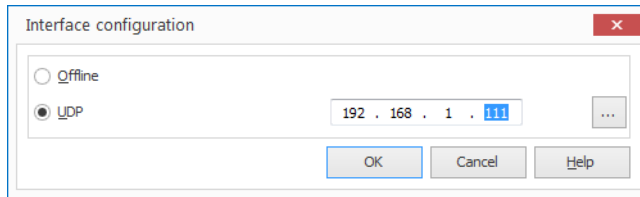


Fig. 4: Interface configuration

- If the IP-address of the device is not known, search the network via the "..."-button.
- Select the device from the list and close with "OK".

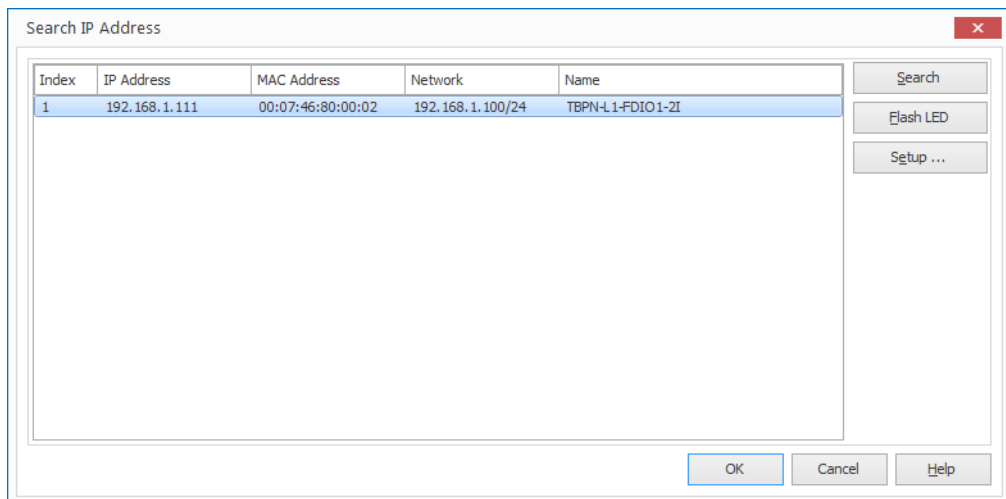


Fig. 5: Search IP address

→The safety module (monitor type) is detected, the connection is established.

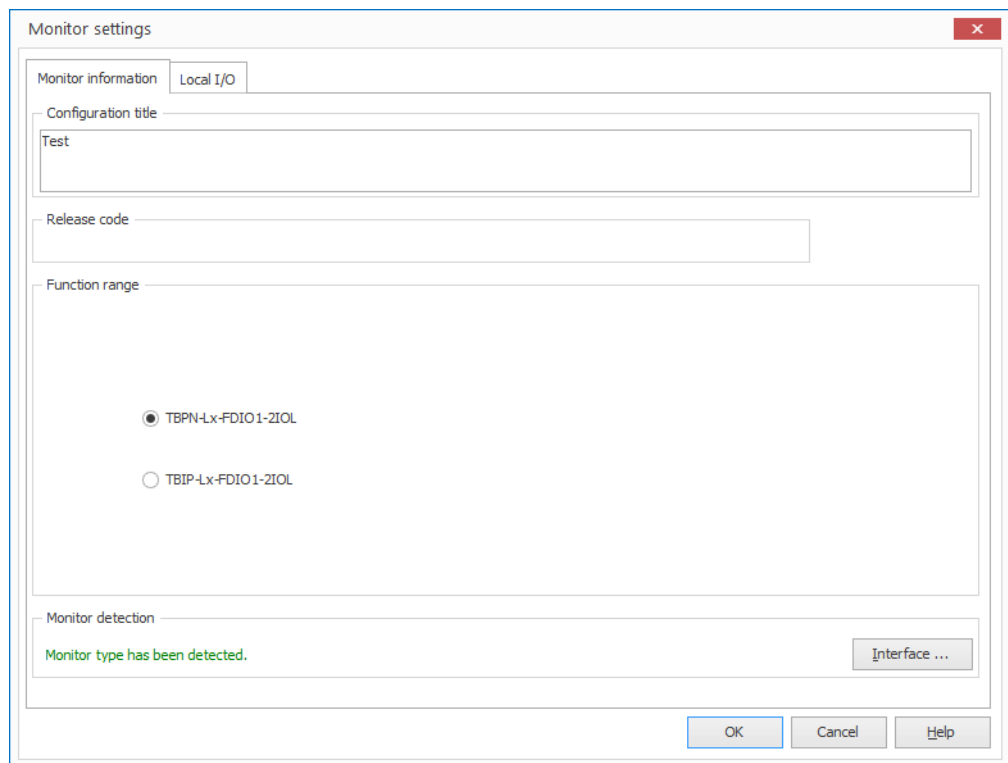


Fig. 6: Device (monitor type) detected

2.2 Set up a standard configuration

The register tab "Local I/O" in "Monitor settings" show the standard configuration for the local device in- and outputs.

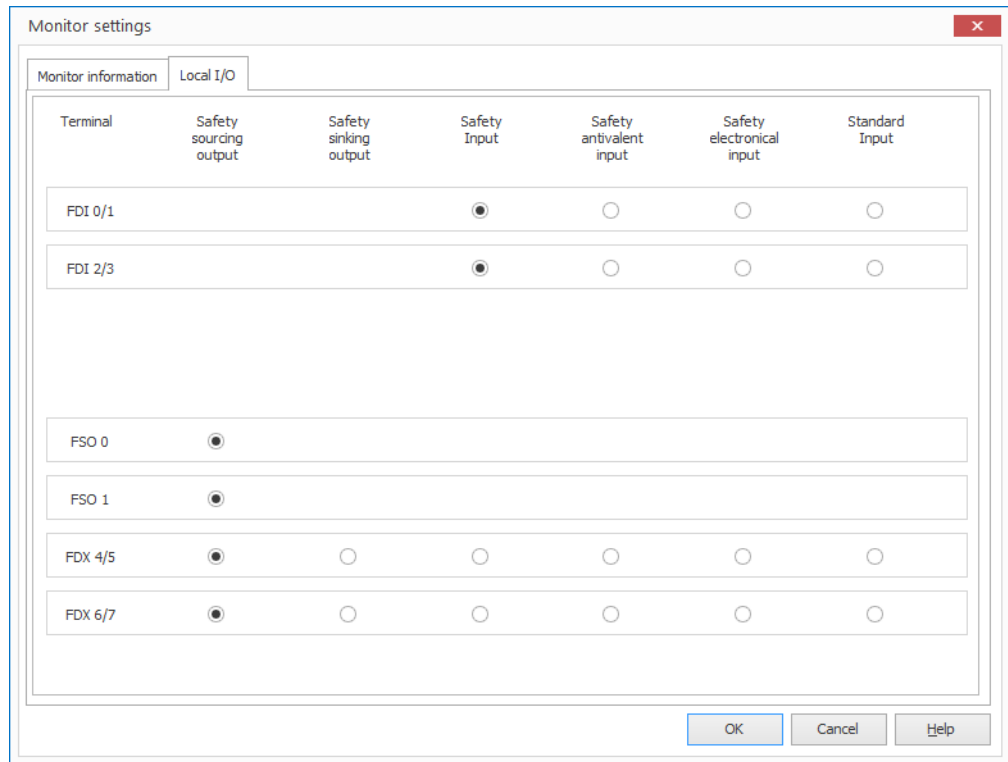


Fig. 7: Standard configuration of the local I/O

- Close the dialog box "Monitor settings" by pressing "OK".
- ➡ The standard configuration is created.

2.2.1 Standard configuration

Outputs:

For each device output, which means, for the two internal safety outputs FSO0 and FSO1 as well as for the two SIL3-outputs FDX4/5 and FDX6/7 one release circuit (OSSD 1 - OSSD 4) is created. The outputs are automatically assigned to the first four output bits of the F-CPU.

Inputs:

Additionally, one release circuit (63. OSSD and 64. OSSD) is created for each of the two SIL3-inputs (FDI0/1 and FDI2/3). The inputs are also automatically assigned to the first two input bits of the F-CPU.

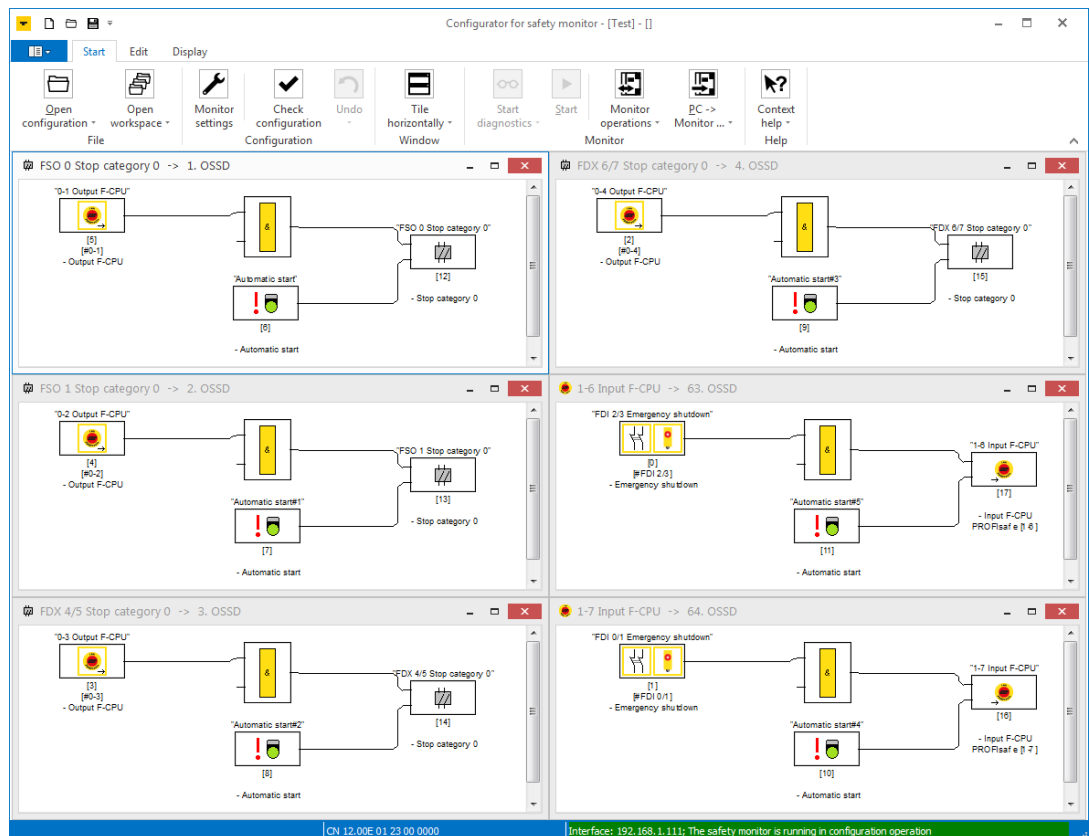


Fig. 8: Release circuits (OSSDs) of the standard configuration

2.3 Checking the configuration

The Turck Safety Configurator checks the created configuration for logical errors, which means, the logical wiring of the single components in the release circuits is checked. The configuration check does not consider double allocation etc..

➔ Start the check using the "Check configuration" -button.

2.4 Loading the configuration into the safety module.

➤ Stop the safety module using the "Stop"-button.

➤ Download the configuration created in the software to the device by using the button "Send configuration" → PC -> Monitor".

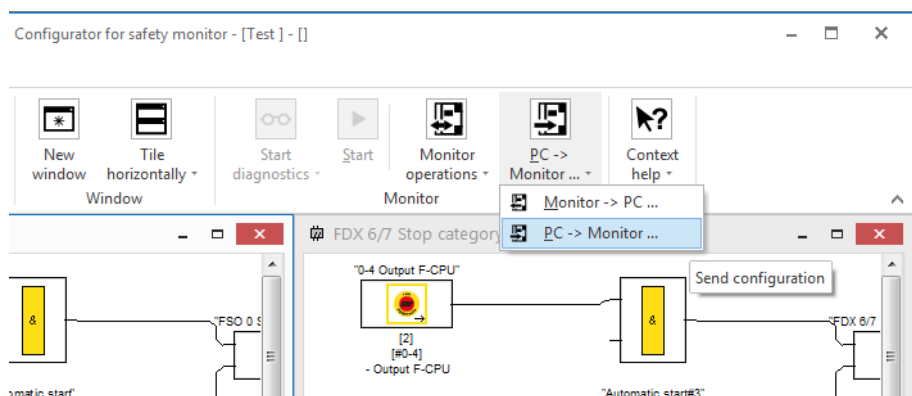


Fig. 9: Send configuration „PC->Monitor“

➤ Enter the password for the configuration.

During the first download of a configuration to the device, the standard password "SIMON" has to be changed.



NOTE

The default password for the safety module is "SIMON". If the device is reconfigured, a new password has to be assigned. This password, must be known only to the responsible authorized safety representative.

2.4.1 Change password

➤ Enter a new password for the application in the "Password dialog".

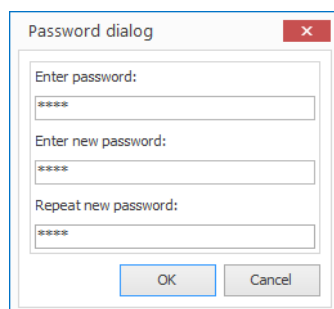


Fig. 10: Entering a new password.

2.5 Checking the configuration

- Confirm the "Information" dialog with "OK" and confirm the configuration validation in the dialog box "Configuration validation".
- Enter the name of the authorized person who is in charge of the validation and enter a password.

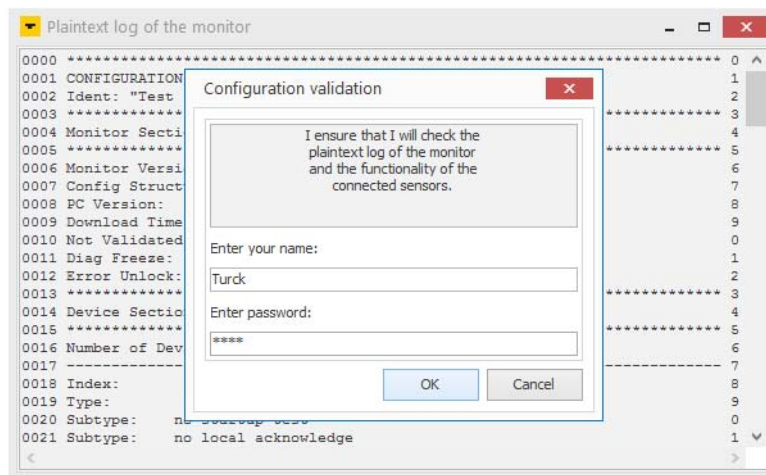


Fig. 11: Configuration release

The configuration log is part of the safety documentation of the machine.

- Copy the plain text log to a text editor, save, print and archive it.
- or
- Save the configuration log as text file via "Monitor operations → configuration log → save as...", print and archive it.



NOTE

Chapter 5.8 of the software's online help contains a detailed description of the structure of the configuration log.

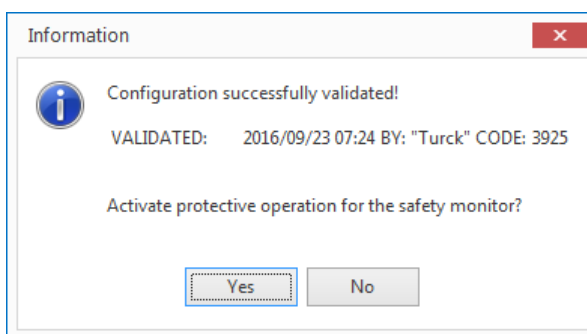


Fig. 12: Release the configuration

- Closing the dialog box with "Yes" activates the protective operation of the device (safety monitor). The device is started.
- ➔ After the configuration release, the device is in diagnostics mode.



NOTE

The CODE (in this example 3925) serves as CRC which has to be entered in the PROFIsafe PLC software **Setting the F_parameters (page 28)**.

2.5.1 Loading the diagnostics configuration

If the diagnostics are activated, the TSC shows the state of the safety I/Os.

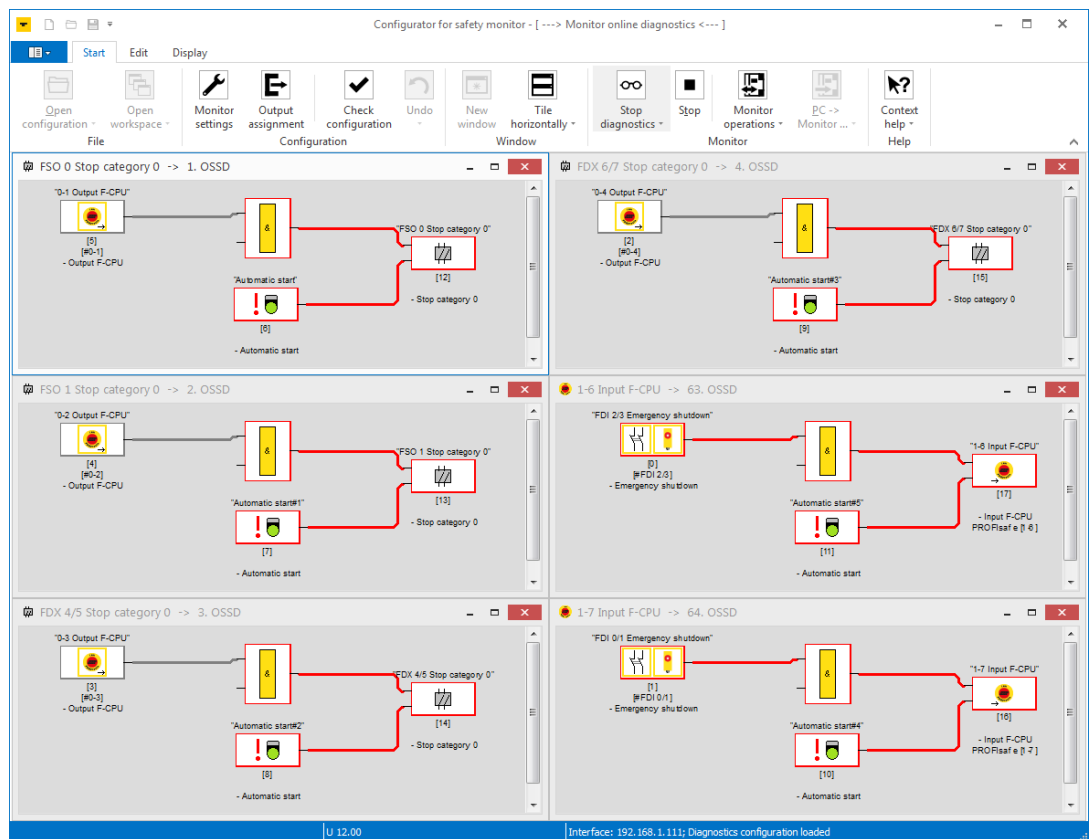


Fig. 13: Released configuration, diagnostics configuration loaded

2.6 Customize the configuration

The standard configuration in the Turck Safety Configurator can be customized in order to meet the requirements of different applications.

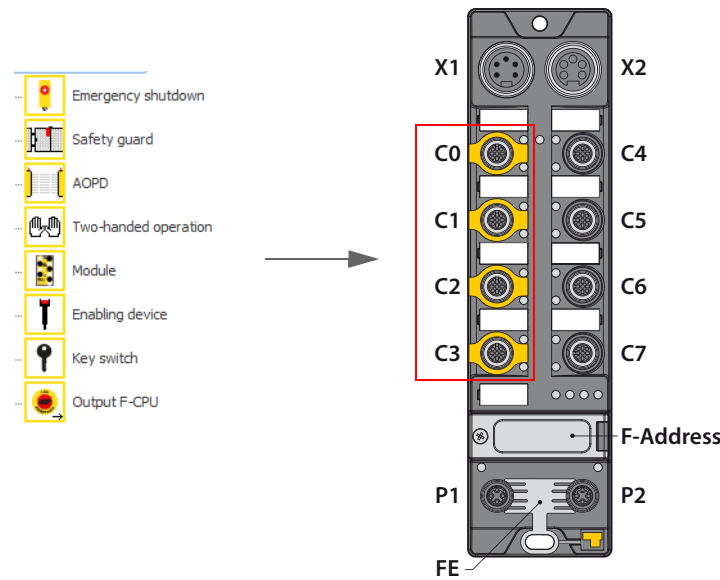
2.6.1 Customizing a standard application (preliminary considerations):

- 1 What is needed?
 - Definition of amount and type of the required in- and outputs
 - Which components are used for the safety function:
 - electromechanical components,
 - electric components,
 - dual channel switching,
 - single channel switching,
 - antivalent switching,
 - components with semiconductor OSSD output.
- 2 Where will the components be placed??

All "yellow" M12-connectors on the left side of the TBPn-L1-FDIO1-2IOL are designed for connecting safety components.

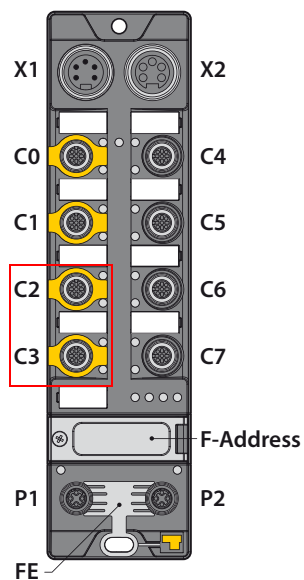
In the standard configuration, the two lower M12-connectors (C2 and C3) are configured as dual channel SIL3-outputs. However, depending on the application, they can be used as SIL3-inputs. In total, up to four dual channel safety related SIL3-inputs can be connected to the device.

Possible input configurations:



Possible output configurations:

- PP-switching
- PM-switching



2.6.2 Set up an own configuration

- Adapt the standard configuration of the safety channels in the Turck Safety Configurator under "Monitor settings → Local I/O".

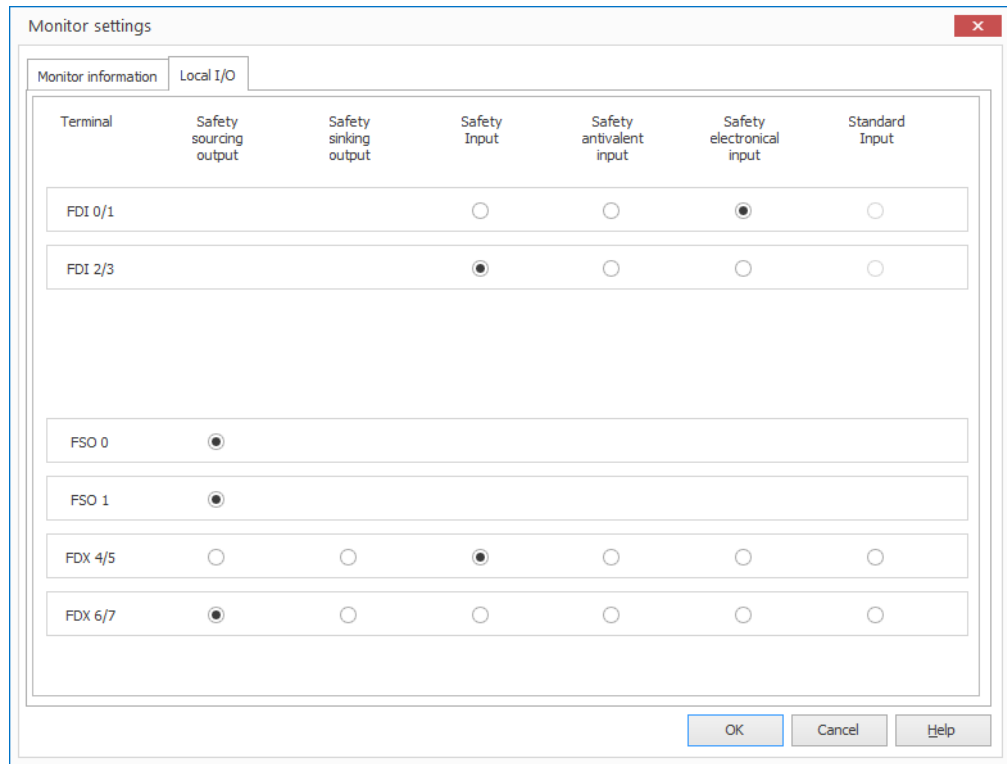
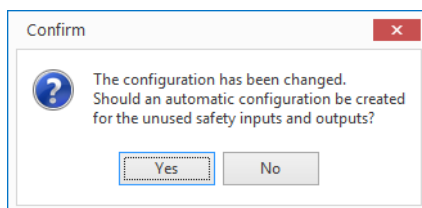


Fig. 14: Customized configuration of the local I/O

- Close the dialog box with "OK".
- ↳ The configuration change is done.
- ↳ The software generates the new release circuits (OSSDs) if the following dialog box is closed with "yes".



- ↳ Again, the PROFIsafe in- and output bits are automatically assigned.



NOTE

Release circuits (OSSDs) which are no longer used, have to be deleted.

New configuration (assignment of release circuits):

Inputs

- FDX4/5 → 62. OSSD (**new release circuit for the input**)
- FDI0/1 → 64. OSSD
- FDI2/3 → 63. OSSD

outputs

- FDX6/7 → 4. OSSD
- FDX4/5 → 3. OSSD (**no longer necessary, will be deleted, see Deleting OSSDs (page 15)**)
- FSO0 → 2. OSSD
- FSO1 → 1. OSSD

2.6.3 Deleting OSSDs

Deleting OSSDs which are no longer necessary is done in the component manager in the software.

► Open the component manger via "Display → Window → Component manager"

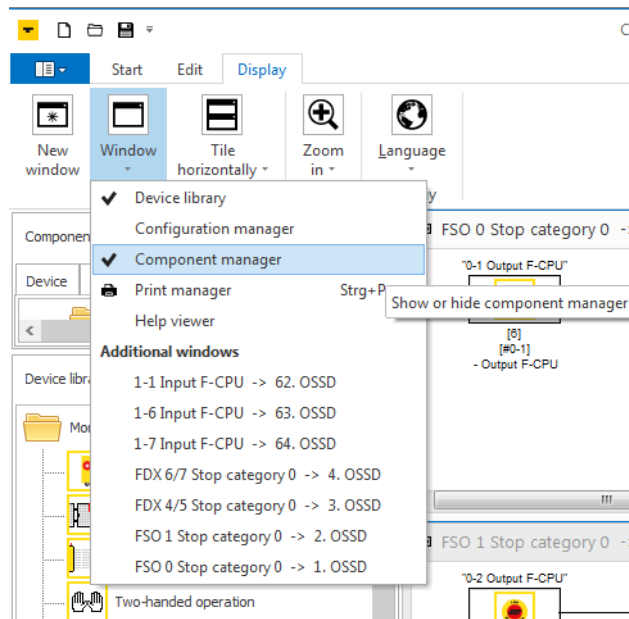


Fig. 15: Open the component manager

- Delete the release circuits (OSSDs) which are no longer used in the component manager (in this example OSSD 3).

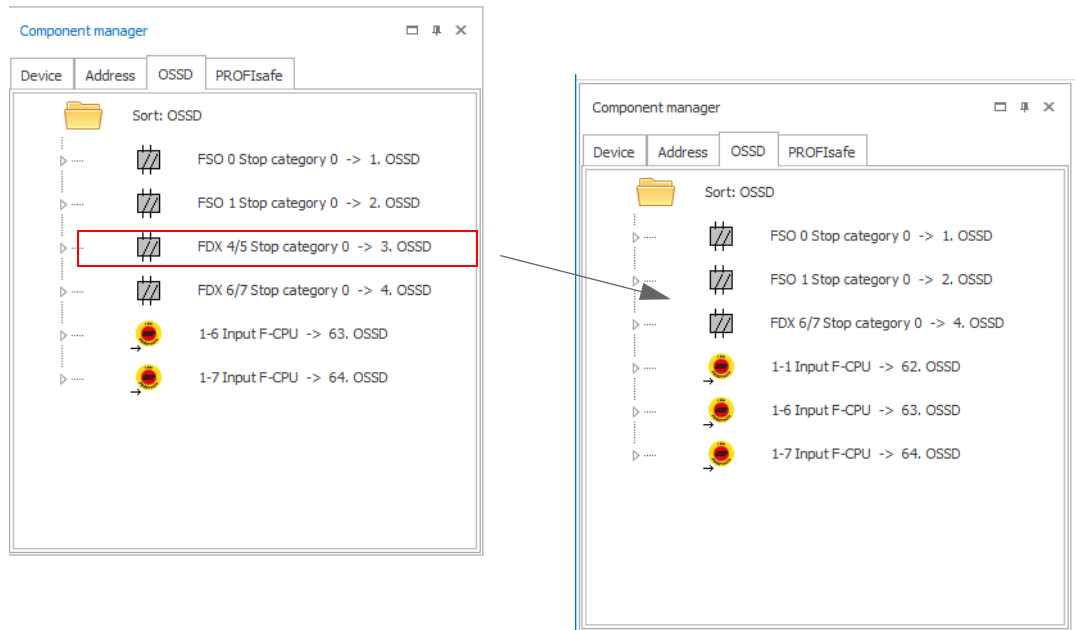


Fig. 16: Deleting OSSDs

2.7 Application example

- Emergency shutdown at FDI0/1 at C0 (64. OSSD), **page 17**
- Light grid (AOPD) at input FDI2/3 at C1 (63. OSSD), **page 18**
- Non-safety channels at C3 - C7 will be switched on permanently via the internal safety outputs (1. and 2. OSSD), **page 20**
- Output FDX4/5 at C2 (3. OSSD) is switched off if the emergency stop and/or the light grid are activated, **page 21**
- Output FDX6/7 at C3 (4. OSSD) is switched off, if output FDX4/5 is switched off, **page 23**. The output state is transferred to the F-CPU.
- Release of the complete safety function via a release bit in the F-CPU (3. OSSD), **page 24**

2.7.1 Add emergency shutdown in 64. OSSD

The release circuit remains unchanged as it corresponds to the standard configuration.

- Emergency shutdown st SIL3-input FDI0/1, assigned to PROFIsafe bit 1-7.

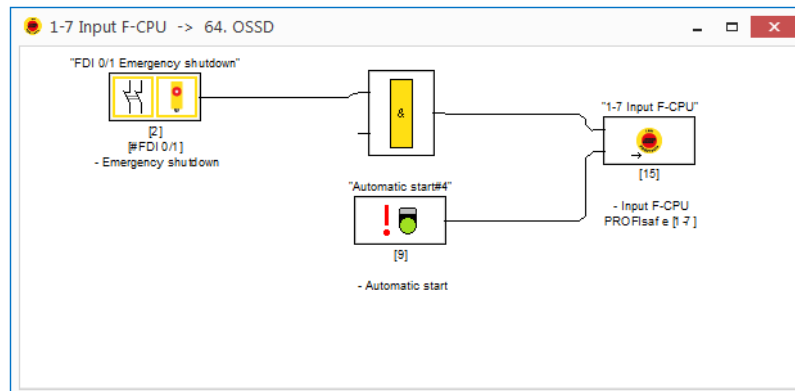


Fig. 17: 64. OSSD with emergency shutdown

2.7.2 Add light grid (AOPD) in 63. OSSD

- Delete the input element "Emergency shutdown".
- Define the input as Safety electrical input in "Monitor settings → Local I/O".

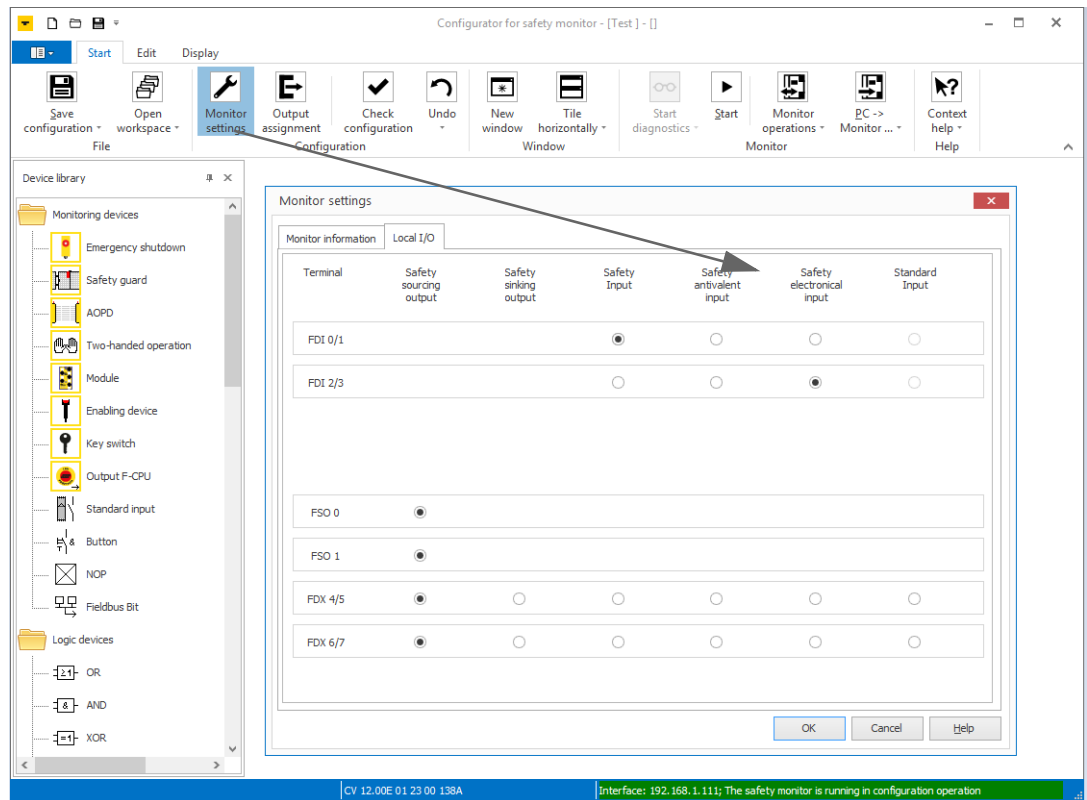


Fig. 18: Define FDI2/3 as Safety electrical input

- Select the light grid from the Device library and add it to the release circuit (OSSD) instead of the emergency shutdown.
The Device library is opened via "Display→ Window → Device library".

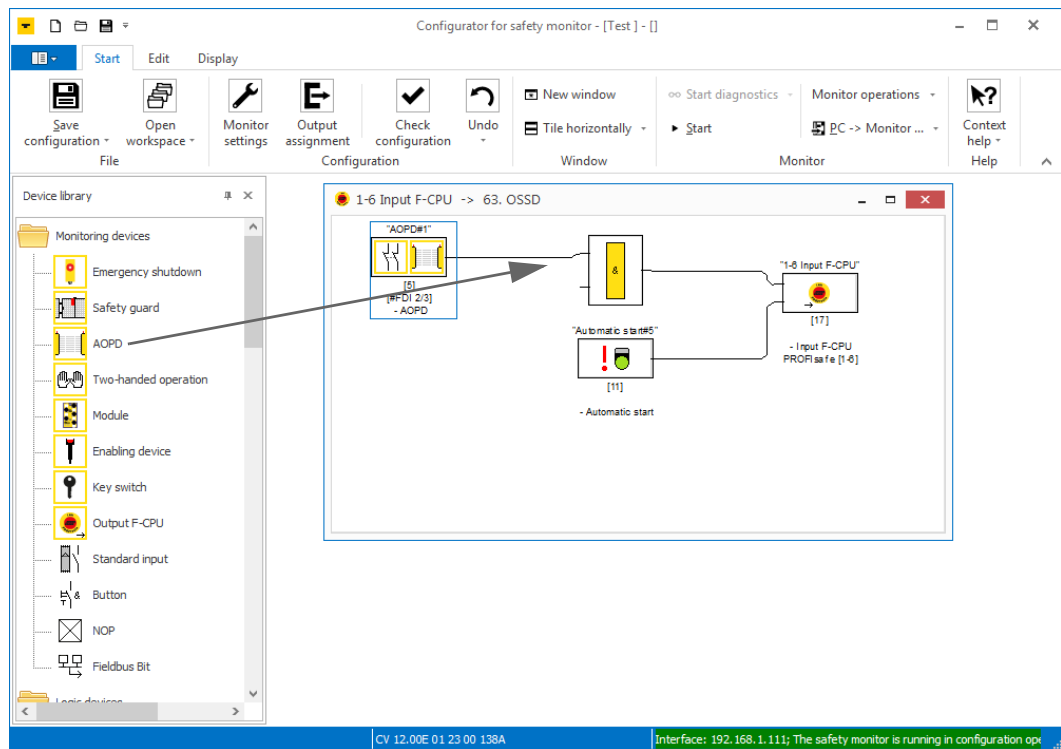


Fig. 19: Light grid (AOPD) in 63. OSSD

- The light grid at FD12/3 is configured and assigned to PROFI safe bit 1-6.

2.7.3 Switch on non-safety channels permanently (1. and 2. OSSD)

The non-safety channels at C4 - C7 of the device can be safe switched off via the internal safety outputs FSO0 and FSO1. If they have to be switched on permanently, then FSO0 and FSO1 need a permanent switch-on condition (TRUE). The programming is done in the 1. and 2. OSSD.

➤ Delete the element "output F-CPU" in both OSSDs (1. and 2. OSSD) and replace it by a TRUE-element from the device library.

↪ Both internal outputs are permanently active.

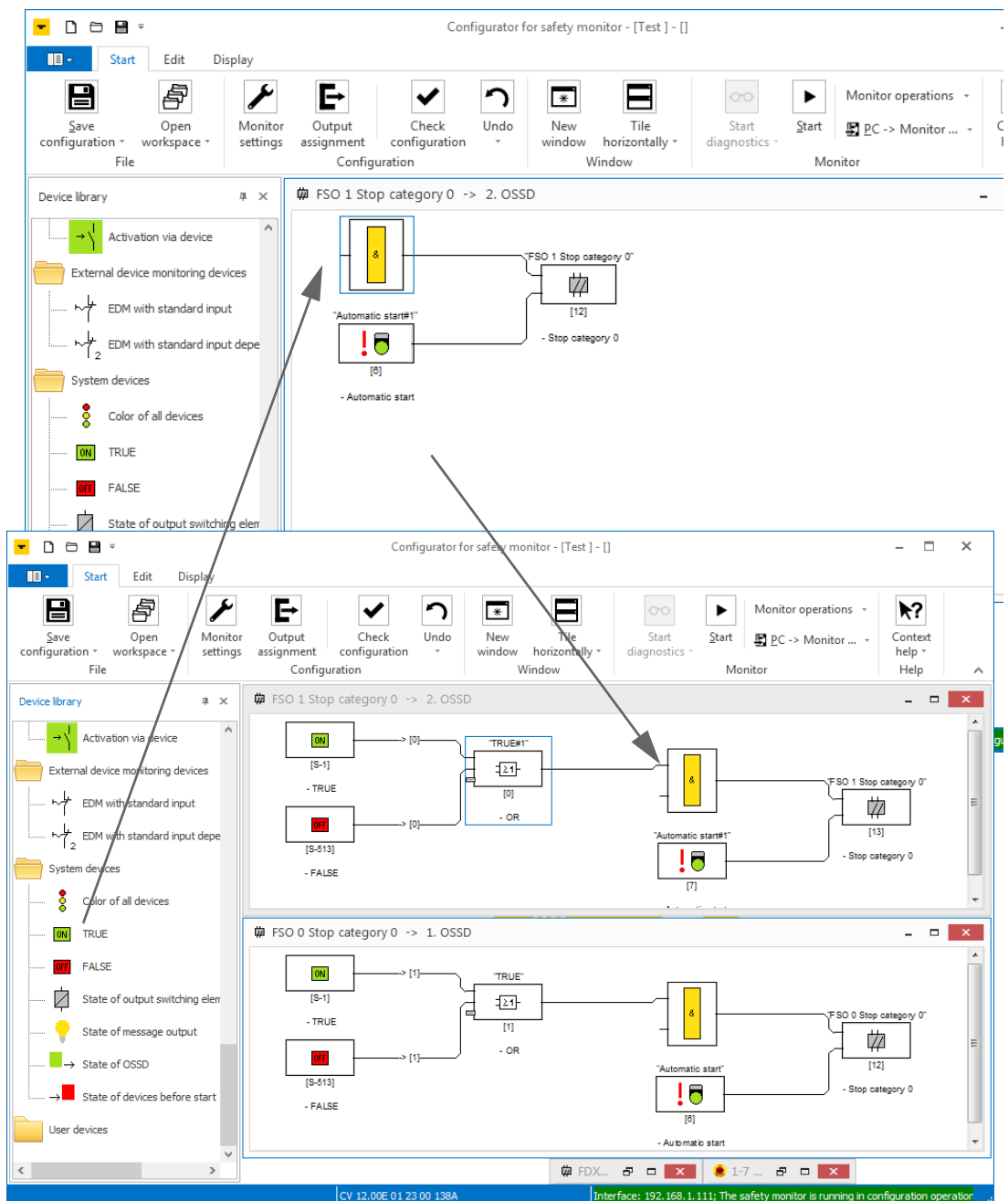


Fig. 20: Permanent activation of FSO0 and FSO1.

2.7.4 Switch off of FDX4/5 if emergency shutdown or light grid activated

Output FDX4/5 at C2 (3. OSSD) has to be switched off as soon as the emergency shutdown at FDI0/1 (64. OSSD) or the light grid at FDI2/3 (63. OSSD) are activated. This means, the state of the OSSD 63 and 64 controls the state of FDX4/5.

- Delete "Output F-CPU" in the release circuit 3 (3. OSSD).
- Select the block "State of output switching element" from the Device library and place it at the function input. In the dialog box "State of output switching element x" select OSSD 63.

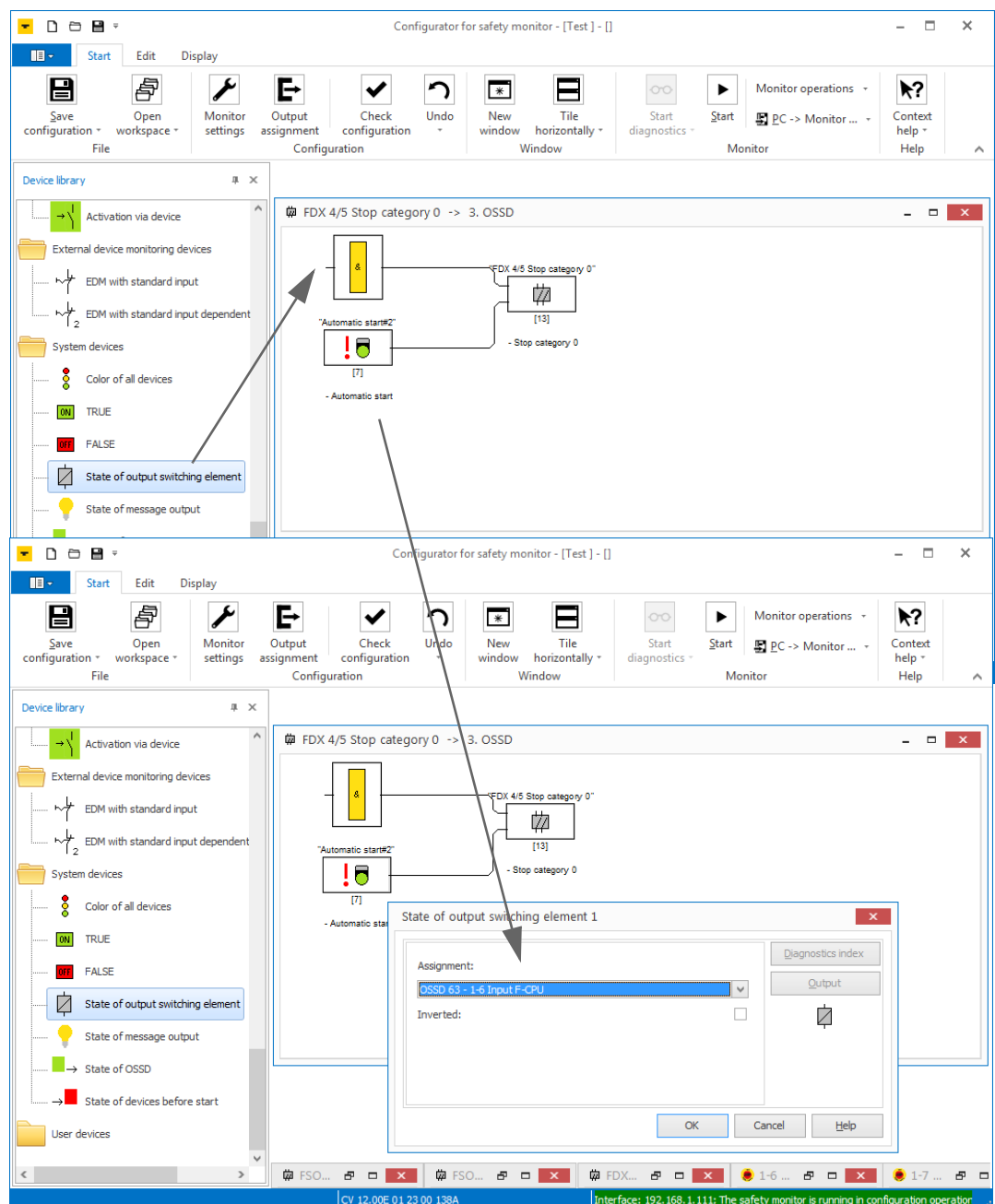


Fig. 21: State of output switching element OSSD 63

- Select the block "State of output switching element" from the Device library and place it at the function input. In the dialog box "State of output switching element x" select OSSD 64.

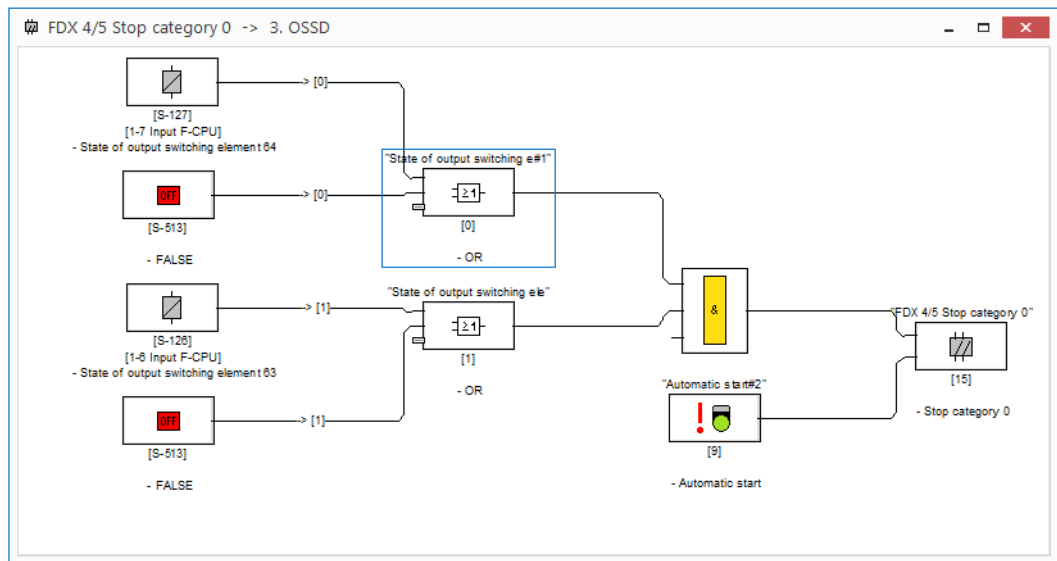


Fig. 22: State of output switching element OSSD 63 and OSSD 64

- ➔ The activation of the emergency shutdown at FDI0/1 or the light grid at FDI2/3 switches off output FDX4/5.

2.7.5 Switch off FDX6/7 at C3 (4. OSSD), if output FDX4/5 is switched.

Output FDX6/7 has to switch off if output FDX4/5 (3. OSSD) switches off.

- Delete "Output F-CPU" in the release circuit 4 (4. OSSD).
- Select the block "State of output switching element" from the Device library and place it at the function input. In the dialog box "State of output switching element x" select OSSD 3.

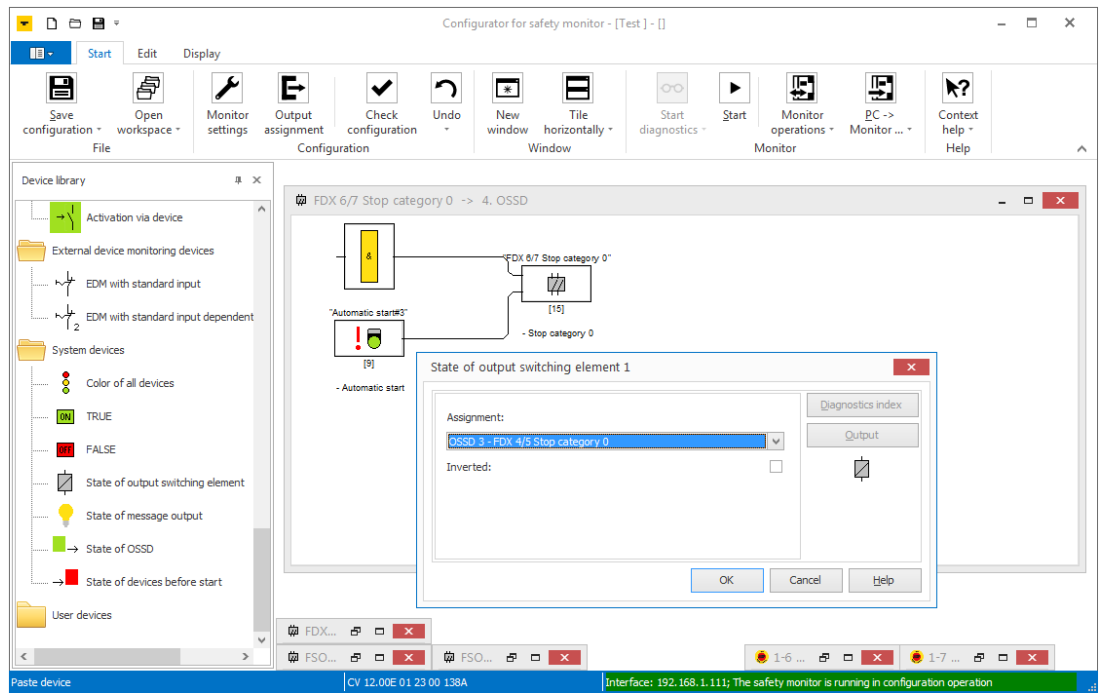


Fig. 23: State of output switching element OSSD 3 in OSSD 4

➔The state of 3. OSSD controls the output FDX6/7 in 4. OSSD.

2.7.6 Release of the safety function via a release bit in the F-CPU

The release of the safety function is done using a release bit in the F-CPU. Therefore, an output bit of the F-CPU is assigned to the output function in the 3. OSSD.

- Select the element "Output F-CPU" in the Device library and place it at the third input of the function.

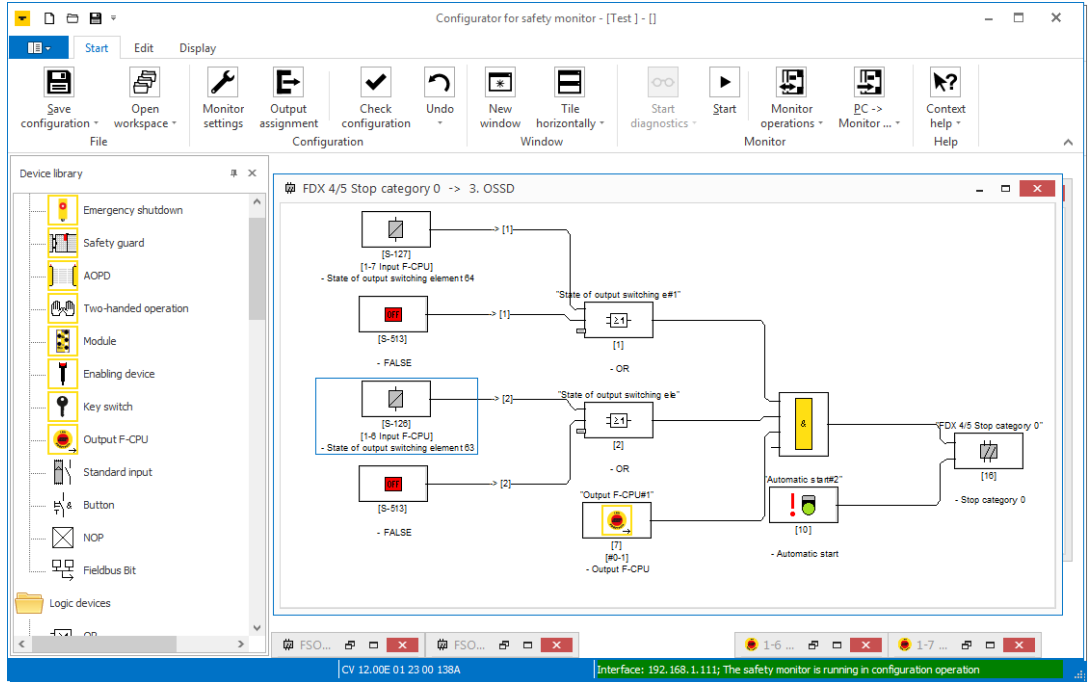


Fig. 24: 3. OSSD with release bit from F-CPU

- After an error, the safety function will only restart if the emergency shutdown as well as the light grid are error free and the release bit in the F-CPU is set.

3 Configuring the device in PROFINET/PROFIsafe (TIA-Portal)

3.1 Adding the device via GSDML

- Install the device's GSDML-file.
- Add the device to the "PROFINET-IO-System (100)".

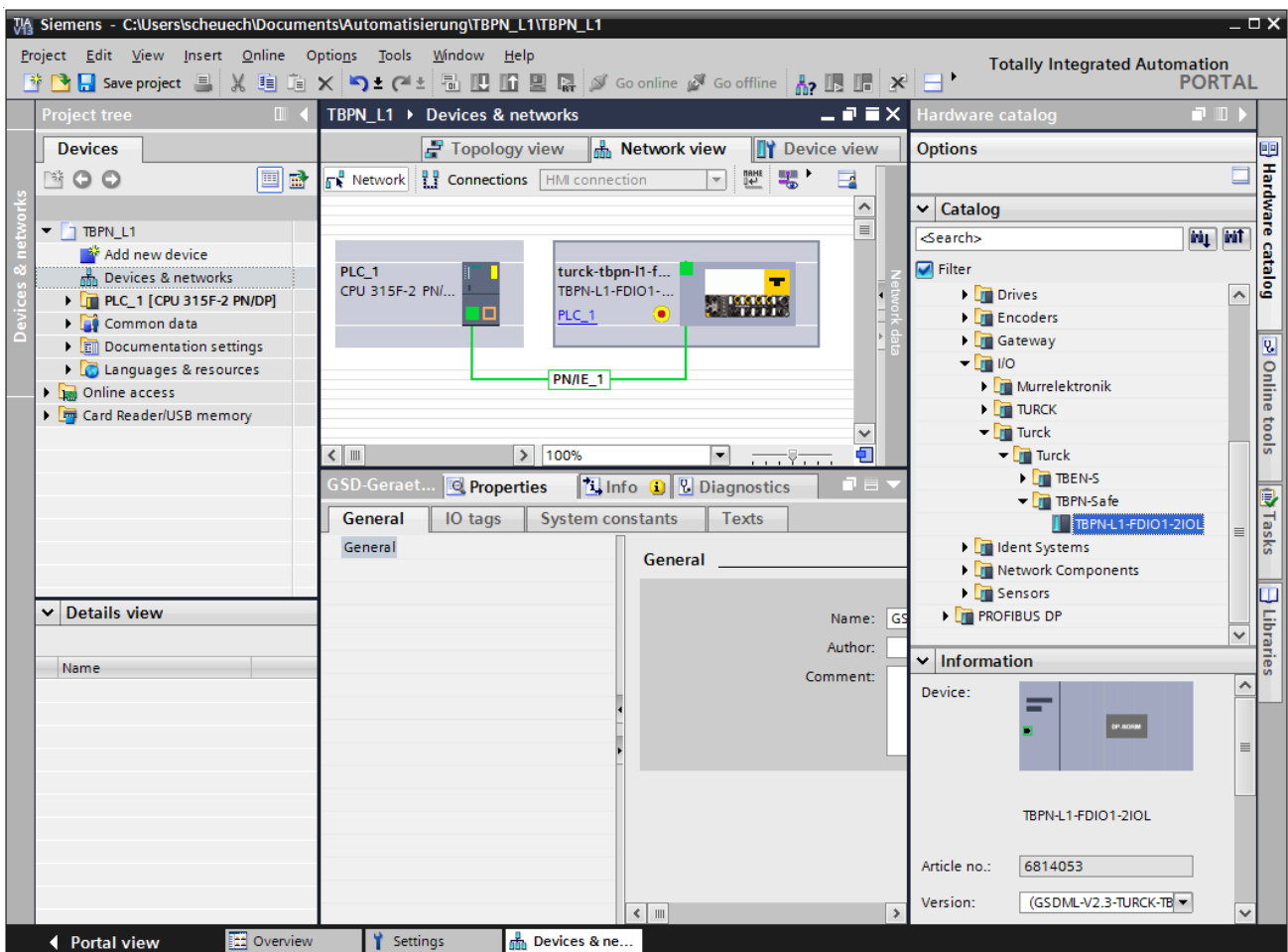


Fig. 25: Adding the TBPn-L1-FDIO1-2IOL to PROFINET

The TBPN-L1-FDIO1-2IOL appears as a modular slave with eight virtual slots.

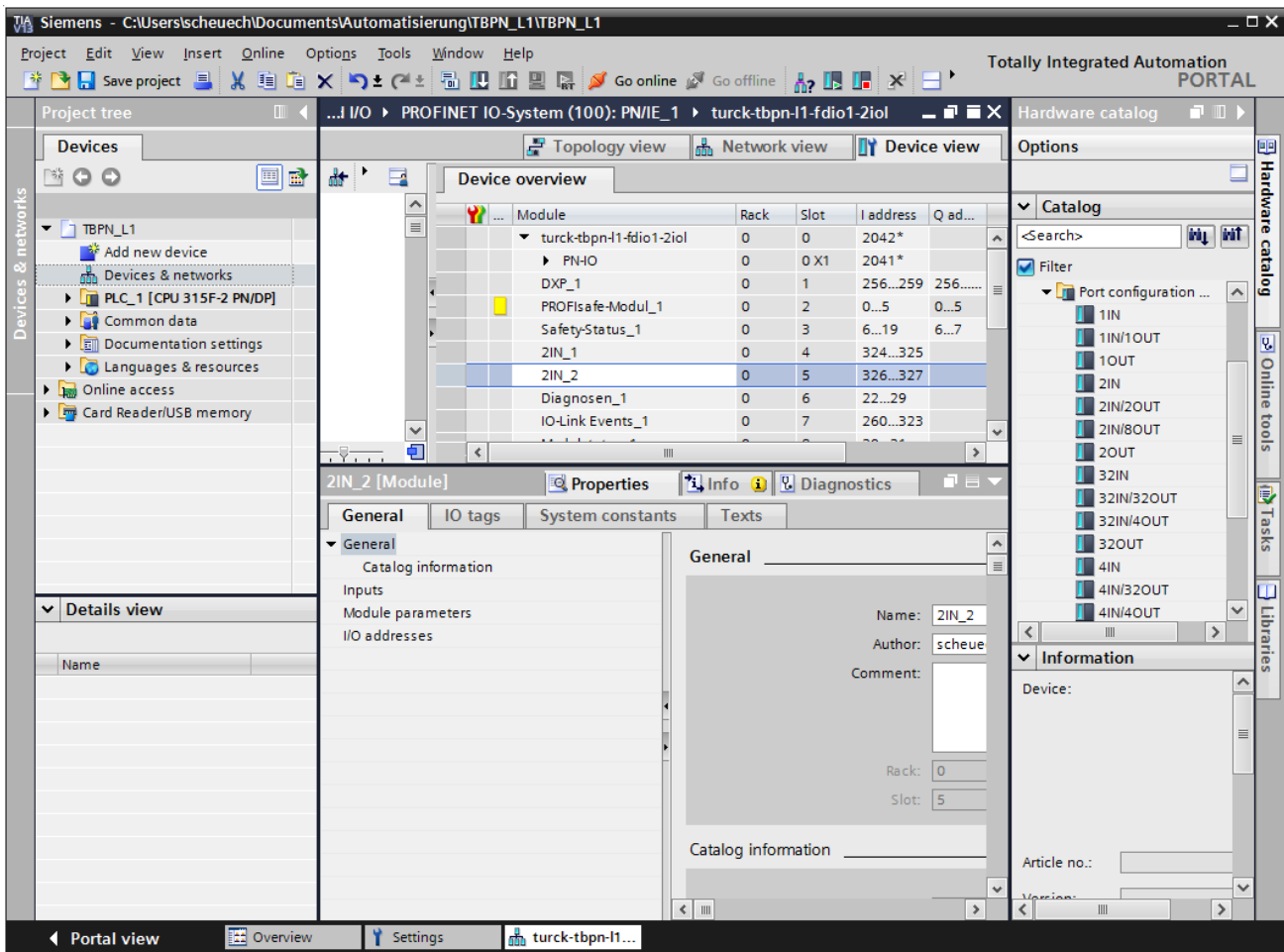


Fig. 26: Slots of the TBPN-L1-FDIO1-2IOL

The function of these slots is either defined via GSDML or can only be used for a specific purpose.

Slot	Module/name	Meaning
0	<i>turck-tbpn-l1-fdio1-2iol</i> (default name)	Main module, parameterization of parameters (deactivation of protocols, etc.) which concern the complete device.
X1	<i>PN-IO</i>	Parameterization of PROFINET functions (MRP, etc.)
X1 P1	<i>Port 1</i>	Parameterization of the Ethernet port properties (topology, connection options, etc.).
X1 P2	<i>Port 2</i>	Parameterization of the Ethernet port properties (topology, connection options, etc.).
1	DXP	DXP-channels of the device (DXP 8, 9, 10, 11, 13, 15).
2	PROFIsafe module	Process data of the safety channels
3	Safety-Status	Status information of the safety channels
4 and 5	IO-Link channels	These slots are used for configuring the 2 IO-Link ports. Assign generic port configurations the IO-Link ports. Select the entries according to the amount of process data of the connected sensor.

Slot	Module/name	Meaning
6	Diagnostics	Optional mapping of the diagnostics (IO-Link and DXP-diagnostics) into the master's process image.
7	IO-Link Events	Optional mapping of the diagnostics (IO-Link and DXP-diagnostics) into the master's process image.
8	Module status	Optional mapping of the diagnostics (IO-Link and DXP-diagnostics) into the master's process image.



NOTE

The TBPN-L1-FDIO1-2IOL offers generic port configuration. A specific port configuration with Turck IO-Link devices via device entries in the GSDML is not possible.

3.2 Setting the F_parameters

The device's F_parameters are set for slot 2 "PROFISAFE-Modul_1":

F_parameters	Meaning
F_Dest_Add	F-address of the TBPN-L1-FDIO1-2IOL
F_iPar_CRC	CRC from the plaintext log of the Turck Safety Configurator

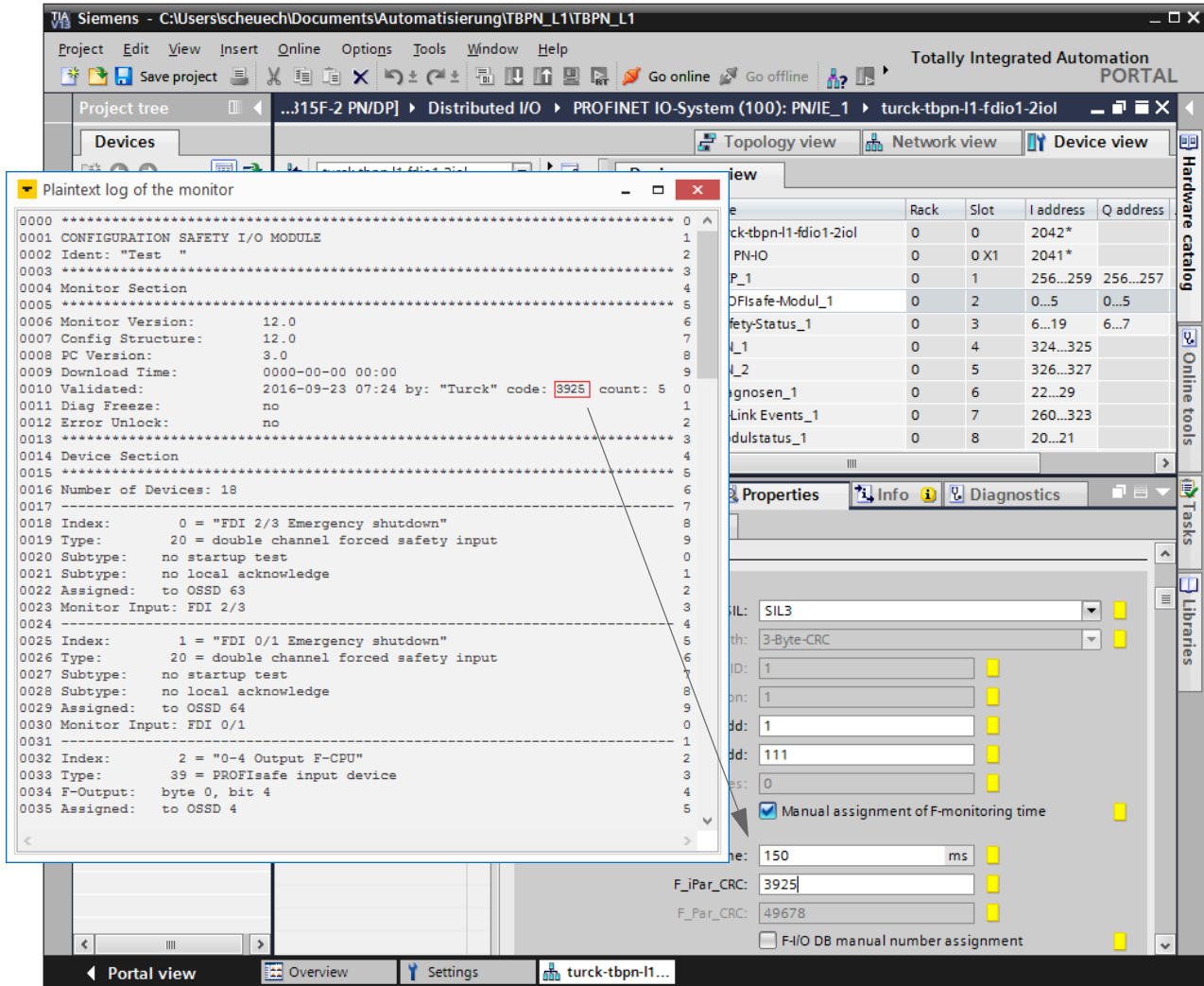


Fig. 27: F_parameters

3.2.1 Start the Turck Safety Configurator from TIA/Step 7



NOTE

Please observe during the installation of Turck Safety Configurator, that the interface for TIA-Portal/Step7 is installed with the software, see [Integration of Turck Safety Configurator in TIA/Step7](#), see [Integrate Turck Safety Configurator in TIA/Step7 \(page 3\)](#).

Open Turck Safety Configurator using the function "Start Device Tool..." in TIA-Portal.

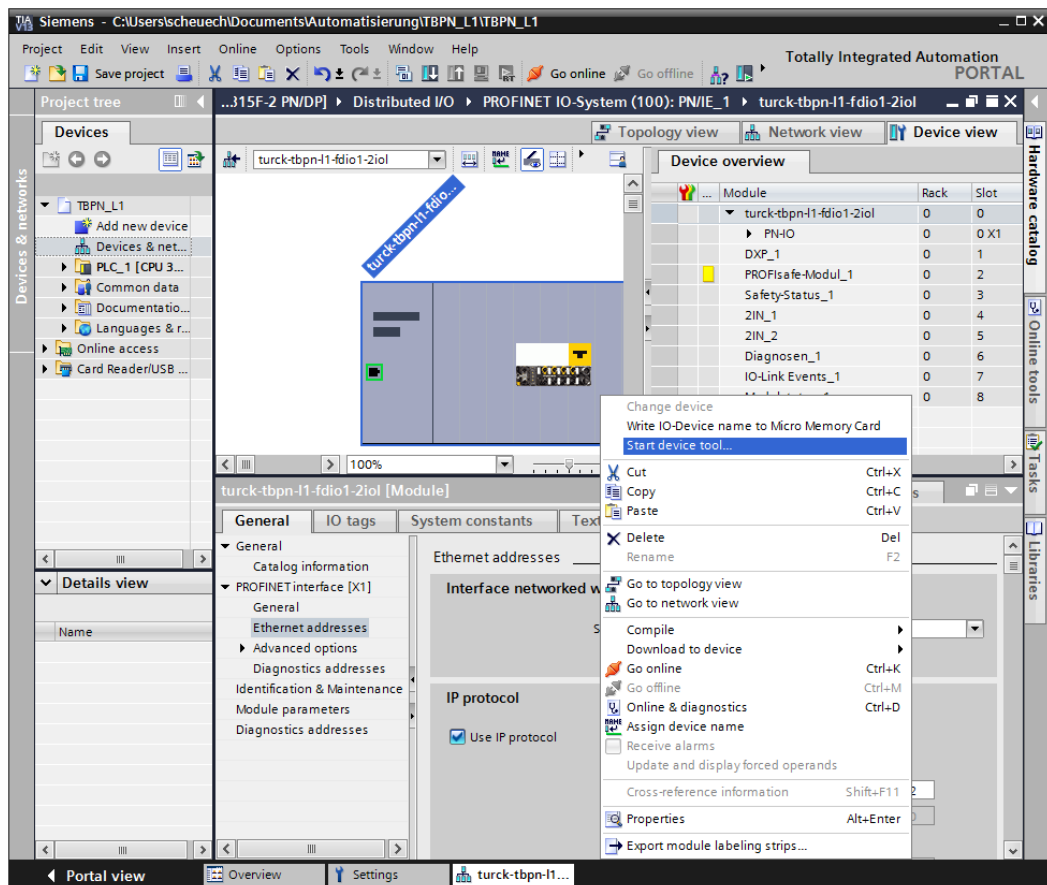


Fig. 28: Start the Turck Safety Configurator from TIA/Step7

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